Context-dependent Interpretation of the Conjunction *und* in different Age-groups

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1 Introduction

This work is concerned with the meaning and interpretation of the conjunction *und* ('and').[1] In natural language *und* seems to express more specific meaning relations than the simple coordination of two events.[2] For instance, the events in (1) and (2) seem to have occurred chronologically although no explicit time reference is given, while the relation between the events in (3) appears to be a causal one.

(1) Marc hat seine Hausaufgaben gemacht und Fußball gespielt.
'Marc did his homework and played football.'

(2) Maria hat geheiratet und ein Kind bekommen.
'Maria got married and had a child.'

(3) Der Strom fiel aus und das Licht ging aus.
'The power was cut and the light went off.'

Crucially, the conjuncts in (1), (2) and (3) are only conjoined by the conjunction *und*. No additional information is explicitly given about the relation that holds between the conjuncts in these sentences. There is also no explicit information given that indicates that the conjunction can be interpreted temporally in (1) and (2) and causally in (3). The specific meaning relations that arise in the mentioned examples are typically associated with the meaning of *und*, which is sketched out in some more detail in section 1.1 below.

As illustrated in (1) and (3) not all occurrences of the conjunction are interpreted in the same way, hence interpretation appears to be influenced by other factors. Influences of the co-text, the situation in which the utterance occurs, different kinds of knowledge as well as the speaker's and hearer's attitude (contextual factors) might contribute to the meaning of the conjunction in a sentence and are required for a more specific interpretation of the conjunction. For this reason the focus of this work is on the contribution of context to the meaning of the conjunction *und*.

One of the challenges in this regard is to arrive at a suitable definition of context. The linguistic fields of semantics and pragmatics are concerned with the meaning and use of words. There are several theories of meaning that attempt to explain how the (complete) meaning of utterances arises. As the meaning and interpretation of the conjunction appears to be influ-

[1] In this work the term 'conjunction' is used for clause linking in general, no matter whether the relation that holds between the conjoined conjuncts is coordinating (e.g. additive relations) or subordinating (e.g. causal relations).
[2] This phenomenon will be described in more detail in section 1.1 (p.5).

enced by a variety of (contextual) factors, it is clearly a phenomenon that has to be discussed at the semantics/pragmatic interface.[3]

Different interpretations concerning the conjunction *und* can either be encoded in the meaning of the conjunction itself and activated or cancelled based on contextual factors or be caused by contextual factors alone. Meaning notions that are communicated by an utterance but are not explicitly expressed or part of the literal meaning of the utterance are ascribed to the linguistic field of pragmatics. Several approaches at the semantics/pragmatics interface are concerned with whether *und* contributes to the establishment of discourse coherence via pragmatic processes or whether the conjunction has complex semantic meaning (cf. Carston, 2002a; Posner, 1979; Txurruka, 2003). The most prominent theories on the interpretation of the conjunction will be introduced and discussed in chapter 3. As the meaning and interpretation of the conjunction is a phenomenon at the semantics/pragmatics interface, the role and influence of context as well as the basic meaning of the conjunction in the individual theories is carved out to see whether one can choose between the individual theories. Moreover, it will be discussed how the theories introduced explain the additive and temporal meaning of the conjunction. The additive and temporal interpretation of the conjunction was chosen because the additive interpretation is in many theories and in analogy to the meaning of the logical operator $\wedge$ often assumed to be the basic meaning of *and* (for details see chapter 3). The temporal interpretation of the conjunction appears to be (apart from the additive meaning relation) in many instances the most preferred meaning relation expressed by the conjunction *und*. Moreover, the additive and temporal meaning relations that can be expressed by *und* are also the first ones that are used by young children (see chapter 5.3.1). As the focus of this dissertation is on the additive and temporal interpretation of the conjunction, it will not be explained what kind of other meaning notions of the conjunction can be explained with the help of the respective theory. For a more detailed analysis about how the individual theories account for other meaning relations than the temporal or additive one between the conjuncts, see Appendix B.

Currently there seem to be no experimental studies that investigate contextual influences on the interpretation of *und* in a systematic manner. The purpose of this dissertation is to investigate how different types of context influence people's interpretation of the conjunction. The questions of interest are: Why do some occurrences of the conjunction suggest a temporal interpretation? Does the temporal interpretation of the conjunction arise due to the meaning of

[3] Current theories of meaning are introduced in Appendix A. As truth-conditions and contextual influences appear to play a central role with respect to the meaning and interpretation of the conjunction, the focus of Appendix A is on how these interface-models account for contextual effects that are necessary in the interpretation process.

the conjunction, is it the default interpretation or is it triggered by contextual factors? Does context influence the interpretation of the conjunction, specifically, how do different types of context influence the interpretation of the conjunction? How does the order of events introduced in a context influence the interpretation of *und*?

To shed light on these questions, a series of three experiments that tested how the kind and nature of events presented in a context affects the temporal interpretation of the conjunction was conducted and is discussed in chapter 6.

While little is known about the interpretation of the conjunction in school-children (for details see Noveck, Chevallier, Chevaux, Musolino, & Bott, 2009; Noveck & Chevaux, 2002), there are currently no findings about how preschoolers interpret the conjunction. For this reason, this thesis systematically investigates how 5-, 7- and 9-year-old children as well as adults interpret the conjunction *und* in different contexts. Several age-groups of children were tested because the general assumption in the literature on language acquisition is that the acquisition of pragmatic knowledge, e.g. the mastery of indirect language and implicatures, is acquired slightly later than other types of linguistic knowledge (e.g. Chierchia, Guasti, Gualmini, Meroni, & Crain, 2005; Noveck, 2001). In previous work (Röhrig, 2010), I showed that children at the age of five can already calculate some types of scalar implicatures. Although these early implicatures differ qualitatively from the ones calculated by adults, these findings indicate that some pragmatic phenomena are mastered earlier than generally predicted in the literature. As the conjunction *und* is a very basic one in addition to being used frequently in everyday language, it is also important to determine whether children understand and interpret the conjunction in the same way as adults do. The questions of interest are: How do preschoolers and school-children interpret the conjunction *und*? Does context influence the interpretation of the conjunction in children? Do children interpret the conjunction differently than adults? If children interpret the conjunction in the same way as adults, it would be interesting from which age onwards they do so. If children interpret and understand the conjunction differently than adults, insights into how children interpret the conjunction and what kind of factors influence the interpretation of the conjunction are important and might in the long run be helpful when constructing target group orientated texts and instructions, e.g. in school-books.

To provide background for the research in children's comprehension of the conjunction *und*, chapter 4 summarizes and discusses the development of pragmatic skills as well as children's use of context in language production and comprehension.

Following the summary and discussion of the main findings in chapters 7, this dissertation concludes by answering the questions of interests introduced above in chapter 8 and gives an outlook and suggestions for further research in chapter 9.

1.1 The asymmetric conjunction *und*

This work is concerned with the meaning and interpretation of the word *und* (Engl. 'and') in different contexts. In the literature the terms 'conjunction' (Zifonun, Hoffmann, & Strecker, 1997, p. 2362), 'coordination' and 'connector' (Pasch, 2003, p. 9) are used to refer to the word *und*. For clarification it is shortly outlined in the following in which respect these terms differ. The term 'conjunction' refers to the word class to which *and* belongs. Generally, conjunctions serve to combine two arguments such as sentences and phrases. The conjunction *und* cannot only combine (transitive and intransitive) sentential structures but also (verb and noun) phrases as well as (transitive and intransitive) verb coordination and gapped (verb and object) coordination. This work is mainly concerned with verb phrase coordination such as in (4).

(4) The cat had some milk and chased a mouse.

In general, (the meaning of) conjunctions indicate and specify how conjoined arguments are topically related. In contrast to juxtapositions (as in (5), p. 6), which force the recipient to figure out how the uttered sentences relate to each other, conjunctions offer the recipient explicit support in understanding complex utterances and in relating arguments with each other (Ettmayer, 1927, p. 5; Redder, 2007, p. 485). However, with respect to the conjunction *und* there seems to be no commonly agreed basic meaning of the conjunction, as it can account for several meaning relations that can arise between arguments. Therefore, the meaning of the conjunction *und* is controversially discussed in the literature. I will come back to this in more detail later.

'Coordination' and 'connector' refer to the function of the word *und* on the sentence level. With respect to its function on the sentence level, *und* is considered to establish the most general functional convergence between two arguments, which means that the conjunction can conjoin arguments such as facts, actions, objects and characteristics with each other to form a category (Lang, 1977; Redder, 2007; Zifonun et al., 1997). 'Connector' simply refers to the property of the conjunction to link a sentence or proposition with the previous one. According to Redder (2007, p. 485) the conjunction *und* is considered to be quantitatively the most frequent and simplest connection in written and spoken language in German. The *Handbuch der deutschen Konnektoren* assigns the word *und* (semantically) to the class of connectors since it possesses two semantically empty categories that have to be filled by arguments. *Und* there-

fore fulfills the criteria of connectives (Pasch, 2003, p. 9).[4] 'Coordination' means that conjuncts such as sentences or parts of sentences are equally linked together. In the traditional sense *und* is a coordinating conjunction, since it conjoins two conjuncts but does not influence the syntactic structure of the conjuncts. Means of coordination are juxtapositions, such as in (5) and conjunctions, such as in (6) (Zifonun et al., 1997, p. 2362).

(5) The sun is shining. The first flowers are blooming.
(6) The sun is shining and the first flowers are blooming.

The non-symmetric relation between two conjuncts such as in (7) is called asymmetric coordination (Pasch, 2003; Schmerling, 1975). If two conjuncts can be interchanged under certain circumstances without influencing the meaning of the sentence, the coordination is called symmetric coordination (Pasch, 2003, p. 6f). An example of symmetric coordination is given in (8).

(7) Das Licht ging aus, weil der Strom ausfiel.
'The light went off because the power was cut.'

(8) Der Abendstern ist der Morgenstern und der Morgenstern ist der Abendstern.
'The evening star is the morning star and the morning star is the evening star.'

The current work is concerned with the meaning and interpretation of the conjunction *und*. The linguistic fields of semantics and pragmatics capture the meaning and interpretation of the conjunction. In the literature several factors such as contextual characteristics (e.g. how many actors are mentioned in the conjuncts conjoined by *und*) and syntactic factors (e.g. degree of syntactic connection, tense and properties of the verb) are considered to influence the interpretation of the conjunction. These factors will be shortly mentioned and discussed at the end of this section for sake of completeness but will not be considered in more detail in this dissertation. This is because this dissertation examines whether and how different types of context influence the additive and temporal interpretation of the conjunction *und*. Therefore, the focus of this work lies in the meaning and interpretation of the conjunction at the semantic/pragmatic interface.

As mentioned above, *und* is said to connect conjuncts in the most general way. In formal logic the logical operator $\wedge$ has a similar function: it connects two arguments that can be interchanged without affecting the meaning of the whole statement. The whole statement is only true, if both conjuncts are true. Therefore, Redder (2007, p. 485) suggests that assumed both

[4] The definition of the class connector given by the *Handbuch der deutschen Konnektoren* differs from the traditional sense of grammatical word classes as it is based on semantic properties of the elements rather than their syntactic function.

conjuncts are true, (natural language) *und* can be represented more easily with the help of a logical operator than other conjunctions. This suggests that in contrast to conjunctions that specify the semantic relation between conjoined conjuncts, the conjunction *und* simply expresses an additive relation between the conjuncts and that the meaning of the whole statement is not affected once the conjoined conjuncts are interchanged.[5] This seems to be the case indeed in some occurrences of *und*. As illustrated in (9) and (10), the conjunction *und* can establish an additive meaning relation between two conjuncts. In this case the conjunction expresses the same meaning as the logical operator ∧.

(9) Die Sonne scheint und die Vögel zwitschern.
'The sun is shining and the birds are chirping.'

(10) Die Vögel zwitschern und die Sonne scheint.
'The birds are chirping and the sun is shining.'

For this reason, it is often argued in the literature that the meaning of *und* is the same as the meaning of the logical operator ∧ because the conjunction can establish very general or additive relations between conjuncts. Despite all, the semantic relation between two arguments conjoined by *und* can be determined in a more specific manner in most cases. Apart from the additive relation the conjunction can establish temporal, causal, adversative, alternative, consecutive, concessive, instrumental and local meaning relations between the conjuncts, as shown in (11) to (19) below. ('/' means that the conjunction *und* can be replaced or amended by the conjunction given in brackets.)

(11) Peter hat seine Turnschuhe angezogen und ist (dann) joggen gegangen.
'Peter slipped into his sneakers and (then) went jogging.'

(12) Der Kapitän verließ das sinkende Schiff und wurde (daher) festgenommen.
'The captain left the sinking ship and was (therefore) arrested.'

(13) Die Prinzessin ist reich und (/aber) unglücklich.
'The princess is rich but unhappy.'

(14) Du kannst tun und (oder) lassen, was du willst.
'You can do as you please whatever you want.'

[5] An example that illustrates that conjunctions can express specific meaning relations between conjuncts is the conjunction *weil* ('because'), which signals that the relation between the conjuncts in the following example is a consequence-cause one: *Der Strom fiel aus, weil das Licht ausging* ('The power was cut because the light went off'). If both conjuncts were interchanged, the meaning of the whole sentence would be affected. Since lights that go off cannot cause the power to be cut, the sentence would make sense and would be truth-conditionally wrong.

(15) *Die Mannschaft gewann und wurde (folglich) Meister.*
'The team won and (consequently) became champion.'

(16) *Er liebt sie und gab ihr (trotzdem) eine Abfuhr.*
'He loves her and (nevertheless) turned her down.'

(17) *Sie sang ein Lied und beruhigte (damit/ so) das Baby.*
'She calmed down the baby (by) singing a song.'

(18) *Sie ist in Göttingen und gibt (dort) Seminare an der Universität.*
'She is in Göttingen and gives lectures at the university (there).'

(19) *Er ging spazieren und traf (dabei) einen Bekannten.*
'He went for a walk and met an acquaintance (whereupon).'

The conjunction *und* can also express so-called backward-relations between two conjuncts, such as in (20). The relation between the conjuncts is a backward relation because the event mentioned in the latter conjunct is the cause for the event mentioned in the first conjunct and hence happened earlier.

(20) *Die Pflanze ging ein und es war Maria, die (zuvor) vergessen hatte, sie zu gießen.*
'The plant died and it was Maria who had forgotten to water it.'

More meaning relations that can be expressed by the conjunction *und* such as reinforcing, conditional and restriction are reported and illustrated in Zifonun, Hoffmann & Strecker (1997). The German examples given in (21) to (23) are taken from Zifonun et. al. (1997, p. 2393ff) and translated into English.

(21) *Am deutlichsten wird die technische – und (/ja) darin übertechnische - Evolution an der Harmonik.*
'In the harmony, the technical – and (even) super-technical evolution – becomes most apparent.'

(22) *Geh nach rechts und (dann) du stehst vor dem Bahnhof!*
'Turn right and (then) you are in front of the train-station.'

(23) *Ich habe für dich gekocht, und das war's.*
'I have cooked for you and that's all.'

The semantic relations that are stated in brackets between the two conjuncts illustrated in (11) to (23) are not explicitly expressed by the conjunction *und*. In examples (11) or (12) the order in which the conjunctions are mentioned seems to be of importance because they seem to

suggest an order in which the events took place. Once these conjuncts are interchanged, the sentence sounds odd. Apparently the meaning of the sentence seems to have changed as well. It is therefore often argued that the meaning of the conjunction comprises more than the meaning of the logical operator ∧.

The (basic) meaning of the conjunction as well as pragmatic, contextual and syntactic factors that might influence the meaning and interpretation of the conjunction are discussed in the literature. According to Zifonun and colleagues (1997, p. 2393) chronological or simultaneous interpretation of the conjunction is preferred, depending on how many actors are mentioned in the statement. The authors report that the hearer assumes a sequence of events if only one actor is mentioned in a statement such as in (11). From my point of view, this expectation might be based on world knowledge (WK) and the experience that most people do not conduct more than one action at the same time, and that certain kinds of actions (e.g. like the ones in (11)) cannot be conducted simultaneously. If more than one actor is mentioned in a narrative and the context does not provide information on whether these actions take place simultaneously or chronologically, the preferred reading of the statement will be a chronological order while simultaneity will be the secondary, less preferred interpretation.

That conjuncts conjoined by *und* can express slightly different meaning notions, depending on how the hearer interprets them suggests that the hearer's knowledge can influence or is at least involved in the interpretation of the conjunction. The relation between the events mentioned in (24) can either be a temporal one (Hanna went home and then wrote her doctoral thesis) or express a specification of the location (Hanna went home and worked on her doctoral thesis there). Which interpretation is chosen is up to the hearer and his preferences, which are dependent on his knowledge and experience. If the hearer knows for example that Hanna usually writes her doctoral thesis at home and not in the office, then he will prefer the latter reading or even the reading that she went home in order to work on her dissertation.

(24) *Hanna ging nach Hause und arbeitete an ihrer Doktorarbeit.*
‚Hanna went home and worked on her doctoral thesis.'

Additionally, syntactic properties seem to have an impact on the interpretation of the conjunction *und* as well and are discussed in the following. Posner (1979) states that the extent to which the conjunction *und* is interpreted temporally is dependent on the degree to which the conjuncts are syntactically connected: „Die Intensität der Mitteilung einer Konnexitäts-Andeutung hängt also offensichtlich vom Grad der syntaktischen Verklammerung der Teilsätze ab" (Posner, 1979, p. 377). 'The intensity of the communicated connectivity-

suggestion depends apparently on the degree of the syntactic connection of the sub-clauses [My translation, SR]'. Posner (1979) fleshes out his hypothesis in more detail by stating that the degree of syntactic connection appears to be strongest in (25)a and weakest in (25)e. The examples in (25) are taken from Posner (1979, p. 377) and translated.

(25)

a. Anna hat geheiratet und ein Kind bekommen.
'Anna got married and (had) a child.'

b. Anna hat geheiratet und hat ein Kind bekommen.
'Anna got married and had a child.'

c. Anna hat geheiratet, und sie hat ein Kind bekommen.
'Anna got married and she had a child.'

d. Anna hat geheiratet, und Anna hat ein Kind bekommen.
'Anna got married and Anna had a child.'

e. Anna hat geheiratet. Und Anna hat ein Kind bekommen.
'Anna got married. And Anna had a child.'

If Posner's hypothesis that the temporal interpretation of the conjuncts increases the stronger the conjuncts conjoined by *und* are connected syntactically is right, I expect that a conjunction that expresses temporality explicitly should have an effect on the well-formedness or acceptability of the statements given in (26). Specifically the acceptability of statements in which the conjuncts are explicitly connected by *und* and a temporal marker should decrease once the syntactic connection of the conjuncts becomes looser. That Posner's hypothesis seems to be right is supported by the fact that the sentences (26)a and (26)b sound much more natural than (26)c and (26)d. This is probably the case because sentences (26)a and (26)b are syntactically less complex than sentences (26)c and (26)d but convey the same information. Statements with a less complex syntactic structure might be preferred over complex ones that convey exactly the same information because they require less processing effort.

(26)

a. Anna hat geheiratet und danach ein Kind bekommen.
'Anna got married and (had) a child afterwards.'

b. Anna hat geheiratet und hat danach ein Kind bekommen.
'Anna got married and had a child afterwards.'

c. Anna hat geheiratet, und sie hat danach ein Kind bekommen.

'Anna got married and she had a child afterwards.'

d. Anna hat geheiratet, und Anna hat danach ein Kind bekommen.
'Anna got married and Anna had a child afterwards.'

Moreover, Posner points out that the likelihood to interpret two conjuncts conjoined by *und* chronologically depends on how deeply the sentence that conjoins two conjuncts via *und* is embedded in the whole sentence:

> „Die Stärke einer Konnexitäts-Andeutung hängt außerdem auch von der Tiefe der Einbettung des betreffenden Satzes im Gesamtsatz ab. […] Auch in diesen Sätzen nimmt die Stärke der Reihenfolge-Andeutung mit dem Einbettungsgrad ab, und der Gebrauch der Satzverknüpfer »wenn« und »und« nähert sich immer mehr ihrer wahrheitsfunktionalen Bedeutung." (Posner, 1979, p. 377ff.)
>
> Further, the strength of the suggested connectivity [between the conjuncts] depends on how deeply the respective sentence is syntactically embedded in the whole sentence. […] In this sentences the strength of the implied order decreases with the degree of the syntactic embedding too, and the use of the sentence connectors 'if'' and 'and' approaches more and more their truth-conditional meaning. [My translation, SR]

In addition, Posner states that tense as well as the verb of the super-ordinate sentence influences how likely it is that the conjuncts will be interpreted in a chronological order (for details see Posner, 1979).

Finally, it is not always the case that the additional meaning relations only arise between events conjoined by *und*. In some instances these meaning relations can also be expressed by juxtaposed sentences. For illustration see example (27).

(27) Julian ging nach Hause. Er schrieb seine Magisterarbeit.
'Julian went home. He wrote his MA-thesis.'

To conclude, the meaning and interpretation of the conjunction *und* ('and') is widely discussed in the literature (e.g. Bar-Lev & Palacas, 1980b; Carston, 2002a; Cohen, 1971; Posner, 1979; Txurruka, 2003).[6] The central question is whether the meaning relations that are stated in brackets result from pragmatic processes during the interpretation of the utterance (meaning-minimalism) or whether they are part of the semantic meaning of the conjunction (meaning-maximalism). According to meaning-minimalism the interpretations in the examples above arise only because the semantic meaning of the conjunction *und* is so general. Other

[6] The meaning of the conjunction is not only discussed for the German *und* in the literature but in other languages. Lee (2002) is concerned with the meaning and interpretation of the English and Korean equivalent of the conjunction while Amfo (2007) discusses the meaning and interpretation of the conjunction in Akan.

conjunctions have a more specific semantic meaning and can therefore not be contextually enriched. Meaning-maximalists believe that the semantic meaning of *und* comprises several meaning features such as temporality or causality (e.g. Cohen, 1971).

The linguistic fields of semantics and pragmatics are concerned with the meaning of words and utterances. Currently, there seems to be no clear or commonly agreed on distinction between both fields. Therefore, the next chapter shortly sketches out current challenges at the semantic/pragmatic interface and why the interpretation of the conjunction can be considered as semantic/pragmatic interface phenomenon.

2 The conjunction *and* at the Semantic/Pragmatic Interface

Theories of meaning at the semantic/pragmatic interface are concerned with how parts of meaning that are not explicitly expressed but communicated beyond the uttered words arise (e.g. Bach, 2004; Carston, 1999; Horn, 2006; Turner, 1999).

The meaning and interpretation of the conjunction is a phenomenon that should be discussed at the semantic/pragmatic interface as it is not clear, whether meaning relations of the conjunction *und* (‘and’) beyond the meaning of its logical counterpart ∧ are part of the conjunction’s semantic or pragmatic meaning (e.g. Bar-Lev & Palacas, 1980b; Carston, 2002a; Cohen, 1971; Posner, 1979; Txurruka, 2003).[7] Another reason to consider the meaning and interpretation of the conjunction *and* as semantic/pragmatic interface phenomenon is, that there is also no agreement about how the more specific meaning of the conjunction arises as well as which role truth-conditions and contextual factors play with respect to the meaning of *and*.

Several suggestions to distinguish between semantic and pragmatic influences on utterance meaning have been suggested in the literature. Specific interface theories that try to explain not explicitly mentioned aspects of utterance meaning are introduced and discussed with respect to the role of semantic meaning, truth-conditions and context in Appendix A.

As show in Appendix A.4 the individual theories of meaning have different criteria to distinguish between semantics and pragmatics. If one attempts to test and modify or reject specific theories based on the experimental data about semantic/pragmatic interface phenomena, one faces the problem that the individual theories are not directly comparable as not all of these approaches use the terms ‘utterance meaning’, ‘what is said’, 'truth-conditions' and ‘context’ in the same way (for details see Appendix A.4).

Contextual influences on the interpretation of the conjunction are investigated experimentally in a systematic manner in this work. However, there is as Finkbeiner, Meibauer and Schumacher (2012) point out, currently no clear definition of context. I will therefore shortly sketch out, how I use the term context in the following.

In general, I distinguish between narrow context and broad context (for details see Appendix A.5). The type of context that is relevant and manipulated in the experiments of this work is broad context and comprises all kinds of information and knowledge the interlocutors have,

[7] The theories of meaning as well as the approaches to the meaning of the conjunction *und* (‘and’) introduced and discussed in the following chapter and the appendix, are not only applicable to the meaning of the German conjunction *und*, but also apply to the meaning of the logical conjunction in other language, e.g. the English conjunction *and* or the French conjunction *et*. Therefore, I will from now on use *and* when referring to the logical conjunction in general.

such as common knowledge, world knowledge, situational knowledge, information previously mentioned, co-text as well as genre, register, scripts, associations, assumptions and expectations, including the list of context attributes pointed out by Schumacher (2012). From my point of view these contextual characteristics trigger and contribute to pragmatic processes by awakening associations and influencing expectations. The types of context manipulated in the experiments of the current work, are influenced by the hearer's knowledge, associations and expectations about specific situations.

3 Approaches to the meaning of *und* ('and')

It is widely discussed in the literature whether the many possible interpretations that can arise between two conjuncts conjoined by *and* result from pragmatic processes or whether they are part of the semantic meaning of the conjunction. Posner (1979) was concerned with the question how much content of an utterance is created by the lexical meaning of a term and how much by its specific use. In the course of this discussion, he distinguishes between meaning-maximalist approaches and meaning-minimalist approaches. While semantic approaches like the one defended by meaning-maximalists argue that the meaning of the conjunction *and*, is richer than the one of the logical operator (e.g. Bar-Lev & Palacas, 1980a; Cohen, 1971), meaning-minimalists suggest pragmatic approaches and believe that the conjunction *and* has only truth-functional characteristics (e.g. Grice, 1975; Posner, 1979). Moreover, there are a number of accounts to the meaning of the conjunction *and*, which approach the meaning of the conjunction *and* from a discourse theoretic point of view. In discourse theoretic approaches the conjunction *and* expresses a discourse relation between conjuncts which is strongly context-dependent. The meaning of the conjunction and the discourse relation it expresses in a context are the product of inferences the hearer draws based on the fact that certain conjuncts are conjoined. Discourse theoretic approaches are not based on the traditional semantic/pragmatic distinction or one of the models that are related to this traditional division of semantics and pragmatics as introduced in A.3.1 to A.3.5.

It is not the purpose of this thesis to dissolve the dispute between meaning-minimalists and meaning-maximalists for two reasons. First of all the meaning of words and lexical entries are men-made in the way that words were assigned to meanings and differ from language to language.[8] Secondly, it can only be studied how people understand and interpret the conjunction. With the help of studies that investigate the comprehension of the conjunction by means of on-line-methods, conclusions about how the conjunction is processed and what the basic meaning of the conjunction is might be drawn indirectly. If longer reaction times e.g. for a temporal reading of the conjunction compared to an additive reading of the same conjunction would be found, this could indicate that certain additional processes like enrichment take place to derive the temporal reading. This again would allow the inference that the basic meaning of the conjunction does not include temporal meaning-components.

What can also be investigated by means of off-line studies is how people interpret and comprehend the conjunction *and* and what kinds of factors have an impact on the interpretation of

[8] Chinese has for example more than one word for the conjunction *and*. Which *and* is used depends e.g. on the word class of the conjoined conjuncts.

the conjunction. The purpose of this thesis is to investigate the influence of contextual factors on the interpretation of the conjunction. Before a series of experiments is introduced in chapter 6, approaches that attempt to explain the meaning of the conjunction *and* will be introduced in this chapter. The theories are categorized in whether they consider the influence of contextual factors or not.

Grice's theory of conversational implicatures can also be used to explain the different kind of meaning relations that may arise in connection with the conjunction *and* but can as a whole not be assigned clearly the categories of context-dependent or context-independent approaches. In Logic and Conversation, Grice (1975) distinguishes between particularized and generalized conversational implicatures. The former ones are calculated because a certain utterance was uttered in a particular situation, while the latter ones generally convey this type of implicatures and are not context-dependent.

> "[…] particularized conversational implicature – that is to say, cases in which an implicature is carried by saying that *p* on a particular occasion in virtue of special features of the context, cases in which there is no room for the the [sic!] idea that an implicature of this sort is normally carried by saying that *p*. But there are cases of generalized conversational implicature. Sometimes one can say that the use of a certain form of words in an utterance would normally (in the absence of special circumstances) carry such-and-such an implicature or type of implicature." (Grice, 1989b, p. 37)

Whether Grice's approach to the meaning of the conjunction *and* is influenced by contextual factors depends on whether one considers the implicatures related to the conjunction *and* as generalized or particularized conversational implicature. Therefore, the meaning and interpretation of *and* can within Grice' approach be explained with and without contextual influences, depending on whether it is considered to be a particularized or generalized conversational implicature. For this reason Grice's theory of conversational implicature will be discussed separately in section 3.1.

This chapter introduces and discussed theories that attempt to explain meaning relations that arise with respect to the interpretation of the conjunction *and*. The central question is on whether and if so how the individual theories treat contextual influences on the interpretation. As the current thesis and the experiments conducted in chapter 6 focus on the additive and temporal interpretation of the conjunction *und* in different types of contexts, it will also be discussed what the individual theories consider as the basic meaning of *and* as well as how they explain additive and temporal interpretations of the conjunction. As the approaches discussed in this chapter considers contextual influences to different extents, chapter 3.4 com-

pares approaches with similar departures and considers how they handle contextual influences. Although a variety of other meaning relations can arise with respect to *and* (see chapter 1.1), it will at this point not be considered how adversative, causal and other meaning relations between conjuncts conjoined by *and* arise and how the interpretation of sentences conjoined by *and* differs from the one of juxtaposed sentences. As these issues are not central to this work, they are summarized at the end of this chapter in form of a concise overview. (For a more detailed discussion of what kind of meaning relations the individual theories can explain see Appendix B.)

3.1 Grice and Neo-Gricean approaches

In his *Logic and Conversation* Grice addresses the differences in meaning between natural language expressions and their logical counterparts, which has the consequence that some utterances in natural language cannot be assigned definite truth values (Grice, 1975, p. 41). Therefore, Grice points out that the Cooperative Principle and the Conversational Maxims govern conversation and introduces his theory of conversational implicatures. Grice is a defender of the pragmatic account. On the level of 'what is said' he considers the meaning of the conjunction *and* as truth-functional and equal to the logical operator. All additional meaning aspects in connection to the conjunction are part of 'what is implicated'. These conversational implicatures arise due to pragmatic processes that are triggered by the Cooperative Principle, the Conversational Maxims and rationality.

Grice (1975) distinguishes between generalized and particularized conversational implicatures but does not explicitly point out, whether he considers interpretations of the conjunction *and* that differ from the meaning of the logical operator as generalized or particularized conversational implicatures.

The main characteristics of particularized and generalized conversational implicatures will be described in the following. In conversational exchange the hearer usually relies on the assumption that the speaker sticks to the Cooperative Principle (CP) and the Conversational Maxims. Hence it is due to the fourth Maxim of Manner ("Be orderly." (Grice, 1989a, p. 46)) assumed that the speaker describes events in the same order in which they occurred, unless he indicates that this is not the case. Particular Conversational Implicatures arise if the speaker fails to fulfill one of the maxims but the hearer assumes that the speaker obeys the maxims. Grice explains four different types of how maxims might be flouted:

> "He [the speaker] may quietly and unostentatiously VIOLATE a maxim […], […] OPT OUT from the operation both of the maxim and of the CP […], […] be faced by a CLASH […] [or] […] FLOUT a maxim; that is, he may BLATANTLY fail to fulfill it." (Grice, 1975, p. 49)

The important point is that particularized conversational implicatures can always be worked out under consideration of the (conventional) meaning of the words, the CP and the Conversational Maxims, contextual factors (including linguistic context), background knowledge and the assumption that both hearer and speaker have access to or rely on the mentioned factors (Grice, 1975, p. 50). Further, Grice introduces three groups or situations in which particularized conversational implicatures can arise:

> "GROUP A: Example in which no maxim is violated, or at least in which it is not clear that any maxim is violated. […] GROUP B: An example in which a maxim is violated, but its violation is to be explained by the supposition of a clash with another maxim. […] GROUP C: Example that involve exploitation, that is, a procedure by which a maxim is flouted for the purpose of getting in a conversational implicature by means of something of the nature of a figure of speech" (Grice, 1975, p. 51f.)

The main characteristics of generalized conversational implicatures are that they do not require a specific context or scenario. Moreover, they arise based on the assumption that at least the Cooperative Principle and the way how things are said is obeyed. Further, the inferences are attached to the semantic content of 'what is said' and not based on the linguistic form (non-detachability), except when the implicature is related to one of the sub-maxims of Manner (Grice, 1975, p. 57f.).

Grice only pointed out that he considers interpretations beyond the logical meaning of *and* as implicatures, but did not specify whether he considers them as particularized or generalized conversational implicatures. Therefore, I will discuss both options in the following, starting with particularized conversational implicatures.

3.1.1 Particularized Conversational Implicatures

Since the conventional meaning of the conjunction *and* is considered the same as the meaning of the logical operator, additive relations between two conjuncts can be explained by the basic meaning of *and*. Other meaning relations between the conjuncts such as temporal, causal or adversative relations have to be explained and worked out as implicatures (see Appendix B.1). Since the fourth Sub-maxim of Manner refers to the order of how things are narrated, it seems likely to explain apparent temporal relations between conjuncts as implicature. Forward temporal relations such as in (28), (29) and (30) could be categorized under PCIs of group A,

namely no maxim is violated or not clearly violated, the temporal reading arises because the hearer assumes that the speaker obeys all of the maxims. The strength of the temporal reading that arises in (28), (29) and (30) varies. In example (29) the suggested temporal reading is much weaker than the one in (30). This might be related to the kind of events mentioned in the statements and the hearer's knowledge about whether the mentioned events typically occur in a certain order or not.

(28) *Mary got married and had a child.*
(29) *The children played hide-and-seek and sang.*
(30) *Klaus brushed his teeth and went to bed.*

If the order of the events is inverted, however as in examples (31) to (33), then the speaker would probably still assume that example (32) falls under the category A situation (no maxim is violated, or not clearly violated).

(31) *Marry had a child and got married.*
(32) *The children sang and played hide and seek.*
(33) *Klaus went to bed and brushed his teeth.*

Example (33) is outstanding and appears to violate the Maxim of Manner because both events do normally or typically happen the other way round. Therefore a forward temporal interpretation of that statement seems odd. Based on world and common knowledge the hearer can however recognize that the Maxim of Order is most likely violated. Wider context as well as linguistic context such as intonation help him to decide whether the speaker violated the Maxim of Manner, e.g., because of a clash of maxims or whether the events really happened in reversed order. This kind of implicature would fall under group B, namely indicated or suspected clash of maxims. In example (31) it is even more difficult to decide whether the events occurred in the order mentioned or in reversed order because both sequences are possible. Depending on the social background of the speaker and hearer the order in which the events took place is of importance because an reversed order could imply that Mary had to get married because she was pregnant. In some social groups it is especially relevant with respect to traditional social norms to get married before a child is born.

If the temporal reading in the examples mentioned is considered as particularized conversational implicature, then it has to be proved that the additional meaning arises due to special contextual features. The consequence of this approach would be that one has to explain each case in which an implicature arises to specify why and what kind of special features the respective context possesses to trigger that implicature. In examples (31) and (33) one could argue that the events follow a script, conventional order or social norms that are part of the hearer's world, social or common knowledge. As these scripts are clearly violated, example

(33) suggests a stronger violation of the Maxim of Order than example (31) as there is no rule or law that says that marriage has to take place before pregnancy. Example (32) could also be interpreted as happening simultaneously. This makes it even more difficult to define what kind of special contextual features influence the interpretation and what kind of factors cancel a temporal interpretation to invite a simultaneous one. Hence the distinction between temporal and simultaneous interpretations appears to be challenging for this account.

3.1.2 Generalized Conversational Implicatures

If one considers the temporal reading of the conjunction *and* as generalized conversational implicature, it follows that the temporal implicature is connected to the meaning of the conjunction and arises independently of contextual influences. This would imply that statements that present events in reversed order should always sound odd, no matter whether events that do typically not occur in a certain order or events that typically occur in a certain order are conjoined. Still, the temporal implicature can be cancelled either by an additional clause as in (34) or if the context indicates that the speaker cancels the implicature as in (35) (Grice, 1975, p. 57f.).

(34) *Steffi baked a cake and prepared dinner. But not in that order.*
(35) *Did Max smash the window? Well the ball hit the window and Max kicked it.*

Another possibility to explain temporal and other meaning relations that arise in connection with the conjunction *und* would be by means of scalar implicatures. Therefore, it has to be assumed that *and* is either ambiguous (Cohen, 1971) or has several lexical entries (Buscha, 1989). If the meaning relations that arise between conjuncts conjoined by *and* are considered as generalized conversational implicatures of the type that *and* has several lexical entries, then each entry should have its own scale. Consequently, the conjunction *and* would be a scalar expression and the variety of different interpretations could be explained with the help of several kind of scales, such as *<and then, and>*, *<and because, and>*, *<and with this, and>*, *<and yet, and>* (for similar (Neo-Gricean) approaches see Atlas & Levinson, 1981; Levinson, 1987). However, this approach does not work without contextual influences: To distinguish between the different kinds of possible scales and implicated meaning-relations, it has to be defined for each scale what kind of situation is considered as "normal" to trigger this kind of implicature or what kind of situation is considered as "absence of special circumstances" (Grice, 1989b, p. 37) for each kind of scale and possible implicature, respectively. Moreover, it has to be defined whether the conjunction is ambiguous or polysemous in the way that each lexical entry possesses its own scale or whether *and* has just one lexical entry that can access a variety of different scales. Therefore, this account is not very economical.

A variety of Neo-Gricean theories discuss the apparent meaning differences between *and* in logical and natural language. These approaches also consider the meaning of *and* as truth-conditionally identical with the logical operator and consider temporal and other interpretations as pragmatically inferred (e.g. Atlas & Levinson, 1981; Gazdar, 1979b; Horn, 1992; Levinson, 1987, 2000; Meibauer, 1997; Posner, 1979). Some of these approaches try to explain the temporal reading that arises between the conjuncts with the help of a principle of iconicity, such as the fourth Sub-maxim of Manner or a similar maxim or heuristics (Dowty, 1986; Levinson, 2000; Meibauer, 1997).[9]

Meibauer (1997) refers to Cohen (1971) as well as Levinson (1983) and argues against the Gricean approach because sentences such as (36) suggest that the order of the conjuncts has an impact on the truth-conditions of the sentence. Rolf (1997) comes up with a similar example and explains that the conjunction has to be interpreted temporally in these kind of examples because of the second Sub-maxim of Quantity.

(36) *It is not true, that Ramona got married and pregnant; she got pregnant and got married.*

In statement (36), the implicature that arises due to contextual factors in the first part of the sentence, is cancelled by an additional clause. From my point of view, the temporal implicature in the first part of the sentence arises due to contextual factors and expectations and is cancelled in the second part of the sentence by the second Sub-maxim of Quantity and contextual factors in the wide sense, specifically syntactic factors (cf. Gazdar, 1979a; Stalnaker, 1968, 1975).

3.2 Approaches that do not assume the influence of contextual factors

This chapter introduces and discusses an approach that tries to account for the temporal meaning (and other meaning relations) that can arise between two conjuncts conjoined by *and*. The Semantic Command approach suggested by Bar-Lev and Palacas (1980b) assumes that the meaning of the conjunction is richer than the one of the logical operator.

3.2.1 The Semantic Command Approach

Bar-Lev and Palacas (1980b) claim that the meaning of *and* is not the same as the meaning of the logical connector $\wedge$ and that the meaning of *and* comprises more than being equal to null. From their point of view, the meaning of the conjunction comprises also the feature ‘semantic command’, which is responsible for the temporal or chronological interpretation of conjuncts

[9] This results from the attempt of Neo-Gricean linguists, such as Gazdar, Horn and Levinson, to improve and develop the Gricean maxims further by reducing or simplifying them.

conjoined by *and*. Semantic command states: "The second conjunct (S'') is *not prior to* the first (S') (chronologically or causally)" (Bar-Lev & Palacas, 1980a, p. 141). Despite the fact that the meaning of *and* includes semantic command in the approach, the simple coordination function of *and* can be maintained in this approach. This is because semantic command does not state that *and* always has to be interpreted as forward temporal relation. It is simply claimed that the latter mentioned conjunct is "not prior" to the first conjunct. This implies that there could also be no relation between the conjuncts (which would be equal to an additive interpretation of the conjunction) or that the relation between the conjuncts might be co-occurrence.

The authors advocate a meaning-maximalist picture by arguing that the meaning features of *and*, characterized by semantic command, are similar to the syntactic features of syntactic command.

> "We can appropriately call this notion 'semantic command' because of the parallel with the well-known concept of syntactic command […]. We find it completely natural for the closest analogy to the discovered meaning of 'and' to be found in syntax, rather than in somewhat extra-linguistic structuring like discourse or reference." (Bar-Lev & Palacas, 1980b, p. 141)

Moreover, the authors argue that their definition of the meaning of *and* does not only account for the simple coordination function but also for a variety of causal and temporal relationships between conjuncts. The authors however restrict these relationships to causal or temporal directional relationships by stating that *and* is "in nontemporal, noncausal cases […] inadmissible in relationships heading in either direction, forward or backward" (Bar-Lev & Palacas, 1980b, p. 144) and "mutually exclusive with other conjoining relationships, including exemplification, conclusivity, and explanation" (Bar-Lev & Palacas, 1980b, p. 140). This claim is supported and illustrated with examples (37) to (39), which are taken from Bar-Lev and Palacas (1980b, p. 144).

(37) *(16) There are his footprints;*
(a) he's been here recently.
*(b) *and he's been here recently.*

(38) *(5a) Max didn't go to school; he got sick.*
(c) (5b) ≠ Max didn't go to school, and he got sick.

(39) *(6a) Max fell asleep; he was tired.*
(6b) ≠ Max fell asleep, and he was tired.

The advantage of 'semantic command' is that it accounts for utterances in which *and* expresses a forward meaning relation, which is either temporal such as in (40), or expresses a cause – consequence relation such as given in (41).

(40) *Hans went to bed and fell asleep.*
(41) *It is raining and the picnic is cancelled.*

Criticism on the semantic command account was put forward by Carston (2002a) because semantic command does not specify how many meaning features the conjunction *and* has:

> "[…] it is not clear what the intended semantics of 'and' is, whether it has, say, three features, one specifiying the truth of the first conjunct, another specifiying the truth of the second conjunct, and the third stipulating the semantic command relation between the two, or whether it just has the semantic command feature with the truth features somehow derived from or implicit in it." (Carston, 2002a, p. 232)

3.3 Approaches that assume the influence of contextual factors

There is a great variety of approaches that point out that the meaning and interpretation of the conjunction *and* is affected by contextual factors. Some of these theories and explanations are meaning-maximalist approaches (e.g. Buscha, 1989; Cohen, 1971) others are meaning-minimalist approaches (e.g. Kitis, 1987, 2000a; Sweetser, 1986, 1990; Txurruka, 2003).[10] Apart from that there are theories that explain the meaning and interpretation of the conjunction from a discourse theoretic point of view (e.g. Lascarides & Asher, 1993; Schiffrin, 1986; Txurruka, 2003). These context-oriented approaches will be summarized and discussed in the following sections.

3.3.1 Cohen's Semantical Hypothesis

One particular pragmatic approach to the meaning of logical particles such as the conjunction *and*, was put forward by Cohen (1971). This approach centers around the Semantical Hypothesis and assumes that the conjunction *and* comprises several additional meaning features which are not part of the meaning of the logical operator $\wedge$. The author suggests that these additional meaning features could be noted down in a dictionary (Cohen, 1971, p. 55).[11] Cohen's proposal is situated within Grice's principle of the modified Occam's Razor which states that "Senses are not to be multiplied beyond necessity" (Grice, 1989a, p. 47) and consequently assigns only one dictionary entry to *and*. Carston (2002a) argues that Grice's modi-

[10] Strawson (1952) also suggested an ambiguity account of the conjunction but it is not clear whether he refers to semantic or pragmatic ambiguity (Carston, 2002a).
[11] There are other approaches that also assume a rich meaning of *and*. Some of them assume several lexical entries for *and* (Buscha, 1989, p. 120f.). The dictionary entry suggested by Cohen is richer than the one suggested by defenders of the Conversational Hypothesis, such as Grice.

fied Occam's Razor could be further modified as: "Semantic features are not to be multiplied beyond necessity" (Carston, 2002a, p. 229). Therefore, she criticizes Cohen's account by pointing out that it multiplies meaning features which is not compatible with this principle. From my point of view, the violation of the modified Occam's Razor can be judged from different point of views, depending on what is considered (amount of dictionary entries vs. meaning features within a single dictionary entry). Although the Semantical Hypothesis violates this principle at a lower level as it multiplies the semantic features of *and* within this single dictionary entry (cf. Carston, 2002a), it obeys the Modified Occam's Razor on a higher level because it only suggests one dictionary entry for the conjunction.

According to Cohen's Semantical Hypothesis, meaning features of *and* are, depending on the context, cancelled "in the process of composing the meaning of a compound sentence out of the meanings of its constituent words and clauses" (Cohen, 1971, p. 56). The cancellation of certain meaning features is considered as a pragmatic process as it is influenced by contextual factors. Consequently, Cohen considers the conjunction *and* as richer than a mere "clause-concatenating particle" because from his point of view it does not only express that two truths are conjoined but also that there exists a relation between them:

> "[…] it also indicates that the second truth to be mentioned is a further item of the same kind, or in the same sequence, or of a kind belonging to the same set of commonly associated kinds of item, or etc. etc. [sic!], as the first truth to be mentioned." (Cohen, 1971, p. 55)

Due to this, Cohen's approach can account for forward temporal meaning relations, such as in (42), as well as additive meaning relations, such as in (43), and a variety of other meaning relations between two conjuncts conjoined by *and* because these meaning features are included in the semantic meaning of the conjunction.

(42) *Peter got home from work and had a rest.*
(43) *Paul went shopping and washed the dishes.*

According to the Semantical Hypothesis, *and* is not considered to be truth-functional (Cohen, 1971, p. 58) and Cohen argues that the non-truth functional property of *and* is the reason for why statement (44) could be true while (45) could be false at the same time. This is because the conjuncts conjoined by *and* in (44) and (45) seem to express a temporal sequence or a cause-consequence relation. If the mentioned examples are interpreted temporally and it is the case that Tom will only be content if the king died of a heart attack before a republic was declared, then statement (44) would be true while statement (45), which contains exactly the same conjuncts but in a different order, would be false. The truth-conditions however predict that the order of the conjuncts conjoined by *and* can be changed without having an effect on

the meaning of the whole sentence. Example (44) is taken and example (45) adapted from Bar-Lev and Palacas (1980b, p. 142).

(44) *If the old king has died of a heart attack and a republic has been formed, then Tom will be quite content.*

(45) *If a republic has been declared and the old king has died of a heart attack, then Tom will be quite content.*

Gerald Gazdar (1979a) criticizes that Cohen used these kind of examples to argue that the conjunction *and* is non-truth-functional. He refers to Stalnaker (1968, 1975) and explains that these differences in meaning do not arise due to the semantic meaning of the conjunction but due to the fact that conditionals have a context-sensitive semantics (Gazdar, 1979a, p. 70).[12]

From my point of view, the Semantical Hypothesis has to be fleshed out in some more detail with respect to contextual factors and the function of context. This account states that meaning relations are cancelled in context, but it does not point out what kind of context or what kind of properties a context has to have to cancel (the irrelevant) meaning features of the conjunction. Specifically it does not explain how certain meaning features are eliminated. Therefore, it is possible that two people who are confronted with the same statement interpret the conjunction *and* differently because each of them cancels different meaning features depending on his or her world knowledge. Thus statement (46) would be ambiguous in the way that it could either express a chronological order or specify the kind of homework Marc had to do.[13] For the latter kind of reading the world knowledge that teachers at music schools give their students homework as well.

(46) *Marc did his homework and practiced playing Rutter's 'Look at the World' on the piano.*

Carston (2002a, p. 229) criticizes Cohen's account for the same reasons and concludes that "the idea of a single rich sense for *and* cannot be maintained" because certain temporal features, e.g. chronological order and simultaneity would contradict each other and because the account does not explain how individual semantic features are cancelled.

A benefit of the Semantical Hypothesis (e.g. over the Semantic Command approach) is that it indirectly defines the conjunction *and* as context-depending variable because it explicitly

[12] According to Gazdar truth-conditions are assigned to conditionals as follows: "First the antecedent is added to the context and only those changes made to the latter that are necessary for maintaining consistency. Then, if the consequent is entailed by this augmented and modified context, the conditional is true. If it is not entailed, the conditional is false" (Gazdar, 1979a, p. 70). Based on this, Gazdar (1979a) explains that (44) and (45) have different truth-conditions because both of the conditionals are uttered in different contexts and that it is the context which modifies the truth-conditions of the utterance.

[13] An alternative way to account for the ambiguous meaning of this example, without multiplying the lexical entries of the conjunction *and* would be an account which considers the conjunction as polysemous (e.g. Buscha, 1989).

states that meaning relations that are not expressed by the conjunction in a specific sentence are contextually cancelled by a pragmatic process. Hence this theory allows pragmatic influences on the interpretation of the conjunction.

3.3.2 Buscha's ambiguity account

Buscha (1989) considers the German conjunction *und* ('and') as ambiguous and lists all relations between two conjuncts that exist apart from the truth-functional definition of the conjunction, such as causality, simultaneity and chronological order. Buscha (1989) classifies *and* as copulative conjunction which expresses that both conjuncts apply at the same time and adds that conjuncts conjoined by *and* can also be interpreted temporally, adversative or other, depending on the relation that holds between the conjuncts (Buscha, 1989, p. 120).

According to Buscha (1989), the conjunction has several lexemes and the lexeme that is picked out of the variety of lexemes offered for the conjunction *and* depends on the knowledge about the relation that holds between the conjuncts. This implies that the additive, forward temporal and other interpretations of the conjunction are context-dependent and may at the same time vary from hearer to hearer, depending on his or her (world) knowledge about possible relations between the conjuncts.

Although (world) knowledge and the kind of relation between the conjuncts is important for the interpretation process, Buscha (1989) does just like Cohen (1971) not carve out what kind of properties a context has to have in order to trigger a specific interpretation of the conjunction. The author does not specify in detail what kind of processes define the meaning of the conjunction in a context and what happens if more than one relation exists or could potentially exist between the conjuncts. It is not clear, whether the described context-dependent process takes place at the semantic or pragmatic level of meaning nor whether this process is mandatory or optional, a top-down or bottom-up process.

3.3.3 Relevance Theory

An approach that looks at the meaning and interpretation of the conjunction *and* from a cognitive perspective is the relevance theoretic approach. This approach is put forward and supported by researchers such as Carston, Blakemore, Sperber and Wilson (see Blakemore & Carston, 1999, 2005; Carston, 1993, 2002a; Wilson & Sperber, 1998). Central to this approach is the framework of Relevance Theory, which assumes that sentence meaning is underdetermined. This theory is hearer-centered and considers influences of Theory of Mind on sentence meaning as well as linguistic and contextual information for sentence processing. The basic assumptions of Relevance Theory are two principles of relevance, namely the Cog-

nitive Principle and the Communicative Principle. These principles are generalizations about human behavior and assume informative intention on the part of the speaker (for details see Sperber & Wilson, 1995; Wilson & Sperber, 2002). The definition of relevance which underlies this theory is defined by the relation of contextual effects and processing efforts (for details see Wilson & Sperber, 1992, p. 67). Processing effort according to Sperber and Wilson depends on two factors:

> „The processing effort required to understand an utterance depends on two main factors: first, the effort of memory and imagination needed to construct a suitable context; second, the linguistic and psychological complexity of the utterance itself.“ (Wilson & Sperber, 1998, p. 286)

Contextual influences seem to be an intrinsic property of Relevance Theory because cognitive effects are triggered when a relevant input (which does not necessarily have to be an utterance but could also be a sound or memory) connects with background information in a specific context. This process involves existing and/or new assumptions on the part of the speaker. Context appears to be essential for Relevance Theory because contextual implications (an important kind of cognitive effects) require both, context and input. Wilson and Sperber (2002) do not specify what exactly makes up a context but point out that a context is not always given but has to be pragmatically inferred on some occasions. However, the example mentioned by Sperber and Wilson (2002, p. 251) implies that their notion of context includes hearer's knowledge:

> "For example, on seeing my train arriving, I might look at my watch, access my knowledge of the train timetable, and derive the contextual implication that my train is late (which may itself achieve relevance by combining with further contextual assumptions to yield further implications)." (Wilson & Sperber, 2002, p. 251)

With respect to the interpretation of the conjunction *and* Relevance Theory follows Grice and assumes that the meaning of *and* is equivalent to the one of the logical operator (e.g. Carston, 1993, 2002a) but point out at the same time that "there is no reason to suppose that in a cognitively-realistic decoding semantics the characterization of *and* […] should match the definition of the corresponding element in a logical calculus, whose semantics is resolutely truth- and reference-based" (Blakemore & Carston, 1999). Carston goes even further by pointing out that the relations that are partially inferred between conjuncts conjoined by *and* are "purely a function of syntactic coordination" (Carston, 2002a, p. 256).

The different kinds of readings of the conjunction *and* are explained from a cognitive point of view and suggest that the meaning of the conjunction is pragmatically enriched. Another theo-

retical assumption that is important for the relevance theoretic explanation is that information and knowledge is stored in form of frames, scripts and chunks.[14] It is assumed that during sentence comprehension the semantic content of an utterance interacts with the hearer's knowledge as well as his assumption schemata (Carston, 1996). Upon being confronted with a sentence (e.g. two conjoined utterances) the hearer directly accesses this knowledge and schemata, which again trigger a stereotypical interpretation because such an interpretation yields high cognitive effects, while processing costs remain minimal.

Based on these assumptions and due to the consideration of context, knowledge and principles of language processing, Relevance Theory is able to explain additive, forward temporal as well as a variety of other meaning relations that might hold between conjuncts. In the following it is shortly outlined how Relevance Theory accounts for temporal and additive relations that hold between conjuncts conjoined by the conjunction *and*.

According to Relevance Theory the chronological order that seems to hold between two conjuncts, such as in (47) and (48), is influenced mainly by two factors, namely processing ease and schemata or scripts of stereotypical sequences of real world relations (Carston, 2002a). Following a highly accessible script and the in the script encoded relation between the events is assumed to cause lower processing costs than constructing a relation between the described events spontaneously. Apart from that, it is assumed that the speaker obeys the communicative principle of relevance and presents events in chronological order because this causes lower processing costs on the side of the reader (Blakemore & Carston, 2005). Therefore the chronological interpretation of statements such as (48) follows from the principle of relevance.

(47) *Barbara got up and got dressed.*
(48) *Theo got on the bus and went to the city center.*
(49) *Bill ate strawberries and attended the choir's rehearsal.*

Relevance Theory also accounts for statements in which no script holds between the events described in the individual conjuncts, such as in (49), and cases in which the script is in conflict with the most accessible route. In the former case natural processing influences the interpretation (unless there is a marked intonation or stress pattern) while in the latter the available script has a higher impact on the interpretation than the most accessible route.[15] This is for

[14] Carston (2002a, p. 254) refers to scripts as "some sort of intermediate structure, between unrepresented Background and particular propositional representations of non-stereotypical knowledge".

[15] Natural processing refers to the assumption, that events mentioned first are processed first. Hence they are to some extent interpreted to have occurred before later mentioned events: „After all, in the case of a sequence of visual or auditory stimuli caused by events taking place in the natural world rather than by an intentional agent, we cannot but interpret them to a significant extent in the order in which they occur because they impinge on our receptors in that order" (Blakemore & Carston, 2005, p. 576).

example the case if backward-relations are holding between two conjuncts, such as in (50). For details on the explanation of backward-relations given by Relevance Theory see Appendix B.5.

(50) *The meat burned and it was Lisa who forgot to switch off the oven.*

In the relevance theoretic approach to the meaning and interpretation of the conjunction, it is not only the (preceding) linguistic context, marked stress and intonation patterns as well as the way of how the information is presented that influence the interpretation of the conjunction. The interpretation and comprehension of statements also depends on the hearer's assumptions and expectations, e.g. of behavior or social norms in certain situations.

Cases in which the conjunction *and* is interpreted additively, such as in (51) (from Blakemore & Carston, 1999, p. 12), are explained by Relevance Theory as described in the following.

In conjoined utterances the whole proposition "carries the presumption of optimal relevance and not the constituent propositions (the conjuncts) individually" (Carston, 2002a, p. 243) as it is the case in juxtaposed sentences. Both conjuncts are considered as list and hence processed as a single unit which as whole gives an answer to the implicit question that results from B's negation (Blakemore & Carston, 1999). Therefore, the order in which the conjuncts are presented is not relevant.

(51) *A: Did Mary do all of her education in the States?*
B: No. She did her BA in London and her A levels at home in Leeds.

From my point of view Blakemore and Carston might be right with their indirect question-answer approach. However, I believe that this is not the whole story. In my opinion the wider context, in this case the question formulated by A and world knowledge contribute to the interpretation of B's statement. The fact that A uses the quantifier *all* combined with the fact that A-levels are a necessary requirement for the admission to BA-studies, makes the order of the conjuncts redundant. Moreover, A's focus is not on the order in which the degrees were achieved but rather on the location of where the education took place.

In a more recent paper, Blakemore and Carston modified the original Relevance Theoretic approach and the definition of explicatures by pointing out that the cognitive effects in conjoined *and*-sentences does not always have to be derived as explicature of the conjoined utterance but may also result from the individual conjuncts alone:[16]

[16] The term *explicature* refers to what Recanati (2001, 2006b) considers as *what is said* on the pragmatic level of meaning (for details see Appendix A.3.3). Explicatures are directly communicated and speaker-meant meanings of an utterance (Carston, 2010, p. 220).

> "The upshot is that we abandon the view that a conjoined utterance must always be treated as a single processing unit – at least in the sense that it refers to a single conjunctive explicature which carries the presumption of optimal relevance - in favour of a more general analysis in which a conjoined utterance must have some cognitive effect which is the result of an inferential process or processes involving both conjuncts as input." (Blakemore & Carston, 2005, p. 575f.)

Due to this modification the relevance theoretic approach to the interpretation and processing of *and*-conjoined sentences can not only account for narratives but also for a wider range of interpretations of the conjunction "including those in which *and* is followed by a discourse marker associated with the cognitive effect of strengthening" (Blakemore & Carston, 2005, p. 573). This is especially an advantage for additive relation, as the individual conjuncts can, based on this modification, also carry the presumption of optimal relevance individually and hence trigger cognitive effects individually.

The relevance theoretic approach to the interpretation of the conjunction *and* can account for additive as well as temporal interpretations of the conjunction and considers contextual influences on the interpretation in the wide sense (including intonation and stress patterns, knowledge, scripts and schemata as well as speaker's and hearer's assumptions). At the same time contextual influences are restricted and controlled by obeying the criterion of consistency with the principle of relevance. This means that the hearer can expect the speaker to provide him with optimal relevant information while the hearer is admonished to "look for the minimal set of contextual effects that would make the utterance worth his attention" (Wilson & Sperber, 1998, p. 290).

3.3.4 Sweetser's Three Level Approach (Pragmatic ambiguity)

Sweetser (1986, 1990) suggests a pragmatic account in which the meaning of the conjunction *and* differs from the one of the logical operator. The author suggests that the conjunction *and* has a very abstract meaning, is semantically monosemous and pragmatically ambiguous rather than lexically polysemous.[17] These multiple functions of the conjunction are determined by pragmatic context. iconicity, stress and intonation (cf. Sweetser, 1986; Sweetser, 1990).

Sweetser (1986, 1990) sketches out an account for modals and conjunctions in general. She points out that conjuncts can be linked at three different levels, namely the content level, the

[17] Sweetser adopted the term pragmatic ambiguity from Horn (1985). The term *pragmatic ambiguity* refers to the idea that a word may have a single semantic value but can nevertheless express multiple functions.

epistemic domain as well as the speech act domain.[18] Segmented discourse theory analyzes the meaning of the conjunction on the discourse theoretic level as well (for details see Asher, 1999; Asher & Vieu, 2005; Lascarides & Asher, 1991; 1993). Segmented discourse theoretic approaches are discussed in chapter 3.3.6. The main characteristics of Sweetser's approach (1986, 1990) are that the conjunction *and* is considered to have an abstract meaning of "joining side-by-side". Therefore the conjunction cannot only connect propositional content but also speech-acts. The basic meaning of the conjunction is considered to differ from the one of the logical operator. There are two main reasons for why Sweetser does not want to equate the meaning of the conjunction with the one of the logical operator. The first reason is related to the fact that within her approach *and* does not conjoin its conjuncts exclusively on the propositional level. A logical meaning of *and* would, according to Sweetser (1990, p. 92) make "more sense when the things conjoined are propositions than when they are epistemic or conversational actions". The second reason Sweetser mentions is that "man-made logical terminology which so clearly derives from natural language (rather than the other way around) […] has needs and purposes distinct from those of natural language" (1990, p. 92). Moreover, she points out that it is unclear what "putting things side-by-side" precisely means in natural language and that the conjunction does not always have the same meaning as the logical operator. She concludes by pointing out that: "Perhaps the closest we can get to stating the relation between *and* and $\wedge$ is to say that $\wedge$ is a mathematical crystallization of one of the most salient uses of *and*" (Sweetser, 1990, p. 93).

Sweetser (1986, 1990) also applies the theory she sketched out for modals and conjunctions in general to the interpretation of the conjunction *and*. Consequently, the conjunction is considered to have three possible readings for conjoined speech acts. The respective interpretation depends "on the (independently motivated) pragmatic structuring of speech acts as having content, representing epistemic states, and bearing speech-act forces" (Sweetser, 1986, p. 531). With examples (52) to (54) (from Sweetser, 1990, p. 89f.), the author illustrates that *and* can conjoin speech acts, content items and logical premises:

(52) *Go to bed now! and no more backtalk!*

(53) *The Vietnam War was morally wrong, and its results are still haunting the world today.*

(54) *Darling, you're wonderful, and how about dinner at Chez Panisse tonight?*

[18] The author explains that two conjuncts that present two contents or real world events are conjoined in the content domain. In the epistemic domain one or both conjuncts result from the hearers beliefs or conclusions that result from previously stated premises. In the speech act domain conjoined conjuncts bear speech-act forces.

In example (52) *and* conjoins two directive speech acts as indicated by the exclamation marks at the end of each sentence. The speaker declares X and Y. The first speech act instructs the hearer to go to bed while the second one instructs him to do it without protest. The conjuncts in (53) are conjoined on the content level. The speaker argues that X and Y are the case, namely that the war was morally wrong and still has consequences for the world. Example (54) conjoins the conjuncts on the epistemic level by suggesting or offering to eat out in the epistemic world.

Moreover, different readings of the conjunction *and* do not only differ between the domains but are also possible within the individual domains:

> "Not only will the connection between the conjuncts be perceived differently depending on the domain in which they are taken to be conjoined, but the iconic usage of word order will (naturally) be iconic on the ordering principles inherent in the domain in which conjunction takes place (temporal ordering and causality in the real-world domain, but logical priority in the epistemic domain)." (Sweetser, 1990, p. 90)

Additionally, in both the content and the epistemic domain, two conjuncts conjoined by *and* can either be interpreted additively or based on the iconic use of word order. An example for an additive reading of the conjunction is given in (55). This example is taken from Sweetser (1990, p. 89).

(55) *Did Mary leave for London last night?*

Well, nobody has phoned from England to ask why she didn't come, and her suitcases are gone, and John said he taught her French 2 section for her this afternoon.

(Conclusion: Yes, she went.)

Sweetser (1986, 1990) explains the forward temporal interpretation of the conjunction with the help of Haiman's approach to connectives. Haiman (1980) suggested that many of the possible readings of the conjunction are "due to an iconic usage of the general concept of addition or connection" (Sweetser 1990: 87).[19] The kind of iconicity relevant for the chronological interpretation of the conjunction is the iconicity of sequence of the category of iconicity of motivation. Iconicity of sequence states: "Other things being equal, the order of statements in a narrative description corresponds to the order of the events they describe" (Haiman, 1980, p. 516). Based on this, forward temporal readings of the conjunction e.g. as in (56) arise from

[19] Haiman (1980) distinguishes between two types of iconicity: iconicity of isomorphism and iconicity of motivation. Iconicity of motivation states that grammatical structures or the structures in language directly reflect the structure of reality (cf. Haiman, 1980).

Sweetser's point of view because of the iconicity of sequence and because the order of the conjuncts corresponds to the order in which the described events happened in the real-world. Sweetser's approach is similar to the Semantic Command approach (Bar-Lev & Palacas, 1980b) in the sense that both approaches assume that the order in which the events are mentioned corresponds to the order in which they occurred (see chapter 3.2.1).

(56) The train stopped and the passengers alighted from the train.

Concerning the influence of context on the interpretation of the conjunction, Sweetser's approach suggests that its interpretation is influenced by intonation, stress and contextual factors. However, it is not clear how exactly context determines meaning and what kind of contextual properties are influential.

Lang (2000) points out that in the case of pragmatic ambiguity the effects of grammar and pragmatics on the interpretation of an utterance have to be distinguished in a strict manner. He supports this by showing that crucial structural features such as clause-type, grammatical categories (subordination vs. coordination) as well as clause-internal differences such as scope and intonation (e.g. comma intonation which can interact with hypotheticality markers), background-focus structure and clausal-internal deletions have an impact on the interpretation.[20] Therefore Lang suggests a modification of Sweetser's approach and argues for adding a level, called "textual progression" or "discourse perspective", which serves "as embracing the three levels discussed so far as grammatically determined patterns of discourse formation" (Lang, 2000). Lang's suggestions resemble the approach by Asher and Vieu (2005), who discuss the meaning of the conjunction *and* as subordinating and coordinating discourse relations that result from inferences (see chapter 3.3.6.1).

Sweetser's account is not as much as other approaches concerned with whether the cognitive processes that take place during processing occur at the semantic or pragmatic level. Concerning the processing of pragmatically determined meaning Sweetser (1990, p. 11) observes the following:

> "It has been argued that expression of certain primary content, plus a knowledge of the context and the interlocutors' reasoning processes, allows indirect expression of some other content, which is systematically related to the first. (For example, "it's cold in here," given some expectation that the addressee cares about the speaker's comfort, could convey "Please close the window.")" (Sweetser, 1990, p. 11)

[20] Hypotheticality markers can dependent on the presence of a comma intonation either have scope over both clauses or the first clause.

However, the interpretation process of the conjunction is in Sweeter's approach a pragmatic process as the use of the conjunction is influenced by contextual factors, pragmatic principles, word-order iconicity, the structure of speech acts, as well as stress and intonation patterns. The kind of the pragmatic principles that contribute to the interpretation of the conjunction suggest that the interpretation of *and* is predominantly a pragmatic top-down-processes.

3.3.5 Kitis' Frame Theoretical Approach

The approach suggested by Kitis (2000a) was developed to explain the meaning and function of connectors in different kind of contexts and is allocated within the framework of frame theory. Similar to Schiffrin (1987), Kitis suggests that connectives function at least at three different levels that may interact: the propositional level, the interpersonal level and the level of organizational structure of conversation (Kitis, 1987, 2000a).

In general, Kitis considers understanding language as a "top-down, frame-driven and expectation-based enterprise" (2000a, p. 371): With respect to the interpretation of connectives she points out that connectives do not only interact with textual and discursive relations but also with "more or less systematic chunks of background knowledge, or as items activating, producing or reproducing, constructing or reconstructing belief-systems or ideological schemata" (Kitis, 2000a, p. 362f.). The author further states that connectors can project into other discourse or belief-schemata and evoke ideological schemata as well as stereotypical knowledge. The function to project into other discourse or belief-schemata is called hypo-text of the utterance (Kitis, 2000a, p. 365). The (stereotypical) knowledge and (ideological) schemata, activated by the connective, contribute at the same time (as hypo-textual premises) to the interpretation of the connector. In this way (intended) additional information is communicated or buttresses the communicated information (Kitis, 2000a, p. 364).

The approach put forward by Kitis (2000a) is a frame-theoretic one because it draws on the representation of background knowledge and beliefs which can, according to the author, best be represented by scripts and schemata.[21] Moreover, Kitis (2000a) points out that the meaning of connectives is rather unconstraint on the level of propositional meaning in accounts of conversational implicatures. She therefore suggests a supplementation of implicatures and frame-theoretic formalism so that the functions of connectives are mainly restricted by frames. Apart from that the account put forward by Kitis could also be used "as a constraint on accessing

[21] The fundamental principles of classical frame theory are summarized by Minsky (1975) as follows: "When one encounters a new situation (or makes a substantial change in one's view of a problem), one selects from memory a structure called a frame. This is a remembered framework to be adapted to fit reality by changing details as necessary" (Minsky, 1975, p. 211).

relevance" (Kitis, 2000a, p. 375f.) and could hence operate within the framework of Relevance Theory.

With respect to the meaning and function of *and*, the central function of the conjunction is according to Kitis' approach "the conjunction of propositions activating frames of components not 'judged' by the overall system as incompatible or conflictual" (Kitis, 2000a, p. 390). This implies that the basic meaning of *and* is simply to express a connective relation within the same frame. Which specific relation is expressed by the conjunction *and* in a specific utterance is context-dependent. Additionally, the interpretation may slightly vary from hearer to hearer because scripts and schemata that are highly dependent on (stereotypical) knowledge have to be accessed, so that the meaning of the conjunction can be inferred. Concerning truth-conditions, Kitis suggests that the conjunction is semantically truth-functional but the acceptability and interpretability of the whole statement is frame-dependent. *And* is considered to be a "prototypical conjoining device" and its interpretation is constrained by stereotypical (sub)frames (Kitis, 2000a, p. 385).

Furthermore, Kitis illustrates and discusses the function of *and* as "hypotextual contrastive, antinominal rhetorical device" which instantiates (sub-)scripts as well as (sub-)frame compatibility (Kitis, 2000a, p. 372). The author probably refers to the conjunction as antinominal device because it can, depending on the context and situation, express everything or nothing. Examples which illustrate that *and* instantiates (sub-)frame or (sub-)script compatibility are utterances in which the conjunction can be interpreted as temporal or causal relation between the conjuncts such as in (57) and (58), respectively.

(57) *Robin Hood jumped on the horse and rode into the forest.*
(58) *The dog jumped into the lake and got dripping wet.*

In example (57) the noun *horse* already activates a certain frame. It is common knowledge that people who get on a horse typically or stereotypically do that for a reason, normally for the purpose of riding. So the activated script in the example is the one of getting on a horse and riding away. This script expresses a temporal relation, hence the conjunction *and* is interpreted temporally in this case.

With respect to contextual influences, Kitis states that the interpretation might vary slightly from speaker to speaker and is dependent on (sub-)frame, script, schemata and expectation and based on the hearer's stereotypical as well as background knowledge. Therefore, the relation between some events is quite naturally interpreted as simultaneous occurrence such as in (59) and (60), while other relations such as in (61) might, depending on the speaker's expectation, be preferably interpreted simultaneously or sequentially.

(59) *The TV was on and Sarah heard the weather-forecast.*
(60) *Mike played the guitar and Donna heard music.*
(61) *Chase had a shower and sang a song.*

Kitis can explain a variety of meaning relations that can hold between conjuncts because sub-frames cannot only be created within frames but can also conjoin related frames that are not incompatible with each other. Kitis (2000a, p. 382) proposes that "a continuum along which functions of *and* can be identified and specified". These functions also include logical- and subversive-conjoining as well as "completely unacceptable or uninterpretable" ones (Kitis, 2000a, p. 382). These functions are depicted in Figure 1, which is adapted from Kitis (2000a, p. 383).

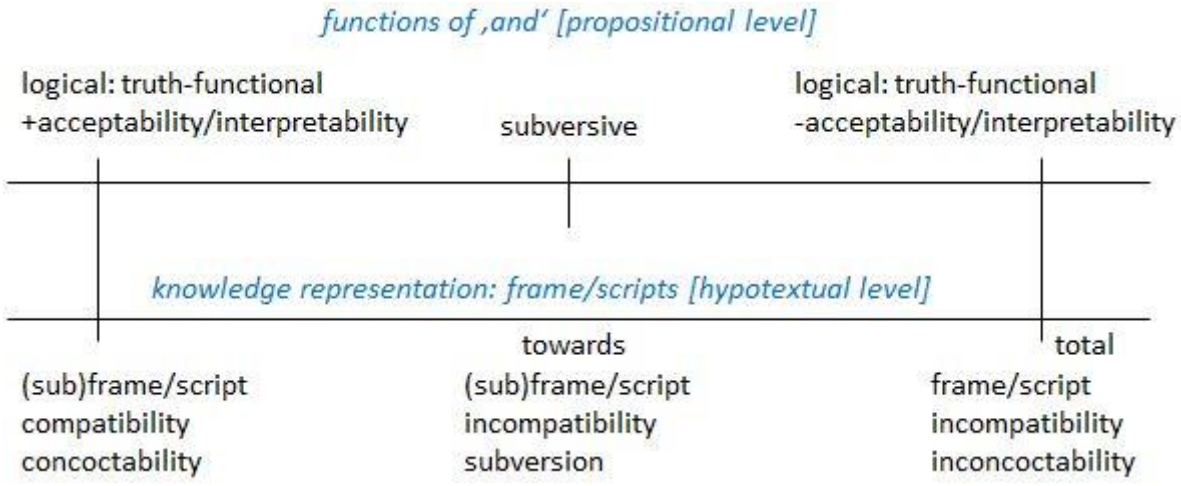

Figure 1: Functions of conceptual *and*.
(Adapted from Kitis (2000a, p. 383).)

The reason why this variety of function can be explained is related to the basic idea of Kitis' approach, namely that "the conjunction of *p* and *q* is interpretable in terms of our cognitive and experimental abilities to subsume it within frames or scripts that are either identical or compatible between them" (Kitis, 2000a, p. 371).

The main characteristic of Kitis' account is that the general function of *and* is to conjoin default values within the same frame and to modify the relation within this frame or between them. Moreover, it can create sub-frames and conjoin related but not incompatible frames (Kitis, 2000a, p. 378).[22] The interpretation process of the conjunction is based on the assumption that the speaker or author is cooperative. Additional effort is necessary on the part of the speaker if the activated frames appear incompatible. Since the inferential processes related to frames and scripts in Kitis account are also based on similar principles as manifested by Grice's Cooperative Principle, Kitis would agree to term the kind of processes related to the

[22] Kitis (2000a) uses the term incompatibility when the overall construction of a frame-system is not possible.

conjunction *and* as generalized conversational implicatures (see chapter 3.1.2) provided that these processes have generalized and predictable constraints:

> "This inferential process is based on the hearer's assumption that the speaker or author is both charitable and co-operative (and not insane). I would have no objections to calling such inferences GCIs as long as they are systematically constrained in a generalized and predictable fashion." (Kitis, 2000a, p. 378)

As constraints on the inferential process Kitis (2000a, p. 390) postulates frames that are always active "even if at times inconspicuous".

3.3.6 Segmented Discourse Representation Theory (SDRT)

One of the first semantic theories that considered contextual influences, especially those of preceding discourse, was the Discourse Representation Theory (DRT) (Kamp & Reyle, 1993). The DRT-approach was extended and modified by Asher (1999) and is known as Segmented Discourse Representation Theory (SDRT). SDRT is a discourse theoretic approach that comprises characteristics of Coherence Theory and DRT, namely discourse relations and discourse structure respectively.

The innovation in SDRT is that it is a fully formalized dynamic semantic approach, which can account for the fact that the specific meaning of utterances arises incrementally, depending on the context. Moreover, in SDRT the language of DRS includes speech act discourse referents that are treated "as labels of propositions or intentional contents" and encodes discourse structure by means of relation symbols (Asher, 1999). Apart from that discourse structure is recursive, which means that DRSs can be embedded within other DRSs. Finally, in SDRT "a specification of the speaker of the speech act" is given within the specification of each discourse constituent (Asher, 1999). The notion of context change potential is also more restricted in SDRT than in DRT because there are constraints that restrict speech act discourse referents in the input context background that can be referred to and secondly, there are mechanisms that put a limit on which discourse relations are permitted.

The SDRT approach can also be used to explain temporal, causal and other readings associated with *and*. In the framework of this theory, context in the form of preceding discourse as well as discourse clues such as intonation, intentionality, linguistic knowledge, common sense entailments, expectation of the participant's speech act related goals (SAGs) and world knowledge are of essential importance (for details see Asher, 1999; Asher & Vieu, 2005; Lascarides & Asher, 1991; 1993). The following accounts consider the conjunction within SDRT.

Discourse theoretic approaches that discuss the meaning and interpretation of *and* are the approaches by Asher & Vieu (2005), Txurruka (2003) and Schiffrin (1986). Schiffrin (1986) discusses the meaning of *and* as coordinate conjunction that possesses a communicative function on the discourse level and argues for a minimal meaning of *and*. The author does not deal with whether the basic meaning of *and* is truth-conditional or not. Contextual factors (specifically discourse) play a central role in this approach (Schiffrin, 1986, 1987) as the variety of meaning relations that can hold between the conjuncts arise due to inferences the hearer draws based on the fact that certain conjuncts are conjoined. As Schiffrin's approach is focused on the grammatical function of *and*, this approach will not be discussed in more detail. Instead the segmented discourse theoretic approaches by Asher & Vieu (2005) and Txurruka (2003) are discussed exemplary for discourse theoretic approaches to the meaning and interpretation of the conjunction *and*.

3.3.6.1 Asher and Vieu

Although the approach by Asher and colleagues (e.g. Asher, 1999; Asher & Vieu, 2005; Lascarides & Asher, 1991; 1993) was not specifically designed to explain discourse relations expressed by the conjunction *and*, it can account for and explain various readings of the conjunction. This is because each conjunct can be considered as establishing a discourse representation structure (DRS) which provides the discourse representation structure background for the next conjunct or sentence. Discourse relations that can be expressed by the conjunction *and* are coordinating and subordinating discourse relations (Asher & Vieu, 2005). Forward temporal relations between two sentences conjoined by *and* arise typically due to a variety of factors, such as world knowledge, linguistic knowledge or syntactic markers: "[T]emporal relations must be calculated on the basis of semantic content, knowledge of causation and knowledge of language use, as well as sentential syntax and compositional semantics" (Lascarides & Asher, 1993, p. 438). If none of these clues indicate that the relation that holds between both utterances is a forward temporal relation, it is assumed that the descriptive order corresponds to the order in which the events occurred.[23] This is also presented by the defeasible rule of narration "If the clause β currently being processed is to be attached by a discourse relation to the clause α that's part of the text processed so far, then normally, *Narration* (α, β) holds" (Lascarides & Asher, 1993, p. 442) and its axiom "If *Narration* (α, β) holds, and α and β describe the eventualities e_1 and e_2 respectively, then e_1 occurs before e_2" (Lascarides & Asher, 1993, p. 443). As the law of narration is defeasible and does not hold in cases where

[23] This is in line with Grice's Maxim of Manner.

there is information that the events occurred in a different order, it can also account for additive and backward temporal relations.

3.3.6.2 Txurruka

Txurruka (2003) believes that the traditional semantic/pragmatic division and the resulting semantic and pragmatic approaches that explain the many possible readings of the conjunction *and* cannot be upheld:

> "[…] neither semantic vacuity nor temporal meanings are appropriate to capture the meaning of and." (Txurruka, 2003, p. 256)

Txurruka (2003) argues against a truth-conditional or temporal semantics for *and* for several reasons: On the one hand, a temporal meaning of the conjunction appears impossible because the relation that can hold between two conjuncts conjoined by *and* comprise causality, location or other. Apart from that, the temporal interpretation in examples such as (62) can also be explained by the discourse principle of iconicity.

(62) *Mary went to bed and dreamt something nice.*

Additionally, Txurruka (2003) points out that the temporal reading between conjuncts often arises if the agents in both conjuncts are the same. If two different agents occur in the conjuncts, then the author suggests that the preferred reading is one of simultaneity. However, the author also shows that overlapping or an interpretation of simultaneity can arise if the agent in both conjuncts is the same. Whether two events are interpreted as overlapping or temporal inclusion depends according to this approach on world knowledge. Therefore, the author explicitly rejects the idea that the conjunction *and* includes a feature or meaning of iconicity. On the other hand, the meaning of *and* is also non-truth-conditional because in some examples, such as in *Stand up, and I'm going to break your arm* (Bar-Lev & Palacas, 1980b; Txurruka, 2003), the inferred relation that holds between the conjuncts is conditional (Eckardt, 2010).[24] This reading of the conjunction *and* is not compatible with a truth-conditional reading of *and*.

Txurruka (2003) analyses the meaning of *and* from a discourse based perspective of the framework of SDRT and suggests that the meaning of *and* is simply one of (discourse) coordination. Hence *and* can be understood like an instruction that requires a Coordinating Discourse Topic (CDT), which is "obtained by equally generalizing over the contents of the representations thus linked" (Txurruka, 2003, p. 282). The author expresses the meaning of *and* in an axiom:

[24] For a semantic/pragmatic analysis of coordination of imperative and declarative sentences see Eckardt (2010).

(π, π') & *and*(π, π') → Coordinator (π, π') (Txurruka, 2003, p. 266)

Consequently, the interpretation of *and* is heavily influenced by a highly structured knowledge base that codes world knowledge as well as lexical knowledge. This means that *"*the interpreter is required to build the smallest generalization over π, and π' as given by a particular knowledge base" (Txurruka, 2003, p. 267). This is expressed by the following re-writing rule *(Coor)*:

Coordinator (π, π') →$_R$ Build a CDT for π and π' (Txurruka, 2003, p. 267)

The discourse relations *Narration*, *Result* (Asher, 1993; Txurruka, 2003), *Parallel*, *Conditional* (Txurruka, 2003) are considered as coordinating discourse relations.[25] With respect to the temporal relations that hold between two conjuncts, Txurruka (2003) can explain instances of temporal interpretations of *and* without taking a default temporal meaning as basis. Based on the fact that subordination and coordination block each other, certain discourse relations (DR) between the conjuncts are blocked although they establish coherence because they are subordinating.

With the help of coordinating discourse relations Txurruka (2003) explains temporal interpretations of *and* that hold between two conjuncts in examples such as (63).

(63) John jumped into the car and drove away.

The temporal interpretation arises because the "interpreter generalizes over the contents of both clauses" (Txurruka, 2003, p. 268). Most hearers attempt to "maximize coherence" between the conjuncts and therefore "try to connect the different pieces of information to each other and relate them to other areas as much as they can" (Txurruka, 2003, p. 268). Some discourse relations that arise between the conjuncts based on this inferential process are ruled out because they are subordinating. Txurruka (2003, p. 268) hypothesizes that "the hearer tries to build a temporal order between events whenever a speaker utters a sequence of events". Consequently the interpreter comes up with forward temporal discourse relations quite often.

Based on Txurruka's explanations, I assume that an additive reading of the conjunction would be inferred in cases in which the hearer stops after the generalizing over the contents of the conjuncts and does not attempt to maximize coherence further.

[25] There is no systematic, completed list of subordinating and coordinating discourse relations yet (Asher & Vieu, 2005; Txurruka, 2003). Asher and Vieu (2005) attempt to account for this.

3.4 Comparison and synthesis of the individual approaches

The accounts that try to explain temporal and additive meaning relations between conjuncts and were discussed in the previous sections, consider contextual influences to different extents. In this chapter approaches with similar departures are compared. Further, the individual theories are considered concerning their handling of contextual influences (in the wide sense) to see whether one can choose between the suggested theories.

There are two approaches that try to explain the many different possible kinds of reading of the conjunction *and* with the help of an ambiguity approach. While Cohen (1971) considers the conjunction as an ambiguous word with one lexeme, Buscha (1989) also considers the conjunction as ambiguous but assumes that it comprises several lexical entries. Although these accounts do not consider contextual influences in detail, they can account for a variety of meaning relations between conjuncts. However, Carston (2002a) criticizes Cohen's account because it violates the modified Occam's Razor. The same argument can be used against Buscha's account because it could be argued that it multiplies meaning although it is not necessary. It is unnecessary because a pragmatic account which assumes a single sense for *and* while accounting for the variety of readings with the help of pragmatic processes, could avoid multiplying meaning. However, as mentioned above, the violation of the modified Occam's Razor can be judged from different point of views, depending on what is considered (amount of dictionary entries vs. meaning features within a single dictionary entry). Yet, this line of argumentation is weakened by the observation that it could as well be argued that such a use of Occam's Razor would question the characteristics of polysemy in general. Apart from that, nobody will ever attempt to invoke the (modified) Occam's Razor to complain about polysemous nouns such as the German word *Zug* which can refer to a vehicle (train), a mountain range, a move in a board game, a character trait, place name or platoon, to mention a few.

Another challenge of the Semantical Hypothesis which is related to Carston's (2002a) argument is the following: If the meaning features expressed by examples (64) and (65) are part of the meaning of the conjunction *and*, it would mean that the conjunction does not only have various meaning features but also that it contains meaning features that are inconsistent or contradict each other. With respect to examples (64) and (65) it would mean that the conjunction does not only express cause-consequence relations but also consequence-cause meaning relations. The same holds for chronological and backward temporal relations between conjuncts.

(64) *There are moths in the cupboard and the T-Shirts have holes.*
(65) *The T-Shirts have holes and there are moths in the cupboard.*

As it is not mentioned how exactly the irrelevant meaning features of the conjunction are cancelled and how relevant meanings are selected in Cohen's account, it would have been desirable to sketch out contextual influences in more detail. Buscha's ambiguity account faces a similar challenge as Cohen's account because it postulates a lexeme for each meaning relation. This has the consequence that if one would like to account for all meaning relations by listing them; one would come up with an immense amount of lexemes which is uneconomical. An advantage of the polysemous lexeme account outlined by Buscha (1989) over an account that defines *and* as single lexeme with several meaning features (e.g. Cohen, 1971) is that the former does not have to deal with the challenge that a single word consists of several meaning features which are at odds with each other (cf. Carston, 2002a, p. 229). However, challenging for both accounts is that they do not carve out what kind of properties a context has to have in order to trigger a specific interpretation of the conjunction.

Apart from the ambiguity accounts, there are several approaches that explain (forward) temporal meaning relations expressed by the conjunction *and* with the help of the principle of iconicity (Grice, 1989a; Sweetser, 1986, 1990), a similar maxim or heuristics (Dowty, 1986; Levinson, 2000; Meibauer, 1997) or a rule which indicates that the events have to be interpreted as forward temporal relations (Bar-Lev & Palacas, 1980b). Approaches that rely on a principle of iconicity as the sole contextual influence, such as the Semantic Command (Bar-Lev & Palacas, 1980b) and the approach by Sweetser (1986, 1990), cannot account for all kinds of relations that can hold between conjuncts conjoined by *and* because they can, for example not account for backward meaning relations or co-occurrences of events. This is because iconicity of sequence and the correspondence of the order of narration to the order in which events happen in the real world suggest forward readings and do not allow backward readings. It is therefore claimed that accounts that rely on a principle of iconicity can also not account for causal or temporal relations between juxtaposed sentences because juxtapositions often suggest backward relations (cf. Meibauer, 1997, p. 246). However, this cannot be generalized for all accounts that explain forward temporal meaning relations with a principle of iconicity as shown below. Moreover, juxtaposed sentences are not directly comparable to sentences conjoined by *and* because they possess different syntactic structures and might hence be processed differently. In (66) each sentence might be processed and interpreted separately before an interpretation that establishes the relation between the individual sentences takes place.

(66) *Mary fell. John pushed her.*
(67) *Mary fell and John pushed her.*

In (67) the sentences are coordinated. Hence, the first conjunct is processed but not fully completed because *and* indicates that the sentence is not completed yet. Therefore, the hearer unconsciously establishes expectations, which are influenced e.g. by world knowledge and the Conversational Maxims. The hearer expects further information that can be connected with the first conjunct in a felicitous way, preferably as forward interpretation. These expectations might contribute to the interpretation of the whole sentence. Upon hearing the second conjunct, these expectations are violated because the preferred forward-interpretation (see Zwaan, 1996 and literature cited there) is not compatible with the content of the second conjunct. At the end of the sentence the preferred or expected interpretation has to be cancelled because it turns out that it does not make sense. A reanalysis has to take place to come up with the correct relation that holds between the conjuncts. This is costly because a reanalysis draws on more processing costs. Hence, it is possible that some people try to avoid searching for another interpretation, and rather stick to their first interpretation as long as it makes sense somehow, to keep the processing costs as minimal as possible. (For details and psycholinguistic evidence on the comprehension and the temporal interpretation of events and narratives see Mandler, 1986; Münte, Schiltz, & Kutas, 1998; Pyykkönen & Järvikivi, 2012; Zwaan, 1996.)
The apparent influence of syntactic properties and other contextual influences (as illustrated in the previous sections) further support that approaches that only rely on a principle of iconicity alone cannot account for all kinds of relations that can hold between conjuncts conjoined by *and*. An important point for the defense of the Gricean account however is, that Grice did not suggest that it is the Sub-maxim of Manner alone which is involved in the interpretation of the conjunction. Meaning relations that arise in connection with the conjunction *and* could as well be influenced by other maxims and contextual factors, e.g. relevance (for details see the Relevance Theoretic approach in section 3.3.3). Backward-relations expressed by *and* such as in (67) could for example also arise based on world knowledge, rationality, the third Maxim of Manner ("Be brief (avoid unnecessary prolixity)." (Grice, 1989a, p. 46)) and the second Maxim of Quantity ("Do not make you contribution more informative than is required." (Grice, 1989a, p. 45)). Moreover, the (pragmatic) meaning of utterances is usually influenced by a variety of factors such as intonation, stress, Conversational Maxims, rationality, the syntactic structure as well as linguistic and non-linguistic context. Some of the accounts discussed in this chapter explicitly consider the influence of contextual factors such as stress and intonation (e.g. Blakemore & Carston, 1999; Sweetser, 1986, 1990) or tense and aspect (e.g. Levinson, 2000). In the relevance theoretic approach to the interpretation and comprehension of statements also depends on the hearers assumptions and expectations, e.g.

of behavior or social norms in certain situations. Hearer's expectations are also considered in the account by Kitis (2000a). In example (68) the recognition of the speakers attitude depends on the hearer's "acceptance of the assumption that a woman is not expected to see other men while her spouse is in hospital" (Blakemore & Carston, 2005, p. 581).

(68) She's seeing other men and her husband is in hospital.

The influence of world knowledge as a contextual factor on the interpretation of the conjunction *and* is considered in a variety of the accounts introduced above (Asher & Vieu, 2005; Carston, 2002a; Kitis, 2000a; Lascarides & Asher, 1993; Txurruka, 2003). However, these accounts differ with respect to how they treat these influences in detail e.g. what type of knowledge they consider as important for the interpretation of the conjunction. Stereotypical relations between conjuncts are addressed by Levinson (2000), Kitis (1987, 2000a) and Relevance Theory (Carston, 2002a). The role of stereotypes in the individual approaches varies. While Levinson (2000) just addresses that stereotypical relations that might hold between conjuncts have to be assumed, Relevance Theory assumes that knowledge is stored in scripts and schemata and evokes stereotypical interpretations, Kitis assumes that the connector activates stereotypical knowledge, schemata, frames and scripts. Other approaches that directly address the influence of world knowledge, scripts and schemata on the interpretation of relation between two conjuncts conjoined by *and* are the discourse theoretic approaches (Asher & Vieu, 2005; Txurruka, 2003).

World and common knowledge, specifically about the relation that holds between the conjoined conjuncts, is an essential requirement for the meaning and interpretation of the conjunction *and* in a context in frame-theory (Kitis, 1987, 2000a) and the discourse theoretic accounts (Asher & Vieu, 2005; Lascarides & Asher, 1993; Txurruka, 2003). This is because the meaning of the conjunction in a context is inferred based on the relation that holds between conjuncts. As the hearer's knowledge is essential for the interpretation of the conjunct, these accounts can explain why the interpretation of the conjunction in a context can slightly vary from hearer to hearer, depending on his or her knowledge. If one lacks knowledge about how two conjuncts are related, it is very difficult and in some instances even impossible to derive an interpretation. This might for example be the case if a hearer is confronted with specialized research literature of a research area, he is not familiar with.

The only account that explicitly explains why some uses of *and* are more acceptable than others and why the conjunction cannot be interpreted in some instances such as in (69) is the frame theoretic one my Kitis (1987, 2000a). It is difficult to interpret the conjunction in this

example, because only related frames that are not incompatible with each other can be conjoined.

(69) *The train to Cologne was cancelled and the snow geese flew back home.*
(70) *They had -18°C in Berlin and people at the Alexanderplatz complained about the tropical heat in Taiwan.*

According to the frame-theoretic approach by Kitis (1987, 2000a) statements (69) and (70) cannot not be conjoined by *and* because the (sub)frames in (69) are not related and the ones in (70) are related but inconsistent.

3.5 Conclusion

In this chapter, a variety of theories that try to explain additive, temporal and other meaning relations that can arise between conjuncts conjoined by *and* were presented. For each theory, it was discussed how the meaning of *and* is defined. It was considered whether *and* is regarded as truth-functional, ambiguous or whether the respective theory assumes that *and* comprises additional semantic features and properties. Apart from that, the role of context for the interpretation of the conjunction was discussed. For a short overview and comparison, these results are depicted in table Table 1.

As can be seen in Table 1 the meaning of *and* varies between the approaches discussed in this chapter. Grice (e.g. 1989b), Neo-Griceans (e.g. Levinson, 2000), Relevance Theorists (e.g. Blakemore & Carston, 2005; Carston, 2002a) and Kitis (2000a) argue that the logical operator $\wedge$ expresses the same meaning as *and*. Opponents of this view are Bar-Lev and Palacas (1980b) as well as Cohen (1971) and Sweetser (1986, 1990). Discourse theorists do not take part in this discussion but consider the meaning of *and* based on its function in context as coordinating conjunction. As the meaning of *and* depends on the rhetorical relation that holds between the conjuncts in these approaches, it is not clear what is considered as basic meaning of *and*. Two lines of argumentation are possible: One option is that the meaning of the conjunction is ambiguous or comprises more than the meaning of the logical operator. In this case it could be argued that the relevant meaning features in a specific context are picked depending on the rhetorical relation between the conjuncts or that irrelevant meaning features of *and* are cancelled based on the relation that holds between the conjuncts in a specific context. The other option is that the basic meaning of *and* is the same as the one of the logical operator and that the meaning relations that can be expressed by the conjunction in a specific context arise based on contextual influences, specifically knowledge about the relation that holds between two conjuncts.

With respect to the role of context in the individual approaches, the Semantic Command approach by Bar-Lev and Palacas (1980b) is the only theory in which context does not play a role and that does not consider contextual influences with respect to the interpretation of *and*. All of the other approaches discuss contextual influences on the interpretation of the conjunction. However, the extent to which they do so differs (see chapter 3.4. and Figure 1).

As can be seen in Table 2 all of the theories discussed in this chapter can account for additive and temporal meaning relations that can arise between conjuncts conjoined by *and*. The accounts differ with respect to what they consider as basic meaning of the conjunction. It is difficult to choose between the individual theories because they have different requirements: Some of them focus on the grammatical function of *and* (e.g. Schiffrin, 1986, 1987), while most of the other theories that were introduced and discussed in this chapter explicitly try to explain the different kinds of interpretations and meaning relations that can hold between conjuncts conjoined by *and* (Bar-Lev & Palacas, 1980a; Cohen, 1971).

Moreover, the individual theories discussed in this chapter have different starting points for their approaches and analyses. Some theories start their investigations from and focus on the basic meaning of the conjunction (e.g. Bar-Lev & Palacas, 1980b; Cohen, 1971; Grice, 1989b; Posner, 1979) while others are concerned with the function of *and* in discourse and hence start from the (rhetorical) relations that hold between the conjuncts (e.g. Asher & Vieu, 2005; Lascarides & Asher, 1993; Txurruka, 2003). Therefore, they consider contextual influences to different extents.

In this chapter, it was discussed how additive and temporal interpretations of *and* are explained by the individual theories. For the reader who is interested in which other meaning relations between conjuncts conjoined by *and* can be explained by the individual theories, an overview is given in Table 2 (p. 48). The symbol ✓ was used if the theory can explain the respective phenomenon. An X was used if a theory cannot explain a certain meaning relation or phenomenon. The symbol (✓) indicates that the relation or phenomenon was not explicitly explained by the respective theory although it could account for it. For details on how the relation or phenomenon could be explained within the individual theories see Appendix B.

Table 1: The meaning of *and* and the role of context in the discussed theories

Account	Grice and Neo-Grice	Relevance Theory	Semantic Command	Semantical Hypothesis	Ambiguity Account	Pragmatic Ambiguity	Frame Theory	Discourse Theory	
Representative	Grice, Levinson, Posner	Blakemore, Carston, a.o.	Bar-Lev Palacas	Cohen	Buscha	Sweetser	Kitis	Txurruka	Asher & Vieu
What is the meaning of *and*?	and = ∧	and = ∧	and ≠ ∧ feature 'semantic command'	and ≠ ∧ one lexical entry, several meaning features	several lexemes; copulative conjunction	and ≠ ∧ abstract joining side by side	and = ∧ connective	discourse coordination	coercing coordination
Does context play a role?	yes	yes	no	yes	yes	yes	yes	yes	yes
What kind of contextual features are influential?	maxims/ heuristics; stereotypical relations; "language-specific semantic constraints"	scripts; schemata; knowledge; relevance	none	not mentioned	knowledge of relations between conjuncts; WK	stress and intonation determine which domain is conjoined; iconicity, WK	scripts, schemata; BK; expectations, stereotypical knowledge; beliefs;	highly structured knowledge base (WK and lexical knowledge); intonation	preceding discourse, DRS-background for next S, LK, WK
How/where are contextual influences at work?	trigger implicatures; conjunction buttressing	enrichment; explicatures	not at all	cancellation of meaning features	relations between conjuncts	context determines function of *and*	top-down processes; schemata contribute to interpretation; frames constrain interpretation	instruction requires CDT	common sense; entailment; expectations; participants SAGs

WK – World Knowledge; S – Sentence; LK – linguistic knowledge; BK – Background Knowledge

Table 2: Relations between conjuncts that can be explained by the individual theories

Theory / Relation btw. conjuncts	Grice	Relevance Theory	Semantic Command	Semantical Hypothesis	Ambiguity Account	Pragmatic Ambiguity	Frame Theory	Discourse Theory	
	PCI & GCI	Carston, Wilson, Sperber	Bar-Lev Palacas	Cohen	Buscha	Sweetser	Kitis	Txurruka	Asher & Vieu
additive	✓	✓	✓	✓	✓	✓	✓	✓	✓
forward temporal	✓	✓	✓	✓	✓	✓	✓	✓	✓
backward temporal	✓[1] / X[2]	✓	X	✓	✓	X	✓	✓	✓
simultaneity	X[1] / ✓[2]	unaccounted	X	(✓)	(✓)	X	(✓)	✓	✓
causal	✓	✓	✓[3] / X[4]	✓	✓	✓[3] / X[4]	✓	✓	✓
adversative	X[1] / ✓[2]	✓	X	✓	✓	X	✓	unaccounted	not considered
sentence initial	not considered	✓	not considered	not considered	not considered	✓	✓	not considered	not considered
juxtaposed = *and*-sentence	✓	✓	✓[5]	not considered	not considered	✓	✓	✓	not considered
juxtaposed ≠ *and*-sentence	X[1] / ✓[2]	✓	✓	not considered	not considered	X	✓	✓	✓

1 – PCI; 2 – GCI; 3 – cause-consequence; 4 – consequence –cause; 5 – in forward relations

4 Intermediate Summary

The previous chapter has sketched out how the individual theories explain the temporal and additive interpretation of the conjunction and what role context plays in the individual theories. The experiments conducted in chapter 6 were not carried out to mediate between these approaches. Instead the experiments focus on the influence of different types of context on the interpretation of the conjunction. It is important to keep in mind that these experiments just investigate how people understand and interpret the conjunction in specific types of contexts and do not allow arguing for one of these approaches because the data are behavioral data that were collected by means of an offline-method.

An issue that is addressed in this work and is investigated experimentally in chapter 6 is what kind of contextual attributes contribute to the interpretation of the conjunction. Specifically, it is tested whether it is relevant what kind of events are conjoined and whether (participants') world- and common-knowledge about events that are associated with a specific order, script or event schemata is relevant for the interpretation of the conjunction in a context. It is known that not all types of knowledge are accessed equally easily. Knowledge that can be assessed easily is more likely to be used during text comprehension (Barnes, Dennis, & Haefele-Kalvaitis, 1996; Glucksberg, Brown, & McGlone, 1993) and therefore contributes to the interpretation process. Script-based contexts are supposed to be less complex than neutral contexts that only present events that are related (somehow). It is therefore suggested, that different types of knowledge have to be distinguished with respect to the interpretation of the conjunction *und*. It is not enough to say that it is context in general that invites interpretations of the conjunction that are different from the additive one. Different types of context have to be distinguished and characterized in more detail. Theories that try to explain the meaning and interpretation of the conjunction with respect to their consideration of different types of knowledge and related contextual attributes are recalled in the following.

The theory suggested by Txurruka (2003) does not explicitly distinguish between different types of context.[26] With respect to the influence of different types of knowledge on the interpretation, Txurruka's account assumes a knowledge base that is relevant for inferences about discourse relations. This knowledge-base contains lexical-knowledge, semantic-knowledge and world knowledge. Txurruka explicitly points out that this knowledge base is crucial for

[26] The author points out that some interpretations of the conjunction such as overlapping of events "can be easily triggered in the right context" (Txurruka, 2003, p. 263) and requires the "contribution to make sense in the context" (Txurruka, 2003, p. 269) but does not point out what kind of features the "right context" has to have. It is a clear disadvantage of this account that it uses the term context but does not explain what exactly is meant by the term and whether knowledge is considered as a feature of context or not.

the interpretation of discourse relations and does in this way also account for the fact that interpretations depend on the recipient's knowledge (Txurruka, 2003, p. 268).

The discourse theoretic approach, discussed by Asher and Vieu (2005) points out the importance of knowledge in the interpretation process and distinguishes between different types of knowledge, namely world- and common-knowledge, knowledge of causation and knowledge of language use.[27] As world- and common-knowledge influences the interpretation process and differ in richness from person to person, this discourse theoretic approach can also explain why the interpretation of the relation between two conjuncts or sentences might differ from recipient to recipient. Lascarides and Asher (1991) also state that if the hearer does not know how to conjoin a certain event with a state, then he will consider the relation between both conjuncts automatically as an overlap of state and event (Lascarides & Asher, 1993, p. 560). Asher and Vieu (2005) as well as Lascarides and Asher (1991) do not explicitly distinguish between different types of context, but consider the relation between conjuncts and sentences based on the preceding discourse and therefore consider different types of context automatically, although they do not point it out explicitly.

Relevance Theory mentions that relevant input connects with background information in a specific context and considers a variety of contextual attributes but does not explicitly differentiate between different types of context. With respect to the factor knowledge, Sperber and Wilson (2002) assume that knowledge is stored in the form of frames, scripts and chunks. Whatever, Sperber and Wilson consider in detail as context, it seems to consist of a variety of attributes and the factor knowledge appears to be part of contextual attributes in their approach. With respect to sentence comprehension and interpretation Relevance Theory considers hearer's encyclopedic and general knowledge as well as assumption schemata (which trigger stereotypical interpretations) as influential. With the help of world knowledge, the consideration of stereotypical relation, hearer's assumptions and expectations as well as influences of TOM this approach could theoretically explain differences concerning the interpretation of *and* in different types of contexts as well as differences between interpretations of individual participants.

Representative for Neo-Gricean approaches to the meaning and interpretation of the conjunction *and,* the account by Levinson (2000), will be discussed. Levinson considers the interpretation of the conjunction as I-implicatures and discusses it as conjunction-buttressing (Levinson, 2000). In his approach "shared background presumptions" and "language specific

[27] To what knowledge of language use refers to in detail is not explained. It might refer to something like Grice's Conversational Maxims or the Cooperative Principle or to knowledge about language specific differences.

semantic-constraints" are important for inferences and temporal interpretations, while the cross-context and cross-linguistic invariance are not considered as influential in I-inferences: "Most of these inferences interact with shared background presumptions, which might in principle vary, and thus the inferences might have none of the cross-context, even crosslinguistic, invariance that are the hallmarks of GCIs" (Levinson, 2000, p. 118). This implies that Levinson does not consider different types of context as important with respect to the interpretation of the conjunction. Knowledge however is addressed and appears to be an important factor: "The inference is typically guided by stereotypical assumptions; to spell such inferences out more fully would be both redundant and onerous, and perhaps (in the case of euphemism, etc.) socially undesirable" (Levinson, 2000, p. 119). The temporal interpretation of the conjunction is considered as default which may be cancelled due to influences of world knowledge and prosodic clues (Levinson, 2000, p. 123).[28] This would imply that the interpretation of the conjunction is partially recipient dependent and suggest that people with less complex world knowledge should in some kind of situations be less likely to cancel temporal interpretations of the conjunction and therefore come up with more temporal interpretations than recipients with more complex world knowledge. I consider it as controversial that Levinson is at the one side of the opinion that the temporal meaning relation of *and* arises by default and at the other hand, points out that it does not arise in some instances:

> "Most authors agree that although the inference to temporal sequence is defeasible, and in some conjunctions hardly seems to even arise, it is nevertheless crosslinguistically the default interpretation of two conjoined past-tensed event descriptions without special prosodic or other marking." (Levinson, 2000, p. 123)

Furthermore, he does not point out in what kind of instances or conjunctions the temporal reading does not arise. A more detailed specification of in what conjuncts the temporal meaning arises and when it is cancelled would have been desirable.

Finally, Kitis (2000a) does not refer to different types of context specifically, but to textual and discourse relations as well as knowledge with which the conjunction interacts on at least three different levels (discourse level, interpersonal level and conversational structure). These levels and factors that interact with the conjunction are strictly speaking contextual attributes. Different types of knowledge (e.g. background and stereotypical knowledge) and beliefs in form of scripts and (ideological and belief) schemata are central in this approach because the conjunction activates, produces, reproduces, constructs and reconstructs them. According to

[28] Moreover, background knowledge and the activation of frames is considered as important with respect to I-inferences and the attempt to establish coherence between two conjoined or juxtaposed clauses.

this approach frames and schemata help to establish a relation between the conjuncts and constrain the inferential process. By pointing out that these frames are not always conspicuous, Kitis indirectly admits that the conjunction occurs in different types of contexts (e.g. conjuncts that are related in an obvious stereotypical way and conjuncts that are just somehow related). Furthermore, the interpretation of the conjunction is recipient-dependent because it depends on knowledge that has to be accessed to infer the relation between the conjuncts.

In summary, it can be said that none of these theories explicitly distinguished between contexts that conjoin events that are logically related and contexts that conjoin events that are just somehow related. The approaches that come closest to this idea are the approaches by Asher and Vieu (2005) as well as Kitis (2000a) because they distinguish between different types of discourse. It can be said that discourse- and frame-theoretic approaches seem to be able to account best for contextual influences on the interpretation of the conjunction because they consider relations that hold between the conjuncts by default.

However, all of these approaches just discussed consider different types of knowledge as an important factor in the interpretation process and could therefore account for slightly different interpretations by different people and different age-groups. This is because knowledge is recipient dependent and differs in the individual age-groups. Depending on the definition of context, knowledge can be considered as contextual attribute. Based on the idea that knowledge appears to be part of context, one could theoretically create different types of contexts based on knowledge involved (e.g. script- and schemata-based contexts vs. neutral contexts in which events are not related to each other based on world knowledge).

5 The role of context in the acquisition of language and pragmatic skills

The purpose of this chapter is twofold. First of all the importance of pragmatics and the role of context in language acquisition will be dealt with. Secondly, the acquisition of pragmatic skills that are relevant for the experimental design of this thesis will be discussed. The definition of context varies in the literature and can either be limited to linguistic context (e.g. previous utterances and syntactic structures) or considered as a wider and more extensive concept which includes the communicative situation, pervious utterances as well as social, cultural, situational and other non-linguistic context. The definition of context that underlies this chapter is the latter one.

Pragmatic skills are not only relevant to language production but also to language comprehension and are often related to the use of context. Pragmatic abilities do not only help to understand the meaning of new words in a context but are also necessary to access information beyond the meaning of the words given linguistically. The general focus of this chapter is on the use of context in language acquisition and comprehension. This thesis does not focus on the acquisition of the lexicon, therefore, only few is said about the acquisition of meaning in general. Central in this chapter are the acquisition of semantic/pragmatic interface phenomena such as implicatures and inferences as well as theories on their acquisition. In the last part of this chapter, the role of context for other acquisition phenomena that are relevant to the experimental design of the experiments described in chapter 6, such as narratives, are dealt with. The acquisition of linguistic meaning of connectives and conjunctions will be discussed in more detail, as this is directly related to the interpretation of the conjunction *and* introduced and discussed in this thesis.

5.1 Context in Language Acquisition

The acquisition of pragmatic skills appears to go hand in hand with the acquisition of other linguistic skills. Some pragmatic skills, such as the use of context are relevant for word learning, language comprehension and language production. In the following the relevance and use of context in language acquisition is dealt with because knowledge about the use of context in comprehension and production might give valuable background knowledge for understanding how children use and interpret words such as the conjunction *and* in a context.

Children do not only understand other people's intentions but also the meaning of words before they start to produce them (Karmiloff-Smith, 1986, p. 62; Klann-Delius, 2008, p. 39; Snyder, Bates, & Bretherton, 1981). This is quite natural because understanding the meaning

of words is the basis for the use of words as reference. For the acquisition of meaning, a variety of contextual factors and characteristics are of importance and serve as clue for meaning. Inferences about others' intentions and the establishment of joint attention are some of the factors that are important for the acquisition of the meaning of words.[29] Children learn new words in communicative situations by listening, segmenting and analyzing their input language. This process is often guided by joint attention.[30] As Donaldson (1978, p. 37) demonstrated, infants do understand what people mean before they can understand the meaning of the respective words (cf. Astington, 1994, p. 48; Karmiloff-Smith, 1986, p. 62). This further indicates that children's learning-process in communicative situations strongly relies on the physical context, joint attention and other contextual clues.[31] To be able to understand and follow communicative exchanges, it is important to understand people's actions and intentions (Astington, 1994, p. 79). In communicative situations children have to figure out what people are talking about and focusing on. This kind of shared experience is important for many aspects of (early) language acquisition and development (Baldwin, 1995; Cleveland & Striano, 2007; Dunham & Moore, 1995; Mundy & Gomes, 1998; Tomasello, 1995). The same strategies might still be used at a later age as comprehension or interpretation strategy to derive a more specific context-dependent interpretation of general terms or utterances.

The development of the receptive lexicon is of great importance for language acquisition because this helps learners to realize that the same words can differ in meaning depending on the respective situation and context. Different theories about how children assign meaning to words are discussed in the literature (Baldwin, 1993; Chomsky, 1986; Crain & Khlentzos, 2008; Crain & Lillo-Martin, 1999; cf. Evans & Levinson, 2009; Pinker, 1984, 1994; Tomasello, 1992; Tomasello & Akhtar, 1995). The most prominent ones are shortly outlined in the following. Markman and Wachtel (1988) assume that children are guided by predispositions, prefer certain interpretation of words over others and narrow down the meaning of

[29] Clark (2009b, p. 296) points out that imitation and repetitions of words in conversational situations is also essential. The author shows that children take up words from the conversation in this way and often replace their own words with the new accepted expression.

[30] Joint attention refers to the sharing of attention between people, e.g. an adult and the child, with respect to an object or event.

[31] An important pragmatic skill, closely related to joint attention and the ability of making inferences, is the Theory of Mind (TOM). TOM abilities enable children to change to and consider the speaker's or other people's perspectives. A longitudinal study by Charman, Baron-Cohen, Settenham, Baird, Cox and Drew (2000) found evidence that suggest that joint attention is a precursor of theory of mind. Furthermore, there is evidence from studies that suggests that TOM is relevant for language acquisition and word learning. Several theories concerning Theory of Mind (TOM) are discussed in the literature. Some of them assume that theory of mind abilities are acquired (e.g. Gopnik & Astington, 1988; Perner, 1991; Wellman, 1990), while others ascribe theory of mind abilities to an innate mental module (Baron-Cohen, 1995; Leslie, 1994). The literature states that TOM develops around the age of three and four (e.g. Gopnik & Astington, 1988; Perner, 1991; Wellman, 1990).

words with the help of constraints and principles (cf. Markman, 1989; Markman, 1990, 1993; Waxman, 1989). However this approach is controversially discussed in the literature as there are not only studies that support this approach (e.g. Blewitt, 1994; Markman, 1990; Markman & Wachtel, 1988) but also studies that challenge this account (e.g. Blewitt, 1994; Gathercole, 1987; Mervis, 1984). This suggests that children also use other clues to figure out the meaning of words. The approaches by Tomasello (2001) and Clark (2009c) focus on the role of communicative intentions and pragmatic factors during the acquisition of words, respectively. According to these approaches many different factors such as communicative intentions, (social) context, syntactic structures as well as the principles of conventionality and contrast have an influence on children's interpretation of words. A variety of empirical studies support these approaches (e.g. Fisher, 1996; Fisher, Klinger, & Song, 2006; Gelman & Raman, 2003; Hall & Graham, 1999; Hall, Quantz, & Persoage, 2000; Hall, Waxman, Brédart, & Nicolay, 2003; Waxman & Booth, 2001). The latter approaches are also consistent with the idea that toddlers have to make pragmatic inferences to derive the meaning of a word in a certain situation and context, based on their understanding of the situation and the interlocutor's intention. This is especially important in the phase of early word acquisition. Findings of a study by Cleveland and Striano (2007) on the importance of joint attention on object processing in 4- to 9-month-old babies supports this idea. The authors found evidence of enhanced object processing in 9-month-old babies after a situation of joint attention. This indicates that joint attention situations have a positive effect on the development of language and word meaning. Similarly, Clark suggested that the "study of word acquisition should be the study of the pragmatic inferences children make about language use" (Clark, 2009c, p. 129). The fact that toddlers are able to make pragmatic inferences about the meaning of words in a specific context is also relevant for the interpretation of the conjunction *and*. The ability to draw inferences about meaning at an early age suggests that children should be able to draw inferences about the specific meaning of the conjunction in a context if they have enough knowledge about the specific situation and relation between the conjoined conjuncts. This should be the case independent of the assumed meaning of the conjunction. If it is assumed that *and* comprises several meaning features (e.g. Cohen, 1971), it has to be inferred which one is the relevant or intended one, while a more specific meaning of the conjunction has to be inferred if it is assumed that the basic meaning of the conjunction is one of simple coordination (e.g. Asher & Vieu, 2005; Lascarides & Asher, 1993; Txurruka, 2003) or the same as the logical operator (e.g. Carston, 1993, 2002a).

Contextual clues and joint attention are not only important for the comprehension of words and the recognition of meaning but also for the production. Carpenter, Nagell and Tomasello (1998) point out that TOM abilities such as recognizing the intentions of other people are important for the development and acquisition of language and vice versa. Children who recognize the intentions of others later also start to produce language later and the other way round (cf. Steinkrauss, 2010, p. 302).[32] This might be related to the fact that the recognition of people's intentions is important for the acquisition of meaning which is a necessary prerequisite for using words as reference. Hence, TOM abilities are not only important for the acquisition of pragmatic skills but also for the development and extension of the lexicon and vice versa. Zufferey (2010) showed in an analysis of discourse connectives that the use of certain connectives and TOM abilities are also linked. TOM abilities are important for the production of connectives because some connectors require the manipulation of mental concepts, e.g. due to their procedural meaning (Zufferey, 2010). The acquisition of connectors is discussed in more detail in chapter 5.3.1.

Concerning the acquisition of language production, contextual clues are not only important for children but also for their adult interlocutors. Making inferences and the establishment of common ground as well as joint attention are also important for adult interlocutors, since the usage of children's early words differs from the adult usage. Keil describes that children's representation of early words is shallower than the one of adults (Keil, 1981; Keil & Batterman, 1984). Children often refer to characteristic features of objects first before referring to the core meaning. Karmiloff and Karmiloff-Smith (1986, p. 77) state that children "change their mental representations of the words they have learned". This observation is discussed and explained in the literature as over-extension and under-extensions (Bowerman, 1978; Steinkrauss, 2010; Weinert & Grimm, 2008).[33] From my point of view, it does not necessarily have to be the case that children over- or underextend the meaning of words in production because they assign different meaning to them than adults. Over- and under-extensions might as well result from limited vocabulary.[34] As children still want to express

[32] Other authors, such as Zufferey (2010) as well as Slade and Ruffman (2005) postulate a complex and bidirectional link between the acquisition of language and the development of TOM.

[33] *Overextension* refers to the phenomenon that a term is used too loosely. The word *cat* might, for example not only refer to cats but any animal that shares certain characteristics with a cat, e.g. a dog of a similar size or other animals with four legs. *Under-extension* means that a term is used in a context that is too close, e.g. if the word *flower* is only used to refer to flowers in the garden but not to artificial flowers or flowers depicted in a concept-book.

[34] Karmiloff and Karmiloff-Smith report a similar idea: "In some instances, she may well have correctly processed the perceptual and conceptual differences that demarcate categories of animals or objects, but not yet possess the words to express these differences. She is forced to generalize the use of the few words she does possess in order to extend the function of her limited vocabulary" (Karmiloff-Smith, 1986, p. 67).

their ideas or thoughts, they can only do so by generalizing the use of their words and hope that interlocutors infer the intended meaning based on contextual clues. Hence, single words uttered by young infants may, depending on the context, express different meanings. Additionally, in the one- and two-word-phase early words often stand for whole sentences because children cannot express the relation between single words yet (cf. Butzkamm & Butzkamm, 2008; Crain & Lillo-Martin, 1999; Karmiloff-Smith, 1986).[35] Therefore, adults have to make inferences about the meaning the child wants to convey, taking the communicative situation, previous utterances and the context into consideration (cf. Bloom, 1970). With respect to these findings, it would be interesting to see whether children also use general expressions, e.g. the conjunction *and*, in situations in which they actually want to express more specific information and rely on the fact that the hearer draws the necessary inferences to derive more detailed information.

As shown in this section, contextual clues are of great importance for language acquisition and communication as they support both production and comprehension strategies. From my point of view, children's production strategies such as over- and underextensions indicate that children might be aware that general things can in a specific context express more detailed information or meaning relations, if the hearer draws the respective inferences. If it is the case that children are at a certain age (actively) aware of this and have enough contextual and background knowledge, then they might recognize that in some contexts general words (e.g. the conjunction *and*) might convey more specific information if the hearer draws inferences. For this reason it would be interesting to know whether and from which age onwards children are (actively) aware that they can draw inferences and how they interpret the conjunction *and* in specific contexts. The next section of this chapter is concerned with the acquisition of pragmatic skills and phenomena at the semantic/pragmatic interface.

5.2 Acquisition of semantic/pragmatic interface phenomena

According to Bates (1976) the acquisition of pragmatics can be split up in three stages: the Sensorimotor Period, which applies to pragmatic skills in babies up to 18 months, the Pre-operational Period, which describes the development of pragmatic competence between the age of 18 months and 4 years and the Concrete Operational Period, which accounts for the pragmatic development in four- to six-year-old children. Although the Concrete Operational Period ends at the age of six, the acquisition of pragmatics and linguistics is not accomplished

[35] Children's utterances between the age of 12- and 24 months consist of one or two single words. This period is called one- and two-word-phase, respectively. Roger Brown (1968) and Dan Slobin (1970) studied two-word utterances in more detail. They found typical meaning-relations between words in two-word utterances.

yet. Some pragmatic phenomena develop slightly later: Children around the age of seven can master more complex metalinguistic tasks (for details see Foster-Cohen, 1999). Other pragmatic skills that still develop later are related to comprehension and include linguistic humor, irony, differences between form and meaning of words and sarcastic intonation (Foster-Cohen, 1999). The Preoperational Period and the Concrete Operational Period are most relevant for this work because important semantic/pragmatic interface phenomena such as the comprehension of indirect utterances and implicatures develop. This chapter is concerned with the development of skills at the semantic/pragmatic interface that develop in the Preoperational and Concrete Operational Period and are relevant or related to the experiments that are conducted in chapter 6. As the experiments in chapter 6 investigate the influence of context on the interpretation of the conjunction, knowledge about how and what kind of contextual information children use in language comprehension is of importance. Therefore, another focus of this chapter is on the role of context for the acquisition of these phenomena.

As already indicated in chapter 5.1, contextual factors are not only important for language acquisition and early communication but also for successful language comprehension, especially if pragmatic phenomena such as inferences, irony or implicatures are involved.[36] The situational context, world knowledge or experiences are of great importance because the meaning of an utterance depends on these factors and is beyond the information explicitly expressed.

Drawing inferences is necessary to fully comprehend indirect speech, enrichment, irony and implicatures (Dews & Winner, 1997). However, each of these phenomena requires processing of contextual information to different extents. Although toddlers use context to comprehend and acquire words already, the successful use of contextual information to answer questions that require inferences, enrichment or implicatures seems to be related to age (Loukusa, 2007; Loukusa, Leinonen, & Ryder, 2007; Ryder & Leinonen, 2003). The understanding of indirect commands starts to develop first, followed by more complex phenomena such as enrichment, implicatures and irony.

It is controversially discussed in the literature whether young children have difficulties to comprehend and answer indirect statements (Bernicot & Legros, 1987; Bucciarelli, Colle, & Bara, 2003; DeVilliers & DeVilliers, 1979; Elrod, 1987; Heinzmann, 2006; Kelly, 2001; Shatz, 1974; Shatz, 1978). Shatz (1978) observed that 2-year-olds respond with actions to indirect requests, which indicates that they can understand indirect requests. The studies by

[36] Drawing inferences requires connecting information of different kinds and sources (e.g. linguistic information, contextual situation, world knowledge, TOM etc.) to retrieve the meaning of an utterance based on given information.

Shatz (1974) and Bucciarelli, Colle and Bara (2003) further support the observation that children as young as 2 years comprehend indirect requests. If it is the case that children at this age are already able to understand indirect language, they might also be able to understand meaning relations beyond the general or additive meaning of the conjunction *and* expressed in a specific context. This however is not for sure because a variety of other factors influence comprehension of (indirect) language. Moreover, the study by Bucciarelli and colleagues (2003), also revealed that 2;6 to 7-year-old children (in and across all tested age-groups) have more difficulties with complex indirect demands. Children's difficulties with (complex) indirect utterances are confirmed by the experimental results of the studies by Elrod (1987) and Heinzmann (2006). This indicates that the processing of indirect statements is more complex or involves more processing costs than indirect questions. A study by Loukusa (2007) supports this assumption because it suggests that there are different types of indirect speech that are more or less complex and demanding because they require different degrees of contextual processing. Furthermore, tasks in which information from more than one source or unfamiliar situations have to be combined are more complex and therefore cause more processing costs and difficulties (cf. Bezuidenhout & Sroda, 1998; Loukusa, 2007; Loukusa et al., 2007; Ryder & Leinonen, 2003). Hence, the processing of contextual information is said to develop with age (Ryder & Leinonen, 2003): While 3-year-old children are still said to be unable to answer questions that involve taking into account world knowledge, verbally given information or prior context, 5-year-olds answer the majority of these questions correctly (Ryder & Leinonen, 2003). This could also explain why young children are able to use certain contextual clues during the acquisition of words (see chapter 5.1) but do not master or still have difficulties with more complex pragmatic phenomena that require higher degrees of contextual processing until they are older.

Another pragmatic phenomenon which requires processing demands and the consideration of more complex contextual factors are implicatures. The development of implicatures is important for this work with respect to how children interpret the conjunction *and* because some of the theoretical approaches to the meaning and interpretation conjunction assume that meaning relations beyond the additive reading of the conjunction arise due to the calculation of implicatures (see chapter 3.1.1 and 3.1.2). The comprehension of (scalar) implicatures is reported to develop with age (e.g. Chierchia, Guasti, Gualmini, Meroni, & Crain, 2001; Chierchia et al., 2005; Noveck, 2001, 2005; Noveck & Sperber, 2007; Papafragou & Musolino, 2003; Pouscoulous, Noveck, Politzer, & Bastide, 2007). This might also be related to the fact that the processing of contextual information develops with age. However, there is

also evidence that one has to distinguish between different types of implicatures and that some types of implicatures are acquired earlier than others (Röhrig, 2010, 2011). Apart from that, there is also evidence that the type of task and whether additional encyclopedic or lexical knowledge is needed, has an impact on the calculation of implicatures (Barner, Brooks, & Bale, 2011; Breheny, Katsos, & Williams, 2006; Katsos & Bishop, 2008; Papafragou & Tantalou, 2004; Verbuk, in Press, Corrected Proof). As the acquisition of implicatures is of great importance for the current work, chapters 5.2.1 to 5.2.3 are specifically concerned with the acquisition of implicatures and factors that influence their calculation.

Furthermore, increasing experience and knowledge of scripts supports children's language production and comprehension, e.g. drawing inferences, recalling events (Hudson & Nelson, 1983; Hudson & Slackman, 1990; Nelson, 1978). An empirical study by Nelson (1978) revealed that preschool-children described familiar routines more coherently and detailed if they were more experienced with the event. This is in line with findings from Hudson and Nelson (1983), that show that 4;4- to 7;2-year-old children are able to recall more information from a presented story, if they were familiar with the events described in the story. Moreover, children were better at sequencing events of the stories, if the story presented events that occur logically in a certain order. Additionally, authors found a developmental effect: Younger children's event knowledge "tends to be schema bound", while the older children are "more flexible in their use of scripts in story recall" (Hudson & Nelson, 1983). That younger children strongly rely on scripts is also confirmed by the data of the empirical study on script-based, invited and logical inferences by Hudson and Slackman (1990). The authors found that 4;1- to 5;5-year-old children were able to draw script-based inferences more easily than invited or logical inferences. The 5;10- to 7;5-year-old children had less difficulties with script-based as well as invited inferences compared to logical inferences. The results of this study further suggest that there is a relation between the development of knowledge and the ability to draw inferences: Script-based inferences are mastered before invited inferences which are mastered earlier than logical inference (cf. Hudson & Slackman, 1990). This shows that one has to distinguish between different types of inferences when talking about the acquisition of inferences. The types could be categorized according to experience and the contextual complexity involved. Moreover, findings on children's use of script structures, world knowledge and script-based inferences support that the use of context develops as children get older. These findings are relevant for the current thesis and the experiments conducted in chapter 6 because it tests the interpretation of the conjunction in different types of context. If the kind and nature of the context or story presented is relevant for children's performance, e.g. in the way that

script based events or events children are familiar with can be processed and recalled more easily, then the type of context in which the conjunction *and* is presented might influence children's interpretation of the conjunction.

5.2.1 Acquisition of Enrichment and Implicatures

Metalinguistic skills, the ability to change perspective and knowledge of Grice's conversational maxims are preconditions for the calculation of implicatures and the comprehension of indirect speech. Empirical findings reported in the literature suggest that the acquisition of implicatures is a late developmental phenomenon because several studies show that even 7- to 10-year-old children do not perform adult-like when comprehension involves the calculation of implicatures (e.g.Chierchia et al., 2001, 2005; Heinzmann, 2006; Noveck, 2001; Papafragou & Musolino, 2003). These findings are also robust across different languages: Developmental studies on scalars have for example been conducted in English (Chierchia et al., 2001; Gualmini, Meroni, & Crain, 2000; Hurewitz, Papafragou, Gleitman, & Gelman, 2006), Greek (Papafragou & Musolino, 2003), French (Noveck, 2001; Pouscoulous et al., 2007) and Italian (Foppolo, Guasti, & Chierchia, 2011; Guasti et al., 2005). The comprehension of a variety of scalar terms has been investigated: Noveck (2001) conducted experiments on the acquisition of the scalar terms in which he examined the comprehension of the English verbs *must* and *might* as well as the French quantifier *certains* ('some'). Results revealed that children accept the modal *might* more frequently than adults in situations where *must* would be optimal. The author therefore puts forward that children consider relatively weak terms as compatible with the respective stronger term of the scale. This suggests that children interpret weak scalar terms differently than adults. Similar experimental findings and observations were also made for other scalar terms such as numbers, quantifiers and the scales <*some – all*>, <*finish – start*> and <*at least - at most*> (Chierchia et al., 2005; Noveck, 2001, 2005; Noveck & Sperber, 2007; Papafragou & Musolino, 2003; Pouscoulous et al., 2007). These papers also suggest that children enrich weak scalar terms generally less often than adults and younger children enrich weak scalar terms less often than older children. This suggestion is based on the fact that younger children accept scalar terms, which are actually under-informative in the tested context, more often than older children and older children accept these terms more often than adults. As young children appear to enrich weak scalar terms less often than older children and older children less often than adults, the literature considers the ability to calculate scalar implicatures (SIs) and to reject under-informative statements as an ability that increases with age. These findings suggest that if meaning relations beyond the additive meaning expressed by the conjunction *and* are implicatures as suggested for example

by Neo-Gricean approaches (see chapter 3.1), then temporal and other interpretations of the conjunction should be found less often in younger children than in older children and adults.

A field of research in language acquisition, which is also based on Grice's Conversational Maxims, and of great importance for the calculation of implicatures is the development of informativeness.[37] This is because the detection and calculation of implicatures is often related to recognizing underinformativity.[38] Several empirical studies focus on the development of informativeness (e.g. Davies & Katsos, 2010; Katsos, 2009; Katsos & Bishop, 2008; Katsos & Bishop, 2011). In order to find the balance between both maxims and to avoid producing statements that are over- or under-informative, contextual factors, common ground and the hearer's state of mind have to be considered.

Research on children's comprehension and evaluation of under-informative statements revealed that younger children accept under-informative statements more often than older children and adults (Katsos, 2009; Katsos & Bishop, 2008). Despite all, there is evidence that suggests that young children seem to recognize underinformativity and are able to detect semantically wrong utterances because they reject these statements more often than optimal ones (Davies & Katsos, 2010; Katsos & Bishop, 2008).[39] Hence, Katsos (2009) suggests that the ability to reject under-informative statements develops with age and is a relatively late developmental phenomenon.

The findings on the comprehension of underinformativity are in line with research on scalar implicatures: Studies that examined the acquisition of scalar implicatures by means of truth-value judgment tasks found that children do reject weak-scalar terms in situations where the stronger terms holds less often than adults (e.g. Chierchia et al., 2001; Noveck, 2001).

Common between the rejection of under-informative statements and scalar implicatures is that hearers need to recognize that a statement is under-informative and additionally have to consider this violation as severe enough or worth to reject the respective statement. The findings that young children seem to be able to recognize semantically under-determined statements supports the idea that children calculate less implicatures because they have different criteria

[37] Conversational Maxims help interlocutors to optimize conversational contributions and support the hearer when decoding utterances, because he assumes cooperativity and optimal contributions. With respect to optimal informativeness the Maxim of Quantity and its sub-maxims "1. Make your contribution as informative as is required (for the current purpose of the exchange)." and "2. Do not make your contribution more informative than is required" (Grice, 1989b, p. 26) are of great importance, as they help the partner to make contributions which are sufficient.

[38] Under-informative statements can either be rejected because they are not informative enough or because they are interpreted as utterances that contain a scalar term (cf. Davies & Katsos, 2010, p. 49).

[39] However, there is also evidence that children's performance on the comprehension of underinformativity is related to task demands (Katsos & Bishop, 2008).

when evaluating statements as *good* or *bad* and *right* or *wrong*, respectively. This hypothesis is in line with findings of several studies which report that children younger than six years produce under-informative statements or responses (Davies & Katsos, 2010; Ford & Olson, 1975; Katsos & Bishop, 2008; Roeper, 2004; Sonnenschein, 1982) but are able to clarify and produce more optimal utterances when asked to (Matthews, Lieven, & Tomasello, 2007). Moreover, there is evidence that under-informativity decreases when children get older, becomes optimal around the age of six and over-informative around the age of seven to nine (Davies & Katsos, 2010; Ford & Olson, 1975; Sonnenschein, 1982). A possible explanation might be that older children are not only able to consider and use more complex contextual factors in comprehension but also in production. They therefore provide more detailed information to establish common ground and to update the speaker's state of mind. Another possible explanation for the production of over-informative utterances in 7-to 9-year-old children would be that school-children are aware that their knowledge is evaluated regularly at school. Consequently it might be possible that they make their utterances as informative as possible and state all they know because they need to do so at school to achieve good marks and evaluations.

5.2.2 Factors that influence the calculation of implicatures

The probably most frequently used method in assessing participants understanding of under-informative statements and implicatures are binary judgment tasks (e.g. Foppolo et al., 2011; Guasti et al., 2005; Noveck, 2001; Papafragou & Musolino, 2003; Papafragou & Tantalou, 2004; Pouscoulous et al., 2007). Results of these studies showed that children do not perform adult-like with respect to the evaluation of under-informative statements and implicatures. Katsos and Bishop (2011) point out that children's failure in binary judgment tasks, might either be due to being unable to derive implicatures or due to not being sensitive to the degree of informativity. However, failure in this kind of tasks might also mirror that participants have difficulties with the task, e.g. because they cannot decide whether a non-optimal statement should be evaluated as *wrong* since it is not optimal-informative or whether it should be accepted because it is true though under-informative. Findings from several studies which manipulated the kind of task (picture matching task vs. judgment tasks vs. act-out tasks), the evaluation scale (binary vs. five-point scale vs. punishment and reward tasks) or the contextual setting (e.g. whether the task implicates that the speaker uttered a complete statement), indicate that these factors do indeed influence children's performance: Papafragou and Tantalou (2004), showed that 4- to 6-year-old children are very good at evaluating and making judgments on inferences of entailment scales in scenarios in which a speaker made an implication

about having not completed an assigned task. In this study children were asked to give rewards rather than making *true/ false* statements. Katsos and Bishop (2008) gave children a five-point scale rating task and asked them to reward a puppet with one, two, three, four or five strawberries, depending on how well the uttered sentence was (cf. Katsos & Bishop, 2011). Results showed that children recognized and punished under-informative statements by giving fewer strawberries to the puppet. Davies and Katsos (2010) conducted an experiment on over- and under-informative utterances with 4;10- and 6;5- year-old children as well as adults. Results revealed that when given a binary-judgment task, children treated over-informative utterances just like optimal utterances, but rejected under-informative utterances more often than optimal ones. However, when given a magnitude estimation task, 5-year-olds rated over- as well as under-informative utterances lower than their optimal counterparts. Moreover, children additionally displayed a trend to evaluate over-informative utterances higher than under-informative ones and appeared to reject under-informative sentences less often, than statements with syntactic or semantic violations (Davies & Katsos, 2010). Results from the same study also show that children are sensitive to both Sub-maxims of Quantity but seem to punish violations of the first one more than violations of the second one. The study further revealed that the nature of the given task influences the results in the way that binary-judgment tasks might conceal children's ability (Davies & Katsos, 2010). These findings are in line with the observations of my MA-thesis (Röhrig, 2010): In a modified replication study of Noveck's experiment (2001) on the scalar terms *must* and *might*, I asked children to evaluate statements as either *richtig* ('correct'), *halbrichtig* ('partially correct') or *falsch* ('wrong') and found that even 5-year-old children are able to calculate (a kind of) scalar implicatures or at least recognize that the modal *might* is in some situations not perfectly informative. Results indicate further that younger and older children appear to treasure some sub-maxims of the Conversational Principles more than others.[40] Based on this, 5-year-old children calculate different kinds of implicatures than 9-year-old participants and adults. Early implicatures by children as well as scalar implicatures have in common that both of them are based on Grice's Maxims of Quantity. Depending on which sub-maxim of Quantity the hearer exploits, upper- or lower-bound scalar implicatures are calculated. Upper-bound SIs such as child implicatures are inferences from the first Maxim of Quantity, while lower-bound SIs are inferences based on the second Maxim of Quantity (cf. Röhrig, 2010; 2011).

Katsos and Smith (2010) discovered in a study on under-informativity that children are more successful in act-out and sentence to picture matching tasks rather than in evaluating state-

[40] The study was conducted with German speaking subjects of the ages of five, seven and ten.

ments. How severely task demands can influence children's performance, is shown by the studies of Pouscoulous and colleagues (2007) as well as Foppolo and colleagues (2011): Results of these studies show that 11-year-old children's ability to reject under-informative utterances can still be wrapped up and may remain invisible due to a demanding task, while 5- to 6-year-olds do perform well and reliably when given an adequate task. The findings just discussed show that children's performance with respect to semantic/pragmatic phenomena cannot be generalized. Instead it is important to pay close attention to the experimental design of the study to avoid that children's abilities with respect to the investigated phenomenon are concealed due to the influence of the given task or used method.

Other factors that have been identified as influential on children's performance with respect to informativity and scalar implicatures are training, the minimization of processing costs and the kind of necessary knowledge (world knowledge vs. situational/ visual context). Moreover, the kind of scale on which implicatures are based on might be influential.[41] Generalized quantifier scales are the basis for generalized quantity implicatures and may be context-dependent or context-independent. Whether a scale is context-dependent or context-independent is determined by whether the set of items presented in the (experimental) situation is established by world/ encyclopedic knowledge or created by the experimental situation.

Children's performance of implicatures with regard to non-lexical scales, such as scales that are licensed by encyclopedic or world knowledge or ad hoc in a communicative situation has only rarely been tested empirically (e.g. Katsos & Bishop, 2008; Katsos & Bishop, 2011; Papafragou & Tantalou, 2004). Findings of these studies do however indicate that the kind of scale presented and contextual factors are relevant for participants' performance on evaluating under-informative utterances and the calculation of implicatures.

Papafragou and Tantalou (2004) compared the comprehension of the generalized quantifier scale <*some* - *all*> in Greek with scales based on encyclopedic/ world knowledge (part vs. whole) and context-dependent ad hoc scales.[42] Results revealed that 4- to 6-year-old children mastered the task quite well and recognized under-informative statements for all types of scales correctly and identified whether the action was completed or not. With respect to un-

[41] Ad hoc scales consist of a set of different kind of items that do not naturally form a collection but comprise a set in the experimental setting. Generalized scales are made up of several items of the same kind that form a collection, e.g. four stars or ten strawberries (cf. Katsos & Bishop, 2008). Generalized scales can also be lexically triggered by scalar terms or quantifiers. Other types of scales are for example based on encyclopaedic or world knowledge (e.g. chicken are birds) or arise ad hoc out of the experimental situation (e.g. the set of pictures a subject is confronted with).

[42] In the experimental setting the speaker was asked to fulfil a task, then disappeared and came back reporting what he had done. The utterances were formulated so that they implicated that the task was not completed. Participants had to reward the speaker for his performance on the task.

der-informative statements children performed best in contexts that presented ad hoc scales (90% correct answers), followed by utterances of scales that are created by encyclopedic/ world knowledge (77.5% correct answers) and worst with terms of the scale <*some - all*> (70% correct answers).[43] The main finding of the study by Papafragou and Tantalou (2004) is that children's performance with under-informativity and scalars is influenced by the type of scale and context. The just mentioned experimental findings indicate that discourse and contextual factors have an influence on children's performance of implied and indirect language. Hence, the influence of different types of context on children's performance should be considered and controlled for in experimental studies. The fact that different types of knowledge are also relevant with respect to children's comprehension of indirect language, further supports the idea that the temporal interpretation of the conjunction *and* might be dependent on the context in which it occurs and what kind of events are conjoined.

The study by Breheny, Katsos and Williams (2006) further supports that discourse and context have an impact on whether scalar implicatures are calculated by children or not. Breheny and colleagues analyzed the scalar terms <*some - all*> and <*either or - or*>.[44] The authors found that scalar implicatures are context-dependent. Specifically, scalar expressions trigger more implicatures if the discourse context requires detailed knowledge of quantity. If no context was provided, participants did not calculate implicatures unless the experimental setting was manipulated so that participants expect more information.

Katsos & Bishop (2008) tested how 5-, 7-, 9- and 11-year-old children and adults interpret context-independent generalized scales such as *The giraffe ate some of the pears* in a situation where the giraffe ate all of the pears and context-dependent ad hoc scales such as *The boy watered the tree* in a situation in which the boy had watered the tree and the flowers. A binary judgment task was used to test comprehension. Results revealed that adults appeared to have slightly more difficulties with context-dependent ad hoc scales than with context independent-scales while young children have more difficulties with context independent-scales.[45] The same authors made similar observation in a follow-up experiment in which participants had to evaluate the same utterances on a five-point scale (Katsos & Bishop, 2008): 7-year-old partic-

[43] Unfortunately the authors did not conduct the study with an adult control group. Therefore, it cannot be said whether adults performance is also scale dependent or equally well for all types of scales (as suggested by the results of Katsos and Bishop (2011)).

[44] In their setting a stuffed animal was assigned a task. Afterward the animal disappeared and came back and described what it had done by means of a statement which implicated that only part of the task had been fulfilled.

[45] The authors report that adults gave 100% correct answers to context-independent generalized scales and 98.3% correct answers for context-dependent ad hoc scales. 5- and 7-year-old children performed worse on context-independent scales than on context-dependent ad hoc scales, while 9- and 11-year-olds performed nearly equally well in both conditions.

ipants accepted under-informative statements from a generalized context-independent scale more often than the ones from context-dependent ad hoc scales, while adults and 11-year-old children accepted under-informative statements from ad hoc scales more often (Katsos & Bishop, 2008). These findings further support that the kind of context in which children's recognition of underinformativity is tested, has a strong impact on the performance and suggests that not all age-groups perform equally well in the same type of context.

The experimental findings just discussed also indicate that (young) children utilize contextual clues when interpreting utterances and therefore detect under-informative statements more easily. A possible explanation is that children pay more attention to the conversational situation and contextual clues provided in a specific situation rather than on generalized scalar terms and lexical items, possibly because they know and make use of the same strategies during word learning. Additionally, the processing of context-independent scales might be more difficult because it involves the use of existing knowledge and is therefore of higher contextual complexity. Adults and older children might in contrast to younger ones use slightly different strategies because they have a richer encyclopedic and world knowledge. Therefore, adults might be more focused on their knowledge and the general meaning of words because they do not have to decipher the meaning of words based on the context. Moreover, they can process different kinds of contextual information more easily than children because they can handle higher processing demands more easily than young children.

Katsos and Bishop (2011) conducted three studies on scalar and non-scalar expressions with 5- to 6-year-old children and adults by means of a binary-judgment task (experiment 1), a five-point scale (experiment 2) and a picture-pointing task. Results reveal that children as well as adults were sensitive to but also tolerant with respect to under-informative statements for both types of test items (scalar as well as non-scalar expressions): Children did not reveal any significant differences between both conditions, while adults categorically rejected under-informative statements with scalar terms (88%) but less often with non-scalar terms (67%). Therefore, the authors argue that the differentiation between under-informative scalar expressions and under-informative non-scalar expressions develops with age and that children appear to be generally tolerant towards violations of informativity (Katsos & Bishop, 2011).

In summary, contextual factors have the most important impact on children’s performance with respect to the detection of under-informative statements and the calculation of implicatures. Moreover, children’s performance is influenced by whether additional knowledge such as encyclopedic or lexical knowledge is necessary to come up with alternative representations of the tested statements. This is in line with research on children’s use of context

(Bezuidenhout & Sroda, 1998; Loukusa, 2007; Loukusa et al., 2007; Ryder & Leinonen, 2003) and is further supported by studies on the acquisition of focus particles which indicate that 6-year-old German-speaking as well as English-speaking children only consider the uttered context and do not utilize implicitly given information to come up with alternative presentations when evaluating under-informative statements (Müller, Schulz, & Höhle, 2011; Paterson, Liversedge, Rowland, & Filik, 2003). This suggests and further supports that the use of additional context (which is not explicitly mentioned) develops with age and that the complexity of contextual factors that have to be considered when interpreting statements is related to children's performance. With increasing age children can handle more complex contexts and use their world knowledge when evaluating statements. This is most likely because these processes require higher processing demands and appear to develop with age.

5.2.3 Theories on the Acquisition of Implicatures

As indicated in chapter 4, context in the wide sense is important for the acquisition of language and pragmatics. This chapter introduces approaches to the acquisition of implicatures and is concerned with whether and how these theories account for contextual influences on the acquisition of implicatures. It is important to know these hypotheses to see whether the findings of the experiments in chapter 6 match with the theories on the acquisition of implicatures and pragmatic skills. If the temporal and other meaning relations communicated by the conjunction *and* are implicatures, it is also important to be familiar with these hypotheses to see whether and if any of these theories can account for the data collected in chapter 6.

The compuation of implicatures is costly because at least two alternative representations (plain meaning vs. possible alternative interpretations of the statement) have to be compared. Moroever, a decicion on the appropriateness and informativity of the statement in the given context has to be made. Several approaches on the acquisition of implicatures, such as the Processing Limitation Hypothesis (Chierchia et al., 2001), the Pragmatic Delay Hypothesis (Noveck 2001; Chierchia et al. 2005) and the Enriched Lexicon Hypothesis (Guasti et al., 2005) have been suggested in the literature. The Reference-Set Hypothesis as well as the Processing Limitation Hypothesis argue, that children fail to compute implicatures because they can, due to limited working memory, not handle the required processing demands (cf. Chierchia et al., 2001; Chierchia et al., 2005; Gualmini, Crain, Meroni, Chierchia, & Guasti, 2001; Pouscoulous et al., 2007; Reinhart, 1999, 2004). Based on the prediction of these accounts, children should fail calculating implicatures independently of the contextual situation, because in all kinds of situations children have to draw on their computational resources to keep and compare the uttered statement with its alternative(s). However, the predictions of

this hypothesis, cannot account for empirical findings on children's detection of over- and under-informative statements and are not in line with the findings that children's calculation of implicatures is influenced by the type of scale and context-dependence (cf. Barner, Brooks, & Bale, 2010; Davies & Katsos, 2010; Katsos, 2009).

The Enriched Lexicon Hypothesis considers the ability to compute implicatures as a matter of innate grammar (cf. Guasti et al., 2005). This hypothesis is based on the assumption that the lexical entry of scalar terms includes information about the respective stronger or weaker terms of the same scale. Children's difficulties to calculate implicatures are ascribed to their (still) incomplete mental lexicon, which blocks the default mechanisms that are responsible for the calculation of scalar implicatures (Guasti et al., 2005; Katsos, 2009). The advantage of this hypothesis is that it can account for findings that suggest that children's performance on implicatures appears to depend on the type of scale and context.

Barner and Bachrach (2010) postulated the scale specific account, which suggests that the way how children learn new words and extend their vocabulary is related to the ability to calculate implicatures (cf. Barner et al., 2010, 2011). The authors suggest that children acquire the general meaning of words first and later gain knowledge of the corresponding scale and alternative terms. As children do not learn all scales at a time, they have more difficulties to generate alternative formulations for certain scalar terms. Implicatures that involve numerals are, for example, expected to be mastered earlier than those based on quantifiers. This is because numbers are learned in terms of count lists, which has the consequence that children have knowledge of an ordered list of alternative expressions of the same scale quite early (Barner & Bachrach, 2010; Barner et al., 2010). This approach indirectly suggests that the linguistic context (type of scale) and knowledge about expressions of a scale are relevant for the calculation of implicatures.

Based on children's better performance in truth-value judgment tasks compared to binary decision tasks, Chierchia and colleagues (2005) proposed that children and adults focus on different aspects when evaluating utterances. Adults are assumed to concentrate on the appropriateness of an utterance, while children appear to focus on truthfulness or falsity of statements.

The Pragmatic Delay Hypothesis (Chierchia et al., 2001), explains children's difficulties to compute implicatures by stating that children lack the required pragmatic knowledge. This hypothesis is based on the standard view and predicts that children learn semantic knowledge about logical words first and develop pragmatic skills later (Chierchia et al., 2001; Gualmini

et al., 2001).[46] However, this hypothesis is not consistent with empirical findings that indicate that children possess the necessary pragmatic skills for the calculation of scalar implicatures because they appear to know and stick to the Maxim of Quantity (Chierchia et al., 2005; Röhrig, 2010). Moreover the predictions of this hypothesis are not in line with the findings that suggest that children's performance with implicatures is scale- and context-dependent (Barner et al., 2010) as children should generally fail to calculate implicatures if they lack pragmatic knowledge.

The Pragmatic Tolerance Hypothesis (Katsos, 2009) suggests that children possess the required pragmatic skills and detect under-informative statements but calculate implicatures less frequently than adults because they do consider violations of the maxim of quantity as less severe than adults do. Hence, the amount of calculated implicatures depends on what individuals consider to be informative and differing standards concerning how under-informative a statement has to be in order to be rejected. The Pragmatic Tolerance Hypothesis does not distinguish between different types of contexts but considers personal characteristics and attitudes of the hearer as influential. This hypothesis is supported by the fact that children are able to detect and punish semantically wrong utterances (Katsos, 2009) and evaluate under-informative statements as worse than optimal ones (see Davies & Katsos, 2010; Katsos, 2009; Katsos & Bishop, 2011; Katsos & Smith, 2010).[47] Therefore, the authors conclude that children seem to be more tolerant towards violations of informativity and that they might be "operating under a principle of charity, whereby they do not reject utterances as long as they are (even partially) true" (Katsos, 2009, p. 16). Further evidence and support for the Pragmatic Tolerance hypothesis comes from a study by Paterson, Liversedge, White, Filik and Jaz (2006), who showed that children detect under-informative statements but punish this violation not as often as adults do.

Based on data of a pilot study, Röhrig (2010) suggests that young children calculate implicatures that are of different nature than the ones calculated by adults. These early implicatures are based on exhaustive readings and are computed because children rely on and value different maxims of the conversational principle more than adults (cf. Röhrig, 2010; 2011). This approach is based on experimental findings of a pilot-study on the scale < *könnte vielleicht, kann, muss* > (<'might possibly', 'might', 'must'>). Therefore, it still has to be proved whether this approach also holds for other scalar terms or different kinds of implicatures.

[46] The standard view states that the required semantic and pragmatic skills are part of different language modules (Chierchia et al., 2001).

[47] Children's tolerance towards informativity also affects over-informative statements and is task-dependent (Davies & Katsos, 2010; Katsos & Smith, 2010).

5.3 Context and the acquisition of Narratives

The production and comprehension of narrative is a much more complex process for children than conversational exchanges because they cannot rely as much on cues and support from contextual factors such as joint attention and the communicative context as in communicative situations. Many of the non-linguistic pieces of information, which support communication in conversations, have to be communicated explicitly in narratives via coherence and cohesion. Therefore, children have to acquire how to organize and structure longer discourse such as narratives. Some of the structures and words they have acquired already, have to be used differently because these linguistic devices have different functions at the discourse level than at the sentence level (cf. Karmiloff & Karmiloff-Smith, 2002).

This chapter is concerned with how children use contextual information and means of cohesion and coherence in narratives and the differences in use between certain age-groups. As event structure is one of the factors that is manipulated in the series of experiments conducted in this thesis (for details see chapter 6), the use and organization of event structure by children is of interest. If the importance of a correct event structure differs between (young) children and adults, differences in the answering patterns of the age-groups can be expected in the experiments.

In communication even children as young as 1;10-years have strategies to establish coherence and to organize discourse, e.g. they produce juxtapositions and implicitly link their utterances (cf. Bloom, Lahey, Hood, Lifter, & Fiess, 1980; Hickmann, 2004) (see also chapter 5.3.1). Around the age of 2;6 to 3;0 years, the development of memory and the growing vocabulary enables children to produce complex utterance, e.g. about the past or non-present objects (cf. Bates, 1976; DeVilliers & DeVilliers, 1979; McTear, 1985; Wellman & Lempers, 1977). Although 2-year-olds do not use connectives yet and are slower in formulating their conversational contributions than older children or adults (cf. Clark, 2009b; Garvey, 1984), they have acquired a variety of pragmatic and meta-pragmatic skills already (for details see: Bates, 1976; Foster-Cohen, 1999). Concerning contextual factors, even 2-year-olds appear to be aware of the importance of context in communication and language comprehension: O'Neill (1996) reports that 2-year-old children consider their interlocutor's knowledge and supply information that is necessary for a successful communication, e.g. information about the location of an object. Similar findings are reported about 3- and 4-year-old children, who introduced elements in a conversation that were unfamiliar to their interlocutor (cf. Foster, 1990). Other studies show that 3;6-year-olds as well as 4- and 5-year-olds put efforts in establishing a common ground with their conversational partners, if they are aware that they do not share

the same knowledge (cf. Clark, 2009b; Maratsos, 1973; Saylor, Baird, & Gallerani, 2006; Short-Meyerson & Abbeduto, 1997).[48] Moreover, children at this age are able to decode and encode their messages before they utter them and are able to predict what kind of assumptions certain utterances can evoke in a hearer (Bates, 1976). The growing awareness of what kind of inference the hearer could draw when understanding statements differently and the ability to modify utterances to avoid ambiguity helps to avoid misunderstandings or wrong presuppositions (Bates, 1976). These skills show that children have acquired language awareness, know about the importance of context for successful communication and can utilize linguistic and social context purposefully when formulating utterances. Children's awareness about the importance of contextual factors for the interpretation and comprehension is of great importance for this work, because one factor that is manipulated is the kind of context.

Concerning the acquisition of means of discourse cohesion, Peterson and McCabe (1983) observed 4- to 9-year-old children's use of the connectives in narratives. The authors discovered that all of the children used the connective *and* as a kind of „all-purpose-connective" to establish discourse cohesion. Instead of using connectives to specify the relationship between the sentences more explicitly, they used the connective *and* pragmatically to establish discourse relations and to signal that they have not completed their utterance. The only difference between younger and older children's use of *and* was that younger children used it less often than the older ones (Peterson & McCabe, 1983). As the acquisition and use of the connective *and* is of great importance for the current thesis, this topic will be discussed in more detail in chapter 5.3.1.1.

With respect to the use of coherence markers in longer discourse, there are several studies that investigate the characteristics of children's narratives (cf. Hickmann, Liang, & Hendriks, 1989; Hickmann & Schneider, 1993; Karmiloff & Karmiloff-Smith, 2002; Nelson, 1997; Peterson & McCabe, 1983; Stein & Albro, 1997). Information about how children tell stories is relevant to this work because inferences about what kind of structures children master already and what they expect of stories can be drawn. Moreover, these findings can give important hints on what kind of factors have to be controlled for when designing stories for testing children's comprehension.

Peterson and McCabe (1983) revealed in a study, that 4- and 5-year olds are not very competent in the establishment of coherence yet: They produce less structured narratives than older

[48] These communicative advances are possible due to the development of TOM which enables children to change perspective.

children and narrate events in a non-consistent order.[49] Stein and Albro (1997), who investigated how 5-, 8- and 10-year-old children tell stories and how they link the individual events of their stories, found that younger children arrange their narrative in structures similar to a list, while older children link the individual events causally or goal-based (cf. Karmiloff & Karmiloff-Smith, 2002; Nelson, 1997; Stein & Albro, 1997). This is in line with findings on what children expect about narratives and their evaluation of what is a good or bad story. Karmiloff and Karmiloff-Smith (2002) report that very young children evaluate stories that simply list events or a temporal sequence of events such as in (71) as good stories. They do so because the sequence of the events and the characters that perform them are very clear (Karmiloff & Karmiloff-Smith, 2002). The example is taken from Karmiloff and Karmiloff-Smith (2002, p. 159).

(71) John got up from the chair. He put his coat on and left the room. Alice said hello to him when he walked past her.

Moreover, Karmiloff and Karmiloff-Smith (2002) report that younger children often limit their stories to a single character, since this reduces the processing demands caused by the content and structure of the story. The authors further suggest that younger children might be short of the right linguistic form to avoid ambiguity.

Research on children's narratives further revealed that schoolchildren and adults have different standards when evaluating narratives as well as different expectations of and conceptions about what a (good) story is. They consider stories such as in (71) as bad stories because no connectors are used to relate the events of the story temporally or causally and because it is not expressed what kind of relation holds between the individual events (Karmiloff & Karmiloff-Smith, 2002, p. 159). By the age of 8 to 9 years children's linguistic abilities to establish intertextual coherence are fully developed (Karmiloff-Smith, 1986; Klann-Delius, 2008). They are now capable of telling imaginative stories, with more than one character in their narratives. A study based on the analysis of German-, English-, French and Chinese-speaking children's storytelling by Hickmann, Liang and Hendriks (1989) supports these claims.

5.3.1 Acquisition of connectives and conjunctions

Connectors generally serve to conjoin two conjuncts and to structure utterances. Additionally, they often express more specific relations between conjuncts and are necessary for the formation of complex sentences. In order to be able to use connectors correctly, children need to gather a lot of specific information about them, such as the meaning relations they express,

[49] Moreover, they spread information about the protagonist all over the story and do not give an introduction to the story. They are therefore less competent in establishing coherence (cf. Klann-Delius, 2008).

how they are used in discourse and in what kind of syntactic structures they occur (cf. Bloom et al., 1980). In order to figure out the meaning of the individual connectors, children have to observe how adults use them and make inferences about the relations between the individual conjuncts as well as the whole utterance, the situation and context in which the utterance is made.

This chapter is concerned with how children acquire and use connectors. Knowledge about how children use connectors and their precursors in language production is of importance because it might help to understand how children interpret and understand them. Especially children's early use of contextual clues and attributes with respect to the acquisition of connectors is of relevance because it might provide information about how children utilize contextual information for the interpretation of conjunctions and connectives. Therefore, the findings and literature that is discussed in the following sections serves as basis for the development of a research hypothesis concerning the interpretation of the conjunction *and* that will be investigated experimentally in chapter 6.

Children start to produce complex sentences around the age of 2 to 3 years. Hence, the first connectives should be produced by children around that age. The emergence and use of connectives in child language has been investigated in several longitudinal studies (e.g. Bloom et al., 1980; Braunwald, 1985). Bloom, Lahey, Hood, Lifter and Fiess (1980) as well as Braunwald (1985) investigated how and from which age onwards children use connectors. In both studies the meaning relations encoded by the connectors were not analyzed based on the forms children were using. Instead analyses were based on the interpretation of and inferences about the relations that hold between the individual words (in one- and two-word utterances) or sentences.[50] This approach to the interpretation of connectors and conjunctions in children is in line with how discourse theoretic approaches determine the relation between two conjuncts and how they explain what kind of meaning relation is expressed by the conjunction *and* in a specific context (for details see chapter 3.3.6).

Braunwald (1985) observed a single child between the age of 15 and 36 months to investigate possible precursors and the emergence of conjunctions in child speech. She identified that the

[50] The combination of two conjuncts can sometimes express specific relations between the conjuncts even if a very general connector or no connector is used at all (Zifonun et al., 1997, p. 2391). For this reason discourse theoretic approaches (e.g. Asher, 1999; Lascarides & Asher, 1993) and the method of analysis used by Bloom and colleagues (1980) and Braunwald (1985) appear very useful to study precursors of connectives and conjunctions.

implicit use of connectors precedes the actual production.[51] Similar findings were made by Clancy, Jacobsen and Silva (1976). These findings suggest that, before children are able to produce conjunctions, connectors and complex sentences, they express the respective meaning relations between the conjuncts by means of (linguistic) context. The implicit use of conjunctions shows that children are aware of the meaning relations between the conjuncts although they cannot express them yet. This awareness and the use of contextual factors, specifically the meaning relations between the conjuncts, shows that children comprehend the relation between the conjuncts based on contextual clues and suggests that conjunctions serve for faster comprehension of a complex sentence and to clarify the relation between the conjuncts in ambiguous situations. Example (72) illustrates the implicit use of the connector *so* in the sense of *therefore* by a child aged 1;10. This example is taken from Braunwald (1985, p. 517).

(72) This is hot coffee. – Have to careful.

Besides, Braunwald (1985) reported the following findings with respect to the acquisition of conjunctions: First productions of the individual connectors occurred only in fixed situations, patterns or routines and were decontextualized subsequently. Later the child was aware of the arbitrary association between the form and the information the word conveyed. Due to that insight, the child started to use the connector in a meaningful way (Braunwald, 1985).[52]

Bloom and colleagues (1980) observed the acquisition and use of connectives in four children.[53] Observation started with the production of the children's first connective and ended with their third birthday. For analysis, the produced connectors were categorized based on the semantic meaning they expressed. The authors point out that the meaning of the connectives used by children in their study was not always transparent (Bloom et al., 1980). Despite this, Bloom and colleagues (1980) found that the connector *and* was acquired first by all children, although at different ages. Peterson and McCabe (1987) report that the same findings were also made for German, English, Italian and Turkish (cf. Bloom et al., 1980; Clancy et al., 1976; Clark, 1970; Eisenberg, 1980). Figure 2 and Figure 3, adapted from Bloom and colleagues (1980), depict the order in which the syntactic connectives and the semantic meaning relations are productive for the first time. In Figure 2, the connectives that are important for the current work, specifically the conjunction *and* as well as conjunctions that express tem-

[51] Implicit use of connectors refers to the fact that the child connected her utterances in a way that the mentioning of two conjuncts (juxtaposition) expressed a specific meaning relation, although no connector was uttered. Braunwald's analyses (1985) are based on the observation of the child's syntax, detailed knowledge of the child's life and the help of contextual clues.

[52] The acquisition process described by Braunwald (1985) is similar to the acquisition of syntactic structures reported by Tomasello (2000a, 2000b) as well as Wittek and Tomasello (2005).

[53] The authors investigated how these children used connectives, which connectives were used most frequently and in which order they were acquired.

poral meaning, are printed in blue to help the reader to keep track of the relevant conjunctions more easily.

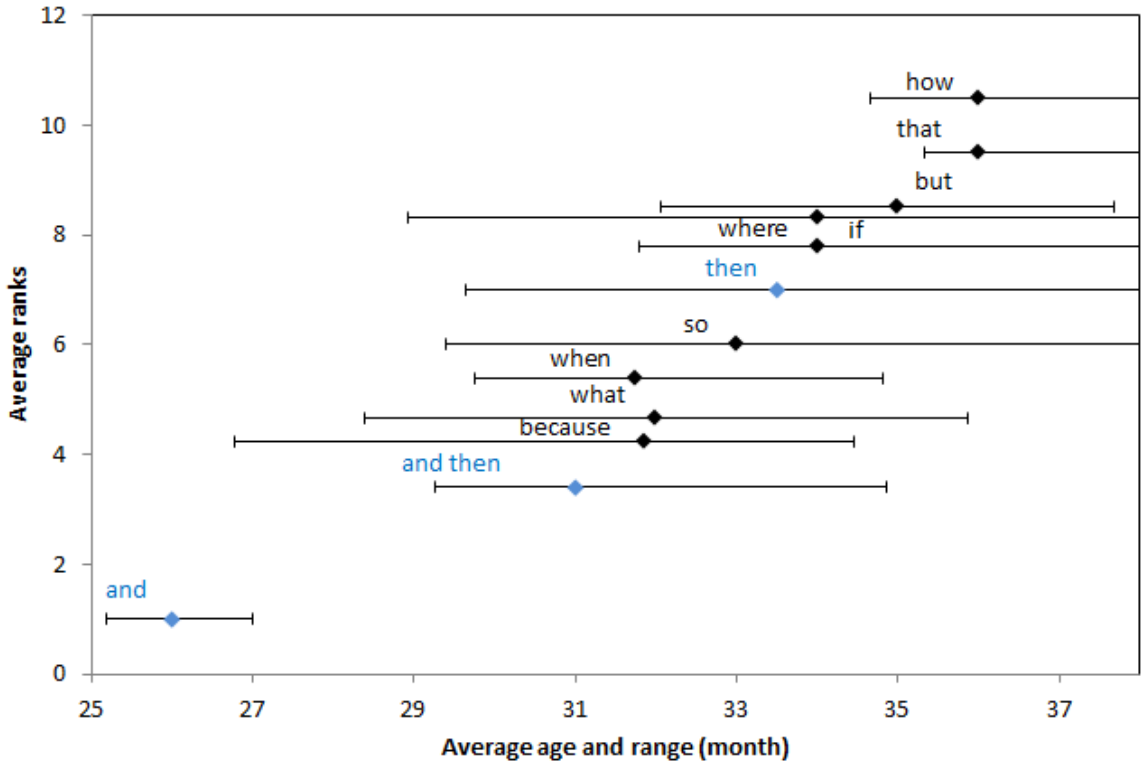

Figure 2: Acquisition of connectives
The figure shows at which age and in which order the individual connectors became productive (Figure adapted from Bloom et al., 1980, p. 242).

As can be seen in Figure 2, most of the syntactic connectors are acquired between the age of two and three. The connector *and then* which expresses a temporal meaning relation between the conjuncts is in average the first more specific conjunction that is acquired. The children observed by Bloom and colleagues (1980) started to express temporal meaning relations with *and then* explicitly between the age of 29 and 35 months, whereby the average produced *and then* for the first time around the age of 31 months. The time span in which temporal relations were expressed by the conjunction *then* ranges from 29 month to later than 37 month, whereby *then* was used by the observed children in average at the age of 33 months. This means that from the age of 29 months onwards children are aware of the fact that temporal meaning relations can be explicitly expressed by conjunctions such as *and then* and *then* and start to do so.

Figure 3: Acquisition of semantic meaning relations
Figure 3 shows in which order and time span the meaning relations of the connective forms developed (Figure adapted from Bloom et al., 1980, p. 248).

Figure 3 depicts the age and order in which specific semantic meaning relations between conjuncts are productive for the first time. As can be seen there, most of the meaning relations are acquired between the age of two and three. As seen in chapter 3, there is a controversy whether the basic meaning of the conjunction *and* is simply additive or includes a temporal meaning relation. Therefore, the additive and temporal meaning relations between conjuncts are for the current thesis most relevant relations between conjuncts. For a better overview, these semantic relations are printed in blue in Figure 3. As can be seen there, the first meaning relation between conjuncts that is acquired is the additive one (in average at the age of 26.5 months), followed by the temporal one (in average around the age of 28 months). More complex meaning relations between conjuncts such as adversative relations are acquired later. This suggests that the semantic meaning relations that are relevant for this work and the experiments conducted in chapter 6 are the first ones that are acquired. As production follows comprehension, the conjunctions *and* as well as *and then* and the respective semantic meaning relations (additive and temporal) should be mastered by children older than 35 months.

McTear (1985) reports that children acquire more complex conjunction such as *when*, *until*, *so ... that* around the age of seven. Until the age of eleven children have acquired a wide

range of conjunctions and use the conjunctions *and* and *and then* less frequently.[54] This might be related to the fact that children know and master a range of more complex and specific conjunctions. For this reason they might use specific conjunctions more often as it is not necessary any longer to refer to the connection between two conjunctions in a rather implicit way. Moreover, children might have noticed that although they can communicate relations between conjuncts without conjunctions or with a general conjunction such as *and*, more specific conjunctions are important for the hearer to understand complex utterances faster and to resolve ambiguity in instances in which two relations between conjuncts are possible, such as in (73). In (73) it is possible that Mary and Peter had an argument and Peter got drunk as a result or that the argument arose because Peter got drunk. The use of specific conjunction can clarify the interpretation of the sentence.

(73) Peter got drunk and Mary argued with Peter.

With regard to the comprehension of connectives, experimental findings indicate that children's interpretation of connectives appears to change with increasing age (e.g. Kail & Weissenborn, 1984). Kail and Weissenborn (1984) investigated the comprehension of the German adversative connectives *aber* ('but') and *sondern* ('but') in 7;8- as well as 8;8- and 9;11-year-old children. Results suggest that younger children interpret *aber* both as substantive (in the sense of *sondern* as in (74)) and contrastive (as in (75)) reading, while the older ones only select the contrastive meaning (Kail & Weissenborn, 1984). This indicates that children adjust or fine grade the meaning of connectives as they get older.

(74) The earth is not a disk but a globe.
(75) The princess is rich but lonely.

Furthermore, the authors report that an analysis of children's errors in contrastive *but*-sentences revealed that these children interpreted the connective as coordinator *and* and considered the relationship between the conjuncts as implication (Kail & Weissenborn, 1984). Therefore, the authors conclude that children possibly ignore the connective completely and evaluate the statements based on a "[…] comparison between the (combined) meaning of P and Q and the contextual information" (Kail & Weissenborn, 1984, p. 155). This supports the idea that children make inferences about the meaning of connectives based on contextual information and the meaning of the conjoined conjuncts and further shows the importance of contextual influences on the acquisition and interpretation of conjunctions. The fact that chil-

[54] However, even if children have acquired most connectors already, they often do not use them in the same way as adults. Akiguet and Piolat (1996) report for example that argumentative connectors are only from the age of 10 onwards used in accordance with the prototypical schema of argumentation. The authors (1996) also observed that the use of argumentative connectors still differs between the 9- and 10- or 11-year-old children.

dren draw inferences about the meaning of conjunctions based on the relation that holds between conjoined conjuncts is in line with discourse theoretic approaches (for details see chapter 3.3.6) and suggests, that children's interpretation of general conjunctions such as *and* might be context-dependent, specifically dependent the kind of events conjoined. The use and interpretation of the conjunction *and* is discussed in more detail in the next chapter.

5.3.1.1 The conjunction and

The focus of this chapter is the acquisition, use and interpretation of conjunction *and*. The findings might provide additional support for the relevance of contextual factors for the interpretation of conjunctions and hence contribute to a more detailed development of a research hypothesis concerning the interpretation of the conjunction *and*.

While there are studies and overviews on the acquisition of *and*-coordination in English and French (cf. Bowerman, 1979; Brown, 1973; Clark, 2006; DeVilliers & DeVilliers, 1987; Noveck et al., 2009; Noveck & Chevaux, 2002), there is not much research into the acquisition and use of German connectives and conjunctions. The acquisition of coordination with *und* (‘and’) is often only mentioned along with the acquisition of complex sentences and structures (cf. Mills, 1987; Stern & Stern, 1975; Szagun, 2010; Tracy, 1991). Observations on the semantic/pragmatic use of *und/and* were made by Bloom and colleagues (1980), Eisenberg (1980) and Braunwald (1985). An overview of the acquisition of different phenomena related to coordination with *und* (‘and’) is given by Hartung (2012).

And is not only the conjunction that is acquired first, namely at the age of 2-3-years (see chapter 5.3.1), but also the one which is used most frequently by young children (cf. Bloom et al., 1980; Brown, 1973). Similar findings as for the English conjunction *and* are also made for the German conjunction *und* (‘and’) (Stern & Stern, 1975). The reason for its frequent use might be the fact that it can be used to express a variety of meaning relations. This would be in line with the findings by Bloom and colleagues (1980), who examined the acquisition of conjunctions in a longitudinal study and report that children use the connector *and* to express a variety of meanings such as additive, temporal, causal and adversative relations. Furthermore, *and* is first used additively to express co-occurrence of events and things. The other meaning relations developed later in the order additive, temporal, causal and adversative (Bloom et al., 1980). If the meaning relations that can arise between conjuncts conjoined by *and* are considered as scalar implicatures (for details see chapter 3.1), the findings, that children acquire the additive meaning of the conjunction *and* first and more specific meaning relations later, would match with the basic assumptions of the hypothesis on the acquisition of implicatures suggested by Barner and Bachrach (2010) (see chapter 5.2.3).

Similar findings as for the acquisition of the English conjunction *and* were made for German *und* (‘and’) by Hartung (2012) who examined the acquisition of coordination based on corpus data from the child Simone (CHILDES). She points out that one can never be totally sure about what exactly Simone wanted to utter. Despite, Hartung (2012) suggests that the first sentence coordinations with *und* uttered by Simone around the age of 24 months have to be interpreted additively:

(76) **CHI: Das geht **und** das geht-,*
‘This works and this works-,’

(File:si020023.cha”: line 1937)

(77) **CHI: Das ist der Kakao.*
‘This is the cocoa.’
CHI: **Und das ist der Kaffee.*
‘And this is the coffee.’

(File: si020121.cha“: line 665)

Examples (76), (77), (78) and (79) are taken from Hartung (2012, p. 77f.). The author further reports that the additive use is followed by temporal coordination encoded with *und* (‘and’) around 29 months of age (see (78)) and causal use at the age of 34 months (see (79)). Hartung further remarks that the acquisition of the semantic relations of the English conjunction *and* seems to correspond with the order of acquisition of the semantic relations of the German conjunction *und*.

(78) **CHI: Max Maxe auch eine-, ich mach die mal auf **und** du machst knacke*
‘Max Maxe also one-, I open this and you make click’

(File: si020513.ch“: line 2554)

(79) **MAX: der Papa bringt die Gans nach Hause.*
‘The dad brings the goose home.’
CHI: ja-, und dann kocht die [/] **und da weint der Peter ganz dolle-,.*
‘yes-, and then she cooks [/] and therefore the Peter cries a lot.’

(File: si021011.cha“: line 209)

Since *and* is used as a general connector first and other uses of meaning emerge later, Peterson and McCabe (1987) examined the spontaneous use of *and* by 2- to 3-year-old children in discourse and expected that it should be used as “general all-purpose connective” less often as

other connectors are acquired. This however was not the case. The authors report that "[…] children at all ages were using *and* in the same ways: a simple temporal relationship between the connected sentences was present about a third of the time, followed by enabling, causal and co-ordination relationships which were each present about a fifth of the time" (Peterson & McCabe, 1987, p. 380). These findings suggest that *and* is used to establish a general connection between the conjuncts and that contextual clues, such as the content of the conjoined conjuncts, have to be used to determine the specific meaning relation between the conjuncts. This further supports discourse theoretic approaches to the meaning of the conjunction *and* (for details see chapter 3.3.6). A recent study by Skerra and Gagarina (2012), who examined the microstructure of narratives elicited from 45 four- to six-year-old monolingual German speaking children, revealed that the temporal use of the conjunction *und* ('and') is not only used most often by 2-3-year olds but also by older children. All of the age-groups examined in that study used *und* to express temporal meaning relation most often. Other functions of the conjunction *und* were to mark reference shift as well as to maintain topic.

Most of the studies on the conjunction *and* examine children's use of the conjunction in spontaneous speech or elicited narratives. From this type of studies it can only be assessed indirectly what meaning children ascribe to the conjunction *and* and how they interpret it. The only studies that investigate children's interpretation of the conjunction, are the experimental studies conducted by Noveck and Chevaux (2002) as well as Noveck, Chevallier, Chevaux, Musolino and Bott (2009). These studies are of great importance for the current work, as they are the only studies that examine the possible inferences of temporal meaning relations with respect to the meaning of the conjunction in children. These studies will be introduced and discussed briefly in the following (for more detailed information on these studies see chapter 6.1).

Noveck and colleagues (2002) looked at children's ability to calculate implicatures in connection with the French conjunction *et* ('and'). Therefore, they conducted two reading-experiments with 7-, 10-, and 18-year-old participants (for details and results see chapter 6.1). Based on the results, the authors draw the conclusion that young children initially interpret the conjunction *et* ('and') as logical connector and enrich it more often temporally with increasing age. The conclusions drawn by Noveck and colleagues (2002) fit with meaning-minimalist approaches to the meaning and interpretation of the conjunction *and* (e.g. Grice, 1975; Posner, 1979) and literature that suggests that the acquisition of implicatures develops with age (e.g. Chierchia et al., 2001, 2005; Heinzmann, 2006; Noveck, 2001; Papafragou & Musolino, 2003). In their 2009 paper, which is a follow-up investigation of the 2002 study, the authors

examined the development and online-processing of the French conjunction *et* ('and') in several experiments. Again, they found a developmental effect concerning the enrichment of the conjunction and report that the pragmatic enrichment of *et* ('and') increases with age. In addition to this, the authors report that children are more likely to enrich the conjunction if the events in the story "are made more salient" (Noveck et al., 2009). The fact that the results in the interpretation of the conjunction change once the context - specifically the events in the story are manipulated - indicates that the interpretation of the conjunction is influenced by the situation of use and should therefore be a pragmatic effect. Unfortunately, it is not specified in more detail what kind of changes in the stories triggered the higher amount of enriched readings of the conjunction in children. Moreover, it has neither been systematically examined yet what kind of contextual and situational influences have an impact on the interpretation of the conjunction, nor whether contextual changes also influence the interpretation of the conjunction in adults. For this reason, the influence of different types of context on the temporal interpretation of the conjunction *und* is investigated in a series of experiments in this work (see chapter 6).

However, before the series of experiments is introduced and discussed, the acquisition of the temporal conjunctions *before* and *after* will be shortly addressed in the next section. The acquisition of temporal conjunctions is of great importance to gather information about how children comprehend and process sequence of events that are introduced in a certain order and events conjoined by temporal conjunctions.

5.3.1.2 The conjunctions before and after

Children's comprehension of the conjunctions *before* and *after* as well as factors that possibly influence comprehension have been investigated in several studies (Amidon & Carey, 1972; Carni & French, 1984; Clark, 1971; Johnson, 1975). The acquisition of the conjunctions *before* and *after* is controversially discussed in the literature (cf. Amidon & Carey, 1972; Clark, 1971). To mediate between both studies, Johnson (1975) conducted a study with three different tasks.[55] The results suggest that the influence of contextual factors and children's comprehension strategies play an influential factor in the comprehension of the conjunctions *before* and *after*. This is in line with findings in other areas of language acquisition and interpretation (see chapters 5.1 and 5.2). What kind of specific contextual influences have an impact on children's interpretation of the temporal conjunctions will be shortly discussed in the following.

[55] Johnson (1975) remarks that the studies by Clark (1971) and Amidon and Cary (1972) are not comparable because they are based on different tasks and materials.

Empirical studies showed that contextual factors, specifically syntactic structures as well as feedback influence and help children with the interpretation of the conjunctions (Amidon & Carey, 1972). Children seem to be guided by the order in which the events were mentioned when interpreting temporal conjunctions (cf. Amidon & Carey, 1972; Johnson, 1975). These findings match with the Semantic Command approach suggested by Bar-Lev and Palacas (1980b) to explain temporal readings of the conjunction *and* (for details see chapter 3.2.1). However, the order of mention strategy is neither the only nor the most important contextual factor involved in the interpretation process: The data by Johnson (1975) further suggest that the situational context such as specific task features seems to be of greater relevance than the syntactic context. The importance of contextual factors in the wide sense, such as the influence of children's knowledge, on sentence comprehension is supported by data from Carni and French (1984). The authors manipulated context and tested event sequences that were familiar to the children and had invariant or arbitrary real-world temporal orders.[56] Results revealed an influence of familiarity of the context and sequence type on children's answers. Children's comprehension appears to be of higher accuracy when they are familiar with the relationship described because they can (based on scripted knowledge) form a mental representation of the relationship more easily. This is in line with the findings by French and Nelson (1981) (cited in Carni & French, 1984).

Children's use of contextual clues and knowledge when interpreting temporal conjunctions suggests that they seem to infer the meaning of the temporal conjunctions based on their knowledge about the conjoined events and the relation that (typically) holds between them. In analogy to the interpretation of the temporal conjunctions children might use the same or similar strategies when interpreting events conjoined by the conjunction *and*. Consequently they should in some instances, specifically if they are familiar with the conjoined events, be able to interpret the conjunction *and* temporally. This would support theoretical approaches to the meaning and interpretation of the conjunction *and* that consider the importance (script) knowledge. Some of these approaches were introduced and discussed in chapter 3.3 (e.g. Asher & Vieu, 2005; Blakemore & Carston, 1999, 2005; Carston, 1993, 2002a; Kitis, 2000a; Levinson, 2000; Txurruka, 2003).

[56] The authors came up with this experimental design because a study by French and Nelson (1981) revealed that "[…] preschoolers spontaneously and correctly use a number of relational terms (e.g., *before, after, if, so, because, or,* and *but*) which investigators using comprehension paradigms have concluded children do not comprehend until several years later" (Carni & French, 1984, p. 394).

5.3.1.3 Summary and relevance for the current study

The findings on the acquisition of connectors and conjunctions discussed in this chapter (e.g. Braunwald, 1985; Kail & Weissenborn, 1984) suggests that contextual factors play an important role in language acquisition as well as in the comprehension and processing of complex sentences. The studies on the acquisition of connectors and conjunctions have shown that very young children express the relation between conjuncts without the respective conjunction first (e.g. Braunwald, 1985; Clancy et al., 1976). This indicates that the content of the whole sentence and the relation between the conjuncts is already understood by the children based on the content of the conjuncts before they are able to produce the required conjunction. This is possible because children draw on contextual clues and their knowledge to infer the relation between conjuncts. However, the production of conjunctions is important to express the relation between conjuncts explicitly.

The conjunction *and* is produced first by children (Bloom et al., 1980) and can express general and specific meaning relations (for details see chapter 5.3.1). Children use *and* to express a variety of meaning relations between conjuncts first. Explicit information about the relation that holds between conjuncts is provided by more specific conjunctions that are produced slightly later than the general conjunction. Around the age of 27 to 29 months children start to express the same meaning relations which they originally communicated with the help of the conjunction *and* by means of more specific conjunctions, such as *and then* and *because* (see chapter 5.3.1.1). These conjunctions can make a real contribution to the meaning of a sentence if the context, specifically the knowledge about the relation between the conjoined conjuncts does not provide enough information. Therefore, the use of connectors that express specific meaning relations makes communication easier and faster as the hearer does not have to infer the relation between the conjuncts by himself.

The way how children acquire conjunctions and children's early use of the conjunction *and*, further suggest that it is not the conjunction *and* by itself that communicates temporal meaning. Instead more specific meaning relations that hold between conjuncts conjoined by *and* arise due to contextual attributes, specifically the content of the conjoined conjuncts and the relations that holds between them (cf. Asher & Vieu, 2005; Kitis, 1987, 2000a). Findings on children's comprehension of the conjunctions *before* and *after* provide further evidence for the importance of context and pragmatic skills in language acquisition, comprehension and interpretation. The studies by Amidon and Cary (1972), Epstein (1972) and Johnson (1975) indicate that contextual clues are not only important for the acquisition of the conjunctions *before* and *after* but also for the processing and interpretation strategies of sentences. Carni

and French (1984) provide evidence for the influence and importance of other contextual factors, such as the familiarity of the events.

If it is the case that contextual factors have such a great impact on sentence comprehension and acquisition of conjunctions as indicated in this and the previous chapter, then one might expect that the interpretation of the conjunction *and* is context-dependent and for example influenced by the type of events that are conjoined. The impact of different types of context on the interpretation of the conjunction will be tested in the following chapter.

6 Empirical studies on the interpretation of the conjunction *und*

As shown in chapter 3 several positions and approaches, both of semantic as well as of pragmatic nature, which are concerned with the meaning and interpretation of the conjunction *and* are discussed in the literature. The main question of interest in both camps is whether the temporal reading of the conjunction *and* in examples like *Mary got pregnant and got married* is caused by the lexical meaning of the conjunction e.g. due to additional semantic features such as temporality or causality or whether the lexical meaning of the conjunction is equivalent to the logical operator $\wedge$. If the meaning of *and* is the same as the one of the logical operator, additional temporal or causal meanings are triggered due to its use in specific contexts. The difference between semantic and pragmatic approaches is that in the former case the additional features are part of the lexical meaning while they are caused by pragmatic processes such as enrichment or implicatures in the latter.

Although there are a variety of pragmatic approaches along with differing ideas and suggestions of how exactly the full meaning of the conjunction is established and what influences the interpretation, most of these theories do not explicitly point out the importance of context and the hearer's knowledge about the conjoined events. Knowledge available to the hearer as well as his general world knowledge is from my point of view influential and important for the interpretation of the conjunction *and*. The only approaches that consider participant's state of knowledge about the conjoined events as well as scripts and frames that are based on hearer's specific knowledge are discourse theoretic approaches (see chapter 3.3.6) as well as the frame-theoretic account suggested by Kitis (2000a) (see chapter 3.3.5). Moreover, none of the empirical studies on the interpretation of the conjunction *and* has to my current knowledge accounted for this fact in a systematic manner.

In this chapter, a series of experiments on the interpretation of the German conjunction *und* ('and') is introduced and discussed. These experiments do not investigate whether the different meanings in the interpretation of the conjunction *und* are of a semantic or pragmatic nature. This question can only be clarified with the help of online experiments. Instead it is assumed that the different kinds of readings of the conjunction arise due to the influence of contextual factors and hearers knowledge.[57] The aim of these experiments is to examine what kind of factors influence the interpretation of the conjunction *und*. Before the factors that are

[57] In this chapter however the specific meaning relations that arise between conjuncts conjoined by *und* are in analogy to existing experiments on the French conjunction *et* considered as pragmatic phenomenon. How well the data fit with the individual pragmatic approaches will be discussed in chapter 7.

examined in this series of experiment are described in more detail, a short overview about existing experiments on the meaning of the conjunction *und* is given.

6.1 Existing studies

Several studies concerning order interpretations and the interpretation of the conjunction *and* have been conducted in the literature: Bott, Frisson and Murphy (2009) investigated adults interpretation of the conjunction *and* in a series of three experiments. The authors examined to what extent the factor order of mention and the discourse relation that holds between the events influences the interpretation of the conjunction. Tomlinson, Bott and Bailey (2011) examined processing times for order interpretation that were either communicated implicitly (events conjoined by *and*) or explicitly (events conjoined by *before*) in nonsense statements (e.g. *John put on his clothes before showering*) and statements that made sense (e.g. *John took of his clothes before showering*). These studies however focus mainly on the interpretation and processing of the conjunction in adults and will not be discussed in more detail at this point.

One of the first experimental studies, that was also concerned with children's comprehension and interpretation of the conjunction *et* (which is the French equivalent to *and*) in natural language was conducted by Noveck and Chevaux (2002) as well as Noveck, Chevallier, Chevaux, Musolino and Bott (2009). These studies were reading experiments that were conducted with children and adults (compare chapter 5.3.1.1). In the first study Noveck and Chevaux (2002) conducted two experiments in which participants (7-, 10- and 18-year-olds) had to read eight stories, that described a series of events – four of them were related to the interpretation of *et* ('and'), the others were fillers. Afterwards follow-up questions that presented two events of the story connected with the conjunction *et* (Experiment I) or the conjunction *et puis* ('and then') (Experiment II) either in correct or in reversed order had to be evaluated. Table 3 depicts the results Noveck and colleagues (2002, p. 5) got for the first experiment.

Table 3: Results from Noveck & Chevaux.
Percentage of seven-year-olds, ten-year-olds and eighteen-year-olds who gave affirmative answers to two kinds of follow-up questions that conjoined events with *et* ('and') (N=83). The table is adapted from Noveck & Chevaux (2002, p. 5).

	Order of Conjuncts	
Age	**Proper Order (A&B)**	**Reversed order (B&A)**
7	90	87
10	94	63
18	98	29

Results revealed that reversed order questions generally received less affirmative responses than the ones in correct order. The amount of affirmative answers to the reversed order questions in the first experiment decreased with growing age of the participants (Noveck & Chevaux, 2002).

Results of the second experiment revealed that 7-year-olds respond affirmatively at levels that are significantly above chance-level to statements that present events in reversed order.[58] The 10- and 18-year-olds accept statements with reversed event order more often if the events are conjoined by *et* compared to when they are conjoined with *et puis*. However, the 18-year-olds did so more often than 10-year olds. This indicates that older participants interpreted the conjunction temporally more often than younger ones. The authors summarize that the 10-year-olds are still uncertain with respect to the interpretation of the conjunction *et*. This is reflected by an acceptance rate of 63 per cent for statements with reversed event order (Noveck & Chevaux, 2002).

The more recent study by Noveck and colleagues (2009) used the same method and investigated the development and online-processing of the conjunctions *and, before* and *after*. This study was conducted in French and events of the story were conjoined with one of the conjunctions mentioned. Statements presented events in correct order, reversed order or with an event that was not mentioned in the story. With respect to the interpretation, the authors found that affirmative answers to reversed event structure were significantly higher among the children (73%) than among adults (53%). Adults were uncertain and did neither show a strong tendency towards the temporal nor to the additive interpretation of the conjunction. The authors conclude that children enrich the meaning of the conjunction less often than adults (Noveck et al., 2009). What I consider challenging is that in this study all three conjunctions were presented in the same experiment. Therefore, participants might intentionally interpret *and* as additive conjunction because they might think that the purpose of the study was to point out the differences between *and*, *before* and *after* or that the temporal conjunctions focus on order while *and* focuses on content.

Experiments II and III of the study by Noveck and colleagues (2009) are online-studies that measure response times. In both experiments materials were presented line by line and all events in the follow-up conditions were conjoined with *and*. As in experiment I, statements presented events in correct order, reversed order or with one event that was not mentioned in the story. The only difference between Experiment II and Experiment III was that the events

[58] Chance level is the level that would be expected if participants give random answers. If two answers are possible then the chance to choose one or the other answer is 50 percent. Hence the chance-level for each answer is 50%. If there are four possible answers for a task, then chance level for each of these answers is 25%.

were made more prominent. Results of the second experiment revealed that statements in reversed order yielded less affirmative answers in both populations. Again a developmental effect concerning the interpretation of the conjunction was found: children rejected statements with reversed event structure less often than adults. This condition also yielded the longest response times in both populations. Moreover, the response times of those children that accepted statements with reversed event structure were comparable to those of the adults and faster than the response times of those participants who rejected these conditions. From this the authors conclude that participants who reject statements with reversed event order enrich the conjunction *et* temporally (Noveck et al., 2009). This is because cognitive processes such as temporal enrichment are considered as additional processes during the computation of sentences meaning. Consequently these processes are related to a higher workload and longer processing times. Results of Experiment III reveal that more children than in Experiment II rejected statements with reversed event order. Adults also behaved differently than in Experiment II in the way that they accepted this condition more often and became uncertain. The authors conclude that the fact that the events described in the stories were made more salient had the consequence that adults recognized that this condition is equivocal and enriched the meaning of the conjunction less often (Noveck et al., 2009).

The importance of context and the hearer's knowledge is not considered or controlled for in existing studies on the interpretation of the conjunction. The fact that the change in material of the story influenced participants responses in the studies by Noveck and colleagues (2009), suggests that the material and the way in which the events are described in the story are indeed related to the interpretation of the conjunction in the follow-up statements. Although the authors recognized and pointed out that the prominence of the events has an effect on the results and the interpretation of the conjunction (Noveck et al., 2009), they did not control for the nature of the events presented in the story. Yet, as already mentioned, the knowledge available to the hearer as well as his general world knowledge might be influential and important for the speaker's interpretation of the conjunction *und*. An event related potentials study (ERP-study) by Münte, Schiltz and Kutas that examined the processing of the conjunctions *before* and *after* in adults further verifies the idea that conceptual knowledge supports the interpretation of sentences. Results of that ERP-study suggest that utterances that present event information in their natural temporal order are processed more easily than when presented in reversed order (Münte et al., 1998). In experimental situations as the ones in the studies previously described (Noveck et al., 2009; Noveck & Chevaux, 2002), all participants have the same knowledge about the situation because it was mentioned in the story. Still, par-

ticipants of different age-groups might differ with respect to the complexity of their world knowledge and relations that hold typically or generally between certain events.

Moreover, I expect that the nature and kind of events presented has an impact on the interpretation of the conjunction. I expect more temporal or sequential interpretations, if events that typically or logically occur in a certain order are conjoined, such as getting up and having a shower. In other kinds of contexts, where the events are not logically related or do typically not occur in a fixed order, I expect that the conjunction is interpreted additively more frequently. This is because the events are not associated with a typical or conventional order. Additionally, the order in which the events occur is for some kind of events not of importance. A possible explanation for the results found in the studies just described might be that the experimental material might draw on different kind of contexts and knowledge. Moreover, knowledge or experience about typical or conventional sequences of events might not be equally rich in all age groups.

A closer look at the materials presented seems to confirm that indeed both kinds of contexts were presented in the experiment.[59] Two of these stories one for each context are reproduced and translated in examples (80) and (81):

(80) *Laurent s'est cassé le poignet en jouant au basket.*
Laurent $_{\text{REFL}}$ be$_{\text{3SG}}$ break$_{\text{PRS.PRF}}$ the wrist while play$_{\text{PRS.PTCP}}$ with basket
'Laurent broke his wrist while playing basketball.'

Son professeur l' emmène à l' infirmerie.
his teacher him take$_{\text{PRS}}$ to the hospital ward
'His teacher takes him to the hospital.'

Pendant ce temps un de ses amis appelle les pompiers.
during this time one of his friend$_{\text{PL}}$ call$_{\text{PRS}}$ the$_{\text{PL}}$ fire brigade
'During this time one of his friends calls the fire brigade.'

Ces derniers, une fois arrivés, font monter Laurent dans le camion.
the$_{\text{PL}}$ latter$_{\text{PL}}$ one time arrive$_{\text{PL.PRS.PRF}}$ make$_{\text{PL}}$ board Laurent into the van
'The latter, once arrived, ask Laurent to get into the van.'

[59] I wish to thank Ira Noveck, who was so kind to send the materials of Noveck et. al (2009) to me.

Puis ils le transportent à l' hôpital.
then they him bring$_{PRS.PL}$ into the hospital
'Then they bring him to the hospital.'

Question:
Laurent est allé à l' hôpital et s' est cassé le poignet?
Laurent be$_{3SG}$ go$_{PRS.PRF}$ into the hospital and $_{REFL}$ be$_{3SG}$ break$_{PRS.PRF}$ the wrist
'Has Laurent gone to hospital and broken his wrist?'

(81) *La maman de Charles lui demande d'aller faire des courses.*
the mother of Charles him ask to go do the$_{PL}$ shopping$_{PL}$
'The mother asks Charles to go shopping.'

Il met son manteau et prend le porte-monnaie sur la table.
he put$_{PRS}$ his coat and take$_{PRS}$ the wallet on the table
'He puts on this coat and takes the wallet from the table.'

Dans l' ascenseur il rencontre Emilie, sa meilleure amie.
in the elevator he meet$_{PRS}$ Emilie his$_{F}$ best$_{F}$ friend$_{F}$
'In the elevator he meets Emilie, his best friend.'

Ils discutent un peu, puis Charles va seul au supermarché.
they chat$_{3PL.PRS}$ a little then Charles go$_{PRS}$ alone to supermarket
'They chat a little bit then Charles goes to the supermarket alone.'

Il achète du pain et du lait avant de rentrer chez lui.
he buy$_{PRS}$ some bread and some milk before to get to him
'He buys bread and milk before getting home'

Question:
Charles a fait des courses et a rencontré Emilie?
Charles has done some$_{PL}$ shopping$_{PL}$ and have$_{3SG.PRS}$ meet$_{PRF}$ Emilie?
'Has Charles done some shopping and has met Emilie?'

If it is true that the interpretation of the conjunction is context-dependent (for specific theories see chapter 3.3), it could possibly explain why adults' were uncertain concerning the interpretation of the conjunction in Experiment I and III of the study by Noveck and colleagues (2009). With context-dependent I mean that the interpretation of the conjunction depends on the kind of events presented in the conjuncts. The relation between conjuncts that present events that typically or logically occur in a certain order should be interpreted temporally more frequently than the relation between events that do usually not occur in a fixed order (neutral events). This is related to the interpreter's world knowledge and experience about the relation that holds between the conjoined conjuncts (cf. Discourse Theory and discourse theoretic approaches to the meaning of the conjunction in Appendix A.3.7 and chapter 3.3.6, respectively). Noveck and colleagues (2009) mixed both kind of contexts in their study. This might explain why participants did neither interpret the events conjoined by the conjunction predominantly as temporal sequence nor predominantly additively. The series of experiments presented in this chapter does among other factors control for the influence of context on the interpretation of the conjunction *und*. Factors that might influence the interpretation of the conjunction and will be considered in the following series of experiments will be shortly introduced in the following.

6.2 Main Hypotheses

As indicated already, I suspect that the nature of events presented in the stories might influence the interpretation of the conjunction. Therefore, I suggest that context affects the interpretation. From my point of view one cannot generalize that whenever two events are communicated that the hearer will always interpret that the events occurred chronologically. Depending on the situation, the hearer's knowledge and context, it might be of relevance to mention the events in a certain order. Sometimes statements that present events in reversed order appear to make no sense, such as in (82). In other cases the chronological order of the events appears to be of no importance even. In examples like in (83) it is quite irrelevant whether Mary played with her ball first and in the sand afterwards, or whether she did it the other way round.

(82) *Peter went to bed and had dinner.*
(83) *Mary played in the sand and played with her ball.*

Therefore, it is likely that participants interpret the conjunction *and* as logical connector without any temporal meaning (because the order of the events does not appear to be of importance) in this example.

In other contexts such as in (84) the order in which the events are mentioned is certainly more relevant because the events do normally not happen in reversed order.

(84) Peter brushed his teeth and went to bed.

Additionally, there is a big difference between brushing one's teeth and (then) going to bed compared to going to bed and (then) brushing one's teeth. If the events are reported in reversed order the latter example would conflict with logic and world knowledge. Therefore, I expect that context, specifically the type of event mentioned, also has an impact on the interpretation of the conjunction *und*. This factor is controlled for in the following series of experiments. In all of these experiments short stories are narrated in which a number of events occur in a specific order. Then a follow-up statement that presents two of the events either in correct or reversed order will be uttered and has to be evaluated by the participants. In the first experiment, stories with events that could potentially also happen in reversed event order and would still make sense are presented. Stories in Experiment III introduce a series of events that typically or normally happen in a certain order. It is hypothesized that if context, specifically the kind of events narrated, affect the interpretation of the conjunction *und*, then differences in the amount of rejection rates of follow-up statements, that present events of the story in reversed order, are expected to be found between the experiments. Higher rejection rates are expected if the conjunction *und* conjoins events that typically/ logically occur in a certain order in reversed order. In contrast to that, events that could also be presented in reversed order and would still make sense are expected to receive lower rejection rates if they are presented in reversed order and conjoined by the conjunction *und*.

Another factor that could have an impact on the interpretation of the conjunction *und* is at what point in time the events presented in the follow-up statement are mentioned in the story. This is relevant if participants strictly adhere to the temporal interpretation of the conjunction. In this case, events that were mentioned directly after one another in the story are more likely to be accepted because they directly follow the event order of the story. If two events that are not directly mentioned after each other, e.g. because another event occurred in-between, then even a follow-up condition that presents events in the correct order might be rejected. This is because the events mentioned in the follow-up statement did not directly follow each other in the narrative. This should show up in lower rejection rates for statements that present events that did not follow each other directly although the events occurred (roughly) in the order mentioned.

The studies on the interpretation of the French conjunction *et* (Noveck et al., 2009; Noveck & Chevaux, 2002) (see above) suggest that children do not interpret the conjunction temporally

as often as adults do and that the enrichment of the conjunction develops with age. These findings about the enrichment of *et* are consistent with current research on the acquisition of implicatures which suggest that children are in contrast to adults less likely to enrich the meaning of under-informative statements (Chierchia et al., 2001, 2005; Noveck, 2001, 2005; Noveck & Sperber, 2007; Papafragou & Musolino, 2003; Pouscoulous et al., 2007). For details on the acquisition of implicatures and children's interpretation of under-informative statements see chapter 5.2. If it is the case that the differences between children and adults regarding the temporal interpretation of the conjunction is only influenced by age, then no differences in the interpretation of the conjunction in follow-up statements with reversed event order are expected in the data of the children in different contexts.

Nevertheless, some of the literature on the acquisition of implicatures and under-informativity introduced in chapter 5.2, suggests that children's performance with respect to the processing of implicatures and their evaluation of under-informative statements is influenced by context (Breheny et al., 2006; Katsos & Bishop, 2008; Papafragou & Tantalou, 2004). Another influential factor on children's calculation of implicatures is whether additional encyclopedic or lexical knowledge is needed (Papafragou & Tantalou, 2004; Verbuk, in Press, Corrected Proof).

Therefore, it is hypothesized that children's temporal interpretation of the conjunction *und* is not purely a developmental effect but also determined by the kind of events conjoined with the conjunction as well as additional world knowledge about events. I would predict that contextual factors, specifically the kind of events conjoined by the conjunction, also influence children's interpretation of follow-up statements in reversed order. Contextually triggered differences in rejection rates are also expected to be found in the data of children. Higher rejection rates are expected if the conjunction *und* conjoins events that typically/ logically occur in a certain order are reported in reversed order. Apart from that, participants' knowledge and experience about the time course of certain events should increase with age. Consequently, the youngest participants should interpret the conjunction *und* temporally in follow-up statements with reversed event order numerically less often than older participants when the story presented events that typically or logically occur in a certain order.

The series of experiments that is described in the following, systematically analyses the influence of context on the interpretation of the conjunction *und*. In order to be able to describe the development of contextually triggered differences in the interpretation of the conjunction *und* more precisely, a group of children that was younger than the ones in the existing studies was tested additionally. The current series of experiments also tested 5-year-old children, while

the youngest participants that took part in the French studies by Noveck and colleagues (2009; 2002) were 7- and 9-year-old children, respectively.

6.3 Experiment I

The first experiment investigates children's and adults' interpretation of the conjunction *und* in follow-up statements of stories that presented events that are not logically dependent on another and typically do not occur in a fixed order. The stories consisted of an introductory statement followed by three events, such as in (85). The follow-up statement that had to be evaluated after each story, included two of the events either in correct or in reversed order.

(85) *Franziska ist mit ihrem Opa in den Zoo gegangen.*
Franziska be$_{3.SG.PRS}$ with her grandfather in the zoo go$_{PTCP}$
'Franziska went to the zoo with her grandfather.'

Sie hat die Ziegen gefüttert.
she have$_{3SG.PRS}$ the goat feed$_{PTCP}$
'She fed the goats.'

Dann hat sie die Elefanten angeschaut.
Then have$_{3SG.PRS}$ she the elephant look$_{PTCP}$ at
'She then looked at the elephants.'

Danach ist sie auf einem Pony geritten.
afterwards be$_{3.SG.PRS}$ she upon a pony ride$_{PTCP}$
'Afterwards she rode on a pony.'

The main questions of interests are how the conjunction *und* is interpreted in these kinds of contexts and whether there are differences between the age-groups. It is also controlled whether it matters which events of the story are mentioned in the follow-up statement.

6.3.1 Hypotheses

In the following the hypothesis concerning the experimentally manipulated factors order and event as well as other factors that might influence participants' performance in the experiment, such as age, pragmatic skills and working memory capacity are put forward.

6.3.1.1 Influence of the factors Order and Event

Concerning the interpretation of the conjunction *und* the following is hypothesized: Based on the assumption that the conjunction *und* is enriched or interpreted temporally, it should be interpreted in the same way as the conjunction *und dann* ('and then').[60] Therefore, the expected answer for reversed order statements that are interpreted temporally is disaffirmation while the one for statements in correct order is acceptance. This means follow-up statements that present events of the story in correct order should receive high acceptance ratings, and follow-up statements that present events in reversed order should receive equally high rates of disaffirmation if the conjunction is interpreted temporally. As negative answers to statements with reversed order are coded as expected answer, no effect of Order should be found in the data. Additionally, if the temporal interpretation of the conjunction *und* is strictly adhered (because event 1 was not directly mentioned prior to event 3, since event 2 was intermediate), it is possible that slightly fewer affirmative answers will be given for condition *1und3*. The null hypothesis tested states that participants do not enrich the conjunction *und* temporally but interpret it in the same way as the logical operator $\wedge$. Consequently, there should be a high amount of acceptance rates for statements in correct order and low rates of disaffirmation for statements in reversed order. Based on this expectation an influence of Order is expected to be found in the data.[61]

6.3.1.2 Influence of the factor Age and participants' individual pragmatic skills

Participants' pragmatic skills contribute to the calculation of sentence meaning as well and may influence whether a statement is accepted or rejected. However, individuals differ with respect to their pragmatic abilities when it comes to language comprehension and production. Some people are simply more focused on the logical interpretation of statements while others tend to enrich their meaning more often (e.g. Baron-Cohen, 2008). Literature suggests that pragmatic abilities develop with age and consequently cause differences in children's inter-

[60] Of course, there are also other options to pragmatically interpret the conjunction *und*. The conjunction can for example also express simultaneity, cause-consequence relations or elaborations (see chapter 1.1). In some stories for example the relation that holds between the introductory sentence and the first event presented, could be interpreted as causal relation or elaboration. This holds for stories that contain *wollte* ('wanted') in the introductory statement, e.g. *Der kleine Tiger wollte etwas Selbstgemachtes verschenken* ('Tiger wanted to give something self-made away'). However, this is not relevant for the interpretation of the follow-up statements because the introductory sentence is never involved in the follow-up statements. Moreover, the events that are presented in the follow-up statements are introduced in a certain temporal order in the story. Hence, if the conjunction *und* is interpreted temporally in the follow-up statements, then the temporal interpretation is the one that suggests itself. The same holds for experiment III.

[61] This is because the disaffirmation is encoded as expected answer in the data. Consequently, if the conjunction is interpreted temporally, then reversed order statements should be rejected which will show no effect of order. If the conjunction is not interpreted temporally then reversed order statements should be rejected less often compared to the acceptance rates of statements in correct order.

pretation of statements and those of adults (Hurewitz et al., 2006; Katsos, 2009; Musolino & Lidz, 2006). Research on implicatures also indicates differences in the amount of implicatures calculated by adults and children (see chapter 5.2.1). Most of these studies suggest that the ability to enrich utterances and to calculate implicatures increases with age (Chierchia et al., 2001, 2005; Noveck, 2001, 2005; Noveck & Sperber, 2007; Papafragou & Musolino, 2003; Pouscoulous et al., 2007). Existing literature and two experimental studies by Noveck and colleagues (Noveck et al., 2009; Noveck & Chevaux, 2002) suggest that there are differences concerning the temporal interpretation of the conjunction *et* between different age-groups.

Based on this evidence, younger participants, especially 5-year-olds should not or less often than older participants and adults interpret the conjunction *und* temporally. Instead they should interpret the conjunction *und* as logical connector in statements that present events in reversed order more often than older children and adults. Therefore, it is hypothesized that the factor Age influences the interpretation of the conjunction *und*. Additionally, older participants should interpret *und* temporally more often than younger participants, if the ability to interpret statements pragmatically develops with age. Hence, an influence of the factor Age on the results is expected, giving rise to significantly more expected answers to the follow-up statements in reversed order by older participants compared to younger participants. If temporal interpretation is adhered strictly in all conditions also fewer affirmative answers to condition *1und3* are expected to be given as age increases. An Age x Order x Event interaction is expected. The null hypothesis tested states that if the temporal interpretation of the conjunction does not develop with age, there should be no differences in the amount of expected answers to statements in correct and reversed order given by younger and older participants. This should show up in equally high amounts of correct answers given by all age-groups. No effect of age is expected to be found.

However, it is not only the factor Age that is said to have an impact on participants' pragmatic abilities. People have their own preferences with respect to evaluating sentences when interpreting under-informative statements or sentences that contain scalar terms. This may be related to whether participants tend to interpret the statement that has to be evaluated literally or pragmatically (Bott & Noveck, 2004; Feeney, Scrafton, Duckworth, & Handley, 2004; Nieuwland, Ditman, & Kuperberg, 2010; Noveck & Posada, 2003). Moreover, people with autistic traits differ from people that do not have such tendencies with respect to pragmatic aspects of language processing. Pragmatic skills in autistic people are more deficient (Jolliffe & Baron-Cohen, 1999; Schindele, Ludtke, & Kaup, 2008; Tager-Flusberg, 1981).

The hypothesis put forward, based on these findings is that people with good pragmatic skills should be more sensitive to pragmatic violations and consequently interpret reversed order statements temporally more often compared to participants with poor pragmatic skills or difficulties. This should be reflected in a correlation of pragmatic skills and performance on follow-up statements that present the events of a story in reversed order. I expect a correlation between measures of pragmatic skills (as assessed in the Autism-Spectrum Quotient test (AQ-test) and it's subcategory *communication)* and response pattern. If the results of the experiment are not influenced by participant's pragmatic skills, no correlation between the variables should be found.

6.3.1.3 Influence of working memory capacity

In order to be able to evaluate the follow up-statement of the experiment, participants have to memorize and recall the events narrated in the story. This requires sufficient attention span and working-memory capacity. Findings on children's production of narratives (see chapter 5.3) suggests that short-stories that are supposed to serve for testing 5-year-old children's comprehension, should be as well-arranged and clearly structured as possible to keep processing demands low. If the stories presented to the participants are too complex or difficult so that they cannot be remembered, experimental results will be falsified. To ensure reliability of the data, the criteria just mentioned were obeyed and kept in mind during the construction of the text materials (for details see chapter 6.3.3.2, specifically 6.3.3.2.1). Additionally, a phonological working memory test should be conducted to make sure and double check that the experimental results are really not influenced by children's working memory capacity. A standardized test that measures auditive memory capacity is the subtest *Phonologisches Arbeitsgedächtnis für Nichtwörter* ('phonological working memory for nonsense-words') (*PGN*-test) of the *SETK 3-5* test battery by Grimm (2001).[62] This test is a measure of phonological working memory and can also be used as screening test to identify children's level of linguistic development (cf. Grimm, 2001).

To rule out that the experimental results are influenced by working memory capacity, it should be assessed, whether phonological working memory capacity has an impact on participants' performance in the experiment. A correlation of phonological working memory capacity and performance in the experiment is hypothesized, if performance in the experiment is influenced by phonological working memory capacity. That is, participants with a high score

[62] Another test that measures auditive memory capacity is the subtest *Gedächtnis für Wortfolgen* (*GW*-test) ('Memory for word order'). This test is a different measure for phonological working memory and does in contrast to the PGN-test not reveal an increase of performance in the age-group of 5-year olds (cf. Grimm, 2001).

in the memory test should perform better in the experiment than participants with a lower phonological working memory capacity. However, no impact of working memory capacity on the evaluation of the statements is expected because the design of the experiment tries to avoid influences of phonological working memory capacity on the data by keeping the stories as short and simple as possible. The tested hypothesis states that if phonological working memory capacity does not influence participants' performance in the experiment, no correlation between participants' performance in the memory test and the amount of correct answers given to the filler items of the experiment is expected.

6.3.2 Choice of method

The experiments are designed to investigate the meaning of the conjunction *und* as well as how people understand it in certain contexts. Since people frequently determine the meaning of sentences and utterances they hear, a good way to figure out how people interpret the conjunction seems to be via a method which relies on people's understanding/ interpretation of statements. Since this study also aims to see whether there are differences in the interpretation/ understanding of the conjunction between children and adults, the method to be used has to be suitable for children as well.

There are several methods that test understanding e.g. act-out tasks, picture-pointing tasks, comprehension tasks as well as judgment tasks, e.g. truth-value judgment tasks and felicity judgment tasks (for details see: McDaniel, McKee, & Smith Cairns, 1996). Comprehension can also be checked by asking participants to answer questions or evaluate statements e.g. about a previously heard story (judgment tasks). Participants' answers enable the experimenter to see how the input or the follow-up statement was interpreted. The advantages and disadvantages of these types of tasks are summarized in Table 4. In the following, judgment tasks are introduced in more detail, as this method was chosen for the current series of experiments introduced and discussed in this work.

Follow-up questions of judgment tasks can be of various types: e.g. *yes*-/*no*-questions or questions with two or more alternative answers. Varieties of judgment tasks are truth-value judgment tasks (TVJ-tasks) and felicity judgment tasks. The only demand the TVJ tasks has, is the participant's comprehension of the input material and its follow-up statement. Compared to other metalinguistic tasks the experimenter gains a high amount of information about the participant's interpretation of the presented material in relation to the simplicity of the response. Therefore, it is a very useful method for testing children's comprehension and knowledge about language. This method is especially valuable with respect to sentence-based semantics.

Table 4: Advantages and challenges of comprehension tasks

Type of task	Advantages	Challenges
Act-out task	- suitable for young children - comprehension assessment does not depend on adult-created interpretations of the sentences	- potential open-endedness of act-out process, which makes this type of task unsuitable for the current study - simultaneous interpretations of events cannot be acted out
picture-pointing task	- suitable for young children - suitable for shy children as they just have to select and point to a picture	- situation in the picture has to be interpreted as well - pictures are created based on adult-like interpretations of the statements - possible distraction of young participants by details of the picture - chronological order of events cannot be displayed unambiguously in a single picture (hence unsuitable for the current study)
judgment tasks	- different types of follow-up questions allow for testing multiple interpretations of statements - simplicity of response	- child has to have some concept about the truth or falsity of a statement in relation to what was uttered

The meaning and interpretation of the conjunction *und* may be examined by means of TVJ-task as follows: Participants are confronted with short stories in which several events happen. Afterwards, two of the events that were heard in the story are mentioned in a follow-up statement, either in the same order as heard in the story or in reversed order (cf. Noveck et al., 2009; Noveck & Chevaux, 2002). If people interpret the conjunction *und* temporally like *und dann*, they should accept statements in correct order and reject statements with reversed event order or comment on the reversed order of the events. This would also account for cases in which participants recognize that the reported events in the follow-up statement are reversed but do not consider the statement as bad enough to be evaluated as *wrong*. A record could be kept about cases in which participants interpreted the conjunction temporally but left a comment and still evaluated the statement as *correct*.

Although Katsos and Smith (2010) point out that children are more successful in act-out and sentence to picture matching tasks rather than in evaluating statements (see chapter 5.2.2), I still opted for a TVJ-task in the current series of experiments because it suits the underlying research-question best. Moreover, the (lexical) complexity of the stories and conditions can be

better controlled for in a TVJ-task than in a picture selection task. Pictures have the disadvantage that they might either be too complex or too simple. To account for potential difficulties children might have with the evaluation task, I tried to make the task as child-friendly and attracting as possible to keep children's interest and attention as high as possible. Therefore, the stories were presented as narratives told by a videotaped glove-puppet.

Another advantage of the videotaped narratives presented by the glove-puppets is that the experimenter cannot give the subject unwittingly hints to produce the correct answer. (Such hints could be facial expressions, fluency differences, tone of voice or stressing certain words, when presenting the story or follow-up statements.) Moreover, the material is presented in exactly the same way to every participant.

The only drawback of a TVJ-task is that participants have to remember the stories while processing and thinking about the evaluation of the follow-up statement. This involves a memory component and might cause noise in the experimental data of the younger participants due to possible memory difficulties. To control for this, stories were kept as short and simple as possible. The memory component, which is currently the only disadvantage of this task, was controlled for by means of a memory test to check whether memory capacity has an impact on the experimental results.

6.3.3 Method

6.3.3.1 Participants

Twenty-two 5-year-old children (10 male and 12 female), twenty-four 7-year-old children (10 male and 14 female), twenty-four 9-year-old children (12 male and 12 female) as well as 20 adults (10 male and 10 female) took part in this study. All of the participants were monolingual native speakers of German. Participants mean ages and age-ranges were the following:

5-year-olds: age from 5;0 to 6;4 (mean age: 5;9)

7-year-olds: age from 7;2 to 8;4 (mean age: 7;9)

9-year-olds: age from 8;5 to 10;1 (mean age: 9;4)

adults: age from 19;0 to 28;2 (mean age: 24;10).

The 5-year-old children were recruited from three kindergartens in Mainz, Idstein and Stuttgart. The 7- and 9-year old children were recruited from schools or after-school care clubs in Mainz, Idstein and the Unstrut Hainich region.

Before the experiment was conducted, kindergartens, schools as well as the supervisory school authority had to give their approval for the conduction of the experiment. Moreover,

the parents had to give their agreement before the children were allowed to take part in the study. Children were given Pixi-booklets or kinder surprise eggs for participating in the study. All of the adult participants were students at the Johannes Gutenberg-University of Mainz. Participants were paid 2€ for participating in the experiment.

Moreover, participants were tested for two further characteristics: Children were tested on working memory capacity while adults filled in a questionnaire to determine their pragmatic skills (see chapters 6.3.3.1.1 and 6.3.3.1.2).

6.3.3.1.1 Test on Working Memory Capacity

In order to successfully master the experimental task, sufficient working-memory is needed, e.g. to remember the events mentioned in the story as well as the order in which they occurred. Once the follow-up statement is heard, children have to compare the content of the follow-up statement and the order of the events mentioned to the one of the previously heard story. If children cannot remember the events or the order of the events presented in the story, they cannot evaluate the test-statement correctly. To check whether all of the 5-year-old children have a phonological working memory capacity that is average of their age-group a standardized phonological working memory test was conducted with each child. The same test was done with the seven- and nine-year-old children. In this way it could be guaranteed that all of the children have at least a phonological working memory capacity that is average or above for 5-year-olds. Moreover, data of participants with insufficient phonological working memory capacity can be excluded from the experimental analysis. In this way noise or artifacts in the data that might be caused due to insufficient phonological working memory capacities can be controlled for. Results of this test were correlated to children's performance in the actual experiment to see whether phonological working memory influences the experimental results.

The working memory test used in this work is a standardized phonological working-memory test (*PGN*-test), taken from the *SETK 3-5* test battery by Grimm (2001). *SETK 3-5* is a test battery which is used to diagnose delays or developmental disorders in children and contains tests for grammatical abilities, complex encoding abilities as well as auditory memory capacity. The *PGN*-test assess how well children can memorize and reproduce lexical units in their phonological working memory. This sub-test requires participants to repeat eighteen nonce-words which are made up of never heard phoneme patterns and have a length of two to five syllables (see appendix C.7). To succeed, never-heard phoneme patterns have to be stored in working memory for a short time. This test is said to be the first standardized test which is

able to access phonological memory function in German speaking preschool children (Grimm, 2001).

6.3.3.1.2 The Autism-Spectrum Quotient Test

Pragmatic language impairment refers to the fact that people have difficulties to understand or communicate what is said and what is meant adequately (Möller & Ritterfeld, 2010). Pragmatic difficulties are known as one of the main symptoms of autistic traits (Möller & Ritterfeld, 2010; Ryder, Leinonen, & Schulz, 2008).

However, current research is concerned with whether pragmatic disorders are a specific symptom of autism or whether pragmatic disorders can also occur individually, e.g. as kind of specific language impairment in individuals that do not have autistic traits (Bishop, 2000; Bishop & Norbury, 2002; Whitehouse, Barry, & Bishop, 2007). To shed light on this question Bishop and Norbury (2002) used standardized diagnostic instruments to test children with language impairments on autism and on pragmatic impairment. They found that pragmatic language impairment seems to be a phenomenon on a scale between autism and specific language impairment (Bishop, 2008; Bishop & Norbury, 2002). Therefore, it is dangerous to conclude that all children with pragmatic difficulties are autistic.

Furthermore, pragmatic skills may also vary within populations that do not have pragmatic language difficulties. This causes differences among participants in studies that examine pragmatic phenomena such as enrichment, implicatures and underinformativity. There is evidence from recent studies on underinformativity that support this by suggesting that people with more pragmatic language difficulties are not as sensitive to these kind of pragmatic 'violations' as people with few language difficulties (Nieuwland et al., 2010).

In order to check to which extent adult participants, that took part in my study, possess characteristics that are associated with Autism Spectrum Disorder (ASD), participants were asked to fill in a translated version (see appendix C.8) of the AQ-questionnaire by Baron-Cohen, Wheelwright, Skinner, Martin and Clubley (2001). This test is self-administered and consists of 50 questions from the following areas: *social skill, attention switching, attention to detail, communication* and *imagination*. Each of these fields comprises 10 questions. Although the AQ is not a diagnostic tool, it and may be used to determine to which extent normal adults possess autistic characteristics. The discriminative validity of the test as screening tool has been tested clinically (Woodbury-Smith, Robinson, Wheelwright, & Baron-Cohen, 2005). The authors of the test report that a score of 32+ can be used as cut-off to identify people with clinically significant levels of autistic characteristics. However, high scores in the test do not

mean that participants are autistic because diagnosis is only justified based on diagnostic measures.

Studies by Bishop and Norbury on autism and pragmatic language impairment have shown that children may have pragmatic impairments without having autistic traits (Bishop, 2008; Bishop & Norbury, 2002). To account for the possibility that participants have pragmatic difficulties but no autistic traits, the questions of the subcategory *communication* of the AQ-test, which is the subcategory that is most closely related to pragmatic abilities, were used to determine participant's pragmatic skills on a continuum from autistic traits to typicality. The following items of the test belong to the subcategory of communication: 7, 17, 18, 26, 27, 31, 33, 35, 38 and 39.

The AQ-questionnaire was not conducted with the children that took part in my experiments, because there is currently no standardized or consistent theory and classification of normal and abnormal pragmatic skills in children (cf. Möller & Ritterfeld, 2010 and literature cited there).

6.3.3.2 Materials

In order to avoid that participants leave the experimental session prematurely, it is important not to present too many items, so that participants' capacities are not overloaded, which could cause noise in the data. When planning the amount of items factors such as participants' age and the amount of time it takes to present the stories has to be considered.

In a comparative study Noveck and colleagues (2009) used 14 stories as items for their first experiment and ten stories for their second and third experiment. However, only six of these stories were relevant for their study on the interpretation of the conjunction in the first experiment. In the second and third experiment nine out of ten stories were items of the study. The remaining story served as practice item. The material Noveck and colleagues (2002) used in their study consisted of twelve stories for Experiment I and II. In both cases four out of the twelve stories were relevant for the study on the conjunction *et* ('and'). The amount of stories used by Noveck and colleagues can only serve as a rough guideline, since their experiment was a reading-experiment with children no younger than 7 and 9 years, respectively. My study is an auditory experiment and is addressed to 5-, 7- and 9-year-old participants.

Peter Gordon (1996, p. 227) states that 3- to 5-year-old children should be able to cope with up to about 20 test items plus training items if the stories presented before the follow-up statement are a few sentences long. Based on Gordon's estimations an amount of 24 items including fillers should be an adequate amount of items so that the 5-year-old children, who are the youngest participants of this experiment are not overloaded and can successfully take

part in the experiment. Therefore, 26 short stories (as well as the respective follow-up statements), which describe several actions of a single character, were constructed. Two of these stories were used for the explanation of the task and served as an exercise. There was a follow-up task after each story. Participants heard a simple sentence, which mentioned two of the events that happened in the previously heard story, and were required to evaluate whether the follow-up statement was right or wrong.

6.3.3.2.1 Design of the stories

The stories presented in the experiments consist of four simple sentences. An example is given in (86) for illustration.

(86) *Franziska ist mit ihrem Opa in den Zoo gegangen. Sie hat die Ziegen gefüttert. Dann hat sie die Elefanten angeschaut. Danach ist sie auf einem Pony geritten.*

('Franziska went to the zoo with her grandfather. She fed the goats. She then looked at the elephants. Afterwards she rode on a pony.')

The first sentence of each story introduces the actor and creates the setting of the story. In each of the following sentences the actor is pronominalized to *er* ('he') or *sie* ('she') and performs one activity per sentence. As mentioned in chapter 5.3, young children often limit their narratives to a single character. It is easier for them to tell stories with a single character because the processing demands caused by content and structure of the story are lower (Karmiloff & Karmiloff-Smith, 2002). To keep the processing demands caused by the structure and content of the story as low as possible, all of the stories in this series of experiments are about one single character. Another advantage of stories limited to one character is that crossing dependencies in the follow-up statements, which could cause noise in the data, as well as possible confusion of names and characters due to several actors, are avoided.[63]

Findings of research on children's narratives further revealed that different age-groups appear to have different standards when evaluating narratives as well as different expectations of and conceptions about what a (good) story is (see chapter 5.3). Therefore, it has to be kept in mind that narratives for children between the age of 5 and 9 should be simple enough so that the

[63] The main reason for avoiding crossing dependencies was that a study by Friedmann und Costa (2010) showed that Hebrew- and European-Portuguese-speaking children up to an age of 5 to 6 years have problems with processing of crossing dependencies in sentences such as in: *Tim met Tina and went shopping*. In contrast to adults, young children consider Tina as subject of the second sentence. The authors also showed that children do not have problems processing coordinated structures without crossing dependencies (Friedmann & Costa, 2010). Since this kind of structures have not been empirically tested for German-speaking children, I decided to avoid these structures in my experimental material, to ensure that they do not cause noise or create artefactual differences in the data.

processing costs of the 5-year-olds are not exceeded, but should not be too simple so that the material is also acceptable for older participants.

The event structure of the stories in this experiment was event 1 – event 2 – event 3 (see (86)). Since unfamiliar words may cause unwanted variability in the material which in turn may induce noise in the data, the narrated events were activities, with which even 5-year-olds are familiar with, e.g. building a sandcastle and playing with different kinds of toys. At the same time attention was paid that the stories are as short as possible to limit children's processing demands.

Moreover, no reflexives were used in the materials and all of the events presented in a story were equally salient.[64] This is important because this experiment also controlled whether the point in time when the event was mentioned in the story has an impact on the interpretation of the conjunction. Hence, differences in the salience of the individual actions might cause artefactual differences between the conditions. The actions narrated in the story were actions that are not logically dependent on each other. This means that they do not necessary have to take place in the specific order mentioned but could theoretically occur in a different order as well. This is to ensure that children's evaluations of the statements are based on the previously heard story and not on their experience or knowledge of the order of certain actions. In order to highlight the plot of the story, the third and fourth sentence of each story began with the temporal marker *dann* ('then') and *danach* ('afterwards'), respectively. These temporal markers were inserted to point out that the events in the story took place in a certain order and to make the order in which the events in the story took place more salient. Moreover, the presence of the temporal markers prevents that sentences 2-4 always start with the same pronominal marker. All of the stories were narrated in present perfect tense, because perfect tense is in colloquial German the standard tense form to refer to events that happened in the past.[65]

24 stories were prepared for this experiment. All of the stories were constructed according to the same criteria and structure. Possible differences in the material that were controlled for when creating the material are length and complexity of the stories as well as follow-up

[64] Events were equally salient refers to the fact that none of the events was stronger emphasized or highlighted (e.g. due to the use of adjectives or adverbs) than any of the other events in the story. Moreover, the narrated events were not causally or logically related.

[65] The perfect tense is a cohesion marker that is used differently by adults and children. It has been observed that German speaking adults shift to the perfect tense to refer back to previous information that is relevant for the discourse and to categorize the discourse into smaller units such as episodes and scenes. Three- to four-year-old children use the perfect tense "[…] to readjust events that are out of chronological order in relation to previous discourse" (Hickmann, 2004, p. 213f.) and to indicate that events are completed (Bamberg, 1987). From the age of nine or ten onwards, children start to use the perfect tense in the same way as adults do. This indicates that even young children attempt to produce coherent narratives. The slight differences in use of the perfect tense should not affect the comprehension and interpretation of the stories as all age-groups use perfect tense to refer to events that happened in the past.

statements, syntactic complexity, familiarity of the activities and salience of the events mentioned. Additionally, the whole sentence material was checked for possible differences in intonation and speed between the individual conditions and stories.

6.3.3.2.2 Design of the test sentences

The design of this experiment is a 2x3 design. This means, that the order of the events (correct or reversed) mentioned in the follow-up statement as well as the event combination (event 1 + 2; event 2 + 3; event 1 + 3) are controlled.[66] Three out of six statements presented events from the story in proper order, the rest in reversed order. Consequently, six follow-up statements were prepared for each story. However, each participant heard only one follow-up statement for each story. The length of the follow-up statements was controlled, so that they were roughly equal in length. The six conditions as well as the abbreviations that will be used in the following to refer to the respective conditions are listed below.

1. follow-up statements that combine event 1 and event 2 with the conjunction *und* in correct order *(1&2)*
2. follow-up statements that combine event 1 and event 2 with the conjunction *und* in reversed order *(2&1)*
3. follow-up statements that combine event 2 and event 3 with the conjunction *und* in correct order *(2&3)*
4. follow-up statements that combine event 3 and event 2 with the conjunction *und* in reversed order *(3&2)*
5. follow-up statements that combine event 1 and event 3 with the conjunction *und* in correct order *(1&3)*
6. follow-up statements that combine event 3 and event 1 with the conjunction *und* in reversed order *(3&1)*

6.3.3.2.3 Filler

To avoid that participants notice the pattern of the follow-up statements, which might lead to conscious analysis of the statements and the development of strategies to answer the questions in the experiment, it is important that participants do not know the purpose of the experiment. The purpose of the experiment was disguised by the insertion of fillers. The experimental material consists of 24 stories. Each story was created with 6 conditions and 6 fillers. The fillers

[66] *Event 1 + 2* means that event 1 and event 2 were combined in the follow-up statement. The order is irrelevant in this case. Event combination simply refers to the fact that the respective events are mentioned (either in correct or reversed order) in the follow-up statement. The same holds for event combinations *event 2 +3* and *event 1+3*.

were created according to the same criteria as the follow-up statements, so that the filler follow-up statement will not obviously stick out from the other follow-up statements. Each of the fillers contained one event that was not mentioned in the story. Fillers were designed as follow-up statements that have to be evaluated as *falsch* ('wrong'), to force participant to give no-answers and to avoid that participants have a positive bias, when evaluating statements. Additionally, the number of wrong filler items gives a hint on how carefully a participant was doing the task. In this way, fillers also served to check whether participants paid attention to the content of the stories and were doing the task correctly.

6.3.3.2.4 Video clips

In order to embed the follow-up statements in a plausible context and to make the task more interesting to achieve that even the youngest participants remain attentive throughout the study, the setting of the study was designed as conversation between two glove-puppets. One glove-puppet narrated a story. The second glove-puppet listened and uttered the follow-up statement (which contained two events of the story). The sentence material was recorded to ensure that the speed of speech, prosody and sentence stress is the same in all stories and conditions. Another advantage of the recordings is that a single experimenter is needed for the conduction of the experiment. In this way, I was able to conduct this study with all of the participants by myself and did not need help of a second experimenter.

Figure 4: Characters that appeared in the video clips

All materials were presented as video clips. The voices of both glove puppets were spoken by two different people to make the video-clip more authentic. Both speakers were native speakers of German.[67]

After the follow-up statements and the stories had been recorded, two glove-puppets (see Figure 4) were videotaped and later synchronized with the auditory material. When choosing the glove puppets care was taken that the glove puppets are non-human characters, so that they will not represent stereotypical puppet-theatre characters such as Caspar, Seppel or Ernie and Bert. This was done to avoid that children are prejudiced against one or both puppet characters and consequently attribute certain characteristics such as stupidity or forgetfulness to them. Therefore, neutral glove puppets, a bird which narrated the stories and a cat which uttered the follow-up statements, were chosen. Moreover, attention was drawn to the matter that only the glove puppet, who was uttering a sentence was moving, so that the puppets would not distract participants. Afterwards a small video clip was created for each story and follow-up statement. Then the video-clips of the stories and the video-clips of the test items were combined. So that each of the resulting video-clips (items) consisted of one story and one follow up statement. Each of these small video-clips had a length of 15-20 seconds.

6.3.3.2.5 Lists

The Latin square method was used to create 6 different lists of material and to match a condition or filler as a follow-up statement with each story. For each list the stories were matched with one out of the 6 conditions or a filler item, so that each list contains only one version of the follow-up statement. 18 of the 24 stories on each list were matched with a follow-up statement that served as condition and the remaining 6 stories were combined with a filler item as follow-up statement.

To prevent that more than two follow-up statements of the same or similar type are presented next to each other and to make it more difficult for the participants to notice the structure of the follow-up statements, the order of presentation of the items of each list (stories with fillers and stories with experimental conditions) was pseudo-randomized. The randomization took also care that the actor in the stories was never the same in two following stories, so that participants will not confuse the events of a story with the events of the previous story.

Due to fatigue, learning or boredom of the subject, follow-up statements presented at the end of a list might be processed or evaluated in a different way than statements presented at the

[67] I did not provide my voice for the glove-puppets, because I conducted the study with the participants. It is better that the speaker of the stories and test-items is not present during any of the sessions so that participants cannot establish a positive or negative relationship to the speaker of the material, which in turn might possibly influence evaluations based on personal sympathy.

beginning of the list, even if they are structurally the same. To balance these effects the order of the materials within a list must be scrambled, so that all of the stories sometimes appear in the first, sometimes in the last and sometimes in the middle part of the experimental list. To scramble each of the six lists, the randomization program Conan was used to create 3 versions for each list so that each participant (even within the same list) gets a unique version and order of stories. Each participant sees only one list, so that he or she only sees one version of each experimental sentence for each story. In total 18 different versions of the materials were created. For each version a power-point presentation was created which contained two exercises and the 24 stories of the actual experiment.

6.3.3.3 Procedure

The type of task in this experiment was a TVJ-task. This kind of task requires the participant to make a binary judgment on whether a statement is right or wrong in a certain context.

The experiment with the adult control group was conducted in a quiet room of the language laboratory at the University of Mainz. Each participant was tested in an individual meeting. After a short introduction participants were familiarized with the characters which appear in the video. They were instructed that they would see short video-clips in which a story is narrated by a glove-puppet and another glove puppet would utter a follow-up statement after each story about the happenings in the story. Participants were told that it was their task to evaluate the follow-up statement as either *richtig* ('right') or *falsch (*'wrong') and that they were allowed to leave a remark on the follow-up statements if they had any.

After the adults had read the task of the experiment, they were asked whether they had any questions. If there were no questions, participants were asked to perform two trials. This was done to see whether the participant had understood the task of the experiment or still had questions to be answered. Two trials were sufficient for all participants.

The study with the children was conducted in a separate quiet room of the school, after-school care club or kindergarten.

Before the experiment was conducted, I took part in the group-meeting of the children and their teachers which takes place in the kindergarten every morning ("Morgenkreis"), where I was introduced to all of the children and shortly explained the purpose of my visit. Afterwards, the study was conducted with each subject individually in a separate quiet room. During the study the participant and the experimenter sat at the same table, next to each other but both at different corners of the table. Except for the laptop from which the video-clips were replayed nothing else was on the table. The laptop was placed in front of the participant, so that the video-clips could be viewed without any problems.

Each participant was tested in an individual meeting. After a short introduction participants were familiarized with the characters which appear in the video and the instruction. The procedure was the same as for the adults. Example (87) shows one of the stories which participants heard during the experiment.

(87) *Der kleine Tiger war heute auf dem Spielplatz.*
the little tiger be$_{PST}$ today at the playground
'Little Tiger has been to the playground today.'

Er ist gerutscht.
he be$_{3SG.PRS}$ slide$_{PRS.PRF}$
'He went sliding.'

Dann ist er Karussell gefahren.
then be$_{3SG}$ he carousel ride$_{PTCP}$
'Then he rode the carousel.'

Danach hat er geschaukelt.
afterwards have$_{3SG.PRS}$ he swing$_{PTCP}$
'Afterwards he swung.'

For each participant the follow-up statement was one of the six possible conditions such as in (88) or one of six possible fillers. An exemplary filler item is given in (89).

(88) *conditions*

(1&2) *Der kleine Tiger ist gerutscht und Karussell gefahren.*
the little tiger be$_{3SG.PRS}$ slide$_{PTCP}$ and carousel ride$_{PTCP}$
'Little Tiger slid and rode the carousel.'

(2&1) *Der kleine Tiger ist Karussell gefahren und gerutscht.*
the little tiger be$_{3SG.PRS}$ carousel ride$_{PTCP}$ and slide$_{PTCP}$
'Little Tiger rode the carousel and went sliding.'

(2&3) *Der kleine Tiger ist Karussell gefahren und hat geschaukelt.*
the little tiger be$_{3SG.PRS}$ carousel ride$_{PTCP}$ and have$_{3SG}$ swing$_{PRS.PRF}$
'Little Tiger rode the carousel and swung.'

(3&2) *Der kleine Tiger hat geschaukelt und ist Karussell gefahren.*
the little tiger have$_{3SG.PRS}$ swing$_{PTCP}$ and be$_{3SG}$ carousel ride$_{PTCP}$
'Little Tiger swung and rode the carousel.'

(1&3) *Der kleine Tiger ist gerutscht und hat geschaukelt.*
the little tiger be$_{3SG.\ PRS}$ slide$_{PTCP}$ and have$_{3SG}$ swing$_{PTCP}$
'Little Tiger slid and went swung.'

(3&1) *Der kleine Tiger hat geschaukelt und ist gerutscht.*
the little tiger have$_{3SG.\ PRS}$ swing$_{PTCP}$ and be$_{3SG}$ slide$_{PTCP}$
'Little Tiger swung and slide.'

(89) filler

(3&0) *Der kleine Tiger ist gewippt und hat geschaukelt.*
the little tiger be$_{3SG.PRS}$ seesaw$_{PTCP}$ and have$_{3SG}$ swing$_{PRS.PRF}$
'Little Tiger seesawed and swung.'

The order of the randomized stories and sentences was presented via a Power-Point Presentation replayed on an IBM T60p laptop. The sound was amplified via an additional loudspeaker. Participant's answers and remarks were written down in a protocol. The whole session of the experiment took, depending on participant's age and how fast they answered, 10-23 minutes. Adults as well as the 7- and 9-year-old children completed the experiment within 10-15 minutes. The 5-year-old participants needed slightly more time and completed the experiment within 18-23 minutes. The time difference results because the 5-year-olds often made comments on what was wrong in the follow-up statement and why. Some children also made remarks about the story, like *I have been to the swimming-pool recently as well* or *In our kindergarten-group there is also a girl called Annika*. Another reason which might have contributed to why children needed slightly more time to complete the experiment is that children are slightly slower in taking turns than adults (Clark, 2009a, pp. 287-289).

After the actual study, participants were shortly debriefed. Participants were asked whether they recognized something special during the experimental session or if they wanted to comment on this study. If a participant did not comment on the order of the events in the test-statements, the participant was asked at the end of the experiment if he had realized anything concerning the order of the events. At this point it turned out that some subjects had recog-

nized that some of the statements were presented in the wrong order but they did not comment on it because they were of the opinion that this is not important. Most of the children said that they liked the study and that it was really fun to listen to the little stories.[68]

After the study was completed I conducted a working memory capacity test (Grimm, 2001, p. 114) with the children. Therefore, I told the children that I was going to play another short game with them. The children were instructed that they were going to hear a couple of funny words which they had to repeat.

Then 18 non-words were read out, which the child had to repeat. Attention was paid during the presentation of the individual words, so that the individual words could not be read off the experimenters lips. Each word was only read-out once. A protocol was kept and it was noted down for each word, whether the participant was able to repeat the word or not. Neutral feedback such as *gut* ('good'), *schön* ('nice'), *ja* ('yes') or *mhm* were given to motivate the child.

While the children's working memory capacity was assessed in a short test after the actual experiment was conducted, adults were tested on the AQ. Participants however, were not told that this is an autism-questionnaire to avoid that this knowledge influences the results. Therefore, they were asked to fill in a questionnaire about communicative behavior (see appendix C.8).[69] The questionnaire is a translated version of the original AQ-test by Baron-Cohen and colleagues (2001) and consisted of 50 statements which had to be evaluated on a four point scale. Participants had to tick whether they agreed fully, partially, not really, or not at all with the statements.

6.3.3.4 Data Analysis

Evaluations of the follow-up statements were coded as correct or wrong. A correct response was assigned a score of 1 while an incorrect answer received a score of 0.

To make sure that participants paid attention to the story and remembered the events of the story, the amount of filler items that was answered correctly was used as criteria to determine whether a participant had successfully mastered the task or not. Participants were excluded from data analysis if they answered less than 5 out of 6 filler items (80 percent) correctly.

[68] Some asked me whether they could play the game once again. Two weeks after her son had taken part in the experiment a mother told me, that her boy liked the study so much that he is imitating the cat and the bird at home and that she has to answer the follow-up statements every day. She therefore asked me whether she could have the video-clips of my study.

[69] Participants filled in the questionnaire subsequent to the experiment. This was because I got the idea to check for possible group differences that might be caused by pragmatic difficulties or poor pragmatic skills after the experiment had started. The questionnaire was send to the participants via email and they were asked to fill it in as quickly as possible to avoid that they think about their answer too long.

Another criteria used to exclude participants from the evaluation was if they evaluated all of the statements negatively, even those conditions that presented items in the correct order.

Since the experimental design of this study has more than one independent variable, an ANOVA with the factors EVENT COMBINATION (event 1 + 2 vs. event 2 + 3 vs. event 1 + 3), ORDER (correct order vs. reversed order) and AGE (5-, 7-, 9-year-old children and adults) as well as the random factor subject (F) was conducted for data analysis.[70] Statistical analyses were carried out with the *ezANOVA*-package of statistic software *R*.

For evaluating effects with more than one degree of freedom in the numerator, the sphericity correction proposed by Huynh and Feldt (1970) was used to compensate for violations of sphericity. In these cases, original F-values are reported with the adjusted p-values. Whenever statistical tests allowed pair-wise comparisons the p-values were corrected according to the modified Bonferroni procedure (Keppel, 1991). The p_{Keppel} was calculated as follows and was set to $0.0\bar{3}$ for comparisons that involved the factor EVENT COMBINATION:

$$pKeppel = \frac{df \times p}{number\ of\ comparisons}$$

Children's achievement in the *PGN*-test was evaluated according to the procedure suggested by Grimm (2001): It was noted down in the protocol whether a child repeated a nonce-word correctly or not. A correct response was assigned a score of 1 while an incorrect answer received a score of 0. Since problems to articulate sounds correctly influences the ability to reproduce the nonce-words correctly (cf. Grimm, 2001, p. 49), wrong answers were additionally noted down in the protocol. In this way it could be checked afterwards whether a failure to repeat the word was due to problems with articulation or related to limited phonological working memory.

When evaluating the test, the evaluation guidelines put forward by Grimm (2001, p. 49) were followed. The author suggested that problems to articulate the will only be reflected in the repetition of the word *Toschlander*. Children with enunciation phone [ʃ] problems related to the sound [ʃ] would therefore lose one point but can still achieve good results. Other articulation problems like articulating the phone [g] instead of [d] or [k] instead of [t] affect the results of the test more severely. Therefore, the authors suggest that the test can in this case not be evaluated or has to be evaluated twice.

The following steps were taken to determine whether a child's performance in the *PGN*-test was average, above average or below average: First of all the age of the child on the date test-

[70] Event combination simply refers to the fact that the respective events are mentioned (either in correct or reversed order) in the follow-up statement.

ed was calculated. Therefore, the child's birthday was subtracted from the date of the day tested. Then the raw-score of the test was determined for each child. The raw-score is equal to the amount of correctly repeated words and is reflected by the points achieved in the task. If a child repeated for example thirteen out of eighteen nonce-words correctly, he or she got a score of thirteen points, which is one point for each correct word. Afterwards the raw-scores were with the help of the table given in Grimm (2001, p. 89) converted into t-values. All of the t-values are normed values with a mean of 50 (M = 50) and a standard deviation of 10 (SD =10.0). Grimm (2001, p. 50) states that children, who achieve a t-value in the interval between 40 and 60 performed on average, while those with t-values above 60 performed above average. A t-value under 40 reflects performance below average. After having determined the t-scores, the confidence interval was determined with the help of a table given by Grimm (2001, p. 51). This was done to define the upper and lower limit of the interval in which the true t-value falls.

The working memory capacity test from the SET 3-5 battery is only standardized for children up to the age-group of 5 and does therefore not contain materials for the analysis of data by older participants. The working memory capacity test from the test battery for older children, the SET 5-10 by Petermann (2010), contains a phonological working memory test as well. This test is, however only for the age-groups 5 and 6 and not comparable to the test by Grimm (2001). In order to be able to compare children's performance in the memory-test, the test by Grimm (2001) was conducted with all participants. Raw scores were converted to t-values only for the age-group of 5-year-olds to see whether they performed below, above or on average for their age-group. For the other age-groups it was not possible to check whether they performed above, below or on average for their age because of the reasons just mentioned. Hence, performance of the other age-groups was evaluated based on the raw scores.

Attention was paid; that none of the 7- or 9-year-old children performed below average of normally developed 5-year-olds. For the standards of the 5-year-olds, a raw-score of 8 in the *PGN*-test corresponds to a t-value of 41 and a raw score of 7 to a t-value of 39. A t-value between 40 and 60 indicates average performance for 5-year olds. Consequently, participants with raw-scores of 7 or lower would have performed below average for the age-group of 5-year-olds. For this reason a raw score value of 8 was used as critical value for the older age-groups. Participants, who achieved less than 8 points in the *PGN*-test, were excluded from data analysis of the experiment because this corresponds to a working memory capacity, which is lower than the average for normally developed 5-year-olds.

The raw scores participants gained in the *PGN*-test were correlated with their performance in the actual experiment. Some of the follow-up statements of the experiment, especially those that presented the events of the story in reversed order, were ambiguous. This means that depending on whether the conjunction is interpreted temporally or not, accepting as well as rejecting the statement could be considered as correct answer. The only follow-up statements that are not ambiguous concerning the answer are the filler items as well as conditions *1und2* as well *as 2und3*. Since it is not clear whether the level of difficulty is the same for conditions *1und2* and *2und3* because answers might possibly be influenced by primary- or recency-effects, the only conditions that are comparable are the filler items. Therefore, participant's raw scores of the *PGN*-test were correlated with the amount of correct answers given to the filler items of the experiment.

Finally, a Pearson product-moment correlation coefficient for all participants (and age-groups) whose data entered the analysis of the experiment was computed to assess the relationship between participants' scores in the test on working memory capacity and the amount of correct filler items.

For the analysis of the AQ-test the results of those participants whose data entered in the analysis of the experiment were considered.[71] Evaluations of the AQ-test were coded as 1 or 0, were 1 corresponded to autistic traits and 0 to no autistic traits (see Baron-Cohen et al., 2001). To explore whether participants had pragmatic difficulties that influenced their performance in the experiment, a correlation analysis that took into account the total scores a participants got in the AQ-test and the amount of expected answers participants gave to statements in reversed order was conducted.

Studies by Bishop and Norbury (2008; 2002) revealed that some children have pragmatic difficulties but are not autistic. In order to check whether participants' potential pragmatic difficulties influence the experimental results, a Pearson product-moment correlation coefficient was computed to assess the relationship between the scores participants got in the subsection *communication* of the AQ-test (AQ_{Comm}) and the amount of expected answers for statements in reversed order was.

[71] Two participants did not send back the AQ-questionnaire. Therefore their data could not enter in the correlation analysis.

6.3.4 Results

6.3.4.1 Phonological Working memory test

Two five-year-old children had enunciation-problems related to the phones [ʃ] and [s]. Instead of the phone [s] they produced [ʃ]. For this reason both children lost one point in the *PGN*-test and got 11 points instead of 12. Nevertheless, their performance was in the range of average for their age-group.

The main purpose for the conduction of the *PGN*-test was to avoid noise or artifacts in the data which might be caused by limited working memory capacities. Results of the *PGN*-test revealed that all of the 5-year-old participants performed on average or even above average.

Figure 5 shows which raw scores were achieved and by how many participants of each age-group. Attention was paid that none of the 7- or 9-year-old children performed below average of normally developed 5-year-olds. None of the 7- or 9-year-old children had to be excluded from data-analysis based on the performance in the *PGN*-test. Figure 16 (p. 296) depicts the precise t-values achieved as well as the number of 5-year-old participants that showed the respective performance.

With respect to the general performance of each age-group in the *PGN*-test it can be said that the five-year-olds scored lowest (*M* = 13.1, *SD* = 2.2). The nine-year-olds (*M* = 15.5, *SD* = 2.3) performed better than the seven-year-olds (*M* = 13.3, *SD* = 2.9).

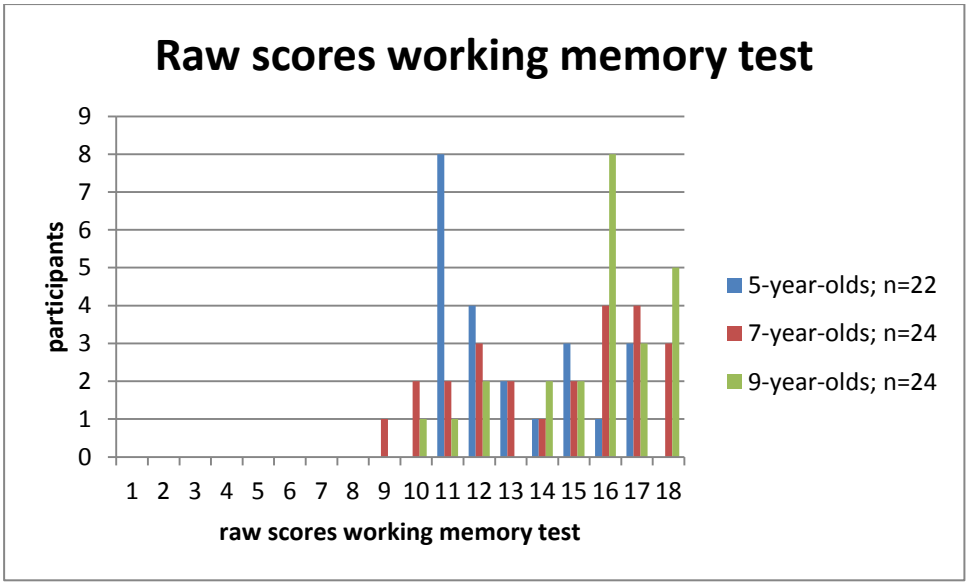

Figure 5: Participants' performance in the *PGN*-test.

The *PGN*-test was also conducted to check whether the results of the experiment on the conjunction *und* are influenced by participants' working-memory capacity. A correlation between raw score in the *PGN*-test and amount of correct answers was expected. A significant correlation for scores in the *PGN*-test and amount of correct filler items was found across all age-

groups (Pearson's r = .28, p < .02). The analysis of the individual age-groups revealed that no significant correlation between score in the *PGN*-test and amount of correct answers in the experiment was found for the 5-year-olds (Pearson's r =.14, p < .52) and 7-year-olds (Pearson's r = .23, p < .27). The data of the 9-year-olds however, revealed a significant correlation between score in the *PGN*-test and amount of correct answers in the experiment (Pearson's r = .51, p < .011). The results for each age-group are depicted in Figure 18 to Figure 20 in the appendix (p.297-298).

In order to see whether the correlation in the data of the 9-year-olds had an impact on the data of the experiment, the scores of the *PGN*-test and amount of correct answers in the experiment were correlated only for those participant's whose data entered the experimental analysis. No significant correlation was found (Pearson's r = .10, p >.65).

Finally a Pearson product-moment correlation coefficient for all participants (and age-groups) whose data entered the analysis of the experiment was computed to assess the relationship between participants' scores in the test on working memory capacity and the amount of correct filler items. The analysis revealed that there was no significant correlation between both variables (Pearson's r = 0.18, p >.178).

6.3.4.2 The Autism-Spectrum Quotient

AQ scores ranged from 12 to 34 (M = 19.61, SD = 5.81). Only one participant (female) scored higher than the cut-off suggested by Baron-Cohen, Wheelwright, Skinner, Martin and Clubley (2001). No significant correlation was found between the total scores participants got in the AQ-test and the amount of expected answers participants gave to statements in reversed order (Pearson's r = -.026, p =.35).

AQ_{Comm} scores ranged from 0 to 8 (M = 2.5, SD = 1.82). The correlation analysis between participants' scores in AQ_{Comm} and the amount of expected answers to statements in reversed order revealed no significant correlation (Pearson's r = -0.11, p < .70).

6.3.4.3 Experiment

Three five-year-old children were excluded from analysis (two girls and one boy) because they gave a wrong answer to two fillers. Another five-year-old boy was excluded because he evaluated all of the statements as *falsch* ('wrong'). Two of the seven-year old children were excluded (two boys) from the evaluation because they gave a wrong answer to more than 80 percent of the filler items. One of them accepted two out of 6 filler items and the other one did so for 5 filler items. For the same reason two adults (one male and one female) as well as three nine-year-olds (three boys) were excluded. All of them got two filler items wrong. For

those participants that were not excluded from the analysis, the amount of correct answers to the fillers as well as the standard deviation is given in Table 5.

Table 5: Results Filler Experiment I
Percentage of correct answers given by each age-group to filler statements with different kinds of event combinations. Standard deviation is given in parentheses.

Condition	**Answers**				
	Expected	given by % of			
		5-year-olds (n=18)	7-year-olds (n=22)	9-year-olds (n=21)	Adults (n=18)
0und1 **'0and1'**	*Falsch* 'wrong'	94.4 (23.6)	90.9 (29.4)	95.2 (21.8)	100 (0)
0und2 **'0and2'**	*Falsch* 'wrong'	100 (0)	95.5 (21.3)	100 (0)	88.9 (32.3)
0und3 **'0and3'**	*Falsch* 'wrong'	88.9 (32.2)	95.5 (21.3)	90.5 (30.1)	94.7 (22.9)
1und0 **'1and0'**	*Falsch* 'wrong'	100 (0)	100 (0)	100 (0)	94.7 (22.3)
2und0 **'2and0'**	*Falsch* 'wrong'	94.4 (23.6)	90.9 (29.4)	95.2 (21.8)	100 (0)
3und0 **'3and0'**	*Falsch* 'wrong'	93.8 (0.25)	100 (0)	100 (0)	100 (0)

Table 6 presents the percentage of expected responses to statements that present the events in correct and reversed order for all age groups. The respective standard deviation (SD) is given in brackets. The data show that children tend to reject reversed order statements more often than adults.

Table 6: Results Conditions Experiment I
Percentage of expected answers to statements with different kinds of event combinations that conjoin two events that happened in a previously heard story. Events were presented in correct or reversed order and conjoined with the conjunction und. Standard deviation is given in parentheses.

Condition	**Answers**				
	Expected[72]	given by % of			
		5-year-olds (n=18)	7-year-olds (n=22)	9-year-olds (n=21)	Adults (n=18)
1und2 **'1and2'**	*Richtig* 'correct'	59.2 (33.4)	72.7 (26.5)	80.9 (30.9)	90.7 (15.4)
2und3 **'2and3'**	*Richtig* 'correct'	87.0 (16.7)	86.4 (19.7)	96.8 (10.0)	98.1 (7.9)
1und3 **'1and3'**	*Richtig* 'correct'	85.2 (23.5)	87.9 (16.4)	90.5 (18.7)	94.4 (12.8)
2und1	*Falsch*	55.6	30.3	31.7	1.8

[72] Conditions *2und1*, *3und2* as well as *3und1* are ambiguous. A *no*-answer shows that the condition was interpreted temporally.

'2and1'	'wrong'	(39.6)	(34.0)	(28.8)	(7.9)
3und2	*Falsch*	25.9	22.7	12.7	0
'3and2'	'wrong'	(35.3)	(29.8)	(24.7)	(0)
3und1	*Falsch*	40.7	24.2	23.9	3.7
'3and1'	'wrong'	(42.1)	(25.6)	(28.2)	(10.8)

The tendency that was suggested by the descriptive statistics was verified using ANOVA. Results reveal a significant main effect of age-group ($F(3,75) = 3.05$, $p < .04$) and of order ($F(1,75) = 333.13$, $p < .03$). The 3-way interaction between AGE, ORDER and EVENT was fully significant ($F(6,150) = 2.65$, $p < .02$).

After resolving the interaction for age, there were a main effect of ORDER ($F(1,17) = 11.67$, $p < .004$) and a reliable 2-way interaction of ORDER x EVENT COMBINATION ($F(2,34) = 14.82$, $p < .001$) for the 5-year-olds. When this interaction was resolved by EVENT, the correct order produced a higher amount of expected answers. The pair-wise comparisons were significant for event combinations *2und3* vs. *3und2* ($F(1,17) = 36.09$, $p < .001$) and *1und3* vs. *3und1* ($F(1,17) = 16$, $p < .001$). The paired comparison for event-combination *1und2* vs. *2und1* was not significant ($F < 1$, n.s.). The influence of order on the results of the 5-year-olds was significant for event-combination 2 (ec_2), which is the combination of event 2 and event 3 mentioned in the story, and event-combination 3, which is the combination of event 1 and event 3 mentioned in the story.

For the 7-year-olds, there was a main effect of ORDER ($F(1,21) = 63.08$, $p < .001$) and a 2-way interaction of ORDER x EVENT ($F(1,42) = 4.34$, $p < .025$). When this interaction was resolved by EVENT the correct order produced a higher amount of expected answers for all of the pair-wise comparisons (*1und2* vs. *2und1*: $F(1,21) = 16.67$, $p < .001$; *2und3* vs. *3und2*: $F(1,21) = 65.22$, $p < .001$; *1und3* vs. *3und1*: $F(1,21) = 77.18$, $p < .001$). The influence of order on the results of the 7-year-olds was significant for all event-combinations.

Results of the 9-year-olds showed a main effect of ORDER ($F(1,20) = 180.0$, $p < .001$) and a 2-way interaction of ORDER x EVENT COMBINATION ($F(2,40) = 4.57$, $p < .002$). This interaction was resolved by EVENT. Statements that presented the event combinations in correct order produced a higher amount of expected answers (*1und2* vs. *2und1*: $F(1,20) = 22.19$, $p < .001$; *2und3* vs. *3und2*: $F(1,20) = 155.19$, $p < .001$; *1und3* vs. *3und1*: $F(1,20) = 84.00$, $p < .0.001$). The influence of order on the results of the 9-year-olds was significant for all event-combinations.

When dissolving the 3-way interaction by age, no reliable interaction of ORDER x EVENT COMBINATION ($F(2,34) = 2.25$, p >.1) was found for the adults. There was only a main

effect of ORDER ($F(1,17) = 15176.86$, $p < .001$). Statements in correct order produced a higher amount of expected answers.

6.3.5 Discussion

Three main hypothesizes were put forward for this experiment in chapter 6.3.1. Concerning the interpretation of the conjunction *und* two hypotheses were put forward. Based on the assumption that reversed order statements should be rejected if they are interpreted temporally, the first hypothesis tested, whether participants interpret the conjunction *und* temporally. An influence of the factor Order was expected if the conjunction is interpreted in the same way as the logical operator.[73] This hypothesis was confirmed. The second question was, whether the factor Age influences the temporal interpretation of the conjunction *und*. The hypothesis tested whether pragmatic interpretations develop with age. There should be differences concerning the evaluation of the follow-up statements between the tested age-groups if the temporal interpretation of the conjunction develops with age. This hypothesis was confirmed as well. In addition to that, it was tested whether working memory capacity influenced the results of the experiment. It was expected that no correlation should be found between participants' results in the *PGN*-test and the amount of correct answers if working memory capacity does not influence participants' performance in the experiment. This expectation was also confirmed by the experimental data.

The analysis of the results revealed a 3-way interaction of Age x Order x Event-Combination. When this interaction was dissolved hierarchically, a main effect of order was found for the adults as well as a 2-way interaction of Order x Event-Combination for the 5-, 7- and 9-year-old participants. The main effect of Order found in the data of the adults arises because adults hardly rejected statements in reversed order. They accepted statement in correct as well as those that presented the events in reversed order at ceiling. No significant correlation between evaluation of statements in reversed order and performance in the AQ-test or subtest on communication was found. Therefore, it can be ruled out that the evaluation of reversed order statements was influenced by poor pragmatic skills of the participants. This further supports the idea that the adult participants interpret the conjunction additively because the meaning of the conjunction *und* is in the contexts presented in the experiment exactly the same as the meaning of the logical operator $\wedge$.

Most of the paired comparisons (except one) that resulted from resolving the 2-way interaction found for the children were significant in all age-groups. They rejected statements in re-

[73] This is because the disaffirmation of statements that present events in reversed order is encoded as expected answer in the data.

versed order less often than they accepted statements in correct order. This suggests that participants did possibly not recognize that some of the statements mentioned the events in reversed order. Another possibility is that they primarily or preferably used the additive reading of the conjunction *und* when evaluating the follow-up statements in this experiment. To find out, whether participants recognized that the events were mentioned in reversed order, attention was paid to how many participants left a remark about the chronological order to statements that presented the events in reversed order. Results revealed that especially in the age-group of adults more participants commented on the reversed order and accepted the statement than participants that rejected statements because events were presented in the wrong order (compare Table 6 to Table 7). This shows that participants recognized that the events were presented in reversed order. The differences in evaluation of the statements as *richtig* ('right') or *Falsch* ('wrong') arise probably because people interpret the conjunction differently. (Participants who interpret the conjunction *und* additively accept statements in reversed order, while those who interpret the conjunction temporally reject statements in reversed order. To prove that participants do indeed remember the order in which the events were presented in the story, another experiment was carried out, which uses the same materials but conjoins the events in the follow up-statements with a temporal connective (see chapter 6.4).

Table 7: Remarks and rejection rates for statements in reversed event order
The table shows the percentage of the participants of each age-group who recognized that the follow-up statements presented the events in the wrong chronological order. Out of all participants, only the percentage of those who either rejected the respective follow-up statement or accepted it and at the same time commented on the fact that the events were presented in wrong chronological order are given below. Standard deviation is given in parentheses.

Condition	**Answers**			
	given by % of			
	5-year-olds (n=18)	7-year-olds (n=22)	9-year-olds (n=21)	Adults (n=18)
2und1 **'2and1'**	55.6 (39.6)	31.8 (33.3)	39.7 (34.3)	14.8 (23.5)
3und2 **'3and2'**	27.8 (34.8)	24.2 (31.2)	27.0 (38.9)	27.8 (36.6)
3und1 **'3and1'**	40.7 (42.1)	27.3 (28.4)	38.1 (38.4)	29.6 (42.6)

The only comparison that resulted from resolving the 2-way interaction of Order x Event-Combination in the data of the children and did not show significant results was condition *1und2* vs. *2und1* in the data of the 5-year-olds. In all other age-groups and paired comparisons (except the one mentioned for the 5-year-olds) statements in correct order were accepted more often than reversed order statements were rejected. This means that almost all of the reversed order statements were in all age-groups predominantly interpreted in the same way as the logical operator $\wedge$. The only exception was the comparison of condition *1und2* vs. *2und1* in the

data of the 5-year-olds. 5-year-olds rejected condition *2und1* almost as often as they accepted condition *1und2*. Additionally, condition *2und1* is, compared to the other conditions that present the events in reversed order, the one that received the highest amount of rejection rates (55.6%) while condition *1und2* received the lowest amount of affirmative answers (59.2%) out of the conditions that present the events in correct order. Additionally, condition *2und1* is, compared to the other conditions that present the events in reversed order, the one that received the highest amount of rejection rates (55.6%) while condition *1und2* received the lowest amount of affirmative answers (59.2%) out of the conditions that present the events in correct order.

As both rates (55.6% and 59.2%) are close to chance level (50%) a χ^2 -test was conducted for each condition per group.[74] With the help of the χ^2-test the probability that two values are the same in the statistical sense can be calculated. It turned out that answering rates between 40.6% and 59.4% ($df=1$, $\chi^2 < 3.84$, $p > .05$) are not significantly different from chance level. Based on this the answers of the 5-year-olds to conditions *1und2* and *2und1* are at chance level. This shows that children have difficulties evaluating these statements.

The following explanation can be offered for the result mentioned above, namely that the paired-comparison of *1und2* vs. *2und1* in the data of the 5-year-olds was not significant. With respect to conditions that present the events of the story in correct order, 5-year-olds have more difficulties to evaluate condition *1und2* compared to conditions *1und3* and *2und3*. A possible explanation could be related to at what point in the story (at the beginning or the end) the events were mentioned. It is possible that children have more difficulties with condition *1und2* because they can recall events that were mentioned at the end of the story better than those mentioned at the beginning. Due to this recency effect 5-year-olds give fewer expected answers to this condition. This might also be the reason why they reject condition *2und1* more often than other conditions in reversed order. Apart from a possible recency effect it is possible that 5-year-olds have access to the logical as well as the temporal interpretation of the conjunction. They may generally have more difficulties when it comes to evaluating statements in reversed order than older participants because they cannot decide whether to interpret the conjunction temporally or logically. This is possibly because they are primed by the stories and remember that the events were explicitly mentioned in a temporal order there but that this is not the case in the follow-up statements. The combination of both of these possibil-

[74] The $\chi 2$ -test cannot be conducted per condition per participant as there are too few values. Due to the small amount of values per participant for statements in both orders the results are subject to very high uncertainties and can be used as a point of reference only. As results revealed the tendency that participants were consistent in their answers, it would be helpful to conduct further studies on this issue with more participants and items per condition to see whether participants can be split up in groups.

ities causes that there are no significant differences in the pairwise-comparison of condition *1und2* and *2und1* in the data of the 5-year-olds.

A similar pattern in the pairwise comparisons can be found in the data of the 7- and 9-year-olds. Just as in the data of the 5-year-olds (where no significant difference was found), the influence of the factor Order was weakest in the pairwise comparisons of condition *1und2* and *2und1*. This might, just as in the data of the 5-year-olds be explained by saying that a possible recency effect as well as temporal interpretations of the conjunction *und* in reversed order conditions lead to the fact that the differences in the pairwise comparison becomes less significant or as in the data of the 5-year-olds not significant at all.

As can be seen in Table 6 (p. 119), the 5-year-olds are the age-group that rejects statements in reversed order most often. The rejection of reversed order statements seems to decrease with age. Adults reject reversed order statements least often. This is still the case if only conditions *3und2* and *3und1* (because condition *2und1* might possibly be influenced by a recency effect) are considered. This pattern of results does not only suggest that there are differences in the interpretation of reversed order statements between the age-groups but also that the youngest participants interpret the conjunction temporally most often and that the temporal interpretation of the conjunction decreases with age. Adults interpret statements in reversed order in the same way as the logical operator most often of all age-groups. Children access both the logical and temporal interpretation. In comparison to the adults, children interpret the conjunction temporally more often.

It can be said that all age-groups accept reversed order statements more often than they rejected them in almost all of the conditions of the presented materials. This suggests that the conjunction *und* is interpreted additively most often. However, there are differences in the extent to which the different age-groups do so. Therefore, the hypothesis that age does not have an impact on the interpretation of the conjunction has to be rejected. The respective alternative hypothesis, which is based on findings of the existing literature, can only be accepted partially. It is right that there are differences between the age-groups when interpreting the conjunction *und*. However, the direction of the differences between the age-groups revealed by the results of the current experiment, are not the same as the literature would suggest. Based on previous research, one would have expected that the temporal interpretation of the conjunction increases with age (cf. Noveck et al., 2009; Noveck & Chevaux, 2002). Younger participants should consequently accept statements that present events in reversed order more often than older participants and adults. However, exactly the opposite seems to be the case.

One could argue that young children reject reversed order statements more often than older children because they have more difficulties to remember the events mentioned in the story. This however is not in line with the correlation analysis of the *PGN*-test and amount of correct answers to filler items. No correlation was found between these variables, not even across the age-groups.

Another possible explanation for differences in the answers between children and adults might be that all age-groups recognize that some statements present events in reversed order. Differences between the age-groups might not result from the linguistic level but rather from the meta-linguistic level. It is not mentioned in the experimental task that the order in which the events occurred is a relevant evaluation criteria for the follow-up statements. Hence, children and adults might have different concepts and criteria about when a statement is wrong. While adults might be more focused on the content of the follow-up statement when evaluating it, children might focus more on temporal order.

Another possibility is that children consider the content and the mentioned order as relevant. The events and the order in which they occurred might be of greater importance to them (compared to adults) because many of the situations described are related to what children experience or do regularly in their daily life. They therefore take the activities and the order in which they occurred more serious. For adults however, these activities are not as relevant as for children because most of the stories are about events or activities that appear trivial to adults. Adults may rather focus on the fact that the activities and events of a single story are part of the same category or a certain script, e.g. activities on the playground. Consequently, it might not be as important for adults to pay attention to the order in which the events occurred because they consider the order of events as more trivial than children do. Another reason why children are more focused on the order of the events and activities could be that they pay more attention to details and differences between story and follow-up statements.

Finally it was also tested whether working memory capacity has an impact on the results of the experiment. A significant correlation between performance in the *PGN*-test and amount of correct filler items was found when taking all participants and age-groups into account, as well as in the data of the 9-year-olds. These results suggest that memory capacity appears to influence performance in the experiment. However, participants with wrong answers to more than 2 filler items were excluded from analysis (see chapter 6.3.4.2). After excluding these participants, no significant correlation between amount of correct filler items and performance in the *PGN*-test was found anymore (neither across all participants and age-groups, nor in the data of the 9-year-olds). There were participants with poor performance in *PGN*-test, who

gave a high amount of correct answers to the filler items in the experiment and vice versa. This suggests that the experimental results are not influenced by phonological memory capacity of the participants.[75]

To summarize the main findings of this experiment, it can be said that there are differences in the interpretation of the conjunction between the age-groups. Adults and older children accept statements that present events in reversed order more often than younger children, which suggests that older participants interpret the conjunction additively more often than younger participants. However, the majority of participants in all age-groups tend to interpret the conjunction additively (as is reflected by the acceptance of statements that present events in reversed event order). This supports the idea that participants tend to interpret the conjunction *und* in same way as the logical operator $\wedge$ in contexts such as the ones presented in this experiment, although the additive interpretation of the conjunction increases with age.

6.4 Experiment II

This experiment serves as control experiment for Experiment I. A question of interest is whether participants remember the events and the order in which they were presented in the story. This can be checked easily, by using (almost) the same materials as in the previous experiment. The only difference is that *und* was replaced by a conjunction that expresses a temporal order. This conjunction has to be easily understood and processed also by the youngest participants. That young children appear to have difficulties with processing the conjunctions *before* and *after*, has been discussed in several studies (Amidon, 1976; Amidon & Carey, 1972; Clark, 1971; Feagans, 1980; French & Brown, 1977; Johnson, 1975). According to Münte et al. (1998) adults have also more difficulties to process sentences beginning with the conjunction *before* compared to sentences that start with the conjunction *after*. It is not commonly agreed upon which temporal conjunction is understood better by children (see also chapter 5.3.1.2). The conjunction *und dann* ('and then') expresses a relation of chronological order or succession between its conjuncts (cf. Jisa, 1984 and literature cited there; Posner, 1979) and is one of those that are acquired first. According to Bloom (1980) and colleagues *and then* is first active between the age of 29 and 35 months. The youngest participants that take part in the present study are five years old. At that age the conjunction is acquired and produced already. Therefore, the conjunction *und dann* should be suitable to replace the conjunction *und* in the follow-up statements in order to examine, whether participants remember

[75] These results also indicate that the criteria for the exclusion of participant's data from analysis is strict enough, to avoid that memory capacity is measured in the experiment. What could unfortunately not be tested was whether participants of the age-groups 7-year-olds and 9-year-olds performed below, above or on average for their age in the *PGN*-test.

the events and the order in which they were narrated in the story. It is also examined, whether the factor Age has an impact on the interpretation of the conjunction *und dann* and whether participants' performance in the experiment is influenced by phonological working memory capacity.

6.4.1 Hypotheses

With respect to the purpose of the experiment, the following is suggested: Assuming that participants can remember the events of the story as well as the order; results should show a generally high amount of correct answers to conditions *1 und dann 2*, *2 und dann 3*, *2 und dann 1*, *3 und dann 2* and *3 und dann 1*. Neither the factor Order nor the factor Event should influence the evaluation of the follow-up statements of these conditions. If temporal meaning of the conjunction *und dann* is strictly adhered, then a lower amount of correct answers is expected for condition *1 und dann 3* (because event 1 was not directly mentioned prior to event 3 since event 2 was intermediate).[76] Therefore, larger differences in the amount of correct answers are expected between (correct and reversed order) follow-up statements of event-combination 3 (event 1 + event 3 = ec_3) compared to event-combinations 1 (event 1 + event 2 = ec_1) and 2 (event 2 + event 3 = ec_2). Such variations would be due to the ambiguity of condition *1 und dann 3*, rather than to difficulties to recall the chronological order of the narrated events.

Since children at the age of 5 have acquired the conjunction *und dann* already (Bloom et al., 1980) they should interpret it in the same way as adults. Based on the assumption that the factor Age does not have an influence on the interpretation of the conjunction, results should reveal no significant differences in the amount of correct answers given by the individual age-groups. No effect of the factor Age is predicted.

As in Experiment I, a standardized working memory test and the AQ-test was conducted in order to control for influences of working memory capacity and participants' individual pragmatic skills on the results of the experiment. Predictions and hypothesis are exactly the same as in Experiment I (for details see chapter 6.3.1, p. 95).

6.4.2 Method

6.4.2.1 Participants

Twenty-two 5-year-old children (11 male and 10 female), twenty-four 7-year-old children (13 male and 11 female), thirty 9-year-old children (15 male and 15 female) as well as twenty

[76] If this effect is very strong, it might evoke an effect of Order for event-combination 3. Such a strong effect is however not expected.

adults (9 male and 11 female) took part in this experiment. None of the participants had been exposed to Experiment I. All participants were monolingual native speakers of German and tested by the same experimenter. Participants mean ages and age-ranges were the following:

5-year-olds: age from 5;0 to 6;3 (mean age: 5;8)
7-year-olds: age from 6;9 to 8;0 (mean age: 7;5)
9-year-olds: age from 8;11 to 10;7 (mean age: 9;8)
adults: age from 20;2 to 28;9 (mean age: 24;9).

The 5-year old children were recruited from four kindergartens. Three of them were in Mainz and one in Wiesbaden. The 7- and 9-year old children were recruited from schools or after-school care clubs in the Unstrut-Hainich region and Mainz.
Before the experiment was conducted, kindergartens, schools as well as the supervisory school authority and parents had given their approval to the conduction of the experiment. Children were given Pixi-booklets or kinder surprise eggs for participating in the experiment. All of the adult participants were students of non-linguistic subjects at the Johannes Gutenberg-University of Mainz and were paid 2€ for participating in the experiment.

6.4.2.2 Materials

With respect to the materials of the experiment, exactly the same stories as in Experiment I were used. The experimental design was also exactly the same as in Experiment I. Participants had to make a binary judgment about the follow-up statements of 24 stories which were presented to them in the form of short auditory video-clips. The follow-up statements were nearly exactly the same as in the previous experiment. The only difference was that the conjuncts in the follow-up statement were conjoined by *und dann* ('and then') instead of *und* ('and').
The design of this experiment is a 2x3 design. This means, that the order of the events (correct or reversed) mentioned in the follow-up statement as well as the events mentioned (event 1&2; event 2&3; event 1&3) are controlled for. An example story of this experiment and all possible follow-up statements for this story as well as two exemplary filler items for this story are given in (90) to (92) for illustration.

(90) *Heute hat es endlich geschneit.*
today have$_{3SG.PRS}$ it finally snow$_{PTCP}$
'Today it has finally snowed.'

Der kleine Tiger ist Schlitten gefahren.

the little tiger be$_{3SG.PST}$ sledge ride$_{PTCP}$
'Little Tiger went sledging.'

Dann hat er einen Schneemann gebaut.
Then have$_{3SG.PRS}$ he a snowman build$_{PTCP}$
'Then he built a snowman.'

Danach hat er mit Schneebällen geworfen.
afterwards have$_{3SG.PRS}$ he with snowball$_{PL}$ throw$_{PTCP}$
'Afterwards he threw snowballs.'

(91) conditions

(1&2) *Der kleine Tiger ist Schlitten gefahren und dann hat er einen*
the little tiger be$_{3SG}$ sledge ride$_{PTCP}$ and then have$_{3SG.PRS}$ he a

Schneemann gebaut.
snowman build$_{PTCP}$
'Little Tiger went sledging and then built a snowman.'

(2&1) *Der kleine Tiger hat einen Schneemann gebaut und dann ist er*
the little tiger have$_{3SG.PRS}$ a snowman build$_{PTCp}$ and then be$_{3SG}$ he

Schlitten gefahren.
sledge ride$_{PTCP}$
'Little Tiger built a snowman and then went sledging.'

(2&3) *Der kleine Tiger hat einen Schneemann gebaut und dann hat*
the little tiger have$_{3SG.PRS}$ a snowman build$_{PTCP}$ and then have$_{3SG}$

er mit Schneebällen geworfen.
he with snowball$_{PL}$ throw$_{PTCP}$
'Little Tiger built a snowman and then threw with snowballs.'

(3&2) *Der kleine Tiger hat mit Schneebällen geworfen und dann hat*

the little tiger have$_{3SG.PRS}$ with snowball$_{PL}$ throw$_{PTCP}$ and then have$_{3SG.PRS}$

er einen Schneemann gebaut.
he a snowman build$_{PTCP}$
'Little Tiger threw with snowballs and then built a snowman.'

(1&3) *Der kleine Tiger ist Schlitten gefahren und dann hat er mit*
the little tiger be$_{3SG.PRS}$ sledge ride$_{PTCP}$ and then have$_{3SG.PRS}$ he with

Schneebällen geworfen.
snowball$_{PL}$ throw$_{PRS.PRF}$
'Little Tiger went sledging and then threw with snowballs.'

(3&1) *Der kleine Tiger hat mit Schneebällen geworfen und dann ist*
the little tiger have$_{3SG.PRS}$ with snowball$_{PL}$ throw$_{PTCP}$ and then be$_{3SG.PRS}$

er Schlitten gefahren.
he sledge ride$_{PTCP}$
'Little Tiger threw with snowballs and then went sledging.'

(92) filler

(0&1) *Der kleine Tiger hat ein Iglu gebaut und dann ist er Schlitten*
the little tiger have$_{3SG.PRS}$ *a igloo* build$_{PTCP}$ and then be$_{3SG}$ he sledge

gefahren.
ride$_{PTCP}$
'Little Tiger built an igloo and then went sledging.'

(1&0) *Der kleine Tiger ist Schlitten gefahren und dann hat er ein*
the little tiger be$_{3SG.PRS}$ sledge ride$_{PTCP}$ and then have$_{3SG.PRS}$ he a

Iglu gebaut.
igloo build$_{PTCP}$
'Little Tiger went sledging and then built an igloo.'

For each of the 26 presented stories participants heard only one of six possible trials or one of six filler-conditions. Participants evaluated the follow-up statements of two stories as training items. The actual experiment consisted of 24 stories (six stories that were combined with a filler item as well as nine follow-up statements in reversed and nine in correct order).

The Latin square method was used to create six lists and to match a condition or filler as a follow-up statement with each story. Each of these six lists was randomized with the randomization program *Conan* to create three versions of each list so that in total 18 different versions of the materials were created.

Additionally the PGN-test (see chapter 6.3.3.1.1) was conducted with the children. Adults filled in the AQ-questionnaire (see chapter 6.3.3.1.2).

6.4.2.3 Procedure

The procedure was exactly the same as in Experiment I. All of the participants were tested in an individual meeting. The experiment with the adults was conducted in a quiet room of the language laboratory at the University of Mainz and the study with the children in a separate quiet room of the school, after-school care club or kindergarten.

During the experiment participants were seated in front of a computer or laptop which was connected to loudspeakers so that they could see the video-clip well and listen to the presented auditory material. Participants were instructed to evaluate the statement about the content of a previous heard story as either *richtig* or *falsch*. After participants had mastered two exercises, the actual experiment, consisting of 24 stories was conducted. Answers and remarks given by participants were recorded in writing.[77] Neutral feedback such as *mhm* or *gut* ('good') was given after each trial. Participants' answers and remarks were put down in a protocol.

After the experiment adults were asked to fill in the AQ-questionnaire. The *PGN*-test with nonce-words was conducted with the children after the experiment. It was noted down in a protocol whether the child had successfully repeated the nonce-word or not.[78]

After the experiment and the *PGN*-test were completed I brought the children back to their play-group. Most children gave positive feedback about the experiment.[79]

[77] Some of the children even remarked that the cat had said the things in the wrong order or had forgotten an event. Others told me their personal experience related to the events narrated in the story or simply said that they liked the story or that the story was funny.

[78] Some of the five- and seven-year old children remarked that these words were no real words but rather a secret language. This task was also enjoyed by the children because they thought these words were funny or just because they were allowed to say something which does not exist.

6.4.2.4 Data Analysis

The experimental data was coded and analysed in exactly the same way as in experiment I (for details see chapter 6.3.3.4). As in experiment I data of participants that evaluated all of the statements negatively, even those conditions that presented items in the correct order, were excluded.

Children's performance in the *PGN*-test was also evaluated and analysed in exactly the same way as in experiment I (for details see chapter 6.3.4.1). The only difference with respect to experiment I was that the answers to all of the conditions in the experiment were unambiguous (except for condition *1 und dann 3*). Therefore, in experiment II participants' raw scores of the *PGN*-test were correlated with their number of correct answers given to all conditions except condition *1 und dann 3*.

For the analysis of the AQ-test only the results of those participants whose data entered in the analysis of the experiment were considered.[80] Evaluations of the AQ-test were conducted in exactly the same way as in experiments I (for details see 6.3.3.4). A Pearson product-moment correlation coefficient was computed to analyze the relationship between the total score participants got in the AQ-test and the amount of expected answers participants gave to condition *1 und dann 3*. Participants' performance in the subsection *communication* of the AQ-test was also accessed. A correlation analysis between participants' scores in AQ_{Comm} and the amount of expected answers for condition condition *1 und dann 3* was conducted.

6.4.3 Results

6.4.3.1 Phonological Working Memory Test

The *PGN*-test was conducted to spot participants with phonological working memory capacity differences. In this way noise or artifacts in the experimental data which might be caused by limited phonological working memory capacities are avoided. Results of the *PGN*-test revealed that all of the 5-year-old participants performed on average or even above average.[81] The precise t-values and the number of 5-year-old participants that showed the respective per-

[79] Quite a few children asked me whether they could take part in the experiment once more. Some of the children who had not taken part in the experiment yet asked me whether they could be the next participant because they were curious and wanted to hear the stories and see the puppets as well. Two boys did not have a letter of agreement from their parents and could for this reason not take part in this experiment. These boys started to discuss and make plans how to convince their parents to sign the letter. The next day both boys happily brought the signed letter of agreement and took part in the experiment.

[80] One participant did not send back the AQ-questionnaire. Therefore, this data could not enter in the correlation analysis.

[81] None of the participating children had enunciation-problems and lost points in the test due to producing the phone [g] instead of [d] or [k] instead of [t] nor due to enunciation-problems related to the phone [ʃ].

formance are depicted in Figure 21 (p. 299). None of the 5-year-old participants had to be excluded from the analysis of the experimental data.

Figure 6 shows which raw scores were achieved in the *PGN*-test and by how many participants of each age-group. Based on the critical value of 8 points in the test on working memory capacity one 7-year-old girl was excluded from analysis of the experimental data because her performance in the *PGN*-test was lower than average of the 5-year-olds. None of the 9-year-old children had to be excluded from data-analysis based on the performance in the *PGN*-test.

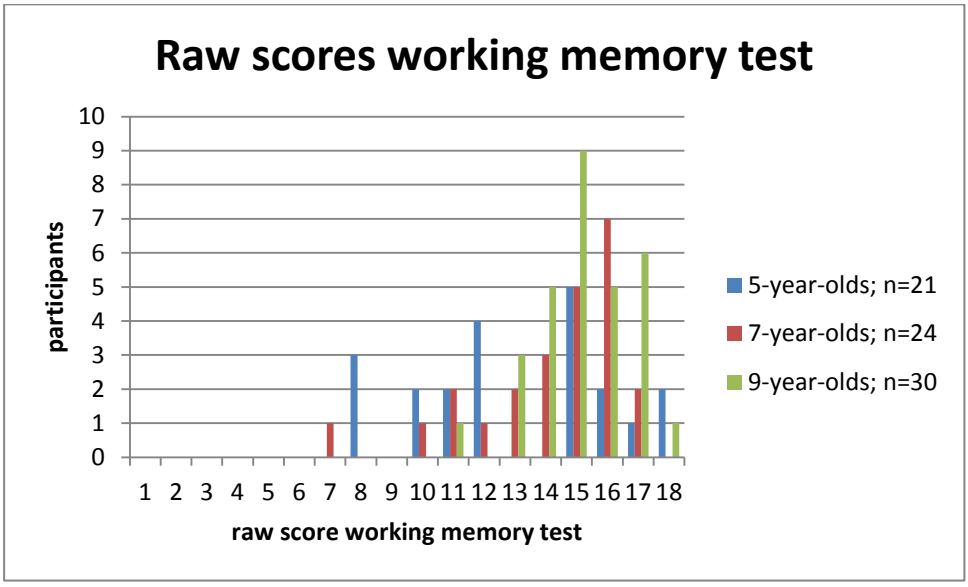

Figure 6: Participants' performance in the *PGN*-test.

With respect to the general performance of each age-group in the *PGN*-test it can be said that the five-year-olds scored lowest (M = 13.0, SD = 3.3). The nine-year-olds (M = 15.2, SD = 1.6) performed better than the seven-year-olds (M = 14.2, SD = 2.5).

It was analyzed whether the results of the experiment are influenced by participants' working-memory capacity. A correlation between raw score in the *PGN*-test and amount of correct answers was expected. For none of the age-groups a significant correlation between score in the *PGN*-test and amount of correct answers in the experiment was found (5-year-olds: Pearson's r = -.047, p >.84; 7-year-olds: Pearson's r = .36, p >.08; 9-year-olds: Pearson's r = -.15, p >.43). The scatter plots for each age-group are depicted in Figure 22 to Figure 24 (p. 299-300).

Additionally, a correlation analysis that took into account the performance in the *PGN*-test and the amount of correct answers for all age-groups was performed. No significant correlation was found (Pearson's r =.10, p >.38).

6.4.3.2 The Autism-Spectrum Quotient

AQ scores ranged from 9 to 36 (M = 19.1, SD = 6.76). Only one participant (female) scored higher than the cut-off suggested by the authors of the test (Baron-Cohen et al., 2001).

No significant correlation was found between the total score participants got in the AQ-test and the amount of expected answers participants gave to condition *1 und dann 3* (Pearson's r = .42, p < .07). Participant's performance in the subsection *communication* of the AQ-test was also accessed. AQ_{Comm} scores ranged from 0 to 6 (M = 2.6, SD = 2.0). The correlation analysis between participants' scores in AQ_{Comm} and the amount of expected answers to condition *1 und dann 3* revealed no significant correlation between both variables (Pearson's r = 0.55, p < .82).

6.4.3.3 Experiment

A five-year-old girl was excluded from analysis because she evaluated all statements even those in correct order as *falsch*. This was because she considered statements in correct event order as wrong because they were incomplete, although it was repeatedly explained that the puppet character would only repeat a part of the story. A five-year-old boy was excluded because he did not give an answer to all items and said *Der Rabe redet so schnell* ('The raven talks too fast'). Two of the seven-year old children (a boy and a girl) as well as two nine-year-olds (a boy and a girl) were excluded from the evaluation because they gave wrong answers to more than one of the six filler items. The seven-year-old girl was also excluded from analysis due to her bad performance in the *PGN*-test. For those participants that were not excluded from analysis, the amount of correct answers to fillers as well as the respective standard deviation are given in Table 8.

Table 8: Results Filler Experiment II
Percentage of correct answers given by each age-group to filler statements with different kinds of event combinations. Standard deviation is given in parentheses.

Condition	**Answers**				
	Expected	given by % of			
		5-year-olds (n=19)	7-year-olds (n=22)	9-year-olds (n=28)	Adults (n=20)
0 und dann 1 **‚0 and then 1'**	*Falsch* 'wrong'	100 (0)	100 (0)	100 (0)	100 (0)
0 und dann 2 **‚0 and then 2'**	*Falsch* 'wrong'	89.5 (31.5)	95.5 (21.3)	96.4 (18.9)	100 (0)
0 und dann 3 **‚0 and then 3'**	*Falsch* 'wrong'	84.2 (37.5)	95.5 (21.3)	85.7 (35.6)	100 (0)
1 und dann 0 **‚1 and then 0'**	*Falsch* 'wrong'	94.7 (22.9)	100 (0)	96.4 (18.9)	100 (0)
2 und dann 0 **‚2 and then 0'**	*Falsch* 'wrong'	100 (0)	95.5 (21.3)	96.4 (18.9)	100 (0)
3 und dann 0 **‚3 and then 0'**	*Falsch* 'wrong'	94.4 (23.6)	96.4 (18.9)	100 (0)	100 (0)

Table 9 shows the percentage of expected responses to statements that present the events in the correct order as well as percentage of expected answers for the critical statements which present the events of the story in reversed order for all age-groups. As some of the answering rates are close to chance level a χ^2 -test was conducted for each condition per group. Results revealed that answering rates between 40.6% and 59.4% (df=1, χ^2 <3.84, p > .05) are not significantly different from chance level. Based on this the answers of the 7- and 9-year-old children to condition *1 und dann 3* and the answers of the 5-year-olds to condition *3 und dann 1*

are at chance level. This suggests that children have more difficulties evaluating these conditions compared to other conditions of the experiment.

Table 9: Results Conditions Experiment II
Percentage of expected answers to statements with different kinds of event combinations. Two events two events that happened in a previously heard story were conjoined with the conjunction und dann either in correct or reversed order. Standard deviation is given in parentheses.

Condition	**Answers**				
	Expected	given by % of			
		5-year-olds (n=19)	7-year-olds (n=22)	9-year-olds (n=28)	Adults (n=20)
1 und dann 2	*Richtig*	66.7	65.2	69.4	90.0
‚1 and then 2'	'correct'	(33.3)	(28.1)	(33.9)	(15.7)
2 und dann 3	*Richtig*	61.4	71.2	77.4	100
‚2 and then 3'	'correct'	(33.8)	(33.0)	(27.3)	(0.00)
1 und dann 3	*Richtig*	59.6	59.1	57.1	86.7
‚1 and then 3'	'correct'	(32.5)	(30.7)	(36.1)	(25.1)
2 und dann 1	*Falsch*	70.2	89.4	75.0	90.0
‚2 and then 1'	'wrong'	(38.3)	(21.5)	(28.1)	(24.4)
3 und dann 2	*Falsch*	61.4	86.4	71.4	96.6
‚3 and then 2'	'wrong'	(33.8)	(24.5)	(36.0)	(14.9)
3 und dann 1	*Falsch*	57.9	89.4	76.2	93.3
‚3 and then 1'	'wrong'	(38.2)	(21.5)	(32.5)	(23.2)

Statistical analyses reveal that there was no 3-way interaction between AGE, ORDER and EVENT ($F(6,170) < 1$, n.s.). Instead a reliable 2-way interaction of ORDER x EVENT-COMBINATION ($F(2,170) = 3.68$, $p < .029$) was found. Moreover, results show a significant main effect of EVENT ($F(2,170) = 3.49$, $p < .033$), a significant main effect of ORDER $F(1,170) = 4.64$, $p < .035$ and of AGE ($F(3,85) = 16.49$, $p < .001$). The effect of age is a general effect that is independent of the factors order and event and hence related to other age-dependent factors that influence children's performance in the experiment. Adults yielded the highest amount of expected answers in all conditions and 5-year-olds the lowest amount.

When the 2-way interaction was resolved by EVENT (to check for the influence of ORDER), the paired comparisons of condition *1 und dann 3* vs. *3 und dann 1* revealed a significant difference between both conditions ($F(1,88) = 7.76$, $p < .007$). In general, the combination of event 1 and 3 yielded more expected answers in reversed order than in correct order. The comparison of conditions *1 und dann 2* vs. *2 und dann 1* ($F(1,88) = 4.05$, $p < .05$) was not significant. No main effect was found for the paired comparison of *2 und dann 3* vs. *3 und dann 2* ($F(1,88) < 1$, n.s.). Except for event-combination 2 (ec_2), which is the combination of events 2 and 3 mentioned in the story, conditions in reversed order yielded generally a higher amount of expected answers than conditions that presented the events in correct order. The

influence of order on event-combination 3 (ec_3) was significant, while it was not significant for event-combination 1 (ec_1) and event-combination 2 (ec_2).

6.4.4 Discussion

Experiment II served as control experiment for Experiment I. It was designed to check whether participants can remember the events of the story as well as the order in which they were mentioned. If participants cannot do so, they are more likely to give wrong answers. The main question of interest was, whether participants can remember the events and the order in which they were narrated in the story.

With respect to working memory capacity, it was suggested that no correlation should be found between participants' results in the *PGN*-test and the amount of correct answers if phonological working memory capacity does not influence participants' performance in the experiment. This hypothesis can be confirmed because results revealed no correlation between participants' performance in the *PGN*-test and their performance in the experiment. As the results, depicted in Figure 22 to Figure 24 (p. 299-300), show even participants with a low memory capacity gave a high amount of correct answers in the experiment. At the same time there were participants, who got high scores in the *PGN*-test and low performance in the experiment. This suggests that participants' performance in the experiment was not influenced by their phonological working memory capacity. No significant correlation between condition *1 und dann 3* and performance in the AQ-test or the subtest on communication was found. Therefore, it can be ruled out that the evaluation of reversed order statements was influenced by poor pragmatic skills or pragmatic difficulties.

With respect to the main question of interest and the influence of the factors Order and Event on the evaluation of the follow-up statements, no influence of the factor Order or the factor Event on the evaluation of the follow-up statements was expected. This hypothesis could not be confirmed as results revealed an interaction of Order and Event. This result indicates that the two factors Order and Event interact during the interpretation of the conjunction.

When this interaction was resolved, a significant difference was found for the comparison of conditions *1 und dann 3* vs. *3 und dann 1*. The significant difference between the conditions arises because condition *1 und dann 3* yielded a lower amount of expected answers than condition *3 und dann 1*. This effect is independent of the factor Age but mostly generated by children. Condition *1 und dann 3* received higher rejection rates compared to conditions *1 und dann 2* and *2 und dann 3* in all age-groups. These findings are in line with the hypothesis that participants reject condition *1 und dann 3* more often than other conditions that present events in correct order because both events do not directly follow each other. Additionally, condition

1 und dann 3 received on average the lowest amount of expected answers out of all conditions (see Table 10). This further supports the assumption that participants are sensitive to the violation of chronological order in condition *1 und dann 3* and recognize that this condition is ambiguous because event 2 was intermediate to event 1 and 3.

Table 10: Expected answers across participants
Percentage of expected answers given across all age-groups (n=89). Standard deviation is given in parentheses.

Condition	Answers	
	Expected	given in %
1 und dann 2 **‚1 und dann 2‘**	*Richtig* ‘correct’	72.3 (30.2)
2 und dann 3 **‚2 und dann 3‘**	*Richtig* ‘correct’	77.5 (30.0)
1 und dann 3 **‚1 und dann 3‘**	*Richtig* ‘correct’	64.8 (33.5)
2 und dann 1 **‚2 und dann 1‘**	*Falsch* ‘wrong’	80.9 (29.3)
3 und dann 2 **‚3 und dann 2‘**	*Falsch* ‘wrong’	78.7 (31.5)
3 und dann 1 **‚3 und dann 1‘**	*Falsch* ‘wrong’	79.4 (32.0)

Further evidence which supports the hypothesis that participants are sensitive to the violation of order comes from additional comments some participants gave when evaluating the statements (see Table 11). These comments pointed out that the intermediate event is missing or the order is not correct, which indirectly also refers to the fact that event 2 is missing. These findings indicate that the significant difference in the pairwise comparison of condition *1 und dann 3* and *3 und dann 1* simply arises because the condition in correct order receives a lower amount of expected answers. This is due to the fact that event 3 does not directly follow event 1.

The pair-wise comparisons did neither reveal significant results for the comparisons of conditions *1 und dann 2* vs. 2 *und dann 1* nor for conditions *2 und dann 3* vs. *3 und dann 2*. This shows that there are no significant differences in the number of expected answers between correct and reversed event order for the respective conditions. The amount of expected answers and no significant effect of Order reveal that participants interpret the conjunction *und dann* as expected. Furthermore, the results indicate that participants do not only remember the events and the event order presented in the story but also recognize that some follow-up statements present events in reversed order.

Table 11: Remarks given to condition *1 und dann 3*
Some of the remarks given by the participants (as well as their age) when evaluating condition *1 und dann 3*.

Age	Answer	Remark
4;11	*Richtig* 'correct'	*Mit Sandförmchen gespielt war richtig, aber andersrum. Er hat noch 'ne Burg gebaut.* (‚Playing with sandmoulds is correct. But the other way round. He has also built a castel.')
5;9	*Falsch*	*Fehlt was.* [Das Kind gibt die Geschichte wortgetreu wieder.] (‚Something is missing.') [Child repeats the story word by word.]
6;1	*Falsch* 'wrong'	*Das ist immer abwechselnd.* (‚That is always alternating.')
6;3	*Falsch* 'wrong'	*Falsch. Er ist zwischendurch über die Brücke gefahren.* (‚Wrong. He crossed a bridge in between.')
9;2	*Falsch* 'wrong'	*Reihenfolge stimmt nicht.* (‚Order is not correct.')
9;1	*Falsch* 'wrong'	*Da fehlt was zwischendrin.* ('There is something missing in between.')
9;7	*Richtig* 'correct'	*Aber in der Mitte hat etwas gefehlt.* (‚But something was missing in the middle.')
21;1	*Richtig* 'correct'	*Richtig, auch wenn sie zwischendrin was anderes gemacht hat.* (‚Correct,. Even if she has done something else in between.')
23;6	*Richtig* 'correct'	*In der Mitte das fehlt.* (‚The one in the middele is missing.')
23;6	*Richtig* 'correct'	*Da fehlt was.* (‚There is something missing.')
23;6	*Richtig* 'correct'	*Hecke fehlt* (‚Hedge is missing.')
24;7	*Richtig* 'correct'	*Schneemann bauen fehlt.* (‚Building a snowman is missing.')
24;7	*Richtig* 'correct'	*Zwischendurch hinter der Hecke versteckt.* (‚In between hiding behind the hedge.')
25;6	*Richtig* 'correct'	*Ja, nach dem Ball.* (‚Yes, after the ball.')
25;6	*Richtig* 'correct'	*Ja, nachdem er die Brücke überquert hat.* (‚Yes, after he had crossed the bridge.')
25;6	*Richtig* 'correct'	*Nachdem er die Äpfel gewaschen hat.* (‚After he had washed the apples.')
27;6	*Richtig* 'correct'	*Auch wenn es nicht genau in der Reihenfolge war.* (‚Even if it was not exactly in this order.')

Another question of interest was, whether the factor Age influences the evaluation of the follow-up statements. No differences between the results of the individual age-groups were expected. Statistical results however revealed a main effect of the factor Age. This suggests that there are differences concerning the evaluation of the follow-up statements between the age-

groups. Although the majority of all age-groups clearly interpreted *und dann* temporally there are differences between the age-groups. On average adults yielded the highest amount of expected answers in all conditions (M = 92.8, SD = 25.9) and 5-year-olds the lowest amount (M = 62.9, SD = 48.4). The 9-year-olds (M = 71.0, SD = 45.4) gave fewer expected answers than the 7-year-olds (M = 76.8, SD = 42.3). Table 12 shows the average amount of expected answers that were in average given to conditions in correct and reversed order by the individual age-groups.

Table 12: Expected answers per age-group
Mean of expected answers for all age-groups to statements in correct and reversed order. Standard deviation is given in parentheses.

Condition	**Answers**				
	Expected	given by % of			
		5-year-olds (n=19)	7-year-olds (n=20)	9-year-olds (n=24)	Adults (n=18)
correct order	*Richtig* 'correct'	62.6 (23.8)	65.2 (23.8)	67.9 (19.9)	92.2 (9.6)
reversed order	*Falsch* 'wrong'	63.2 (30.3)	88.4 (17.6)	74.2 (28.1)	93.3 (20.2)

A possibility to explain the lower scores of the children might be the hypothesis that these age-groups score lower in the experiment because they have difficulties to remember the events presented in the story and their order. If this was the case, then a correlation between scores in the *PGN*-test and performance in the experiment would have been expected. Results of the *PGN*-test showed that participants' performance in the *PGN*-test and performance in the experiment did not correlate (see above and chapter 6.4.3.1). Consequently, the differences in performance between the 5-, 7- and 9-year-olds in the experiment cannot be related to their phonological working memory capacity. However, the *PGN*-test was not conducted with the adults, therefore it cannot be ruled out that the differences between the results of children and adults are related to phonological working memory capacity. It is possible that adults can simply keep the events better in mind and therefore perform better than children.

Since statements in this experiment were connected with a temporal connector, a recent study by Pyykkönen and Järvikivi (2012) might be of relevance. The authors examined children's comprehension of temporal terms and found that not only the encoded event order but also the point in the sentence when a temporal expression is mentioned is relevant for children's performance in evaluating the statements. Results revealed that even children at the age of 12 do not perform adult-like yet and still have difficulties to interpret the chronological order of events when the temporal term, which specifies the temporal relation between events, is men-

tioned in the middle of the sentence. Additionally, the authors state that when ordering of events is required, especially younger children have more difficulties with comprehension. The authors support their argument by pointing out that children perform better in interpreting simultaneous events and by referring to a study by Feagans (1980). Feagans investigated children's comprehension of *since, until, before* and *after* and found that 7-year-old children still have difficulties comprehending order relations. The materials examined in both studies did however only connect the events with the conjunction *before* and *after* or encoded the temporal relation with tense. That children have difficulties interpreting sentences with *before* and *after*, has already been discussed (see chapter 5.3.1.2). The findings of these studies might help to explain why an age-effect was found in the current study although the conjunction *und dann* is acquired early.

Alternatively it could be hypothesized that these differences between the age-groups in the data are related to how different age-groups make and express their judgments on the truth of statements. It is known that adults often have a positive bias when evaluating statements (McDaniel et al., 1996). For this reasons participants were explicitly told that they have to evaluate wrong statements as *falsch*. Despite all it is possible that children might also have a positive bias when evaluating statements. This could possibly explain why 5-year olds accept statements with reversed event order if events are linked with *und dann*. Moreover, different age-groups could for example have different strategies and criteria when evaluating statements as *right* or *wrong*.

As mentioned above, the results of χ^2 –test revealed that the 7- and 9-year-old children answers to statement *1 und dann 3* were at chance level. This shows that these age-groups have difficulties with this condition. Possible explanations are offered in the following. When evaluating suboptimal statements, such as condition *1 und dann 3*, participants have to decide on whether to reject these statements because of wrong event order or whether to accept these statements because the events mentioned are correct although the order is incorrect. This decision is nonlinguistic and made at the meta-linguistic level. The individual differences between participants or groups of participants may be influenced by participants' personal attitudes towards truthfulness (Bonnefon, Feeney, & Villejoubert, 2009; Katsos & Bishop, 2011) and individual evaluation standards. If the remarks that some participants gave to condition *1 und dann 3* are considered (see Table 11), one can see that participants differ in their decision on whether the statement is right or wrong, although all comments refer to the fact that the event order is incorrect. All age-groups remarked that event 2 is missing but adults tended to evaluate the statement as *richtig* and left a remark while children tended to evaluate the statement

as *falsch* and left a comment. This supports the supposition that participants have different criteria when evaluating whether a statement is right or wrong.

Table 13: Remarks 9-year-olds
Remarks given by the 9-year-olds who evaluated conditions that presented the events mentioned in the story in reversed order as richtig.

Condition	Answer	Age	Remark
2 und dann 1 **‚2 and then 1‘**	*Richtig* ‘correct’	9;1	*Reihenfolge* (‘Order.’)
2 und dann 1 **‚2 and then 1‘**	*Richtig* ‘correct’	9;1	*Wahr, aber verkehrtrum.* (‘True, but wrong order.’)
2 und dann 1 **‚2 and then 1‘**	*Richtig* ‘correct’	9;10	*Beides wahr.* (‘Both true.’)
3 und dann 1 **‚3 and then 1‘**	*Richtig* ‘correct’	9;1	*Es ist wahr, aber verkehrtrum.* (‘It is true, but the other way round.’)
3 und dann 1 **‚3 and then 1‘**	*Richtig* ‘correct’	9;1	*Reihenfolge* (‘Order’)
3 und dann 1 **‚3 and then 1‘**	*Richtig* ‘correct’	9;2	*Ist vorgekommen, aber die Reihenfolge ist falsch.* (‘It was mentioned, but the order is wrong.’)
3 und dann 2 **‚3 and then 1‘**	*Richtig* ‘correct’	9;5	*Nur andersherum.* (‘Only the other way round.’)
3 und dann 2 **‚3 and then 1‘**	*Richtig* ‘correct’	9;6	*Reihenfolge vergessen.* (‘The order was forgotten.’)
3 und dann 2 **‚3 and then 1‘**	*Richtig* ‘correct’	9;10	*Aber falschrum.* (‘But the other way round.’)
3 und dann 2 **‚3 and then 1‘**	*Richtig* ‘correct’	9;10	*Beides wahr.* (‘Both true.’)

With regard to conditions with reversed order, only few comments were given. All of the 5- and 7-year-old participants who left a comment on the wrong event order also evaluated the condition as wrong. The data of the 9-year-olds show disparities. Statements that presented events in reversed order were commented upon 36 times. Although nearly all of the comments referred to the wrong order of the events, the statements were rejected only in 26 cases.[82] It was mentioned eight times that the event order was wrong but the statement was still evaluated as *richtig*. In two cases the comment was simply *Beides wahr* (‘Both right’). This does not explicitly refer to the wrong event order but implies it. For illustration the comments given to conditions that were despite of the wrong event order evaluated as *richtig* (‘right’), are given in Table 13.

The disparities in the evaluation indicate potential differences in evaluation standards or in the interpretation of the statement. A possible reason might be that the violation is not considered

[82] Two of the comments were *Beides wahr* (‘Both true’).

as severe enough to reject the statement (possibly because participants focus on content). Unfortunately, not all of the children who rejected condition *1 und dann 3* or conditions that present events in reversed order also commented on their answer. The only age-group that showed a similar answering pattern as the 9-year-olds, were the adults. However, it cannot be ruled out that there are also children in other age-groups who accept wrong event order or reject condition *1 und dann 3* for the same reason as the 9-year-olds.

Since some people commented on the wrong event order but evaluated the condition as right, the answers to the individual conditions were reanalyzed. This time it was considered that people who commented on wrong event order imply that the statement is not completely correct. These people might focus stronger on content rather than on the linguistic level and the meaning of the conjunction *und dann*. Therefore comments on wrong event order were considered as negative answers. Results of this second analysis are depicted in Table 14.

Table 14: Expected answers Experiment II
Percentage of expected answers to statements with different kinds of event combinations that conjoin two events that happened in a previously heard story in correct or reversed order with the conjunction und dann. Standard deviation is given in parentheses.

Condition	**Answers**				
	Expected	given by % of			
		5-year-olds (n=19)	7-year-olds (n=22)	9-year-olds (n=28)	Adults (n=20)
1 und dann 2 **‚1 and then 2‘**	*Richtig* ‘correct’	66.7 (33.3)	65.2 (28.1)	69.4 (33.9)	90.0 (15.7)
2 und dann 3 **‚2 and then 3‘**	*Richtig* ‘correct’	59.6 (36.1)	71.2 (33.0)	77.4 (27.3)	100 (0.00)
1 und dann 3 **‚1 and then 3‘**	*Richtig* ‘correct’	64.9 (32.3)	59.1 (30.7)	61.9 (36.0)	90.0 (21.9)
2 und dann 1 **‚2 and then 1‘**	*Falsch* ‘wrong’	70.2 (38.3)	89.4 (21.5)	77.4 (27.3)	95.0 (12.2)
3 und dann 2 **‚3 and then 2‘**	*Falsch* ‘wrong’	61.4 (33.8)	86.4 (24.5)	73.8 (35.6)	100 (0)
3 und dann 1 **‚3 and then 1‘**	*Falsch* ‘wrong’	57.9 (38.2)	90.9 (18.3)	79.8 (31.9)	98.3 (7.5)

Results show that adults are at ceiling in most of the conditions. There are only minor differences in the performance of the different age-groups of children. The 9-year-olds performed best in conditions that present events in correct order followed by the 7-year-olds. In conditions that present events in reversed order the 7-year-olds perform best.

An ANOVA with the factors EVENT COMBINATION (event 1 + 2 vs. event 2 + 3 vs. event 1 + 3), ORDER (correct order vs. reversed order) and AGE (5-, 7-, 9-year-old children and adults) as well as the random factor subject (F) was conducted for data analysis.

Results revealed a main effect of the factor Age *(F*(3,85) = 21.2, $p < .001$), a main effect of the factor Order (*F*(1, 85) = 6.20, $p < .015$) as well as a marginally significant interaction of the factors Order x Event (*F*(2,170) = 2.66, $p < .077$). Statements with correct event order received a lower amount of correct answers than conditions that presented events in reversed order. With respect to age, children gave fewer expected answers to all of the conditions compared to adults. When the 2-way interaction was resolved by EVENT, the paired comparisons of condition *1 und dann 3* vs. *3 und dann 1* revealed a significant difference between both conditions (*F*(1,88) = 7.7, $p < .007$). The paired comparisons of condition *1 und dann 2* vs. *2 und dann 1* also showed a significant difference between the conditions (*F*(1,88) = 6.29, .014). Conditions *1 und dann 2* and *1 und dann 3* yielded fewer expected answers than the respective condition that presented the events in reversed order. This suggests that children have more difficulties to evaluate conditions that present events in correct order.

One could argue that condition in correct order receive less expected answers because participants cannot remember the first event of the story or because they remember the events but doubt whether the event order of the follow up statement is correct. If this was the case, the condition that presents the same events in reversed order should also receive fewer expected answers. This is however not the case. Moreover, no correlation between performance in *PGN*-test and amount of expected answers in the experiment was found.

As described above the studies by Feagans (1980) and Pyykkönen and Järvikivi (2012) might help to explain why an age-effect was found in the current study although the conjunction *und dann* is acquired early. What is of interest with respect to the effect of order and the significant difference in the pairwise comparison of conditions *1 und dann 2* and *2 und dann 1*, found in the data is, whether children generally have difficulties interpreting conjunctions sentence medially. The data of the Pyykkönen and Järvikivi's study (2012) revealed that children's interpretation difficulties are more severe with statements that require reverse temporal interpretation. If the sentence medial position of *und dann* in the conditions had an impact on the evaluation of the statement in my experiment, then fewer correct answers would be expected for conditions that present events in reversed order compared to conditions that present the events in the correct order. This is however not the case. Instead children appear to have more difficulties with statements in correct order. Therefore it seems unlikely that children's difficulties to comprehend order contribute to the main effect of age in the data of the current

experiment. The sentence medial position of the conjunction *und dann* has very likely no or only a minor influence on the data. Alternative explanations for the significant difference in the pairwise comparison of conditions *1 und dann 2* and *2 und dann 1* have to be considered.

Another possible explanation would be the fact that the individual age-groups have differing ideas about what a good story is and consequently might have distinct evaluation criteria and standards. Investigations by Stein and Albro (1997) into how 5-, 8- and 10-year-old children tell stories and link the individual events of their stories revealed differences between the age-groups. While younger children simply list the events that happened in the narratives and considered this kind of narrative as a good story, older children use connectors to express relations between the events and also expect that these relations are communicated (cf. Karmiloff & Karmiloff-Smith, 2002; Nelson, 1997; Stein & Albro, 1997) (see also chapter 5.3).

That there appear to be differences in evaluation standards between the age-groups has already been indicated above. If the described disparities in what different age-groups expect of a story influence evaluation criteria and standards, then I would expect that younger children pay less attention to whether and how individual events are connected but rather focus on content or completeness. Consequently they might reject statements because they are incomplete or because the puppet character does not retell the story from the very beginning. Participants who evaluate follow-up statements as wrong due to incompleteness would not have difficulties with statements in reversed order. These kinds of statements would be rejected anyhow because they are wrong for two reasons; first of all they present events in reversed order and are secondly incomplete. This explanation would also be in line with the fact that during the training session some children tended to evaluate statements in correct event order as wrong because the puppet character only repeated the story partially. As previously mentioned, one child was excluded from analysis because she rejected conditions *1 und dann 2* and *2 und dann 3* because they were incomplete, although it was repeatedly explained that the puppet never retells the whole story in the follow-up statement but only a part of it. As not all of the children commented on their answers, it cannot be ruled out that there were children who rejected conditions *1 und dann 2* and *2 und dann 3* because the story was incomplete.

A similar explanation which is also related to diverging ideas about good stories and differing evaluation standards in the different age-group is described in the following. It is possible that children are primed by the temporal order mentioned in the story, so that they clearly remember that the events happened in a certain order. Consequently, they might consider it superfluous to refer to the temporal order once again in the follow-up statement. A reason for this possible attitude in children might be that especially young children consider stories that simply

list events as good stories and rarely use connectives as coherence markers (see also chapter 5.3 and literature cited there). These children possibly focus on the content rather than on the temporal order of the events. Based on these findings, children might consider the temporal information in the follow-up statements as over-informative. Studies by Davies and Katsos (Davies, 2011; Davies & Katsos, 2010) revealed that children recognize over-informativity and accept it slightly less often than optimal statements. What could support the idea that children do not focus on the content rather than on the sequence would be the comment by a 5-year-old girl, who asked why the cat would always say *und dann*.

To summarize the main findings of this experiment, it can be said that the factors Order and Event-Combination influence the interpretation of the conjunction *und dann*. Participants are sensitive to statements that present events in reversed event order, which suggests that participants do remember the events presented in the story and their order. Moreover, the factor Age has an impact on the evaluation of the follow-up statements. Although the evaluation of the follow-up statements suggested that the majority of all age-groups clearly interpreted *und dann* temporally, differences between the age-groups were found.

6.5 Experiment III

This experiment is designed to test whether the interpretation of the conjunction *und* is influenced by context and world knowledge related to the kind of events narrated. It is investigated whether contextual factors, specifically the kind of events linked by the conjunction, influence children's and adults' interpretation of follow-up statements.

Another question of interest is, whether the factor Age has an immediate impact on the interpretation of the conjunction *und*. Based on the literature on the acquisition of implicatures and under-informativity (Breheny et al., 2006; Katsos & Bishop, 2008; Papafragou & Tantalou, 2004), there is reason to assume that children's temporal interpretation of the conjunction *und* is not purely a developmental effect but also determined by the kind of events conjoined with the conjunction and additional world knowledge about events.

6.5.1 Hypotheses

Results of Experiment I revealed that the majority of participants seem to interpret the conjunction *und* in same way as the logical operator $\wedge$ in contexts that present events that do not logically or typically occur in a certain order. The majority of participants in all age-groups did so although the events were previously introduced in a story which explicitly mentioned that the events occurred in a certain order. As it could be argued that participants did not recognize that some of the follow-up statements present these events in revered event order, Ex-

periment II was carried out to check whether participants can remember the order in which the events were introduced in a story. Results revealed that participants recognize follow-up statements that present events in reversed order which suggests that they remember the order in which the events were introduced in the story. The current experiment investigates whether contextual factors, specifically the kind of events linked by the conjunction, influence the interpretation of the conjunction *und*. It is hypothesized that context contributes to the interpretation of the conjunction *und*. It is expected that the conjunction *und* is interpreted temporally more frequently when it conjoins events that typically or logically occur in a certain order (logical contexts) compared to contexts in which the conjunction links events that do typically or logically not occur in a certain order (neutral contexts). This is because I assume that the types of context, specifically the kind of events conjoined have a strong impact on the interpretation of the conjunction. Based on the assumption that the conjunction *und* is interpreted temporally in logical contexts, it should be interpreted in the same way as the conjunction *und dann*. However, result of Experiment I revealed that adults hardly rejected statements in reversed order and interpreted the conjunction similar as the logical operator. In analogy of this, the hypothesis tested in the current experiment is the null-hypothesis of my expectations described above. This null-hypothesis states that participants do not interpret the conjunction *und* temporally but interpret it additively. Based on this null-hypothesis no effect of Order should be found if people interpret the conjunction additvely, while an effect of order should be found if people interpret the conjunction temporally. This is because acceptance of statements that present events in reversed order is coded as expected answer for statistical analysis. As in Experiment I (see chapter 6.3.1) it is hypothesized that if the ability to interpret statements pragmatically generally develops with age, older participants should interpret the conjunction temporally more often than younger participants. An influence of the factor Age on the results is expected, giving rise to significantly more expected answers to the follow-up statements in reversed order. If temporal interpretation is adhered strictly in all conditions also fewer affirmative answers are expected for condition *1und3* by older participants compared to younger participants. An Age x Order x Event interaction is predicted.

As in Experiment I and II, a standardizesd working memory test and the AQ-test was conducted in order to control for influences of working memory capacity and participants' individual pragmatic skills on the results of the experiment. Predictions and hypothesis are exactly the same as in Experiment I (for details see chapter 6.3.1, p. 95).

6.5.2 Method

6.5.2.1 Participants

Twenty-one 5-year-old children (11 male and 10 female), twenty-three 7-year-old children (8 male and 15 female), twenty-eight 9-year-old children (10 male and 18 female) as well as eighteen adults (8 male and 10 female) took part in this experiment. All participants were monolingual native speakers of German and tested by the same experimenter. None of the children participated in Experiment I or II. Three adults had participated in Experiment II as well but the period of time between both experimental sessions was more than a month. Participants mean ages and age-ranges were the following:

5-year-olds: age from 5;0 to 6;8 (mean age: 5;9)
7-year-olds: age from 7;0 to 8;8 (mean age: 7;11)
9-year-olds: age from 8;9 to 10;3 (mean age: 9;6)
adults: age from 19;9 to 29;8 (mean age: 24;6).

The 5-year old children were recruited from three kindergartens in Mainz. The 7- and 9-year old children were recruited from schools or after-school care clubs in Mainz and the Unstrut-Hainich region.

Before the experiment was conducted, kindergartens, schools as well as the supervisory school authority and parents had given their approval for the conduction of the experiment. Children were given Pixi-booklets or kinder surprise eggs for participating in the experiment. All of the adult participants were students of non-linguistic subjects at the Johannes Gutenberg-University of Mainz and were paid 2€ for participating in the experiment.

6.5.2.2 Materials

The materials were constructed according to the same structure and criteria as the materials of experiments I and II (for details see chapter 6.3.3.2). Twenty-four stories combined with six conditions and filler follow-up statements were prepared. The experimental design was a 2x3 design. The follow-up statements were controlled for order of the events (correct or reversed) as well as the events mentioned (event 1&2; event 2&3; event 1&3). The only difference compared to Experiment I were the kind of events presented in the story. In the current experiment the events mentioned in the stories were events that typically or logically occur in a certain order. This means that they normally happen in the same order as mentioned in the story. An example story with all conditions as well as two exemplary filler items is given in (93) to (95).

(93) *Sven hat gezeltet.*

Seven have$_{3SG.PRS}$ camping$_{PTCP}$

'Sven went camping.'

Er hat sein Zelt aufgebaut.
he have$_{3SG.PRS}$ his tent set-up$_{PTCP}$

'He set up his tent.'

Dann ist er in seinen Schlafsack gekrochen.
then be$_{3SG.PRS}$ he in his sleeping-bag creep$_{PTCP}$

'Then he crept in his sleeping bag.'

Danach ist er eingeschlafen.
afterwards be$_{3SG.PRS}$ he fall asleep$_{PTCP}$

'Afterwards he fell asleep.'

(94) *conditions*

(1&2) *Sven hat sein Zelt aufgebaut und ist in seinen Schlafsack*

Sven have$_{3SG.PRS}$ his tent set-up$_{PTCP}$ and be$_{3SG.PRS}$ in his sleeping-bag

gekrochen.

creep$_{PTCP}$

'Sven set up his tent and crept into his sleeping bag.'

(2&1) *Sven ist in seinen Schlafsack gekrochen und hat sein Zelt*

Sven be$_{3SG.PRS}$ in his sleeping-bag creep$_{PPTCP}$ and have$_{3SG.PRS}$ his tent

aufgebaut.

set up$_{PTCP}$

'Sven crept into his sleeping bag and set up his tent.'

(2&3) *Sven ist in seinen Schlafsack gekrochen und ist eingeschlafen.*

Sven be$_{3SG.PRS}$ in his sleeping-bag creep $_{PTCP}$ and be$_{3SG.PRS}$ fall asleep$_{PTCP}$

'Sven crept into his sleeping bag and fell asleep.'

(3&2) *Sven ist eingeschlafen und in seinen Schlafsack gekrochen.*

Sven be$_{3SG.PRS}$ fall asleep$_{PTCP}$ and in his sleeping-bag creep $_{PTCP}$

'Sven fell asleep and crept into his sleeping bag.'

(1&3) *Sven hat sein Zelt aufgebaut und ist eingeschlafen.*
Sven have$_{3SG.PRS}$ his tent set-up$_{PTCP}$ and be$_{3SG.PRS}$ fall asleep$_{PTCP}$
'Sven set up his tent and fell asleep.'

(3&1) *Sven ist eingeschlafen und hat sein Zelt aufgebaut.*
Sven be$_{3SG.PRS}$ fall asleep$_{PTCP}$ and have$_{3SG.PRS}$ his tent set-up$_{PTCP}$
'Sven fell asleep and set up his tent.'

(95) *filler*

(0&3) *Sven hat die Luftmatratze aufgepumpt und ist eingeschlafen.*
Sven have$_{3SG.PRS}$ the air-mattress blow up$_{PTCP}$ and be$_{3SG.PRS}$ fall asleep$_{PTCP}$
'Sven blew his air-mattress up and fell asleep.'

(1&0) *Sven hat sein Zelt aufgebaut und die Luftmatratze aufgepumpt.*
Sven have$_{3SG.PRS}$ his tent set-up$_{PTCP}$ and the air-mattress blow$_{PTCP}$ up$_{PREP}$
'Sven set up his tent and blew up his air mattress.'

The procedure for matching follow-up conditions and fillers with the stories as well as the procedures for randomization and list creation were exactly the same as in the previous experiments. Six lists with three versions for each list were created. As in experiments I and II, each participant heard only one follow-up statement for each story. During the experiment, three items of each condition plus six different kinds of filler items were heard by each participant. In total participants had to make a binary judgement about the follow-up statements of 26 stories (two of them served as training items) which were presented to them in the form of short auditory video-clips. After the experiment the PGN-test (see chapter 6.3.3.1.1) was conducted with the children. Adults filled in the AQ-questionnaire (see chapter 6.3.3.1.2).

6.5.2.3 Procedure

The procedure was exactly the same as in Experiment I and II. All of the participants were tested in an individual meeting. Participants were familiarized with the experimenter as well as the characters that appear in the video and the task.

Adults were tested in a quiet room of the language laboratory at the University of Mainz and children in a separate room of the school, after-school care club or kindergarten.

During the experiment participants were sitting in front of a computer or laptop connected to loudspeakers so that they could hear and see the presented auditory material properly.

As in Experiment I and Experiment II the task was a truth-value judgement task. Participants had to make a binary judgement and were instructed to evaluate the statement about the content of a previous heard story as either *richtig* ('right') or *Falsch* ('wrong'). After participants had mastered the exercises, the actual experiment, consisting of 24 stories was conducted. Neutral feedback was given after each trial. Participants' answers and remarks were put down in a protocol.[83]

After the experiment adults filled in the AQ-test. The *PGN*-test was conducted with the children. It was noted down in a protocol whether the child had repeated the nonce-words correctly. After the session children were brought back to their play-group and the next child was picked up. Children enjoyed the experiments and gave positive feedback.[84]

6.5.2.4 Data Analysis

Participants' answers to the follow-up statements were coded as 1 or 0. A correct response was assigned a score of 1, an incorrect as 0. As in the previous experiments the amount of correct filler items was used as criterion to determine whether a participant had successfully mastered the task or not. Participants were excluded from the data analysis if they gave a wrong answer to more than 1 out of 6 filler items or evaluated all of the statements, even those conditions that presented events in the correct order, as *falsch* ('wrong').

Statistical analyses were carried out with the *ezANOVA*-package of statistic software *R* (R Development Core Team, 2010). An ANOVA with the factors EVENT COMBINATION (event 1 + 2 vs. event 2 + 3 vs. event 1 + 3), ORDER (correct order vs. reversed order) and AGE (5-, 7-, 9-year-old children and adults) as well as the random factor subject (F) was conducted for data analysis. The dependent variable was the accuracy of the answers. The within-factors were ORDER as well as EVENT and the between-factor was AGE. Data analysis was carried out in exactly the same way as in Experiment I and II. The sphericity correction proposed by Huynh and Feldt (1970) was used to compensate for violations of sphericity. In these cases, original F-values are reported with the adjusted p-values. Whenever statistical tests allowed pair-wise comparisons the p-values were corrected according to the modified Bonferroni procedure (Keppel, 1991). The p_{Keppel} was set to $0.0\bar{3}$ for comparisons that involved the factor EVENT COMBINATION.

[83] Some children laughed and said that the cat was forgetful because it had said the things in the wrong order or left out an event.

[84] After having participated in the experiment, two seven-year old boys asked whether they could sit in the room and listen to the video clips while another child was participating because they liked it so much. They also promised that they would not whisper the answer to the participant and be very quiet. Nevertheless, I did not allow them to do so because the presence of an observer might distract the participant or may put additional pressure on him because they might be worried that the answer might not be perfect.

The achievement of the 5-year-old children in the *PGN*-test was evaluated according to the evaluation guidelines of the test's handbook (Grimm, 2001, p. 49). Performance of the 7- and 9-year-old participants was evaluated based on the raw scores. The procedure was exactly the same way as in Experiment I (see chapter 6.3.4.1). For each age-group participants' performance in the *PGN*-test was correlated with the amount of correct answers given to the filler items in the actual experiment. Moreover, a correlation analysis that took into account the performance in the *PGN*-test and the amount of correct answers for all age-groups was performed.

For the analysis of the AQ-test only the results of those participants whose data entered in the analysis of the experiment were considered.[85] Evaluations of the AQ-test were conducted in exactly the same way as in experiments I and II (for details see chapter 6.3.3.4). A Pearson product-moment correlation coefficient was computed to analyze the relationship between the total score participants got in the AQ-test and the amount of expected answers participants gave to conditions that presented statements in reversed order. Participants' performance in the subsection *communication* of the AQ-test was also accessed. A correlation analysis between participants' scores in AQ_{Comm} and the amount of expected answers for conditions that presented the events of the story in reversed order was conducted.

6.5.3 Results

6.5.3.1 Phonological Working Memory Test

Figure 7 shows which raw scores were achieved and by how many participants of each age-group. [86] All of the 5-year-old participants performed on average or even above in the PGN-test.[87] The precise t-values and the number of 5-year-old participants that showed the respective performance are depicted in Figure 26 (p. 302). None of the 7- and 9-year-old participants had to be excluded from data-analysis based on the performance in the *PGN*-test. With respect to the general performance of each age-group in the *PGN*-test it can be said that the five-year-olds scored lowest (M = 13.7, SD = 2.6). The nine-year-olds (M = 15.1, SD = 1.7) performed better than the seven-year-olds (M = 14.3, SD = 2.5).

For none of the age-groups a correlation between score in the *PGN*-test and amount of correct answers in the experiment was found (5-year-olds: Pearson's r = .05, p >.82; 7-year-olds:

[85] Two participants did not send back the AQ-questionnaire. Therefore their data could not enter in the correlation analysis.

[86] None of the participating children had enunciation-problems such as producing the phone [g] instead of [d] or [k] instead of [t] nor enunciation-problems related to the phone [ʃ].

[87] What could unfortunately not be tested was whether participants of the age-groups 7-year-olds and 9-year-olds performed below, above or on average for their age in the PGN-test. The PGN-test however ensured that all participants performed on or above the level of 5-year-olds.

Pearson's r = -.25, p >.24; 9-year-olds: Pearson's r = .04, p >.83). The scatter plots for each age-group are depicted in Figure 27 to Figure 29 (p. 302-303). Moreover, no significant correlation was found (Pearson's r =-.04, p > .74) in the correlation analysis that took into account the performance in the *PGN*-test and the amount of correct answers for all age-groups.

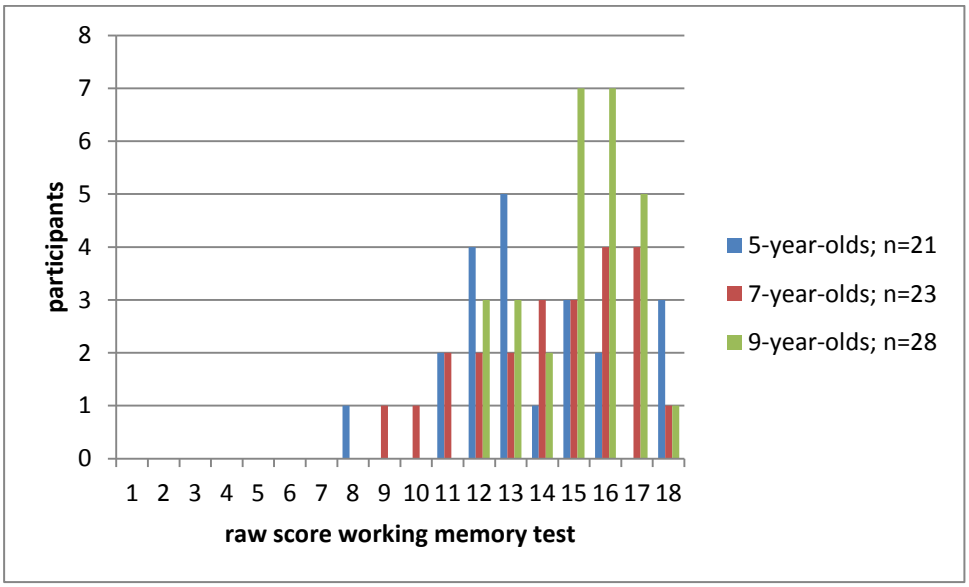

Figure 7: Participants' performance in the *PGN*-test.

6.5.3.2 The Autism-Spectrum Quotient

Participants AQ scores ranged from 8 to 28 (M = 15.3, SD = 5.13). No participant scored higher than the cut-off suggested by the authors of the test. No significant correlation was found between the total score participants got in the AQ-test and the amount of expected answers participants gave to conditions that presented statements in reversed order (Pearson's r = -.27, p>.31). Participant's performance in the subsection *communication* of the AQ-test (AQ_{Comm} scores) ranged from 0 to 5 (M = 2.5, SD = 1.63). The correlation analysis between participants' scores in AQ_{Comm} and the amount of expected answers for conditions that presented the events of the story in reversed order revealed no significant correlation (Pearson's r = -0.30, p >.25).

6.5.3.3 Experiment

Two 5-year-olds (1 male and 1 female) as well as three 7-year-old children (1 male and 2 female) were excluded from the analysis because they gave a wrong answer to two fillers. Four nine-year-olds (3 female, 1 male) were excluded from the analysis as well because three of them got two fillers wrong and one of them got three of the fillers wrong. The amount of correct answers to the fillers as well as the SD is given in Table 15 for those participants that were not excluded from the analysis.

Table 15: Results Filler Experiment III
Percentage of correct answers given by each age-group to filler statements with different kinds of event combinations. Standard deviation is given in parentheses.

Condition	Answers				
	Expected	given by % of			
		5-year-olds (n=19)	7-year-olds (n=20)	9-year-olds (n=24)	Adults (n=18)
0und1 **'0and1'**	*Falsch* 'wrong'	94.7 (22.9)	95.0 (22.4)	95.8 (20.4)	100 (0)
0und2 **'0and2'**	*Falsch* 'wrong'	100 (0)	95.0 (22.4)	95.8 (20.4)	100 (0)
0und3 **'0and3'**	*Falsch* 'wrong'	73.7 (45.2)	90.0 (30.8)	95.8 (20.4)	100 (0)
1und0 **'1and0'**	*Falsch* 'wrong'	94.7 (22.9)	100 (0)	100 (0)	94.4 (23.6)
2und0 **'2and0'**	*Falsch* 'wrong'	94.7 (22.9)	100 (0)	91.7 (28.2)	100 (0)
3und0 **'3and0'**	*Falsch* 'wrong'	84.2 (37.5)	95.0 (22.4)	95.8 (20.4)	94.4 (23.6)

Almost all the filler conditions were answered by all age-groups at ceiling. The only exception is condition *0und3* in the data of the 5-year-olds. This condition received the lowest amount of correct answers.

Table 16: Results Conditions Experiment III
Percentage of expected answers to statements with different kinds of event combinations that conjoin two events that happened in a previously heard story in correct or reversed order with the conjunction 'und'. Standard deviation is given in parentheses.

Condition	Answers				
	Expected	given by % of			
		5-year-olds (n=19)	7-year-olds (n=20)	9-year-olds (n=24)	Adults (n=18)
1und2 **‚1and2'**	*Richtig* 'correct'	70.2 (36.7)	71.7 (31.1)	73.6 (31.1)	98.1 (7.9)
2und3 **‚2and3'**	*Richtig* 'correct'	84.2 (17.1)	78.3 (29.2)	80.6 (29.4)	98.1 (7.9)
1und3 **‚1and3'**	*Richtig* 'correct'	70.2 (35.0)	71.7 (36.3)	59.7 (29.5)	87.0 (20.3)
2und1 **‚2and1'**	*Falsch* 'wrong'	52.6 (32.0)	51.7 (39.7)	73.6 (38.0)	68.5 (42.0)
3und2 **‚3and2'**	*Falsch* 'wrong'	49.1 (40.6)	46.7 (43.8)	75.0 (34.4)	66.7 (36.2)
3und1 **‚3and1'**	*Falsch* 'wrong'	54.4 (44.7)	46.7 (41.0)	73.6 (36.8)	72.2 (41.6)

Table 16 shows the percentage of correct responses to statements that present the events in the correct order as well as percentage of expected answers for the critical statements which pre-

sent the events of the story in reversed order for all age groups. There are apparent differences in comparison with the results of experiment I.

It is eye-catching that the age-group of 9-year-olds is among all age-groups the one that gave the lowest amount of expected answers to condition *1und3*. At the same time this condition yielded the lowest amount of expected answers (M = 0.597 (SD = 0.29)) compared to all of the other conditions among the 9-year-olds.

The tendency that was suggested by the descriptive statistics was verified using ANOVA. Results show that there was no 3-way interaction between AGE, ORDER and EVENT COMBINATION ($F(6,154) < 1$, n.s.). Instead a reliable 2-way interaction of ORDER x EVENT COMBINATION was found. Moreover, results reveal a significant main effect of AGE ($F(3,77) = 6.19$, $p < .001$ ($F(2,154) = 5.07$, $p < .008$) as well as main effects of ORDER ($F(3,77) = 9.20$, $p < .004$) and of EVENT COMBINATION ($F(2,154) = 3.44$, $p < .04$). Adults gave in all conditions more expected answers than the 5- and 7-year-old children. The results of a χ^2 -test for each condition per age-group revealed that the answers of the 5- and 7-year-old children were at chance level for conditions that present the events of the story in reversed order. The effect of age is a general effect that is independent of the factors order and event and must hence be related to other age-dependent factors that influence children's performance in the experiment such as knowledge about the (temporal) relations that typically hold between the mentioned events.

When the 2-way interaction was resolved by EVENT, a significant difference was found for the paired comparisons of condition *1und2* vs. *2und1* ($F(1,80) = 4.51$, $p < .01$). The result of the paired comparison of *2und3* vs. *3und2* revealed a highly significant difference ($F(1,80) = 18.37$, $p < .001$), while the comparison of *1und3* vs. *3und1* was not significant ($F(1,80) = <1$, n.s.). Except for event-combination 3 (ec_3), which is the combination of events 1 and 3 mentioned in the story, conditions in correct order yielded a higher amount of expected answers than conditions that presented the events in reversed order. The influence of order on event-combination 1 (ec_1) and event-combination 2 (ec_2) was significant.

6.5.4 Discussion

Concerning, the interpretation of the conjunction *und* two hypotheses were put forward. Based on the assumption that reversed order statements should be rejected if they are interpreted temporally, an effect of order was expected.[88] This hypothesis was confirmed. The second hypothesis tested is related to the influence of the factor Age and states that if the tem-

[88] This is because the acceptance of statements that present events in reversed order was coded as expected answer for statistical analysis.

poral interpretation of the conjunction does not develop with age, there should be no differences concerning the evaluation of the follow-up statements between the tested age-groups. This hypothesis was confirmed was well, as results revealed no 3-way interaction of the factors Age, Order and Event.

However, the main question of interest was, whether context (specifically the kind of events presented) contributes to the interpretation of the conjunction *und*. More temporal interpretations were expected in contexts in which the conjunction conjoins events that typically or logically occur in a certain order compared to contexts in which the conjunction links events that do typically or logically not occur in a certain order. The answer to this question requires an indirect comparison of the results of Experiment I and Experiment III and therefore will be discussed later (see chapter 6.6).

Analysis of the data of the current experiment revealed a 2-way interaction of Order x Event. This indicates that both factors (Order and Event Combination) interact during the interpretation of the conjunction. When this interaction was dissolved, a significant effect of Order was found for the comparison of conditions *1und2* vs. *2und1* as well as the comparison of conditions *2und3* vs. *3und2*. The significant differences result from the interpretation of statements in correct and reversed order. While the only expected answers for statements in correct order is affirmative (even if participants interpret statements in correct order temporally), statements in reversed order can be evaluated differently, depending on whether the conjunction is interpreted temporally or additively. A main effect of Order indicates that there were enough people who interpreted the conjunction temporally (and therefore rejected reversed order statements), that the difference in the amount of expected answers for the condition in correct and that in reversed order became significant. Results of the pairwise comparison of conditions *1und2* vs. *2und1* as well as the comparison of conditions *2und3* and *3und2* indicate that although the contexts of the story strongly suggest temporal reading, a certain amount of participants still interpreted reversed order statements additively. The number of participants who interpret the conjunction additively and answer affirmatively to statements that present the events in reversed order is high enough to cause a significant difference due to the influence of order. Therefore, the tested hypothesis cannot be rejected. It can further be ruled out that the evaluation of reversed order statements was influenced by participants' poor pragmatic skills or pragmatic difficulties. This is because no significant correlation between the evaluation of statements in reversed order and performance in the AQ-test or subtest on communication was found.

The pairwise comparison of conditions *1und3* and *3und1* did not reveal a significant effect of Order. Hence there are no significant differences in the amount of expected answers between conditions *1und3* and *3und1*. A possible explanation would be that condition *1und3* was rejected more often while the amount of expected answer of condition *3und1* remained stable. This is possible because condition *1und3* can be rejected if the conjunction is interpreted strictly temporally because event 3 did not directly follow event 1 (as event 2 was intermediate). Consequently the difference in expected answers for conditions *1und3* and *3und1* would not be significant anymore. Table 16 shows that across all age-groups, conditions in reversed order yielded a lower amount of expected answers than conditions in correct order. Moreover, all conditions in reversed order received similar amounts of expected answer while there are differences in the amount of expected answers to statements in correct order. From the statements that present events in the correct order, condition *1und3* got the lowest amount of expected answer (71.2%). This is probably the reason for why there is no significant difference in the pairwise comparison.

Table 17: Expected answers across participants in Experiment III
Percentage of expected answers given across all age-groups (n=81). Standard deviation is given in parentheses.

Condition	**Answers**	
	Expected	given in %
1und2 **'1and2'**	*Richtig* 'correct'	77.8 (30.7)
2und3 **'2and3'**	*Richtig* 'correct'	84.8 (24.2)
1und3 **'1and3'**	*Richtig* 'correct'	71.2 (32.0)
2und1 **'2and1'**	*Falsch* 'wrong'	62.1 (38.7)
3und2 **'3and2'**	*Falsch* 'wrong'	60.1 (39.9)
3und1 **'3and1'**	*Falsch* 'wrong'	62.1 (41.8)

If one looks at Table 16 (p. 154) which shows the average of expected answers per condition for each age-group, it is eye-catching that the age-group of 9-year-olds is the one that gave the lowest amount of expected answers to condition *1und3*. This indicates that the answers of the 9-year-old children are the reason for why condition *1und3* got such a low amount of expected answers across all age-groups, as shown in Table 18. Hence, the amount of expected answers given to condition *1und3* by the 9-year-olds are most likely the reason for why there is no significant difference in the pairwise comparison of condition *1und3* vs. *3und1* (across all age-groups), as mentioned above.

To verify this argument an ANOVA with the factors EVENT COMBINATION (event 1 + 2 vs. event 2 + 3 vs. event 1 + 3), ORDER (correct order vs. reversed order) as well as the random factor subject (*F*) was conducted for data of the 9-year-old children. Results revealed a marginally significant main effect of EVENT ($F(2, 46) = 3.04$, $p < .062$). Pair-wise comparisons for the factor EVENT showed that only the comparison of event combination 2 + 3 vs. event combination 1 + 3 was significantly different ($F(1,23) = 8.36$, $p < .0083$). Event combination 1 + 3 received a lower amount of expected answers ($M = 66.67$ ($SD = .21$)) than event combination 2 +3 ($M = 77.78$ ($SD = .18$)). The mean of expected answers for event combination 1 + 2 was ($M = 73.61$ ($SD = .25$)). The low mean for event combination 1 + 3 indicates that the influence of the factor order was weakest for this event combination. Hence the differences in the amount of expected answers between conditions *1und3* and *3und1* are smaller than between condition *1und2* vs. *2und1* or *2und3* vs. *3und2*, respectively. This is because condition *1und3* was rejected more often by the 9-year-old children while the amount of expected answers to condition *3und1* remained stable, compared to other conditions that present events in reversed order. These findings could be explained by arguing that the 9-year-olds rejected condition *1und3* more often than other conditions that present events in correct order because they interpreted the conjunction *und* temporally. Indeed the temporal order of the events presented in this condition is not completely right because event 1 was not directly followed by event 3. This is also illustrated by the comments some participants gave when evaluation this condition (see Table 18). These results and comments show that the conjunction *und* is not only interpreted temporally in reversed order statements but also in condition *1und3*.

Another question concerned the influence of the factor Age on the interpretation of the conjunction. Results of the study reveal a main effect of age. This indicates that there are general differences in the interpretation of the conjunction *und* between the different age-groups. Adults ($M = 81.8$, $SD = 38.7$) gave in all conditions more expected answers than the 5-year-old ($M = 63.5$, $SD = 48.2$) and 7-year-old children ($M = 61.1$, $SD = 48.8$). The 9-year-olds ($M = 72.7$, $SD = 44.6$) performed across all conditions better than the 5- and 7-year-old children but worse than the adults. With respect to conditions that presented the events in correct order, adults gave the highest amount of expected answers to all conditions. Concerning conditions that present events of the story in reversed order, the 9-year-olds gave the highest amount of expected answers and the group of adults the second highest (see Table 19).

Table 18: Remarks to condition *1und3* in Experiment III
The table shows some of the remarks and answers given by the participants when evaluating condition *1und3*.

Answer	Age	Remark
Richtig **'correct'**	5;6	*Aber ein bisschen verkehrtrum.* ('But a little bit reversed.')
Falsch **'wrong'**	5;1	*Ein bisschen richtig und ein bisschen falsch.* ('A little bit right and a little bit wrong.')
Falsch **'wrong'**	5;6	*Nicht richtig, weil sie ein paar Wörter vergessen hat.* ('Not right, because she forgot a couple of words.')
Richtig **'correct'**	7;2	*Reihenfolge war falsch.* ('Order was wrong.')
Falsch **'wrong'**	9;1	*Reihenfolge* ('Order')
Falsch **'wrong'**	9;3	*Reihenfolge* ('Order')
Richtig **'correct'**	23;1	*Da fehlt was, aber ok.* ('There is something missing, but ok.')
Richtig **'correct'**	23;7	*Fehlt was, aber sonst richtig.* ('Something is missing, but apart from that right.')
Richtig **'correct'**	26;11	*Grenzwertig.* ('Boarderline')
Falsch **'wrong'**	28;1	*Es fehlt in der Mitte zu viel.* ('There is too much missing in the middle.')

Table 19: Expected answers to correct and reversed order statements in Experiment III
Mean of expected answers for all age-groups to statements in correct and reversed order. Standard deviation is given in parentheses.

Condition	Answers				
	Expected	given by % of			
		5-year-olds (n=19)	7-year-olds (n=20)	9-year-olds (n=24)	Adults (n=18)
correct order	*Richtig* 'correct'	74.9 (23.4)	73.9 (25.0)	71.3 (21.2)	94.3 (6.9)
reversed order	*Falsch* 'wrong'	52.0 (36.1)	48.3 (39.4)	74.1 (31.5)	69.1 (38.4)

The amount of expected answers given by the 5- and 7-year-olds to conditions with reversed order is at chance level. Therefore results might be due to the possibility that participants were guessing and gave random answers. A possible explanation for why the results of four 5-year-olds and one 7-year-old were not significantly different from chance level might also reflect that it was hard for them to decide between the additive and the temporal reading of the conjunction in statements that presented evens in reversed order. This is most likely because these children recognized that the events were presented in the wrong order and the content does not make sense because it cannot or does normally not occur in reversed order. These partici-

pants might be uncertain about which interpretation (additive or temporal) to choose because they know that both of them are possible. Because it was not pointed out in the task that the order in which the events are mentioned in the follow-up statements is of relevance for their evaluation, these children might be uncertain whether to choose the additive or temporal interpretation.

Overall, these findings suggest that adults and 9-year-old participants interpret the conjunction *und* in statements that present events in reversed order more often temporally than younger participants. From this finding, one could conclude that the temporal interpretation of the conjunction *und* in reversed order statements is related to participant's knowledge about and access to scripts about events. Older participants might have better access to these scripts than younger participants. Therefore the temporal interpretation of the conjunction in statements that present events in reversed order increases with age if the presented events typically or logically occur in a certain order.

Another possible explanation for high acceptance rates of statements that present events in reversed order could be that participants interpret the relation between the conjuncts expressed by *und* as backward relation. That *und* can express backward relations was shown and discussed in chapter 1.1. It was also shown by the literature discussed in chapter 5.3.1 that especially younger children use the conjunction *und* to express a variety of meaning relations between conjuncts. Hence, it is also possible that they do not only use the conjunction *und* to express a variety of meaning relations more often than adults or older children but that they also apply richer interpretation possibilities to the conjunction *und* than adults and older children.

It is also eye-catching that among all age-groups the 9-year-olds gave the lowest amount of expected answers to condition *1und3*. The follow-up condition *1und3* was also the one which yielded the lowest amount of expected answers (M = 0.597 (SD = 0.29)) compared to all of the other conditions among the 9-year-olds. A possible explanation for the amount of expected answers for these conditions would be that the 9-year-olds interpret the conjunction *und* temporally and rejected this condition more often than all of the other conditions because event 1 is not directly followed by event 3. These results are in line with results from Experiment II. In that experiment condition *1und3* also received the lowest score in the age-group of 9-year-olds (M = 0.58 (SD = 0.35)).

Finally it was also tested whether working memory capacity has an impact on the results of the experiment. No correlation between participants' performance in the *PGN*-test and their

performance in the experiment was found. This suggests that the experimental results are not influenced by phonological memory capacity of the participants.

To summarize the results of the experiment, although the presented materials strongly suggest a temporal reading of the conjunction, participants still interpret the conjunction additively in conditions that present events in reversed order at rates that lead to significant effect or the factor Order. Moreover, there are differences in the interpretation of the conjunction between the different age-groups.

6.6 Summary and Discussion

In this chapter, the interpretation of the conjunction *und* was investigated with the help of three experiments. The following factors that might have an impact on the interpretation of the conjunction were considered: Context, Age, Event-Combination, and Order. In these experiments, the events presented in a story and the order, in which they were introduced, was relevant. For this reason a control experiment which was identical to the first experiment but connected the events with the temporal conjunction *und dann* was conducted. It was also controlled for whether phonological working memory capacity influences the performance of children in different age-groups. It was also checked whether pragmatic difficulties and communicative skills of adults are related to their performance in the experiment.

With respect to phonological working memory capacity no correlation with children's performance was found in any of the experiments (neither within the age-groups of children nor across them). Therefore, it can be ruled out that performance was influenced by phonological working memory capacity in the individual age-groups of 5-, 7-, and 9-year-olds and across these age-groups. Similarly, no correlation between pragmatic difficulties or communication skills was found in the data of the adults in any of the experiments. Hence, it can be ruled out, that the evaluation of reversed order statements was influenced by participants' poor pragmatic skills or difficulties.

Results of the control experiment (Experiment II), which tested whether the individual events and the mentioned order were recognized and remembered by participants, revealed that participants do remember the events as well as the order in which they were presented in the story. An interaction of Order x Event was found. This as well as the accuracy ratings for statements with reversed event order shows that participants were sensitive to statements that present events described in the story in wrong order. Moreover, the event-combination (whether two events directly followed each other or whether another event happened in the meantime) influenced accuracy ratings. Condition *1 und dann 3* received lower acceptance ratings because event 2, which was mentioned intermediate in the stories, was left out in the follow-up statement. This further supports that participants do remember the events presented in the story and are able to recognize follow-up statements that present these events in wrong or different order.

The main effect of Age suggests that there are differences concerning the evaluation of the follow-up statements between the age-groups. Although the majority of all age-groups interpreted *und dann* temporally, which is reflected by rejection rates of conditions with reversed

event order, there are differences between the age-groups. Children gave less expected answers and appear to have more difficulties than adults.

The purpose of this experiment that linked the events with *und dann*, was to validate the results of Experiment I, which used exactly the same stories and follow-up statements as Experiment II but linked them with *und*. It was expected that more participants reject follow-up statements in reversed order that link events with *und dann* (Experiment II) compared to follow-up statements that present events in reversed order that are linked by *und* (Experiment I). This is because statements with reversed event order that are linked by *und* are ambiguous, while the ones linked by *und dann* express a temporal relation. If one compares the results of the individual age-groups in Experiment I and Experiment II, one can see that more participants rejected statements with revered event order when the events were linked by *und dann*. This shows that participants behave differently in both conditions. This holds, although some of the 5-year-olds appear to have interpreted the conjunction *und dann* additively, which is illustrated by the remarks of those children who commented on their answer (see Table 20). The fact that more participants rejected conditions that linked events in reversed order with *und dann*, shows that they can remember the events and the order in which they occurred. They accepted reversed order of events conjoined by *und* because they interpreted the conjunction *und* additively more often than temporally in Experiment I.

Table 20: Remarks to statements with reversed event order in Experiment III
The table shows some of the answers and remarks given by the 5-year-olds when evaluating conditions in reversed order in Experiment III.

Condition	Answer	Age	Remark
2und1 **‚2and1‘**	*Falsch* ‘wrong’	5;1	*Ein bisschen falsch.* (‘A little bit false.’)
2und1 **‚2and1‘**	*Falsch* ‘wrong’	5;9	*Auch wieder umgekehrt.* (‘Again the other way round.’)
2und1 **‚2and1‘**	*Richtig* ‘correct’	5;4	*Richtig aber falschrum.* (‘Correct but reversed.’)
2und1 **‚2and1‘**	*Richtig* ‘correct’	5;11	*Das war richtig, aber ein bisschen verkehrt.* (‘That was right, but a little bit wrong.’)
3und1 **‚3and1‘**	*Falsch* ‘wrong’	5;9	*Schon wieder umgekehrt.* (‘Again reversed.’)
3und1 **‚3and1‘**	*Falsch* ‘wrong’	5;9	[Kind lacht] *Auch umgekehrt. Beides ein bisschen falsch.* [child laughs] (‘Also reversed. Both a little bit wrong.’)
3und1 **‚3and1‘**	*Falsch* ‘wrong’	5;9	[Kind lacht] *Die sagt das meiste umgekehrt.* [child laughs] (‘She says most of it reversed.’)
3und1 **‚3and1‘**	*Richtig* ‘correct’	5;4	*Richtig aber falschrum.* (‘Right but reversed.’)

3und1	*Richtig*	5;7	*Eins fehlt. War trotzdem richtig.*
‚3and1‘	‘correct’		(‘One is missing. It was still right.’)
3und1	*Richtig*	5;11	*Aber ein bisschen verkehrt rum.*
‚3and1‘	‘correct’		(‘But a little bit reversed.’)
3und1	*Richtig*	5;11	*Aber verdreht.*
‚3and1‘	‘correct’		(‘But reversed.’)
3und2	*Falsch*	5;1	*Ein bisschen falsch.*
‚3and2‘	‘wrong’		(‘A little bit wrong.’)
3und2	*Falsch*	5;7	*Ein bisschen richtig und ein bisschen falsch.*
‚3and2‘	‘wrong’		(‘A little bit right and a little bit wrong.’)
3und2	*Falsch*	5;9	[Kind lacht] *Er hat es umgekehrt gesagt.*
‚3and2‘	‘wrong’		[child laughs] (‘He has said it the other way round.’)
3und2	*Falsch*	5;11	*Dann müsste sie ja im Mund die Pizza schneiden.*
‚3and2‘	‘wrong’		(‘Then she would have to cut the pizza in her mouth.’)
3und2	*Richtig*	5;4	*Falschrum, aber richtig.*
‚3and2‘	‘correct’		(‘The other way round but right.’)
3und2	*Richtig*	5;11	*Es war ein bisschen falsch. Das letzte war am Anfang.*
‚3and2‘	‘correct’		(‘It was a little bit false. The last thing was at the beginning.’)

Another interesting finding is that children performed better in conditions that presented events in correct event order in Experiment I compared to Experiment II, although the only difference was that events were linked by *und dann* instead of *und*. A possible explanation could be that children were primed by the temporal markers presented in the stories and hence consider it as over-informative that the follow-up statements mention the temporal order in which the events happened. It is possible that the sequence of events in the story was so prominent to them that they would consider events linked by *und* as optimal informative and reject the same events when they are linked by *und dann* because they consider them as over-informative. This explanation would be in line with empirical studies that showed that 5- and 6-year-old children considered over-informative statements worse than optimal utterances (Davies & Katsos, 2010; Katsos & Smith, 2010).

Experiment I and Experiment III examined the interpretation of the conjunction *und* in different contexts. Results of both experiments, the one which presents events that could occur in any kind of order and would still make sense (Experiment I) and the one which presents events that typically or logically occur in a certain order (Experiment III), were influenced by

the factor Order.[89] Statements in correct event order were accepted more often than those with reversed event order. Conditions with reversed event order are ambiguous because they can be accepted if the conjunction is interpreted additively and rejected if interpreted temporally. For the analysis of the experimental data the amount of people who rejected conditions with reversed event order was considered because the temporal interpretation of the conjunction in different contexts was investigated. The main effects of Order found in the data of both experiments, indicate that there were enough people who interpreted the conjunction additively (and consequently accepted reversed order statements), that the difference in the amount of expected answer for the condition in correct and reversed order became significant. The fact that the amount of participants that interpret the conjunction additively is so high that data shows an effect of Order even in Experiment III, where the contexts and knowledge about the events presented strongly suggests a temporal interpretation of the conjunction, supports the idea that the basic meaning of the conjunction *und* is the same as the meaning of the logical operator $\wedge$. However, there were differences with respect to the additive interpretation of the conjunction in the individual experiments and age-groups. In Experiment I all age-groups interpret the conjunction *und* additively most often in almost all of the conditions of the presented materials. This is different for Experiment III, in which temporal interpretations were more prominent. However, there were differences in the extent to which the different age-groups interpret the conjunction additively. In Experiment III, additive interpretations of the conjunction *und* were close to chance-level (5- and 7-year-olds) or less frequent than temporal interpretations (9-year-olds and adults).[90] These findings support the view that all other meaning components and interpretations of the conjunction *und* such as those of temporality or causality are influenced by contextual factors (e.g. whether events typically or logically occur in a certain order) and result from contextual influences.

Concerning the temporal interpretation of the conjunction *und*, it was hypothesized that context and world knowledge influence the interpretation in the way that the nature or the kind of events presented matter. It was expected that the conjunction *und* is interpreted temporally more often in contexts that present events that typically or logically occur in a certain order

[89] Data of experiment I showed a significant interaction of Order x Event in the data of the 5-, 7- and 9-year-old participants and a significant main effect of Order in the data of the adults. Results of experiment III revealed a significant effect of Order x Event. Resolving the interaction by Event revealed a main effect of Order (except for the paired comparison of condition *1und2* vs. *2und1* in the 5-year-olds in experiment I and the paired comparison of condition *1und3* vs. *3und1* in experiment III).

[90] Evaluation rates close to chance-level are due to the fact that the group of 5-and 7-year-olds as well as the one of adults seems to consist of two groups: A group that prefers an additive interpretation of the conjunction and a group that prefers the temporal one. This can be assumed because statistical tests revealed that the individual participant of these age-groups were consistent in their answers.

because general world knowledge additionally contributes to the temporal reading of the conjunction. If events are presented in reversed order in this kind of context, a temporal interpretation of the conjunction conflicts with world knowledge. This should result in high rejection rates of conditions that present events that typically or logically occur in a certain order. This is because people are familiar with the fact that this kind of events can only or typically occur in this order which strengthens the temporal reading. In contexts that present neutral events or events that could very well also occur in reversed order and would still make sense or events for which there is no script or fixed schema with respect to order available do not as strongly suggest a temporal reading of the conjunction as the former kind of context does. The experimental results of both experiments, depicted in Table 9 (p. 136) and Table 16 (p. 154), show the percentage of participants, who rejected conditions that presented events in reversed event order due to a temporal interpretation of the conjunction. If one compares the results of follow-up statements that present the events in reversed order, linked by the conjunction *und* of Experiment I (neutral contexts) with the ones of Experiment III (logical contexts), one can see that participants of all age-groups behaved differently. As expected, participants of all age-groups rejected conditions with reversed event order more often in Experiment III. This experiment presented events that were logical dependent on each other or typically occur in a certain order. This indicates that more participants rejected statements with reversed event order, most likely because they interpreted the conjunction *und* temporally, in contexts in which the order of the events presented conflicted with world knowledge. Temporal interpretation of the conjunction was found most frequently in contexts where formal logic and natural language logic are in conflict with each other. These results show that context has an impact on the temporal interpretation of the conjunction *und*. This is not only the case of statements that present events in reversed order, but is also true for condition *1und3*. This condition was accepted less often in all age-groups when events that typically occurred in a certain order were mentioned compared to neutral events. This finding is most prominent in the data of the 9-year-olds, who gave the lowest amount of expected answers to condition *1und3* in Experiment III (M = 0.597 (SD = 0.29)). The 5-year-olds gave 70.2% (SD = 35.0) of expected answers to this condition, the 7-year-olds 71.7% (SD = 36.3) and the adult 87.0% (SD = 20.3). A possible explanation for why the 9-year-olds are the age-group that interprets condition *1und3* temporally most often might be that children at different ages focus on or value some conversational maxims more than others (for details see: Röhrig, 2010, 2011). Hence it is possible that 9-year-olds value the first Maxim of Quantity more than the second one or even exploit it. If this was the case and they have recognized that the follow-up statement is less

informative than the preceding story (because it is not explicitly mentioned that event 2 occurred after event 1 and before event 3), they might reject the follow-up statement because they consider it as under-informative or not good enough as it violates the first Maxim of Quantity.

Lower acceptance rates for condition *1und3* show that the conjunction is not only interpreted temporally in statements that present events in reversed order but also if the exact order of events is violated. In this case the condition was accepted less often because event 3 did not directly follow event 1. This indicates that the sequential interpretation of the conjunction *und* can in both kinds of context also influence the evaluation of statements that present events in correct order. A possible explanation for why the interpretation of the conjunction differs depending on the context might be related to the accessibility of knowledge. It is known that knowledge that is easily accessed is more likely to be used during text comprehension than knowledge which is more difficult to retrieve (Barnes et al., 1996; Glucksberg et al., 1993).

Based on this, violations of event order in the follow-up statements are easier assessed in contexts that present events that typically occur in a certain order because they are illogical and conflict with the hearer's world knowledge if presented in the wrong order. Events of neutral contexts still make sense if presented in the wrong order and are not related to world knowledge. The event structure of stories that present events that are independent of each other (Experiment I) is more difficult to access because it was just learned in the previous stories and is not part of the hearer's general world knowledge already. Therefore, the contexts presented in Experiment I and III differ in the way that the interpretation of the conjunction *und* in the follow up statements, might be influenced by the accessibility of general world knowledge in logical contexts while this is not the case in neutral contexts. This might explain why participants tend to interpret the conjunction *und* temporally in logical contexts and additively in neutral contexts. Additionally, the conjunction *und* can be interpreted temporally as well as additively. If interpreted additively, participants only have to remember the events. For temporal interpretations however, participants need to remember the order of mention of the story as well in order to be able to evaluate the follow-up statement correctly. Due to the accessibility of world knowledge it is easier to evaluate the temporal order of the follow-up statements in logical contexts than in neutral contexts. A temporal interpretation of the conjunction in follow-up statements that present events from neutral contexts would be of more effort since there is no additional support by world knowledge. Therefore, it is possible that participants tend to pursue the strategy of least effort and hence evaluate the follow-up statements based on an additive interpretation of the conjunction.

The main finding of the current work was that the interpretation of the conjunction *und* is context-dependent: In neutral contexts participants tend to interpret the conjunction additively while a temporal interpretation appears to be preferred if the conjoined events typically or logically occur in a certain order. The influence of context on the interpretation of the conjunction was not considered and paid attention to in the existing studies introduced in chapter 6.1. These studies did not differentiate between different kinds of contexts. Therefore the data of the existing studies has to be treated with caution.

As mentioned already, context was not the only factor that influenced the temporal interpretation of the conjunction. Age had in both experiments an impact on the interpretation of *und* as well. The difference of the factor Age between the experiments was that Age interacted with Order and Event in Experiment I and was independent of the factors Order and Event in Experiment II and Experiment III. When contexts were presented that supported a temporal interpretation because the presented events typically occur in a logical order and are illogical if presented in reversed order (Experiment III) adults and 9-year-olds rejected statements with reversed event order marginally more often than the two younger age-groups (see Table 16, p. 154). On average, conditions that present events in reversed event order had similar rejection rates in the 5- and 7-year-olds and the rejecting rates of the 9-year-olds were similar to those of the adults. Adults and 9-year-olds rejected conditions with reversed event order more often than the younger participants, probably because they interpreted the conjunction temporally slightly more often. The acceptance rates suggest that the temporal interpretation of the conjunction increases marginally with age.

Experimental results of existing studies suggest that the temporal interpretation of the conjunction increases with age. In Experiment I in Noveck et al. (2002) an interaction of Age x Event Order was found. Rejection of statements with reversed event order increased with age. In that study 87% of the 7-year-olds, 63% of 10-year-olds and 29% of adult participants accepted statements with reversed event order. These findings are further supported by a later study from Noveck and colleagues (2009). In Experiment II of that study the authors found a significant interaction of Age x Question Type, which was due to statements with reversed event order. Children accepted reversed order statements more often than adults (44% affirmative answers given by 10-year-old children vs. 18% given by adults). This indicates that children interpreted the conjunction additively more often than adults in those experiments. Based on these findings the authors concluded that young children initially interpret the conjunction as logical connector and that the development of the temporal enrichment of the conjunction increases with age.

In experiments II and III of my study however, the factor Age influenced the interpretation of the statements independent of the factors Event and Order. This suggests that there are no significant differences between the age-groups that depend on the factors Order or Event. Consequently the marginal differences in the amount of temporal interpretations between the two youngest and the two oldest age-groups cannot be considered to be a developmental effect. It rather suggests that the differences between the age-groups are not significant and all age-groups interpret the conjunction temporally at similar rates. This finding conflicts with results of existing experimental studies on the interpretation of the conjunction. If one considers the temporal interpretation as a special type of implicatures, as Noveck and colleagues (2002) did, the findings of the present study would also conflict with a wide range of literature on the acquisition of (scalar) implicatures and research on children's comprehension of under-informativity.[91] These studies suggest that the calculation of implicatures as well as the rejection of under-informative utterances develops with increasing age (e.g. Chierchia et al., 2001; Chierchia et al., 2005; Katsos, 2009; Katsos & Bishop, 2008; Noveck, 2001, 2005; Noveck & Sperber, 2007; Papafragou & Musolino, 2003; Pouscoulous et al., 2007). Consequently, the findings of my studies can be interpreted in two ways: Either the temporal reading of the conjunction is not a case of implicatures, or alternatively theories on the acquisition of implicatures have to pay more attention to the importance of contextual influences and world knowledge on children's ability to calculate implicature.

In the first experiment of the studies presented in this chapter, events that could also occur in reversed order and would still make sense were presented. In this study the influence of age on the interpretation of the conditions was dependent on the factors Order and Event. As the results presented in Table 9 (p. 136) show, adults accepted statements with reversed event order at ceiling while children rejected these conditions more often. On average (mean of all conditions with reversed event order) 5-year-old participants rejected reversed order statements 40.7% of the times while 25.7% or negative answers were given by the 7-year-olds, 22.8% by the 9-year-olds and by 1.8% of the adults.[92] Adults accepted statements with reversed event order at ceiling, probably because they interpreted the conjunction additively. Children rejected statements with reversed event order more often, most likely because they interpreted the conjunction temporally and punished the wrong event order. This pattern is also reflected in the acceptance ratings of condition *1und3*, which is accepted least often by

[91] They consider the enrichment of the conjunction as I-implicature, where *I* refer to informativeness.

[92] Although the results of the 5-year-olds are close to chance level statistical tests revealed that many of them are consistent in their answers ($p<.02$ for six participants, $p<.01$ for three participants and not significant results ($p<.32$) for 9 participants)..

the 5-year-olds (85.2%) and most often by the adults (94.4%). Higher acceptance rates by older participants compared to those of younger participants indicate that younger participants interpret the conjunction temporally in this condition more often than older ones and reject it because event 3 does not directly follow event 1.[93] The acceptance rates and the 3-way interaction of Age x Order x Event suggest that the interpretation of the conjunction underlies a developmental effect and show that the additive interpretation of the conjunction increases with age.

That the interpretation of the conjunction underlies a developmental effect is in line with existing studies on the conjunction. However, the direction of the developmental effect in my study and the existing studies is in conflict because opposite directions of the developmental trend were shown. While previous studies suggest development of the temporal interpretation or temporal enrichment of the conjunction with increasing age, data of my first experiment (neutral contexts) suggests that the temporal interpretation of conditions with reversed event order decreases with age while the additive interpretation increases. Results of Experiment III (contexts that present events with a logical/ typical event order) revealed a general effect of age that is independent from order and event. This suggests that other age-related factors influence participants' performance in Experiment III. The interaction of Order and Event in Experiment III is independent of age. This suggests that differences of the individual age-groups in the interpretation of reversed order statements and statements in correct order are not a developmental effect. A comparison of the results of Experiment I and Experiment III suggest that the interpretation of the conjunction is only interacts with the factor age in the first experiment. Hence, the interpretation of the conjunction cannot purely be a developmental effect but must also be determined by other factors such as the nature of the events conjoined with the conjunction and additional world knowledge about events. In contexts in which the events are logically dependent, the youngest age-groups interpret the conjunction temporally least often while the same age-groups interpret the conjunction temporally most often in contexts that present neutral events. At the same time adults interpret the conjunction temporally most often in contexts where reversed event order is illogic and least often in neutral contexts. A possible explanation could be that participant's behavior in answering is influenced by their world knowledge or knowledge about the order in which events typically occur. Adults have a broader world knowledge and experience about the temporal sequence of certain events. This might explain why marginally more adults than children interpreted the

[93] The difference in the acceptance rates of condition *1und3* between the age-groups only indicates a trend because these differences are only numerical and not statistically significant.

conjunction temporally in Experiment III. In neutral contexts however, conditions with reversed event order are still logical. Therefore, adults might focus primarily on the content of the follow-up statements while children consider the order of the events as more important. Hence, adults might interpret the conjunction additively more often while children prefer the temporal interpretation. Once the events are presented in a context that strongly suggest a temporal reading (because they always occur in a certain order), adults reject conditions with reversed event order because the sentence appear illogical.[94]

Possible explanations for the finding that children interpret the conjunction *und* temporally more often than adults in neutral contexts and roughly as often as adults in contexts that present events that typically occur in a certain order might be the following: One of the strategies children use in the process of language acquisition, is that they refer to their general event knowledge and infer possible intentions of adults in order to figure out the meaning of new words (Tomasello & Akhtar, 1995, p. 220). Since the conjunction *und* can express a variety of meaning relations between its conjuncts, children probably also infer different meaning relations between the conjuncts depending on the context. As the stories presented in the experiment, connect the individual events chronologically, it is possible that especially young children still use this strategy because they know of the different functions of the conjunction. Hence they prefer the temporal interpretation when evaluating the follow-up statements because the meaning relation presented in the story is still present.

The fact that children also use the conjunction *und* to express many different kind of meaning relations between the conjuncts (Bloom et al., 1980, p. 249) suggests that they are aware of the different coherence relations the conjunction can express. Moreover, there are studies which investigated the use of the conjunction in 2- to 3-year-old English speaking (Peterson & McCabe, 1987, p. 380) as well as 4- to 6-year-old German speaking children (Skerra & Gagarina, 2012) and found that the temporal use is the most frequent one. Based on these findings one might hypothesize that if children use the conjunction *und* most frequently to express temporal relation, the temporal meaning relation might also be the most prominent one in language comprehension.

To summarize the main findings of this series of experiments, it can be said that the present series of experiments has shown the importance of contextual factors on the interpretation of the conjunction *und*. The results of the experiments revealed that the interpretation of the conjunction *und* is context-dependent. In neutral contexts adult participants tend to interpret the conjunction additively. This was reflected by the fact that the majority of adults interpreted

[94] For a similar independently developed idea see Meibauer (2012).

the conjunction temporally in Experiment III as opposed to Experiment I, in which nearly all of the adults interpreted the conjunction additively. This might explain why adults' responses to conditions with reversed event order were equivocal in Experiment I and III in the study conducted by Noveck and colleagues (2009). Apart from that, one must also consider that the study by Noveck and colleagues was conducted in French while mine was conducted in German. The conceptualisation and representation of events is influenced by language-specific principles that are influenced by grammatical aspects, specifically temporal frames that underlie language specific principles influence the ordering of events (Caroll & von Stutterheim, 2011). Therefore, the preferred interpretation of the conjunction in a certain context might also be influenced by more general language-specific influences.

That contextual attributes also influence children's interpretation of the conjunction might have been inferred already from the fact that Noveck and colleagues (2009) reported that children were more likely to enrich the conjunction if the events in the story "are made more salient". The present series of experiments revealed that young children are (in average) equivocal between additive and temporal interpretation of statements with reversed event order in logical contexts, while older children (like adults) tend to interpret statements in this kind of contexts temporally.[95] In neutral contexts, it seems that children tend to prefer the additive interpretation.[96] Children's additive interpretation of the conjunction in neutral contexts becomes even more prominent with increasing age.

In the following, the consistency of the experimental findings of the current thesis with existing studies is discussed.

Tomlinson, Bott and Bailey (2011) found that sentences that conjoin events with *and* receive lower accuracy but are derived faster than sentences that communicate the temporal relation between the events explicitly (for details see Tomlinson et al., 2011). The authors explain the lower acceptance rates of the conjunction by pointing out that participants do not necessarily have to interpret the relation between the conjuncts temporally. This is in line with the findings of my experiments that showed that the interpretation of the conjunction is context-dependent. This supports the view that lower acceptance ratings in statements that conjoin events with *and,* might be because the conjunction is quite general and can be enriched with many different meaning relations. Based on participants response times, the authors examined

[95] Equivocal refers to the results across the age-group as the majority of the individual participants are consistent in their answers to statements with reversed order in Experiment III (Results of 10 participants were significant in the $\chi 2$-test and results of 5 close to marginal significance). In Experiment I results of six 5-year-olds were significant and results of 3 participants marginally significant. However, it does not mean that participants whose results were not significant answered randomly as there might be other factors that cause inconsistency in their answers (for details see 6.3.5).

[96] At least for condition *3and2* children prefer the additive interpretation.

whether the order implication in *and*-sentences arises due to an iconic or maxim-based process (Tomlinson et al., 2011).[97] Longer response times were expected for maxim-based processes and shorter response times for processes based on iconicity. As sentences conjoined by *and* were derived faster, the authors further conclude that the interpretation of the conjunction supports an iconic account of temporal order implicatures (Tomlinson et al., 2011).

As the authors examined the interpretation of the conjunction only in a context that presented events that are typically or logically related, which strongly suggest temporal interpretations anyway (as the findings of my studies suggest), I am of the opinion that these findings (an iconicity-based process) should not be generalized to the interpretation of the conjunction *and* in general. This study only showed that temporal readings of the conjunction appear to be an iconicity-based process in the context examined (which is one that presents events that are logically related). Hence, the preferred temporal interpretation of the conjunction might be due to the strong influence of world knowledge and the conflict of formal and natural logic. Another factor that might influence processing of the conjunction in this experiment is that the authors presented statements that explicitly and implicitly connect events temporally. The presence of statements that explicitly connect statements in a temporal order might increase and additionally support temporal interpretations of the conjunction. Hence, some participants might recognize that the order of mention is relevant for the evaluation of the statements and might for convenience interpret all statements presented in the experiment temporally by default. This group of participants would presumably only cancel the temporal interpretation of the conjunction if it conflicts with world knowledge or logic (as it is the case in the implicit nonsense statements). If that was the case then statements that present events in nonsense order should have longer response times than those that indicate a temporal order implicitly and make sense. This is however something that I cannot judge because I do not know the experimental data in detail.

Bott, Frisson and Murphy (2009) examined the influence of the factor order of mention and the discourse relation that holds between the events on the interpretation of the conjunction. Results revealed that in about half of the statements that presented the events in reversed order were interpreted to present events in reversed order if the events were conjoined by *and* (for details see Bott et al., 2009).[98] The difference between the data found by Bott, Frisson and Murphy is that in their experiment "For example, 5 out of 6 participants understood *She*

[97] If the implication is an iconic process, the authors expect that the order implicature is always derived and the temporal meaning is cancelled in certain situations. Further, the authors expect that the temporal interpretation is based on the order of mention only if it is needed.

[98] More backward interpretations were found for juxtaposed sentences.

checked her email and she turned on the computer to mean that she turned on the computer first and then she checked her email, even though they saw she checked her email first in the sentence" (Bott et al., 2009, p. 690). This suggests that participants would evaluate this kind of statement as correct. In my experiment that presented events that are script-based (experiment III), almost all of the adults rejected this kind of statement, which suggests that they interpreted it as a forward temporal relation. This difference arises from my point of view due to the conflict of order and mention and world knowledge. In the experiment by Bott, Frisson and Murphy (2009) participants were asked to evaluate in which order the events occurred. It is quite natural that they will also draw on their world knowledge and evaluate this kind of statements as backward relations. In my experiment a story that clearly pointed out in which order the events occurred preceded the follow-up statement. Moreover, participants were not explicitly instructed to pay attention to the order. This might have the effect that participants in my experiment interpreted the follow-up statement more naturally without explicitly thinking about a possibly implied order, while participant in Bott, Frisson and Murphy's (2009) experiment might have evaluated statements more consciously based on their world knowledge rather on how the understood the utterance in the first place.

In another experiment (experiment III of that study) Bott, Frisson and Murphy (2009) constructed two sets of items: one set that presented events that could occur in either order but not simultaneous while the second set presented events that could occur in any order or simultaneous (for details see Bott et al., 2009). Results revealed that participants assumed that the events occurred in the order they were mentioned, no matter whether they were juxtaposed or conjoined by *and*. The authors point out that participants appear to have a weak preferred ordering for neutral events and state "Participants apparently thought that sequential ordering was pragmatically unimportant if there was no schema already in place for the event ordering" (Bott et al., 2009, p. 694). These findings are in line with my findings because adults interpreted neutral events that presented events in reversed order additively at ceiling in my experiment. This is further supported by the author's findings that most participants said that the order in which the events occurred in the statements was unclear. This indicates that participants interpreted the conjunction additively in the experimental sentences and further supports the data of my first experiment which showed that almost all adults accepted reversed order statements, most likely because they considered the conjunction as simple connector of two events. Therefore, the preferred interpretation of the conjunction in contexts that do not suggest a certain reading due to influences of scripts, frames or world knowledge seems to be additive or simply coordinating. Further support for a simple coordinating function of *and*

comes from Bott, Frisson and Murphy (2009) (experiment III), who found that participants interpreted juxtaposed sentences that present events that can occur simultaneously less frequently as simultaneous occurring, if the events were presented in form of juxtaposed compared to when the same statements were conjoined by *and*. This suggests that participants are more likely to infer a relation between both events if the events are conjoined by *and*. This is from my point of view in line with discourse theoretic approaches and approaches that consider the function of *and* as coordinating conjunction or discourse marker.

Bott, Frisson and Murphy (2009, p. 695) wonder why participants did not interpret the (neutral) events conjoined by *and* in a sequential order in their experiment, although they were "explicitly asked about order and […] the only temporal information was the order of presentation of the events" and conclude that the temporal reading of the conjunction cannot be the default interpretation.[99] These findings are not very surprising to me because they are also in line with my findings. In contrast to the experiment by Bott, Frisson and Murphy (2009), a story in which the events were clearly mentioned in a certain order preceded the follow-up statements (about the story) that had to be evaluated in my experiment. Therefore, participants should reject follow-up statements that present events in reversed order if they interpreted the conjunction temporally because they know in which order the events originally happened in the story. Participants should do so even if the order in which the events occurred is not additionally supported by world knowledge. As almost all participants did still accept reversed order statements, this indicates that they interpreted the conjunction additively in these cases and suggests that an additive reading is preferred if the events that are presented are neutral, which means that they do not typically occur in a script-based order.

Another argument which supports that world- and script-knowledge strongly influences the interpretation of the conjunction is indicated by the data of Bott, Frisson and Murphy (2009), specifically the finding that participant's sequential reading of the conjunction exceeds 30 per cent only if the interpretation is supported by script order. This is most likely because script order supports temporal interpretations (as my experiments have shown). However, the temporal readings were lower in the study by Bott, Frisson and Murphy (2009) than in my experiment, probably because the proceeding story further supports script order as it explicitly points out in which order the events occurred. The authors further point out that statements in which "there was a mismatch between world knowledge and order of presentation" were preferably interpreted in the order suggested by world knowledge (Bott et al., 2009, p. 698). This explains and further supports the findings of my third experiment, which showed that almost

[99] Instead participants were unsure in which order the mentioned events occurred (Bott et al., 2009).

all of the adults rejected statements in which the presented (logically related) events were mentioned in an order that was in conflict with world knowledge.

In general the results of the experiments conducted by Bott, Frisson and Murphy (2009) support the findings of my study. Namely, that the interpretation of the conjunction is context-dependent and is one of simple coordination if neutral events are conjoined while it is one of sequential order if events that typically, logically or script-based occur in a certain order. Beyond that, the study by Bott, Frisson and Murphy (2009) (experiment I) revealed that participants interpreted events conjoined by *and* more often as backward relations if the relation between the events was a causal relation compared to events that are temporally related. This suggests that it is not only simply the kind of events conjoined that matters (in the sense of neutral versus logical related events) but also the specific kind of relation that holds between the events in more detail. These findings support discourse theoretic approaches as well as approaches that consider the importance and influence of world knowledge for the interpretation of the conjunction.

Based on these findings the theoretic approaches to the conjunction can be narrowed down: Concerning the theoretical debate on whether the temporal interpretation of the conjunction arises by default, Bott, Frisson and Murphy (2009) suggest that additional meaning relations that rise between conjuncts by *and* are no implicatures and do not arise by default because the majority of participants interpreted neutral events conjoined by *and* additively (when order of mention was the only clue that suggested in which order the events might have occurred) although they were instructed to state in which order the events took place. Based on these findings the authors reject approaches that consider temporal interpretations as implicature and additive interpretations of instances of cancelled implicatures. To support their argument Bott, Frisson and Murphy (2009) cite studies from Glucksberg, Gildea and Bookin (1982) as well as Shapiro and Murphy (1993), who showed that implicatures can only be cancelled but not ignored. The findings of my Experiment I (that adults interpreted the conjunction additively at ceiling) would further support the argument that temporal interpretations of the conjunction are not implicatures.

7 Final Discussion

This chapter brings the empirical findings of chapter 6 together with the theories introduced and discussed in the first part of this thesis. It will be discussed which theories and approaches to the meaning and interpretation of *and* as semantic/pragmatic interface phenomenon can account for the current data (see chapter 7.1). The focus lies on what kind of contextual attributes contribute to the interpretation of the conjunction and how the individual theories account for this. As shown in chapter 2, the meaning and interpretation of the conjunction *and* is a semantic/pragmatic interface phenomenon. Therefore, it will be considered what kind of implications the experimental findings of the current dissertation have for the theories on the acquisition of implicatures and other interface phenomena (see chapter 7.2). The individual theories consider different kind of factors as important for the differences in the data between children and adults. However, none of these approaches (see chapter 5.2.3) can fully account for the data and results of the experiments discussed in chapter 6 because most of them do not consider contextual influences, specifically the influence of different types of context on the interpretation process. Therefore, it is suggested how different types of contextual factors might contribute to a more extensive explanation of the differences in the interpretation between (young) children adults (see chapter 7.3).

7.1 Theories of meaning revisited and approaches to *and*

The series of experiments introduced in the previous chapter tested the impact of different types of context on the interpretation of the conjunction *und* in 5-year-old, 7-year-old, 9-year-old children and adults. In experiment I short stories were presented that introduced events that are independent of each other in a certain order. These short stories served to establish a context for the follow-up statement that presented two of these events conjoined by *und* either in correct or reversed order. In experiment III the stories that provided the context for the follow-up statements presented events that typically or normally occur in a certain order. The events were also introduced in the order in which they normally occur. This kind of stories should invite temporal interpretations of the conjunction because a sequential interpretation should in this specific context require less processing efforts because this interpretation is supported and invited by world knowledge and typical event schemata. As in experiment I, the follow-up statements presented two of the events that occurred in the story in correct or reversed order. These follow-up statements had to be evaluated as right or wrong. Statements that presented events in reversed order are ambiguous – they require a *yes*-answer if the conjunction is considered as simple connector or as representative of an additive meaning be-

tween the conjuncts, while *no*-answers signal that the speaker interpreted the relation between the conjuncts temporally and hence rejected the statement.

Participants' evaluations of these statements give insights in how people understand and interpret the conjunction in different types of contexts. If one follows the Relevance Theoretic principle of least effort, one can assume that participants follow the path of least effort and evaluate the statement based on its basic meaning first before they construct or think about other meaning relations that could hold between the conjuncts. Results of the conducted experiments show that the amount of participants who followed an additive interpretation of the conjunction in statements that presented events in reversed order was so high that a main effect of Order was even found in contexts that support temporal reading of the conjunction. These findings support theories that suggest that the basic meaning of the conjunction corresponds to the one of the logical operator as well as theories that define the meaning of *and* as one of simple coordination. Theories that were discussed in chapter 3 and define the meaning of *and* in this way were put forward by Grice as well as Neo-Gricean linguists (e.g. Atlas & Levinson, 1981; Gazdar, 1979b; Horn, 1992; Levinson, 1987, 2000; Meibauer, 1997; Posner, 1979), Kitis (2000a), Txurruka (2003) as well as Asher and Vieu (2005). The approaches by Sweetser (1986, 1990), who defined the function of the conjunction as joining side by side, and Buscha (1989) are also consistent with the experimental findings.[100]

An issue that was addressed in this work and can be discussed based on the findings of chapter 6 is what kind of contextual attributes contribute to the interpretation of the conjunction. The results of experiments I (that presented events that could occur in any kind of order and would still make sense) and III (that presented events that typically or logically occur in a certain order) show that the nature of events that are connected as well as the order in which they are reported matter (for details see section 6.6). The fact that the results of both experiments are influenced by the factor order indicates that there were enough people who interpreted the conjunction additively and consequently accepted reversed order statements, that the difference in the amount of expected answers for the condition in correct and that in reversed order became significant. However, there are differences in the amount of additive interpretations in experiment I and experiment III, which show that statements that present

[100] This thesis focusses only on the temporal interpretation of the conjunction *and*. With respect to other meaning relations that can be expressed by the conjunction, some of these theories and approaches (e.g. approaches that try to explain the meaning and function of *and* with the help of PCIs as well as Sweetser's (1986, 1990) and Cohen's approach (1971)), are challenged by approaches that consider contextual influences as an important factor for the interpretation of *and* (e.g. approaches that consider the different meaning features as GCIs, Relevance Theoretic approaches, Kitis (2000a), Schiffrin (1986), Txurruka (2003) as well as Asher and Vieu (2005)). This is because the former cannot account for all the various readings of the conjunction or because they have severe shortcomings such as contradicting meaning-features.

events in reversed order were in general interpreted additively more often in experiment I than in experiment III.[101] The fact that additive interpretations of the conjunction were more prominent in experiment I and temporal interpretations more prominent in experiment III, supports the idea that meaning relations beyond the additive meaning of the conjunction *und* are influenced by contextual factors. With respect to context, it is relevant what kind of events are conjoined and if these events are due to world- and common-knowledge associated with a fixed or logical order in which they typically occur or whether they are not associated with a specific order, script or event schemata. In the case of experiment III, it is world and common knowledge as well as knowledge about certain event-schemata and structures of situations and events that support temporal interpretations. This is because statements that present neutral events or events that could very well also occur in reversed order do still make sense if the events are reported in reversed order and interpreted temporally. However, if events are presented for which a script or fixed schemata with respect to order is available, temporal readings are strengthened because recipients are familiar with the fact that these kinds of events typically occur in this order. If these events are presented in reversed order and interpreted temporally, the whole statement appears odd because it conflicts with people's knowledge.

The fact that the events that are mentioned in the statements that had to be evaluated by the participants are preceded by a short- story, in which the events are narrated in a specific order, might also contribute to temporal interpretations of the conjunction in the follow-up statements. However, a story in which the events occurred explicitly in a temporal order preceded the follow-up statements in both experiments. Still, there are differences in the amount of additive interpretations of the conjunction in both experiments. This further supports the importance of different types of knowledge as well as the influence of fixed script and event-schemata on the interpretation of the conjunction.

Moreover, there are differences in the amount of additive interpretations between the age-groups and experiments. The neutral events (experiment I) were interpreted additively most often in all age-groups and almost all conditions (see Table 6, p. 119). Events that typically or logically occur in a certain order (experiment III) were interpreted in average close to chance-level (5- and 7-year-olds) or received additive interpretations less frequently than temporal ones (9-year-olds and adults).[102] These findings might be affected by the fact that not all types of knowledge are accessed equally easily and that knowledge that can be assessed easily is

[101] In experiment III, the results of the individual age-groups differ with respect to the amount of additive interpretations.

[102] The individual participants were however quite consistent in their answers. Hence the closeness to chance-level for the average across the age-group results from the fact that there are participants who prefer the temporal interpretation as well as participants that prefer the additive interpretation within the same age-group.

more likely to be used during text comprehension (Barnes et al., 1996; Glucksberg et al., 1993).

The different types of contexts presented in experiment I and III draw on different types of knowledge which are more or less easy to access and therefore have different influences on the interpretation process: The relation between the events in experiment I has just been learned in the previously heard stories and might hence belong to the category of knowledge that is more difficult to access. The relation between the events in experiment III is a logical one or script based and might, apart from being just learned in the proceeding story, be accessed more easily because the order in which the events occurred is additionally supported by general world knowledge. This supports the idea that participant's knowledge might support the interpretation process and result in more temporal interpretations of the statements in experiment III than in experiment I. Furthermore, the age-groups tested, differ in their general and common world knowledge. Script-based contexts are supposed to be less complex than neutral contexts that only present events that are related (somehow). This could explain why the conjunction was in general interpreted temporally more often in experiment III and why the amount of temporal interpretations in experiment III slightly increases with age. It is assumed that especially the youngest age-groups give fewer temporal interpretations in experiment I than in experiment III (although they are the age-group that gives the highest amount of temporal interpretations in experiment I) because the context in experiment III is less complex and easier to access than the one in experiment I. These findings further support that different types of knowledge have to be distinguished with respect to the interpretation of the conjunction *und*. It is not enough to say that it is context that invites interpretations of the conjunction that are different from the additive one. Different types of context have to be distinguished and characterized in more detail.

Most of the approaches to the meaning and interpretation of the conjunction consider different types of knowledge as important in the interpretation process (Relevance Theory; Asher & Vieu, 2005; Kitis, 2000a; Levinson, 2000; Txurruka, 2003). Some of these theories even explain the relations that arise between conjuncts conjoined by *and* with the help of scripts and schemata (e.g. Relevance Theory; Kitis, 2000b). These theories can account best for the finding of the current dissertation that the interpretation of the conjunction is strongly context-dependent and that temporal interpretations of the conjunction arise predominantly in script and schemata-based contexts. If the theories that consider different types of knowledge as important in the interpretation process would also point out that different types of contexts have to be distinguished and that there are also events that are not script- or schemata-based,

they could also account for the findings of the current dissertation and explain why the conjunction is not in all kinds of contexts interpreted predominantly temporally. Moreover, they could, based on a distinction of script- or schemata-based contexts vs. neutral contexts in which events are not related to each other based on world knowledge, make clear predictions about when the conjunction is preferably interpreted temporally and when additively.

7.2 Implications for the acquisition of Pragmatics

As indicated in chapter 5, context in the wide sense is important for the acquisition of language and pragmatics. The meaning and interpretation of the conjunction *and* is clearly a semantic/pragmatic interface phenomenon (see chapter 2), although it is still unclear whether temporal meaning relations communicated by the conjunction have to be considered as implicature, enrichment or some other phenomenon. As some of the theories introduced and discussed in chapter 3 consider the interpretation of the conjunction as implicature, this section is concerned with how the experimental findings of the current dissertation match with the theories on the acquisition of implicatures and other theories on the acquisition of interface phenomena.

Results of the experimental data revealed that even 5-year-old children are able to interpret the conjunction *und* temporally (experiment I and III). The amount of temporal interpretations is however influenced by contextual factors. In contexts that present events that are logically related, all age-groups (children and adults), rejected the follow-up statements that presented events in reversed order most often (experiment III). In these contexts adults and 9-year-olds rejected statements with reversed event order marginally more often than the two younger age-groups (see Table 16, p. 154). The 5-year-olds behaved in average (mean of all conditions with reversed event order) similar as the 7-year-olds and the 9-year-olds rejected reversed order statements roughly equally as often as the adults. Hence, it can be said that the temporal interpretation of the conjunction increases only marginally with age in contexts that present events that typically occur in a certain order.[103]

In contexts that present events that do typically not occur in a fixed order, children generally interpret the conjunction temporally more often than adults did in the same situation (experiment I). In average (mean of all conditions with reversed event order) the 5-year-olds gave by far the highest amount and the adults the lowest amount of negative answers to statements that presented events in reversed order. This suggests that children interpreted the conjunction temporally and punished the wrong event order more often than adults. This pattern is also

[103] A general effect of Age that influenced the results independent of the factors Order and Event was found. This suggests that the results are influenced by other (age-related) factors.

reflected in the acceptance ratings of condition *1und3*, which is accepted least often by the 5-year-olds (85.2%) and most often by the adults (94.4%).[104]

A comparison of both experiments reveals that children's and adults' temporal interpretation of the conjunction *and* is context-dependent. The youngest age-groups interpret the conjunction temporally less often if logical related events are presented (compared to contexts that present neural events) while adults interpret the conjunction temporally most often in logical contexts. This suggests that the interpretation of the conjunction is influenced by the type of events conjoined and whether additional world knowledge, e.g. about the order of certain events is involved.

In the following, it will be discussed how well these findings fit with approaches to the acquisition of implicatures and other hypotheses about the acquisition of semantic/pragmatic interface phenomena (see chapter 5.2.3).[105] Several hypotheses on the acquisition of implicatures were introduced and discussed in chapter 5, section 5.2.3. Based on experimental findings from Katsos (2009), Barner, Brooks and Bale (2010) and Davies and Katsos (2010), it was already argued in chapter 5.2.3 that the Reference-Set as well as the Processing Limitation Hypothesis, which argued that children fail to calculate implicatures because they have a limited working memory and cannot handle the required processing costs, cannot be upheld. The reason was that these hypotheses imply that children should fail to calculate implicatures independently of the contextual situation as processing costs have to be brought up in any kind of context. This implication is not in line with the data and results found by the series of experiments introduced in this chapter. If working memory and processing costs alone would be responsible for children's failure in calculating implicatures or enriching statements, then 5-year-olds should have enriched statements less often than adults in experiment I and III, which was not the case. If this hypothesis would be more specific and distinguish between processing costs in different types of contexts, e.g. by stating that some types of contexts require more processing costs than others, it could account better for the current data.

Another hypothesis that has been rejected is the Pragmatic Delay Hypothesis which claimed that children lack pragmatic knowledge which is necessary to calculate implicatures. That this

[104] The acceptance rates and the 3-way interaction of Age x Order x Event suggest that temporal interpretations of the conjunction in contexts that present events that do typically not occur in a certain order underlies a developmental effect and show that the additive interpretation of the conjunction increases with age.

[105] It is not for sure that temporal interpretations of the conjunction *and* are implicatures or arise due to other pragmatic processes. What is for sure however is that theories on the acquisition of pragmatic phenomena have to pay more attention to the importance of contextual influences and world knowledge. As shown in chapter 3, there are a variety of theories that try to account for the meaning and interpretation of the conjunction and only some of them consider temporal meaning relations of the conjunction as implicatures .Therefore, the hypotheses discussed are not explicitly restricted to approaches that explain the acquisition of implicatures but also consider hypothesis on other pragmatic phenomena such as the acquisition of informativeness.

cannot be the case was already indicated by empirical findings from Chierchia and colleagues (2005), Röhrig (2010), Barner, Books and Bale (2010). The experimental findings of the current work further support this as they show that even 5-year-old children do obviously possess the pragmatic knowledge required to enrich statements and to calculate implicatures. This is because 5-year-old children interpreted the conjunction temporally even more often than adults in experiment III.

The scale specific account as suggested by Barner and Bachrach (2010) is based on the assumption that the meaning of words is acquired before knowledge of the scale that belongs to a certain word and alternative terms emerge.[106] This hypothesis seems to account specifically for the acquisition of scalar implicatures and distinguishes between different kinds of scales. However, it is for the following reason not suitable to explain the findings of the current experiment, even if the conjunction *and* would be considered as a scalar term: Based on this hypothesis it could be argued that 5-year-olds reject statements that present events in reversed order less often than adults when events that logically occur in a certain order are conjoined (as in experiment III), because they are not aware that *and* and *and then* can form the scale <*and then, and*> and consequently do not recognize that the follow-up statement is underinformative. This appears to be consistent with the findings of experiment III. If events are conjoined with *and then* children should reject statements in reversed order more often because it is the stronger term of the scale. Findings of experiment II show that this is the case. Therefore, the results of experiment II are not in conflict with this theory. However, if one looks at the results of experiment I, in which the scale is exactly the same as in experiment III, it is clear that 5-year-olds must be aware of the scale <*and then, and*> because the majority of them rejected statements that presented events in reversed order if the events do typically or logically not occur in a certain order. Hence, the hypothesis that children are not aware that *and* and *and then* form a scale is not sufficient and there must be other factors that are of importance. In the case of the current experiments, it must be the nature of the events conjoined rather than the type of scale that matters with respect to whether young children calculate implicatures or not. This factor is not considered by the scale specific account. The conclusion that can be drawn from this is that even if the conjunction *and* was considered as scalar term, the hypothesis could still not account for the findings of the current experiments as it does not consider contextual factors. The enriched lexicon hypothesis (cf. Guasti et al., 2005) which suggests that children's mental lexicon is incomplete and therefore blocks the calculation of scalar implicatures cannot be upheld with respect to the conjunction *and* for the same reasons.

[106] This account is only suitable if the conjunction is considered as scalar term.

Chierchia and colleagues (2005) suggested that adults and children focus on different aspects when evaluating statements. Specifically, adults are assumed to evaluate statements based on appropriateness while children are supposed to focus on truthfulness and falsity of the statement. In the experiments conducted in chapter III, statements in reversed order can either be interpreted temporally (in which case they would be false and should be rejected) or additively (and should be accepted as the content is correct). However, statements that present events that logically or typically occur in a certain order in reversed order (experiment III) appear less appropriate than events that are simply somehow related are connected in reversed order. This is because formal logic and natural language logic are in conflict. Based on the experiment and the hypothesis by Chierchia and colleagues (2005), children should accept or reject reversed order statements in both contexts (neutral related events in experiment I vs. logical related events in experiment III) similar often. This is because additive readings of reversed order statements should lead to acceptance of the statement in both contexts and temporal interpretations should trigger rejecting rates in both contexts. Moreover, the acceptance of additive readings in both contexts should only be influenced by appropriateness (as logical related events presented in reversed order appear less appropriate). Adults however should reject reversed order statements that present events that typically or logically occur in a certain order (experiment III) more often because they are less appropriate than reversed order statements of events that do typically not occur in a fixed order (experiment I). This is because in the former case formal logic and world knowledge interact and conflict with each other as world knowledge suggests and supports a temporal reading in the statements that are logically related. In neutral contexts however, conditions with reversed event order are still logical. If one looks at the results of both experiments, it turns out indeed that participants reject statements that present events in reversed order more often in experiment III than in experiment I. In experiment III adults and 9-year-old children also reject reversed order statements in average more often than the 5-year-old and 7-year-old children. This is in line with the hypothesis suggested by Chierchia and colleagues (2005). However, the results of experiment I are not in line with this hypothesis because children of all age-groups also rejected reversed order statements in experiment III more often than in experiment I. Moreover, children of all age-groups rejected reversed order statements in average more often than adults. Results of both experiments suggest that appropriateness of the statement could be a factor that influences children and adults evaluations. Still, the rejection rates of reversed order statements given by the 5- and 7-year-old participants are slightly lower than those given by the 9-year-old and adults. A possible reason might be that adults have broader world

knowledge and more experience or knowledge concerning the temporal sequence of certain events and therefore reject reversed order statements more often than children in experiment III. The hypothesis put forward by Chierchia and colleagues (2005) seems to be partially right in the way that children and adults focus on different aspects when evaluating statements. However, in the context of the current experiments these aspects are influenced by contextual factors in the wide sense and are not truthfulness/ falsity vs. appropriateness but rather general content and more detailed content, specifically order of the events mentioned. Therefore, adults might focus primarily on the content of the follow-up statements while children consider the order of the events as more important in experiment I. Hence, adults might interpret the conjunction additively more often while children prefer the temporal interpretation. Once the events presented in a context strongly suggest a temporal reading (because they always occur in a certain order) which makes the sentence appear illogical, adults seem to adjust their criteria for sentence evaluation and reject conditions with reversed event order more often (experiment III).

The Pragmatic Tolerance hypothesis (Katsos, 2009) explains differences in the amount of calculated implicatures and enriched utterances by suggesting that children might be more tolerant towards violations of informativeness and accept utterances as long as they are (at least partially) true. This explanation matches with the results of experiment III, if one argues that 5- and 7-year-old children accept reversed order statements in experiment III more often than 9-year-olds and adults because the content of these statements is still correct and it's only the chronological order in which the events occurred that is wrong. However, this argument is not in line with the experimental data of experiment I (in which children rejected reversed order statements more often than adults). If this hypothesis was right, then children should accept statements that present events in reversed order more often than adults not only in experiment III but also in experiment I. This is however not the case.

The hypothesis put forward by Röhrig (2010, 2011), that children and adults value different maxims more than others may explain the differences in the rejection rates between children and adults in experiment I. It could be argued that children pay more attention to the maxim of quantity and reject statements because they focus on content and order while adults focus on the content of the statements only. Although this hypothesis could explain why adults and (young) children behave differently in experiment I, it cannot fully account for the data of the current study because it does not consider the influence of context on the interpretation process.

What the data of the current thesis clearly show, is that the interpretation of the conjunction is influenced by contextual factors, specifically the kind of events conjoined and the knowledge involved. As just shown, none of these hypothesizes can account for the differences in the interpretation of the conjunction *und* between children and adults because none of them considers the influence of different types of context on the interpretation process.

That contextual factors influence children's performance on evaluating under-informative utterances and the calculation of implicatures has already been shown in studies that tested children's comprehension of implicatures with regard to non-lexical scales (e.g. Katsos & Bishop, 2008; Katsos & Bishop, 2011; Papafragou & Tantalou, 2004). Papafragou and Tantalou (2004) showed for example that 4- to 6-year-old children have the fewest difficulties with under-informative statements in contexts that presented ad hoc scales, followed by scales that are created by encyclopedic/ world knowledge and worst with terms of a lexical scale. Katsos & Bishop (2008) tested 5-, 7-, 9- and 11-year-old children and adults and found that adults appeared to have slightly more difficulties with context-dependent ad hoc scales than with context independent-scales while young children had more difficulties with context independent-scales. The findings that contexts that are supported by encyclopedic/ world knowledge and contexts that invite for ad hoc scales (neutral contexts) influence participant's performance concerning pragmatic comprehension are in line with the results of my experiments.[107] Therefore, it seems to be of importance that theories on the acquisition of implicatures and other pragmatic comprehension phenomena such as enrichment consider the influence of context and knowledge involved.

Under the assumption that most of the theories discussed in this section are at least partially right (as all of them are based on empirical findings), a possible explanation that considers all these factors and explains the differences in the interpretation of the conjunction *and* between (young) children and adults in different contexts suggested in the next section.

7.3 Age-dependent influences on (children's) pragmatic interpretations

The enrichment of statements and the calculation of implicatures are not only influenced by one factor but by an interplay of a variety of different factors. The following factors influence pragmatic comprehension and the calculation of implicatures: processing costs, evaluation of statements from a different perspective, preferably adhere to different maxims, knowledge (world knowledge and knowledge about scales) and tolerance towards violations of informativeness. The experiments conducted in this work suggest that there were differences in the

[107] The contexts in experiment III are supported by world knowledge while the neutral contexts in experiment I are not additionally influenced by these factors and are therefore closer to ad hoc scales.

complexity of context which might lead to differences in the interpretation of statements that present events in reversed order.

The familiarity and knowledge of scripts and certain event orders supports interpretations of reversed order statements in experiment III. This knowledge strongly suggests a temporal interpretation and makes statements that present events that are logically related more easily to process for participants who are familiar with these scripts and orders or know that the mentioned events typically or logically occur in a certain order. This additional knowledge is not required in statements of experiment I. If participants would not be familiar with the typical relations between the events in experiment III, then the enrichment or temporal interpretation of reversed order statements of experiment III would probably be as costly as the temporal interpretation of reversed order statements in experiment I. This is because in both cases participants could not rely on typical scripts or event order (these relations do not exist in experiment I and are not known in experiment III). Under the assumption that children's world knowledge and knowledge about certain event orders is not as complex as the one of adults, I suggest that temporal interpretations of statements in reversed order are more costly for children than for adults if events are logically related. This is because additional influences of world knowledge support the interpretation process. This would be in line with the experimental data which shows that children appear to have more difficulties with temporal interpretations of reversed order statements in experiment III than adults (which is reflected by slightly lower rejecting rates of reversed order statements in the data of the 5- and 7-year-old participants).

However, during material preparation attention was paid that all of the events presented in the stories are events that children should be familiar with. For this reason statements that present logical related events (experiment III) should be easier to process for children than events that typically do not occur in a certain order and its interpretation is purely context-dependent (experiment I). This assumption is based on the idea that additional world knowledge about certain event orders supports temporal interpretations. The data of experiments I and III show that children of all age-groups interpret the conjunction temporally more often (in average across the individual conditions in reversed order) in experiment III than in experiment I. This is reflected by higher rejecting rates of reversed order statements. Results of experiment III also suggest that participants can handle more complex contexts with increasing age because the temporal interpretation of the statements increases slightly with age.

In experiment I, children reject reversed order statements more often than adults. This matches with other findings reported in the literature, namely that adults have more difficulties with

context-dependent (ad hoc) interpretations than children (Katsos & Bishop, 2008). A possible hypothesis could be that adults rely stronger on their knowledge than children when interpreting statements and therefore have more difficulties in ad hoc contexts because the interpretation of these types of statements is not necessarily supported by world knowledge. It is possible that adults focus more on their knowledge and know that the temporal order is more relevant for logically related events than for events that are not logically related. They therefore stick to the additive interpretation in neutral contexts. Children however might use comprehension strategies which they are familiar with from the acquisition of the lexicon: They infer the meaning (in this case the meaning of the connector) from the meaning relation between the conjuncts introduced in the story and therefore interpret the conjunction temporally more often than adults (Tomasello & Akhtar, 1995, p. 220).

Additional to processing costs and interpretation strategies that directly influence the interpretation and comprehension of the statements between the age-groups and might develop with age, there are other factors that might have an impact not only on the performance of the different age-groups but also on the performance of individual participants. These factors will be described in the following and can influence the interpretation of every participant (independent of its age).

The first relevant factor is the evaluation behavior, specifically the criteria participants adopt when evaluating statements. If participants are only focused on whether the events mentioned are correct and not on their order, then they will interpret the statements additively. If participants focus on more detailed information, specifically whether the order mentioned is correct then they might reject the statement either because no order is indicated (additive interpretation) or because they interpreted the statement temporally and reject it because of wrong event order.

Another possibility is that participants assume that the speaker of the follow-up statement made his utterance as informative but not more informative than required (maxim of quantity). The participants rely most likely on the idea that the speaker should have uttered *und dann* if he meant to indicate a temporal relation between the conjuncts in the follow-up statement. As no temporal relation is explicitly indicated, they interpret the statement additively and assume that order is not relevant and evaluate the statement based on whether the events were mentioned in the story or not.[108] Some people might also assume that the order in which the events occur is relevant but does not have to be repeated by the speaker of the follow-up

[108] In contexts that present events that are logically related, reversed order might be rejected more often because the order in which the events occurred appears to be of greater importance. This is because the events mentioned cannot occur in reversed order or appear extremely odd.

statement because the event order was just mentioned in the story and is assumed to be still present. These participants might enrich the follow-up statements temporally and reject them because they present events in reversed order. Other participants might reject follow-up statements because they believe that they are not informative enough (as they do not mention a temporal order while a temporal order is explicitly given in the story).[109] Participants' possible considerations are also influenced by how tolerant participants are towards underinformativity and what kind of information they consider as under-informative. If a participant considers the procedure or order in which the events occurred as important, he or she is more likely to enrich the utterances temporally and to reject reversed order statements consequently. These possible types of participants or motives for evaluating statements are not necessarily age-dependent but can occur in all groups of participants. The results of experiment I however seem to indicate that there might be a tendency in the young children to pay attention to details of the story or the sequential order of the events because they reject reversed order statements more often than older children and adults. With increasing age of the participants the content of the story appears to be more important (possibly because they assume that the speaker knows the correct order in which the events occurred and therefore just mentioned the events independently of their order). In experiment III all groups of participants appear to consider the order of events as important (as reversed order appears odd or is impossible) as indicated by higher rejection rates in all age-groups compared to experiment I.

[109] This cannot only affect statements that present events in reversed order but also statements that present the events of the story in correct order.

8 Conclusions

This dissertation aimed to investigate contextual influences on the meaning and interpretation of the conjunction *und*. Three truth-conditional judgement studies with 5-year-old, 7-year-old and 9-year old children as well as adults were conducted in German. The main question of interest was: Why do some occurrences of the conjunction suggest a temporal interpretation? Based on the experimental findings of the current studies, it can be said that context (in the wide sense) as well as order of mention are involved in the interpretation process. The results of the experiments further revealed an effect of age. The effect of these three factors will be shortly summarized in the following.

Does context influence the interpretation of the conjunction, specifically, how do different types of context influence the interpretation of the conjunction? Contextual factors, specifically the specific type of context, influence the interpretation of the conjunction. As the basic meaning of the conjunction *and* can be quite general, more specific meaning relations arise most likely due to the hearer's knowledge and inferences about the relation between these events. The experimental data of experiment I and II (see chapters 6.3 and 6.5) indicates that, if two events that typically occur in a certain order are conjoined, it is more likely that the hearer interprets the conjunction temporally than additively. This is because certain events, especially those that typically or logically occur in a certain order are stored in certain scripts, frames and event schemata as part of the hearer's world or common knowledge. The hearer accesses his knowledge to infer a more specific relation between them because these scripts and schemata support and contribute to the interpretation process. This is not possible with events that do not typically occur in a fixed or logical order. As participants cannot draw on knowledge that specifies how the events are related to each other in neutral contexts, it is likely that they are satisfied with the general or additive interpretation of the conjunction.

The second important influence on the interpretation of the conjunction *und* is, how the order of events introduced in a context influence the interpretation of *und*? The data show that the order has the following effects: In logical as well as neutral contexts, statements that present events in reversed order are rejected more often than statements that present events in the correct order. Further, events in correct order that are logically related tend to receive lower acceptance ratings (especially by the 9-year-olds and adults), when the events mentioned do not directly follow each other, such as in condition *1und3*. The latter effect is related to a strict temporal interpretation of the conjunction in logical contexts.

In the following it is considered how the interpretation of the conjunction develops with age: Do children interpret the conjunction differently than adults? How do preschoolers and

school-children interpret the conjunction *und*? Does context influence the interpretation of the conjunction in children?

Children and adults interpret the conjunction *und* differently. The difference in the interpretation of the conjunction by children and adults is stronger in neutral contexts compared to contexts that present logically related events. In contexts that present events that typically or logically occur in a certain order the 9-year-olds behave similar as the adults, which means that the majority of them rejects statements that present events in reversed event order. The younger age-groups, specifically the 5- and 7-year-olds accept this type of statements more often than adults. This suggests that they interpret the conjunction temporally less often than older children and adults. In neutral contexts the interpretation of the conjunction in statements that present events in reversed order is age-dependent: A small minority of adults rejects statements that present events conjoined by *und* in reversed order in these contexts, while children reject this type of statements much more often than adults. The acceptances rate of reversed order statements increases with age in neutral contexts which suggests that the temporal interpretation of the conjunction decreases with age in neutral contexts. The type of context also influences children's interpretation of the conjunction. While 5-year-olds reject reversed order statements similarly often in logical and neutral contexts, the 7- and 9-year olds reject these type of statements more often in logical contexts than in neutral contexts.

Finally, it was considered in how far the results of the present studies support theories and approaches to the meaning and interpretation of the conjunction that are discussed in the literature: Does the temporal interpretation of the conjunction arise due to the meaning of the conjunction, is it the default interpretation or is it triggered by contextual factors? This question cannot be answered definitely based on the experimental results of this dissertation. It is for sure that contextual factors, especially the type of events connected by *und*, strongly influence the interpretation of the conjunction. However, it remains unclear whether the temporal reading is the default interpretation of the conjunction (e.g. Levinson, 2000), part of the conjunction's basic meaning (e.g. Bar-Lev & Palacas, 1980b) or arises due to pragmatic processes and contextual influences (e.g. Kitis, 2000a; Schiffrin, 1986; Txurruka, 2003). This is because findings on how the conjunction is processed are required. The experimental results of the current work do not allow drawing conclusions about the processing of the conjunction. In order to be able to make statements about this issue, experimental data from online-studies are necessary.

9 Outlook

In this chapter ideas and suggestions for follow-up studies that profit from the findings of this work are put forward. Finally, the relevance of the main findings of this work will be pointed out.

Based on the findings of experiments I and II, the question why children perform worse in follow-up statements that present events conjoined by *und dann* (‘and then’) in correct order (experiment II), compared to the same follow-up statements that conjoin events by *und* (‘and’) (experiment I) arose. A possible explanation that was suggested in chapter 6 was that children are primed by the temporal order of the events in the stories that precede the follow-up statements. It was hypothesized that children reject follow-up statements that present events in correct order more often when a temporal relation is explicitly expressed because they consider the follow-up statements in experiment II as over-informative. This could be the case because the order of the events was explicitly mentioned in the story and repeated in the follow-up statements, although the order in which the events were presented was correct already.

This hypothesis can be tested experimentally by presenting exactly the same material as in experiment I and II with the slight modification that the events in the stories are not explicitly linked by temporal markers. Under the assumption that participants consider the events of the story as a sequence of events, they should still interpret the follow-up statements similarly as they did in experiment I and II. If it is the case indeed that children rejected follow-up statements with correct event order in experiment II because they punished over-informativity, then they should reject statements that present events in correct order less often after this modification than in experiment II. Additionally to this modification participants could be instructed to pay attention to the order in which the events were narrated in the story to ensure that they interpret the events of the story in a chronological order.

Experiment II served to validate the results of experiment I. However, a detailed analysis of the results and participants comments to statements of experiment II, has shown that some of the 5-year-olds appear to have interpreted the conjunction *und dann* (‘and then’) additively (see chapter 6.6). Based on the fact, that the conjunction was interpreted additively by some of the 5-year-olds, one can conclude that these children considered the conjunction rather as a general discourse connector than a temporal marker. This suggests that the temporal relation expressed by *und dann* is not as clear as expected. Moreover, a study by Jisa (1984) on the equivalent French conjunction *et pis* (‘and then’) revealed that *et pis* is used by children to encode a variety of meaning relations (sequential, additive, no relation, causal, adversative).

Young children used *et pis* to encoded a wider variety of relations than older ones.[110] Unfortunately, there are to my knowledge no studies that investigate whether German children used the conjunction *und dann* in a similar way as French children use *et pis*. If this was the case, this could explain why younger children performed worse with statements that presented events linked by *und dann* in reversed order than older participants. The fact that the temporal relation expressed by *und dann* does not seem as clear to all participants as expected, I would have been better off, if I had chosen the conjunction *und danach* ('and afterwards') to conjoin the events in the statements of the control experiment. This would most likely have led to even clearer results concerning the interpretation of reversed order statements in experiment II as no additive interpretation is possible with *und danach*.

Another question of interest is why do adults perform worse than children or interpret the conjunction temporally less often than children in neutral context-dependent utterances? Is this because children rely generally stronger on contextual clues while adults predominantly rely on their world knowledge? A suggestion how this could be tested empirically is put forward in the following.

I expect that children have disadvantages with the temporal interpretation of logical context-dependent statements because the interpretation is probably triggered by the relation that holds between the conjuncts which is in some types of context strongly influenced by world knowledge. Adults can due to broader world knowledge derive the relation between conjuncts more easily and consider the relation between the conjuncts as additive one, if a temporal or causal relation is not strongly supported by world knowledge or appears irrelevant. Based on this I suggest to test the performance of children and adults in different types of context that require world knowledge to different extents.[111]

With respect to the interpretation of the conjunction *and*, three types of contexts could be tested. In the first type of context the conjunction has to be enriched on the basis of strong influence of world knowledge. Events that are conjoined by the conjunction are events that typically or logically occur in a certain order. This kind of context involves common and basic world knowledge, which is also familiar to children. These types of statements should be the ones

[110] Nevertheless, *et pis* was used most frequently to encode temporal relation followed by additive and no-relation use.

[111] Ideal would be situations in which the conjunction is interpreted based on contextual influences because empirical findings discussed in the literature showed that children perform better in ad hoc contexts than in situations based on WK (see Papafragou & Tantalou, 2004). The disadvantage is that one cannot test the direct influence of WK in context-dependent situations. If events are conjoined by *and* without a proceeding story that states in which order the events occurred, children should have more difficulties than adults interpreting the statements because they cannot rely on contextual information as strongly as they could in the experiments conducted in chapter 6.

that are processed most easily because the interpretation is strongly supported by world knowledge. The second type of context in which the interpretation of the conjunction could be tested is a neutral context which presents statements that are related but do not typically occur in a certain order, such as *The pilot got on board and the stewardess coughed*. This type of statement does not require knowledge about certain scripts and frames. As participants strive for coherence, when interpreting statements, they might try to interpret the relation that holds between the events temporally or causally. Alternatively, they could consider the events as simultaneous events or stick to the additive interpretation. Hence it should be easy to derive an interpretation other than the additive one. However, world knowledge beyond the one of frames or scripts of typical situations is required for more detailed interpretations than additive ones. Therefore, children should have more difficulties with the enrichment of these statements than adults. The third type of context that could be tested, presents events conjoined by *and* that are not related at all. In this type of context it should be difficult to derive more specific meaning relations that hold between the conjuncts because the events are not related. However, it is still possible that participants try to make sense of the event combination and try to interpret the conjunction somehow. The processing of these types of contexts should be most difficult.

Apart from the initial purpose of this experiment, the theoretic approach put forward by Kitis (2000a), who suggested that additional effort is necessary on the part of the speaker if the frames activated in the statement appear incompatible, might be tested by means of online-methods. Based on the hypothesis suggested by Kitis (2000a), statements that present unrelated events (type III contexts) should be unacceptable because they cannot be interpreted at all and should therefore cause more comprehension difficulties than statement that connect events that are related based on frames or scripts. Related events (type II contexts) should cause slightly more comprehension difficulties and interpretation efforts than events that are related based on frames or scripts (type I) contexts.

One of the main differences between the theories on the meaning and interpretation of the conjunction is whether the temporal reading is the default interpretation of the conjunction (e.g. Levinson, 2000), part of the conjunction's basic meaning (e.g. Bar-Lev & Palacas, 1980b) or arises due to pragmatic processes and contextual influences (e.g. Kitis, 2000a; Txurruka, 2003). Experimental results of the current work do not allow drawing conclusions about the processing of the conjunction. In order to be able to make statements about this issue, experimental data from online-studies are necessary. Methods that can be used to examine cognitive processes during reading are eye-tracking studies (Rayner, 1998) and event-

related potential studies. If eye-tracking (ET) is used as a method to investigate the processing of the conjunction during reading, information about comprehension difficulties can be traced with the help of a variety of measures. First fixation times and first pass times can provide information about comprehension difficulties that occur early, while late measures such as total time and go past time can give information about difficulties that occur later during language processing. However, it has to be kept in mind that the conjunction *and* has a high probability to be skipped during the reading process because it is a very short function-word. If one treats the conjunction as separate region in the data analysis, it is likely that one does not get enough data for this region because words that have only 3 letters have a probability of 30% to be skipped (Rayner & McConkie, 1976, p. 834).

With respect to experimental investigations into the basic meaning of the conjunction online-studies are required. As discussed above, Tomlinson, Bott and Bailey (2011) conducted an online-study and measured processing times for order interpretations in contexts that present logically related events and suggested based on their data, that the interpretation is an iconicity based process. However, Tomlinson, Bott and Bailey (2011) presented the statements conjoined by *and* along with statements that explicitly express a temporal relation. This might have invited participants to interpret all statements presented in the experiment temporally by default because they might have recognized that a temporal interpretation is relevant for the evaluation. Moreover, the findings of my work have shown that the interpretation of the conjunction is context-dependent and that logically related events strongly suggest a temporal interpretation. To see whether the iconic interpretation simply results from the kind of statements presented (logically related events) or is also influenced by the experimental environment (statements that explicitly express a temporal relation), suggestions for further (modified) experiments are made in the following. To test whether the influence of context and world knowledge have the strongest impact on the interpretation of the conjunction, it would be interesting to conduct the same study as the one by Tomlinson, Bott and Bailey (2011) with statements in which the conjunction occurs in a context that conjoins events that do not typically occur in a certain order. Theoretically data of such an experiment would show, whether the iconic reading of the conjunction found by Tomlinson, Bott and Bailey (2011) results from the influence of context and world knowledge on the interpretation. Such an experiment can however not be put into practice so easily because it has to be accessed how people interpret the statements. Further, sensicality judgments are not appropriate in neutral contexts because the events can occur in any order and would still make sense. Moreover, it cannot be ruled out that participants interpreted the statements additively.

To rule out that experimental statements with explicit temporal order influenced the interpretation of the statements in the experiment by Tomlinson, Bott and Bailey (2011) e.g. by inviting participants for default temporal interpretations, an experiment that does not mix items that express temporal order implicitly and explicitly could be designed. This can be done most easily if exactly the same experiment as the one by Tomlinson, Bott and Bailey (2011) was conducted without statements that express a temporal relation explicitly. The results of this kind of experiments could be compared to the one by Tomlinson, Bott and Bailey (2011) to see whether statements conjoined by *and* are still derived faster than statements with an explicit temporal order.

Another very important observation made in this thesis is that the results of the experiments conducted, indicate that the comprehension of semantic/pragmatic interface phenomena is not a late acquisition phenomenon in general. This is supported by the fact that 5-year-olds interpret the conjunction *und* temporally more often than adults in contexts that conjoin neutral events. Based on this, theories on the pragmatic development in children have to be reconsidered and investigated in more detail. It is of special importance that these detailed observations and further experiments have to consider the influence of different types of contexts on the pragmatic comprehension of children. These findings could contribute to a detailed model about the stages of the acquisition of pragmatics. Moreover, the main findings of this thesis, specifically children's pragmatic comprehension strategies and skills should be kept in mind when constructing and formulating texts or tasks in children's books or schoolbooks.

The results of the studies conducted in this work show the impact of context on the interpretation of the conjunction *and*. However, there is no clear and commonly agreed definition of context in the current research literature (see contributions in Finkbeiner et al., 2012). It is also not widely agreed in the literature what kind of contextual attributes affect meaning and at which level of meaning (for details see the figures that summarize the individual theories of meaning in Appendix A). The findings the current work underline the request for a commonly agreed definition of context and suggest that context should have a more prominent role in the theories of meaning. Due to the lack of a commonly agreed definition of context the approaches to the meaning of *and* consider contextual influences to different extents as well and have varying opinions about contextual attributes that affect the meaning and interpretation of the conjunction. (For an overview of what kind of contextual features are considered in the individual theories see Table 1.) This further illustrates the urgent need for a commonly agreed definition of context and the role of context in theories of meaning. In order to account for these needs, a definition of context (at least for the purpose of this work) was given and a

suggestion for the role of context at the semantic/ pragmatic interface was made (for details see chapter 2, Figure 14 and Appendix A.5).

From an interdisciplinary perspective, the empirical findings of this thesis can be useful for the development of future algorithms that are able to process pragmatic aspects of language. Specifically, conjuncts and different types of events conjoined by the conjunction *and* could be processed properly under the consideration of contextual factors and world knowledge.

10 References

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11 Appendix

A Theories of Meaning

This chapter is concerned with theories that explain how meaning as well as not explicitly mentioned aspects of utterance meaning arise. Differences in meaning between what is explicitly said and parts of meaning that are not explicitly expressed but still communicated has for a long time been a debate between "Ideal Language Philosophers" and "Ordinary Language Philosophers" (Sbisà, 2011) (see Appendix A.1). The terms Ideal Language Philosophers and Ordinary Language Philosopher originate from the linguistic turn in in the 20th century, when analytical philosophers started to look for a "rational agreement in philosophy" that could lay the ground for cooperation (Sbisà, 2011, p. 12). Based on this purpose two groups of philosophers arose: those who assumed the existence of an ideal language (Ideal Language Philosophers) and those that promoted "an ideal understanding of our ordinary language" (ordinary Language Philosophers) (Sbisà, 2011, p. 12).

Grice introduced his theory of implicatures and suggested to distinguish between 'what is said' and 'what is implicated' to account for the differences in meaning between logical and natural language (see section Appendix A.2). Nowadays, differences between meaning that is explicitly uttered and meaning that is communicated beyond words, is discussed at the semantic/pragmatic interface (Bach, 2004; Carston, 1999; Horn, 2006; Turner, 1999). The focus of research at the semantic/pragmatic interface is on the distinction between semantic and pragmatic influences on utterance meaning as well as on the role and definition of truth-conditions.

As both truth-conditions as well as contextual influences appear to be of importance and should be discussed with regard to the meaning of the conjunction *und* ('and'), this chapter introduces and discusses current theories of meaning at the semantic/pragmatic interface.[112] Specific claims about the conjunction *and* will be discussed in chapter 3.

The current chapter will highlight that research at the semantic/pragmatic interface is confronted with several challenges. The main challenges are that the individual approaches use their own terminology for certain phenomena and that some terms are used differently or have different meaning notions across the theories of meaning (see section). To avoid that the same drawbacks affects the current work, an attempt to define the most important terms is made and a description of how they are used in the remaining chapters of this thesis is given in sec-

[112] The theories of meaning as well as the approaches to the meaning of the conjunction *und* ('and') introduced and discussed in the following sections and chapter are not only applicable to the meaning of the German conjunction *und*, but also apply to the meaning of the logical conjunction in other language, e.g. the English conjunction *and* or the French conjunction *et*. Therefore, I will from now on use *and* when referring to the logical conjunction in general.

tion A.5. This clarification is important for the discussion of the individual theories on the meaning of the conjunction in chapter 3.

A.1 Ideal Language Philosophy

Formal language philosophers such as Frege (1892), Russell (1924 cited in Sbisà, 2011, p. 13) and Moore (1966) were concerned with the meaning of words and sentences. In their framework of Ideal Language Philosophy they distinguished formal languages from natural languages and tried to apply rules of formal languages to natural language in order to explain the meaning of words and sentences in natural languages. According to Ideal Language Philosophy, the meaning of a sentence is created by its truth-conditions, which in turn are determined via syntax and semantics (Recanati, 2006c, p. 442f.).

In the following the core idea of Ideal Language Philosophy is applied to natural language sentences containing the conjunction *and*. In formal languages *and* is a logical connector and is formally represented as &, ∩ or ∧. The truth-conditions of the logical connector ∧ are presented in Table 21. According to the truth table definition of ∧, a sentence in which the conjuncts *p* and *q* are conjoined by ∧, is only true if both conjuncts are true (see Table 21).

Table 21: Truth conditions of *and*

p	q	p ∧ q
true	false	false
true	true	true
false	true	false
false	false	false

If one applies the truth definition of *and* to natural language as it is done in the Ideal Language Philosophy, one comes up with the following conclusions: Sentences with arbitrary meaning can be connected and the order of the conjoined sentences does not affect the truth conditions of the whole sentence since it is irrelevant (Meibauer, 2010). This implicates that the following sentence is acceptable.

(96) *We will go to the city tomorrow and cats like milk.*

However, people normally do not utter this kind of sentences, since the individual conjuncts are not related to each other at all and the sentence as a whole does not make any sense. Moreover, truth-conditions predict that there is no difference in meaning between the following sentences:

(97) *Peter went swimming and earned his swimming badge.*

(98) Peter earned his swimming badge and went swimming.

In natural language however, there seems to be a difference between (97) and (98), namely that Peter went to the swimming pool and earned his swimming badge there in (97) while he earned his swimming badge at an earlier point in time and then went to the swimming pool in (98). Therefore, statements (97) and (98) seem to express different things although they consist of exactly the same conjuncts – just in the reversed order. These examples have shown that the meaning of the whole sentence cannot be defined by the truth-conditions alone because statements sometimes seem to convey additional information, which is not explicitly mentioned but created by additional (contextual and pragmatic) influences and processes. This is in contrast to what the truth conditions of *and* predict for the examples just mentioned above and therefore is a challenge for the position of Ideal Language Philosophy, as this theory cannot account for the differences in meaning just discussed.

Another example which clearly expresses the differences between natural and formal languages is the following statement:

(99) Klaus had dinner and fell asleep.

If the order of both conjuncts was reversed, example (99) would be true according to formal logic if both of the conjuncts are true. In natural language this example is often not understood as a simple coordination of two events in one statement but is typically interpreted as a sequence of activities. If the order of the events in (99) was reversed in natural language, we would not just end up with a different understanding of the statement than predicted by the truth definition of *and* but we would also be faced with a conflict of logic, since it is not possible to fall asleep and to have ones dinner afterwards (without waking up before). Therefore, it is not possible to apply the rules of the logical operator to the natural sentence.

That there are or appear to be differences between natural language and formal language is well-known and has already been pointed out by Grice in his *Logic and Conversation*:

> "It is a commonplace of philosophical logic that there are, or appear to be divergences in meaning on the one hand, FORMAL devices […] - ~, ∧, ∨, ⊃, (x), […] (when these are given a standard two-valued interpretation) – and, on the other, what are taken to be their analogues or counterparts in natural language – such expressions as not, and, or, if, all, some […]." (Grice, 1975: 41)

While Ideal Language Philosophers considered context-sensitivity as defect of natural languages, the opposing camp, namely the Ordinary Language Philosophers such as Strawson and Grice, favored a descriptive approach to natural languages and considered these differences in meaning as important features of natural language (Recanati, 2006c: 442).

For this reason, Grice proposed to distinguish between the logic of formal operators and natural languages:

> "[…] not only do the two logics differ, but sometimes they come into conflict; rules that hold for a formal device may not hold for its natural counterpart." (Grice, 1975: 43)

In order to solve the conflict and explain the meaning between natural and logical language, Grice introduced his theory of implicature and proposed to distinguish between 'what is said' and 'what is implicated' in natural language.[113] This theory will be sketched in the following.

A.2 Grice

As mentioned before, the crucial distinction proposed by Grice is the one between 'what is said' and 'what is implicated' in natural language. Differences in meaning that arise between the said and the implicated are ascribed to contextual influences and pragmatic processes.
With 'saying' Grice refers to the part of the utterance, which is close to the conventional meaning:

> "In the sense in which I am using the word *say*, I intend what someone has said to be closely related to the conventional meaning of the words (the sentence) he has uttered. […] Given a knowledge of the English language, but no knowledge of the circumstances of the utterance, one would know something about what the speaker had said, on the assumption that he was speaking standard English, and speaking literally." (Grice, 1989b, p. 25)

In Grice's theory contextual influences affect the conventional meaning of a sentence to ascribe meaning to indexicals and free variables and to determine the meaning of ambiguous words. Therefore, the full meaning of 'what is said' is context-dependent and influenced by certain pragmatic processes such as disambiguation, reference fixing and saturation.

> "But for a full identification of what the speaker had said, one would need to know (a) the identity of x [where *x* refers to the demonstrative *he*], (b) the time of utterance, and (c) the meaning, on the particular occasion of utterance, of the phrase in the grip of a vice."
>
> (Grice, 1989b, p. 25)

With the term 'what is implicated' Grice refers to those kinds of meaning aspects which arise in conversational exchanges. Implicatures are additional and implicit notions of meaning beyond what is explicitly said and based on the following assumptions:

[113] Ideal Language philosophers were aware of this problem as well. However, they did not ascribe these meaning differences, which are often influenced by contextual factors, to pragmatic influences. Instead they neglected pragmatic influences and considered the mismatch between formal and natural languages as a defect of natural language.

1. The speaker is cooperative in the sense that he obeys the Cooperative Principle:

   "Make you conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of the talk exchange in which you are engaged." (Grice, 1989b, p. 26)

2. The speaker as well as the hearer are rational:

   "Our talk exchanges do not normally consist of a succession of disconnected remarks, and would not be rational if they did. They are characteristically, to some degree at least, cooperative efforts; and each participant recognizes in them to some extent, a common purpose or set of purposes, or at least a mutually accepted direction." (Grice, 1989b, p. 26)

3. Implicatures are based on certain norms which Grice calls Conversational Maxims.[114] The Conversational Maxims consist of the Maxims of Quantity, Quality, Relation and Manner as well as their sub-maxims and state that speakers should make relevant, connected remarks and follow a purpose, when contributing to a conversation.[115]

Moreover, Grice (1975, p. 46) points out that the Maxims of Quantity, Quality and Relation are related to 'what is said' while the Maxim of Manner describes how it should be said. A violation of these maxims by the speaker, such as a less informative answer than required, triggers certain pragmatic inferences in the conversational partner and leads to the calculation of implicatures. This is because humans are pragmatically orientated and the hearer assumes that the speaker is cooperative. Consequently, he is looking for a relation between the individual conversational contributions. As a result of this the hearer will conclude that the speaker did not utter the more informative statement because it does not hold or because a lack of knowledge or information does not put him in the position to make the particular statement. In some cases however it is not possible to stick to all the maxims at the same time because these maxims are interacting or in conflict with each other. In this kind of situation the speaker is forced to give up one of the maxims but has to inform his interlocutor to stick to a certain maxim or sub-maxim (Green, 1989; Kearns, 2000). If the speaker does not do so, the hearer will assume that all of the maxims are obeyed and might draw wrong inferences from the conversational contribution. In this framework, differences between logical and natural language *and* are hence considered as implicatures.

[114] All of the Gricean Maxims as well as their sub-maxims are assumed to be known and will not recapulated in this thesis. For details on the Conversational Maxims see Grice (1989b, pp. 26-27).

[115] An ideal theory explains as much as possible with as few assumptions as possible. Therefore, Neo-Griceans such as Levinson (2000) and Horn (1996) and other philosopher and linguists developed Grice's approach further by trying to reduce the amount of Conversational Maxims. The Relevance Theoretic framework is based on a single maxim of Relevance (Wilson & Sperber, 1997).

Concerning truth-conditions, Grice points out that one has to differentiate between truth-values for 'what is said' and 'what is implicated'. The truth-values for both levels of meaning are independent of each other and might differ:

> "Since truth of conversational implicatum is not required by truth of what is said (what is said may be true – what is implicated may be false), the implicature is not carried by what is said, but only of the saying of what is said […]." (Grice, 1975, p. 58)

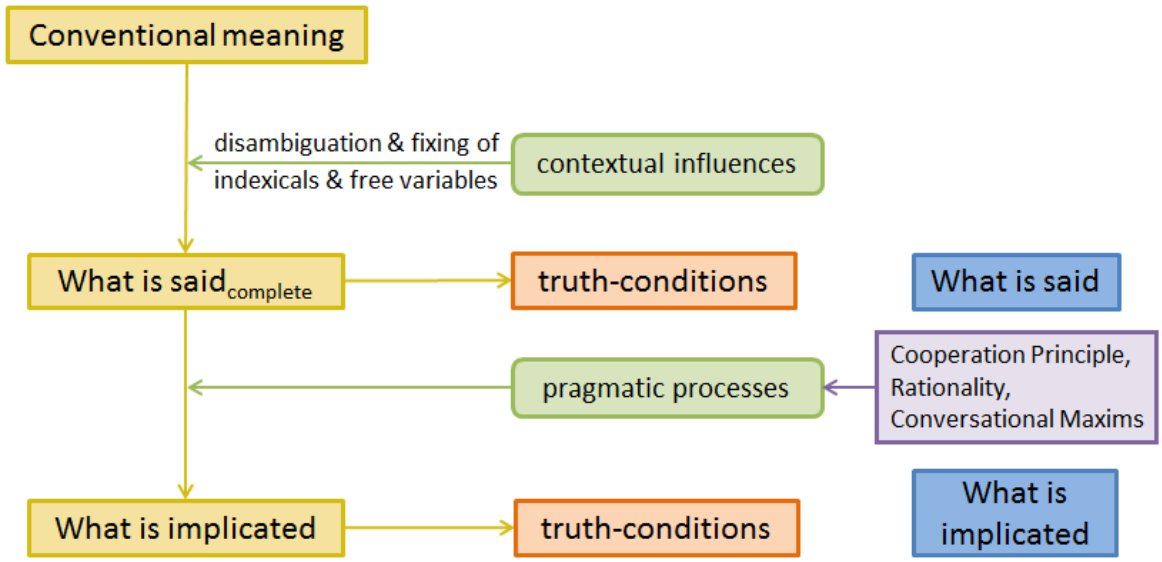

Figure 8: Grice's Theory of Meaning

Based on Grice's explanations on the differences between 'what is said' and 'what is implicated', I suggest that his theory of meaning could be summarized and depicted with the help of the illustration given in Figure 8. The model has three levels of meaning (depicted by yellow boxes), because I assume (based on Grice's statements that 'what is said', is "closely related the conventional meaning" and not fully identifiable without the help of contextual information) that the literal meaning of an utterance can be split up in the conventional meaning which presents something like an 'uncompleted what is said' and the complete notion of 'what is said', which one arrives at after the computation of certain contextual information. Further pragmatic processes based on the general Cooperative Principle and its Conversational Maxims are necessary to derive what is implicated.

A.3 Research at the semantic/pragmatic interface

The Theory of Ideal Language Philosophy was unable to account for non-literal and figurative language, indexicality and ambiguity because it considered contextual influences on meaning

as a defect of natural language.[116] This did however change in the middle of the 20th century (cf. Bar-Hillel, 1954; Reichenbach, 1947). Contextual influences were now considered as an elementary component of natural language (Recanati, 2005).

Since then not only the linguistic field of semantics was concerned with meaning but also the field of pragmatics. However, it seems that there has been no clear-cut definition of what pragmatics is. In general, pragmatics is understood as a linguistic field, which deals with language use. However, it is controversially discussed and seems unclear how pragmatics should be defined in detail and based on which criteria it should be separated from semantics (see Carston, 1999, 2010; Turner, 1999). Several theories of meaning have been suggested and discussed to provide a framework for explaining the meaning of natural language sentences and to characterize processes within this framework as either semantic or pragmatic (Bach, 2002, p. 66). The criteria on the basis of which these approaches distinguish semantics and pragmatics include truth-conditions (e.g. literalism), meaning vs. use (e.g. contextualism), and context independence vs. context dependence (Bach, 2002, p. 70; 2005b, p. 475; Katz, 1977). Carston (2008, p. 322) summarizes the various distinction criteria of current theories as follows:

(1) Context-independent linguistically encoded meaning (LEM) versus speaker meaning (or communicated meaning or utterance meaning).
(2) LEM plus contextual values for pure indexicals versus speaker meaning.
(3) LEM plus contextual values for all indexicals versus (the rest of) speaker meaning.
(4) Minimal proposition expressed versus (the rest of) speaker meaning.
(5) Intuitive proposition expressed versus (the rest of) speaker meaning.

The different criteria mentioned by Carston (2008, p. 322) concerning the semantic/pragmatic distinction will be discussed in the individual approaches in the following sections. Exemplary for the distinction in (2) is minimalism (see Appendix A.3.1), while Indexicalism (see Appendix A.3.2) draws the semantic/pragmatic distinction based on the criteria mentioned in (3). I will come back to terminological issues at the semantic/pragmatic interface (such as LEM vs. minimal proposition) in Appendix A.4 and A.5. Several approaches to the semantic/pragmatic distinction will be introduced in the following sections. It will be considered how these models define semantics, how they define truth-conditions and at which level of meaning truth-conditions are at work. Moreover, it will be considered, how these models deal

[116] Early attempts at the semantic/pragmatic interface strictly distinguished semantics from pragmatics. Although it was admitted that semantics and pragmatics complement each other, these two domains were considered as independent non-overlapping fields (for details see Recanati, 2006b, p. 450). According to these early views, the syntax, semantics and pragmatics were modular, whereby each discipline provided input for the following one. Exemplary for these early views are the approaches by Morris (1938) and Carnap (1942).

with contextual influences and processes, e.g. whether they consider contextual influences generally as pragmatic influences or allow for finer distinctions and differentiate between different kinds of context. An approach that distinguishes between two kinds of context was put forward by Bach (2002, 2005a): Semantic context refers to "a set of parameters whose values fix or delimit the semantic values of expressions with variable references" (Bach, 2005a, p. 43) while pragmatic context is a "set of salient mutual beliefs and presumptions among participants at a stage in a conversation" (Bach, 2005a, p. 43).

A.3.1 Minimalism

This section is concerned with Minimalism, an approach which is the most radical form of literalism. From the minimalist's point of view semantics is concerned with the conventional meaning of linguistic expressions. Accordingly, semantic meaning is considered as syntactic structures plus meaning, which is reflected by truth-conditions (Bach, 2005a, p. 24). Pragmatics is, by contrast, concerned with speaker's use of words.

Contextual influences are, except in the case of true indexical expressions and free variables, not allowed to affect the semantic meaning of an utterance.[117] Therefore, the semantic content of a sentence is only minimally different from the linguistic meaning expressed by the sentence. It is assumed that the semantic content of a non-ambiguous sentence without indexicals corresponds to "the proposition expressed by *every* utterance of that sentence" (Bianchi, 2011, p. 54). In the case of true indexicals, demonstratives and personal pronouns (which Cappelen and Lepore (2005b) defined as 'Basic Set') pragmatic processes are allowed to affect the semantic content of these words, because the conventional meaning of the sentence demands that these values are assigned meaning (cf. Bianchi, 2011; Borg, 2004).[118] These kind of pragmatic processes are the only processes that are allowed to affect semantic content because they are triggered by the meaning of the sentence itself (e.g. a context-sensitive word or morpheme, or free variable in the logical form) and are therefore linguistically controlled pragmatic processes which are also known as bottom-up processes (Recanati, 2005, p. 175).

Truth-conditions are assigned to the sentence at the semantic level and are only influenced by bottom-up processes. According to the minimalist approach truth-conditions are assigned to the sentence based on its conventional meaning and are only affected by pragmatic processes

[117] There are several conceptions about the term context discussed in the literature. For an overview on what kind of contextual features are involved in language comprehension see Schumacher (2012). In this and the following sections, I do not define or distinguish between different types of context yet but follow the terminology of the authors of the respectively described model of meaning. For details on my definition of the term context see Appendix A.5.

[118] Pragmatic processes will be dealt with in more detail in the next paragraph.

in the case of indexicals or free variables where meaning of the sentence has a "slot" which has to be fixed contextually (Bianchi, 2011, p. 54; Recanati, 2005, p. 175).

As the semantic meaning of a sentence is affected by pragmatic processes, a very clear distinction between different kinds of pragmatic processes has to be drawn in order to be able to differentiate between semantic and pragmatic meaning. Three kinds of processes that affect meaning can be distinguished. Pragmatic processes at the pre-semantic level are in cases of ambiguity and ellipsis responsible for disambiguation by picking up the correct syntactic structure (Bianchi, 2004). At the semantic level, pragmatic processes assign values to indexicals and free variables. The pragmatic processes at the semantic level are mandatory and triggered by linguistic expressions. Saturation is a process at the semantic level, which completes the meaning of a sentence by assigning semantic values to context-dependent constituents. Processes at the semantic and pre-semantic level are also called bottom-up processes because they are triggered by the syntactic structure and the linguistic material. They are the only pragmatic processes that have an impact on the determination of the literally expressed proposition. The third kind of pragmatic influences are optional and context-driven processes and are at work at the post-semantic level. These processes are also called top-down processes because they are not triggered by the linguistic material but exclusively by contextual or situational factors. They are needed for the derivation of conversational implicatures, enrichment and transfer. Top-down processes are needed to specific the proposition implicated by the speaker and are essential because in some cases the conventional meaning of a sentence does not make sense in the particular context or is in conflict with Grice's Cooperative Principle (Bianchi, 2011; Recanati, 2005).

Figure 9 depicts and summarizes the Minimalists approach to the semantic/pragmatic distinction based on the contents and explanations of the texts introduced and discussed in this section. As illustrated, truth-conditions belong to the field of semantics and can be influenced by contextual information which is triggered by bottom-up processes.

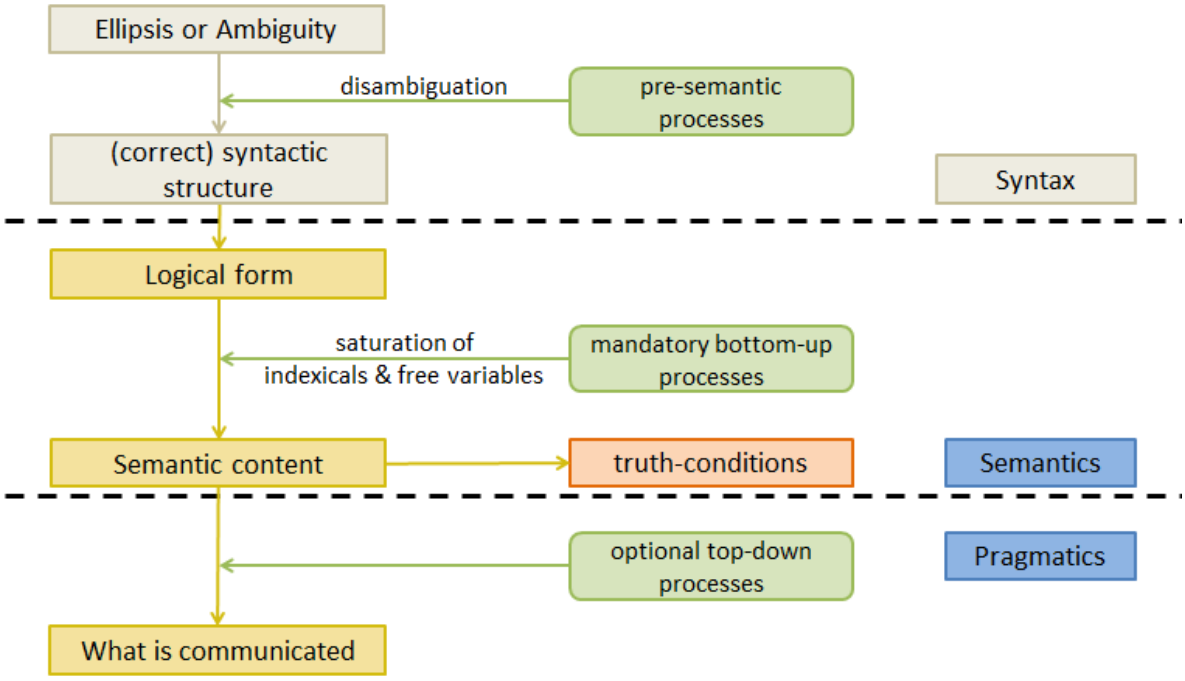

Figure 9: Minimalism

A.3.2 Indexicalism

Indexicalism is another literalist approach between Minimalism and Contextualism. Representatives of this approach are Stanley and Szabò (Stanley, 2000; Stanley & Szabó, 2000). Compared to Minimalism it allows slightly more contextual influences on semantic meaning. Just as in the approach of Minimalism, bottom-up processes exclusively assign values to context-sensitive items, if demanded by the conventional meaning of an expression. In contrast to minimalists, indexicalists assume that the linguistic meaning of context-sensitive items has a semantic gap and includes an instruction about how to fill the gap (Recanati, 2005, p. 184; Stanley, 2000). These gaps which are in the indexicalists' framework referred to as hidden indexicals are part of the logical form of a sentence and serve to restrict the influence of pragmatic processes on semantic meaning (Bach, 2005a; Bianchi, 2011; Stanley, 2000; Stanley & Szabó, 2000). These gaps were introduced because in the statement *It rains*, the place at which it rains is considered as free variable that has to be contextually specified. The Binding Criterion states that contextual influences do not optionally influence the truth-conditional content but are assigned to a free variable (Recanati, 2006b, p. 104). Consequently, the truth-conditional content of a sentence is partly context-dependent because hidden indexicals and context-sensitive items have to be assigned a value before truth-conditions are assigned to the semantic meaning of a sentence (Recanati, 2006b, p. 104; Stanley, 2000;

Stanley & Szabó, 2000). This is the only pragmatic process that is allowed to affect truth-conditions, because this mandatory process, which is called saturation, is trigged by a syntactic element of the sentence. The difference between saturation in the sense of Minimalism and the one of Indexicalism is that saturation does not only affect overt but also hidden indexicals. All of these contextual effects on truth-conditional content are, as Stanley (2000, p. 391) argues in his paper, "traceable to elements in the actual syntactic structure of the sentence uttered" (cf. Bianchi, 2011, p. 56; Recanati, 2006b, p. 89).

Indexicalism differs from Minimalism because it assumes that the elements influenced by mandatory bottom-up processes do not have to be explicit but can also be hidden elements. Consequently, indexicalists have to prove for each sentence that does not contain a free variable or indexical but shows contextual influences on its truth-condition, that the utterance contains a hidden indexical. This is important because only in this case it can be argued that it is a process of saturation which influences the truth-conditions.

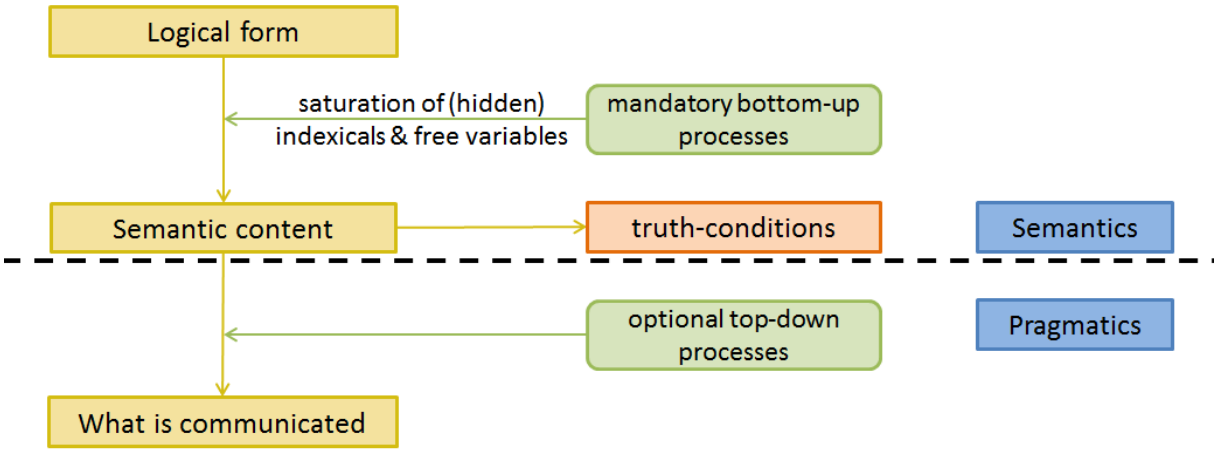

Figure 10: Indexicalism

Figure 10 shows that Indexicalism also distinguishes optional pragmatic processes from mandatory processes. This illustration is based on the basic assumptions of Indexicalism as described in the texts that are discussed in this section. Indexicalism assumes that verbs have complex frames with argument roles. To give an example, the verb *open* is treated like an indexical expression which has argument roles e.g. for the instrument a door is opened with. The assignment of contextual values to argument roles of verbs is an optional process because context rather than the syntactic structure determines which arguments are assigned values to (Recanati, 2005, p. 187). If it is for example relevant to provide information about whether the door is opened with a key or with a picklock then the instrument role has to be filled. If it is irrelevant with what instrument the door is opened the argument role can remain empty. Therefore, the process of assigning contextual values to argument roles of verbs is not a case

of saturation because it is contextually triggered and consequently not allowed to affect the truth-conditional content of the sentence. As in Minimalism, mandatory bottom-up processes can affect truth-conditional contents while optional top-down processes cannot.

A.3.3 Availability based approach

Recanati (2006b) criticizes minimalist approaches because they assign truth-conditions to the semantic content of an utterance (or 'what is said'). He argues that truth-conditions that are assigned to semantic content will yield different results depending on the context. Recanati (2006b) presents example (100) (which is uttered by a mother to her child) and explains that in the view of Minimalism the truth-conditions assigned to the semantic content of this sentence state that in all kinds of context the addressed person is not going to die – he or she is basically immortal.

(100) *You are not going to die.*

This however is not what the mother, who made the utterance, wanted to express, nor what the child (as hearer) will infer on hearing this statement and will therefore give the wrong truth-values for the utterance.

To account for this challenge, Recanati (2006b) came up with the availability based approach. In this approach, literal truth-conditions and intuitive truth-conditions are distinguished. The term literal truth-condition refers to the standard kind of understanding of truth-conditions, as presented in literalism. Intuitive truth-conditions, on the other hand, are affected by the intention of the speaker. The following example also underlines the necessity to draw this distinction:

(101) *He went to the cliff and jumped.*

This example is taken from Recanati (2006b, p. 13) who got it from Carston. Based on the minimalist's and indexicalist's approach, the truth-conditions of this statement will be satisfied in the situations given in a) to c):

a) if he went to the cliffs and jumped up and down at the cliffs (in the sense of repeatedly) (cf. Burton-Roberts, 2005)
b) if he jumped up and down (repeatedly) somewhere and later on went to the cliffs
c) if he went to the cliffs and jumped down the cliffs.

In natural language a hearer who hears (101) will process this statement based on contextual information and will most likely comprehend that a male person jumped down the cliffs. For this reasons, Recanati comes up with a different notion of 'what is said'. He follows Rumfitt

(1993) and defines "the conscious output of the complex train of processing which underlies comprehension" as 'what is said' (Recanati, 2006b, p. 16).

Contextual influences on meaning are in the availability approach generally considered as pragmatic processes. In contrast to Minimalism and Indexicalism, it is not only saturation but also optional pragmatic processes that affect the level of 'what is said' in the Availability Approach. Recanati classifies the processes of saturation and optional pragmatic processes such as free enrichment in (102) as primary pragmatic processes. Therefore, the meaning-level of 'what is said' belongs in this approach to the field of pragmatics. In example (102) the enriched meaning of the utterance is given in brackets.

(102) Clara took her shovel, went to the sandpit and dug a hole [in the sand with her shovel].

Recanati's approach to the semantic/pragmatic distinction is depicted and summarized in Figure 11. This illustration is based on the basic assumptions of the Availability Approach as described in the texts that are discussed in this section. As can be seen in Figure 11, truth-conditions are not assigned to the literal meaning of a statement but to the "primary truth-evaluable representation" of a sentence, which can be assessed by the hearer and corresponds to the level of 'what is said' (Recanati, 2006b, p. 17). This idea is also the basis for approaches in the framework of Contextualism. As Recanati differentiates between literal and intuitive truth-conditions, but only means intuitive truth-conditions when referring to truth-conditions, the category of literal truth-conditions is only highlighted in grey. Challenging for this account is that the level of minimal sentence meaning gets lost because optional top-down processes already affect the meaning level of 'what is said'.

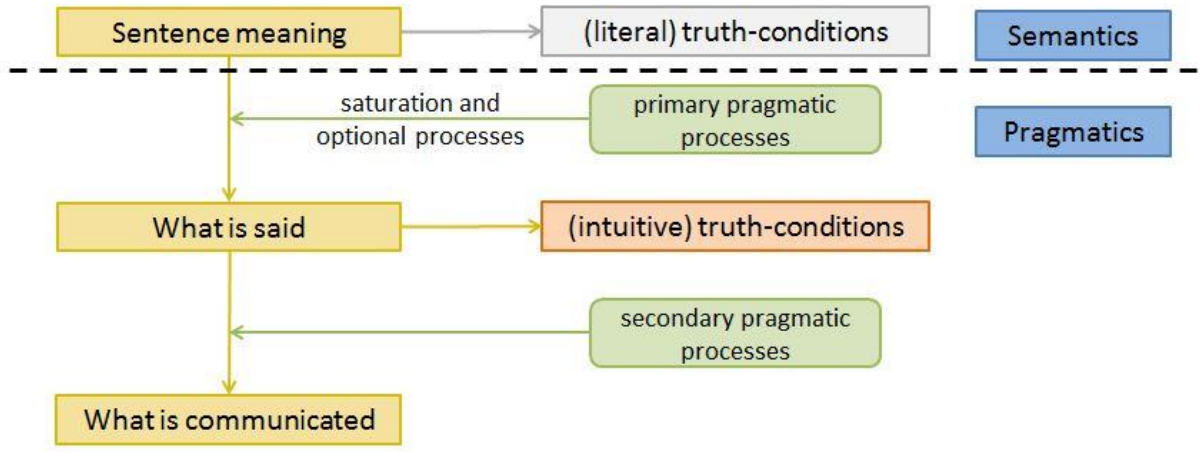

Figure 11: Availability Approach

A.3.4 Syncretic View

The Syncretic View is a semantic/pragmatic interface account which tries to mediate between Minimalism and the Availability Approach by splitting up 'what is said' in a semantic and a pragmatic component (Bach, 1994; Cappelen & Lepore, 2006; Recanati, 2006b; Salmon, 1991). This brings about four instead of three different levels of meaning. The semantic level of 'what is said' refers to the literal (minimal) meaning while the pragmatic level of 'what is said' refers to the intuitive meaning of the utterance and is influenced by optional pragmatic top-down processes (see Figure 12). This illustration is based on the basic assumptions of Syncretic View as described in the texts that are discussed in this section. Other approaches that also distinguish between semantic and pragmatic 'what is said' were put forward by Salmon (1991) and Bach (1994).

Moreover, the Syncretic View as outlined in Recanati (2006b) is not based on the standard (genuine) notion of truth-conditions. Advocates of the Syncretic View hypothesize that truth-conditions are dependent on background information and influenced by speakers meaning. Recanati (2005) explains the notion intuitive truth-conditions with the help of (103).

(103) *Oscar cuts the sun.*

He points out that there are different possible ways of cutting depending on what is cut. For example, cutting someone's hair is different than cutting a cake. He therefore argues that truth-conditions are influenced by optional top-down processes. In (103) for instance, the precise way of cutting is determined and influenced by optional pragmatic processes, depending on what *sun* refers to. If *sun* refers to a cake that comes in the form of a sun, than *cut the sun* means that the cake is cut into pieces. If however, *sun* refers to a drawing or picture of a sun, than *cut the sun* means cut (out) the sun on the picture. A third option I can imagine is that the grass or a hedge, e.g. in a designers garden, was grown in the form of a sun, then *cut the sun* would mean something like shorten the grass or the newly grown leaves of the hedge. As the just mentioned notion of truth-condition is influenced by pragmatic effects and dependent on the speaker's meaning, it is referred to as intuitive truth-conditions. Genuine truth-conditions on the other hand underlie the minimalist constraint.

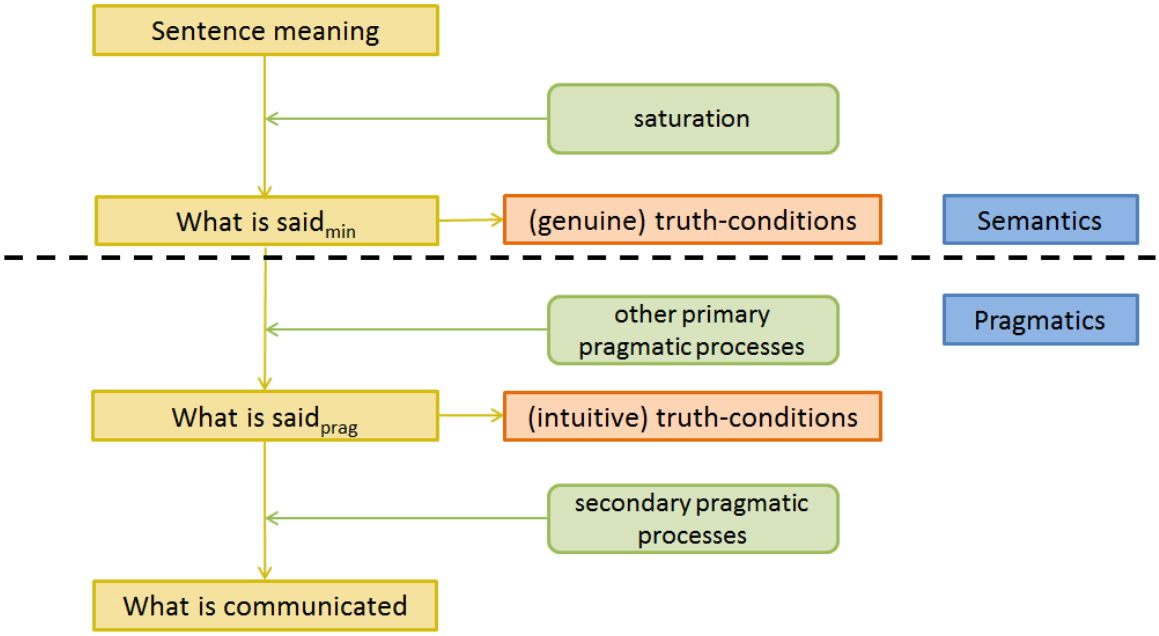

Figure 12: Syncretic View

The Syncretic View mediates between Minimalism and the availability constraint because the four level picture as presented in Figure 12 accounts for the strict minimal meaning of 'what is said' because this level of meaning is only influenced by saturation, which represents a pragmatic bottom-up process. At the same time Syncretic View accounts for top-down pragmatic influences on the truth-conditional content because it works with the notion of intuitive truth-conditions. Recanati (2006b, p. 53) summarizes the mediating function of the Syncretic View as follows: "One can be a minimalist with respect to what is said in the strict and literal sense, and at the same time give up Minimalism when it comes to what the speaker asserts, which is subject to the availability constraint".

In the Syncretic View, contextual factors influence meaning on the semantic as well as pragmatic level. The distinction of semantic and pragmatic is determined by the kind of processes that affect meaning.

There is not only one Syncretic View account but several approaches that slightly differ.[119] Representatives of Syncretic View approaches that are discussed in the literature are, among others, Nathan Salmon (1991) with his Pragmatic Fallacy account, Recanati (2006b) with his

[119] Some approaches of the Syncretic View are closer to Contextualism or Minimalism than others, this is why Syncretic View approaches are sometimes categorized 'Radical Syncretism' and 'Quasi Contextualism'. Versions of syncretism that consider semantic content as non-propositional are also termed Quasi Contextualism. Contextualism and Quasi Contextualism share the following characteristics: Firstly, the intended meaning which is "consciously available to the speaker" is not the same as the semantic interpretation of the sentence and secondly, semantic content is not propositional because it is underspecified (Stanley, 2005). Cappelen and Lepore's or Borg's account are categorized as radical syncreticists' approaches (Recanati, 2006b, p. 92) because they argue against the view that sentences do not have truth-conditions.

Strong Optionality View as well as Bach (1994). The definition of the semantic content of a sentence varies in these approaches. While Bach argues for the view that the semantic content of a sentence is not fully propositional, Cappelen and Lepore (2006) have a more pragmatically orientated conception of semantic content because they assign values to all kinds of indexicals and argue that the "semantic contents of sentences are always propositional" (Stanley, 2005):

> "[…] if you fix the referents of the obviously indexical/ demonstrative components of S […] and if you disambiguate the ambiguous expressions, then what you end up with is a proposition. We call this proposition the minimal semantic content of u." (Cappelen & Lepore, 2006, p. 425)

A.3.5 Contextualism

There are different more or less radical concepts about Contextualism. Contextualistic accounts hypothesize that all utterances are underspecified. Therefore, they argue that all levels of meaning are affected by pragmatic top-down factors. Scholars in the field of Contextualism are Recanati (2006a, 2006b, 2010, 2012), Sperber and Wilson (1995), Levinson (2000), Jaszczolt (forthcoming; 2005) and Carston (2002a, 2004, 2010), to name a few.

In general, Contextualism assumes that sentences are always underdetermined and fail to express minimal propositions. However, Contextualism can be split up in two main groups: Quasi or moderate Contextualism and full-fledged Contextualism. The only difference between these two concepts of Contextualism is that the latter is of the view that the minimal proposition is useless and plays no role in communication, while the former has a slightly less radical opinion by considering it only theoretically useless (Recanati, 2006b).[120]

In contrast to Indexicalism, only sentence constituents that are syntactically or phonologically presented are considered as part of the semantic meaning (Bach, 2010).

Sentence meaning that is not explicitly presented by a constituent but still communicated by the sentence arises due to the influence of pragmatic factors. Contextual enrichment is a pragmatic process that contributes to sentence meaning. Unlike in Minimalism and Indexical-

[120] Jaszczolt (forthcoming) splits up Contextualism in two types: the free, top-down modulation and the hidden indexical theory. This however in not a distinction between different varieties of Contextualism in the narrow sense such as used by authors like Recanati (2006b) and Atlas (2011) but rather a distinction in the broad. Jaszczolt (forthcoming) considers all approaches that allow contextual influences on the semantic meaning of a sentence as Contextulism and therefore draws a distinction between (strong) minimalistic approaches and contextual approaches. Based on this divide Indexicalism is considered as a form of Contextualism because contextual effects (even if they are caused by bottom-up processes) affect truth-conditions. In the present work, I will stick to the definition of Contextualism in the narrow sense, such as the one by Recanati (2006b), because this definition is more common in the literature on Contextualism and Minimalism (cf. Bianchi, 2011; Carston, 2010; Recanati, 2005).

ism, the contribution of contextual processes on sentence meaning is not restricted to bottom-up processes in Contextualism. Instead, context is licensed to "make a free pragmatic contribution to the semantic interpretation of a sentence" (Bianchi, 2011, p. 57). Contextualism does not only assume that indexicals and free variables are enriched but even claims that no proposition can be expressed without being influenced by the process of contextual modulation.

Moreover, Contextualists have a different understanding of truth-conditions than Minimalists. The contextualistic understanding of truth-conditions corresponds to the notion of (intuitive) truth-conditions of the Availability Principle. Knowing the truth-conditions of a sentence means knowing the situations in which the sentence is true, as well as to whom or what indexicals and free variables refer to because processes of saturation and modulation are allowed to affect truth-conditions (Recanati, 2006b, 2010).

Although the individual contextualistic approaches vary slightly, Recanati's (2010) approach is sketched out as representative: Recanati (2010) explicitly points out that in his framework "neither referential values nor truth-values can be assigned to linguistic forms independent of context" (Recanati, 2010, p. 235). Furthermore, Recanati (2010) distinguishes two kinds of truth-conditions, which are applied to different levels of utterance meaning: truth-conditional content proper and intuitive truth-conditions. 'Truth-conditional content proper' is at work at the meaning level that Recanati considers as the 'semantic interpretation of the logical form' and is only affected by pragmatic processes that the linguistic material (e.g. words or morphemes) demands. 'What is said' refers in Recanati's terminology to a level of meaning that "corresponds to the primary truth-evaluable representation made available to the subject (at the personal level) as a result of processing the sentence" (Recanati, 2006b, p. 17). Based on this definition 'what is said' refers to a level in the hearer's comprehension process, which the hearer intuitively comes up with due to semantic/pragmatic processing and is the level of meaning to which intuitive truth-conditions are applied to. 'Intuitive truth-conditions' are affected by free pragmatic processes such as enrichment, loosening or transfer and the output of semantic/pragmatic processing. The modified logical form of an utterance is created by the intuitive truth-conditions (Recanati, 2010). The traditional semantic/pragmatic distinction considers semantics and pragmatics as distinct "modules" (Borg, 2004) and semantics as input to pragmatics. In Contextualism, contextual influences (including speaker's intentions) are essential for determining the semantic value of context-sensitive expressions such as indexicals (cf. Recanati, 2010). The semantic value of context-sensitive expressions "varies not as a

function of some objective feature of the context but as a function of what the speaker means" (cf. Recanati, 2010, p. 8). Therefore, it is difficult to depict Contextualism in a schema.

A.3.6 Literalism versus Contextualism

As just shown there is a wide range of attempts and approaches, ranging from Minimalism to radical Contextualism, which try to draw a semantic/pragmatic distinction (for an overview see: Recanati, 2005, 2006b). These approaches have different criteria to distinguish between semantics and pragmatics.

Depending on how meaning is defined, it serves as a good distinction between semantics and pragmatics. It is however challenging and confusing that there are several conceptions of meaning, such as truth-conditional meaning (as in truth-conditional semantics; for an overview see Carston (2011)), linguistic encoded meaning (Carston, 2008, p. 336), meaning as use (Wittgenstein (1953) cited in Leilich (2011, p. 303)) and meaning as speaker intention (Grice, 1957). Most analytical philosophers equate meaning with truth-conditions while Grice and Neo-Gricean linguists, inspired by Ordinary Language Philosophy, put meaning on a level with speaker's meaning (cf. Sbisà, Östman, & Verschueren, 2011).

The distinction based on linguistic encoded meaning (LEM) versus non-linguistic information (necessary to completely understand the speakers meaning) seems to be a very useful conception because semantics and pragmatics can be defined by the kind of psychological processes that take place. LEM is defined as "[…] content that all utterances of a sentence S express no matter how different their contexts of utterance are" (Carston, 2008, p. 336). Decoding processes to retrieve LEM are considered as semantic processes while inferential processes such as extending and adjusting LEM to recover the speakers meaning are taken to be pragmatic processes. Based on this approach semantics and pragmatics would be two independent fields. A challenge for this account is that truth-conditions cannot be applied to LEM because indexical expressions do not have LEM since contextual information is needed to make sentences such as *She is ready to go now* fully propositional. Many philosophers, especially those in the tradition of Ideal Language Philosophy, who define semantics in terms of truth-conditions, would not agree with such an approach because truth-conditions would not be a matter of pure semantics any longer.

Other approaches try to draw the distinction between semantics and pragmatics based on context, e.g. Bach (1987, 2002), Cappelen and Lepore (2005a) or Borg (2004, 2005). The 'insensitive-semantics' approach by Cappelen and Lepore (2005a, 2005b, 2006) as well as the approach by Borg (2004, 2005) have different conceptions of semantic content. Both of these approaches reject the idea that context influences the semantic content of (some) linguistic

items. As context influences the meaning of indexicals, free variables and ambiguous terms it is questionable to claim that semantics is not influenced by context at all. This is because indexical expressions that refer to other people but the speaker and hearer or to time and places differing from the one of the utterances could not be assigned values. Sentences such as *He is ready* can only be assigned truth-conditions if wide context is applied to complete the proposition. Otherwise this sentence cannot be evaluated by truth-conditions because information about to whom *he* refers and with what he is ready has to be enriched pragmatically via wide context. In these cases truth-conditions can only be applied after pragmatic influences. This is also questionable because semantics is not fully truth-conditional any longer. A way out would be to allow certain pragmatic or contextual influences on semantics or to define what kind of context may affect the semantic level and what kind of contextual influences are considered to affect only pragmatics. The latter suggestion is put forward by Bach (2002). Bach's semantic/pragmatic distinction is based on the division of context into narrow (semantic) and wide (pragmatic) context. In this framework narrow context only provides values for some variables such as "the identity of the speaker and the hearer and the time and place of an utterance" (Bach, 2002, p. 72) while "contextual information in the broad sense is anything that the hearer is to take into account to determine […] the speaker's communicative intention" (Bach, 2002, p. 72). The former suggestion, namely that certain pragmatic or contextual influences on semantics are allowed, is partially put into practice in the framework of Indexicalism which assumes implicit arguments in linguistic forms that "make a pragmatic process of contextual saturation [obligatory]" (Carston, 2008, p. 329).[121] For details see Appendix A.3.2 and literature cited there.

Again other approaches try to define semantic content by means of truth-conditions. On the first glance this seems to be a very clear definition. However, this approach is disputable because there are different opinions about which level of meaning truth-conditions are applied to and what kind of processes are at work before truth-conditions are applied. Some theories (e.g. Frege, 1892; Moore, 1966) apply truth-conditions to an utterance before any processes like saturation, which give indexical and demonstrative expressions specific context-dependent meaning, are applied to the utterance. Minimalism does for example believe that there are such things as "eternal sentences" and therefore consider truth-conditions as independent of the speakers meaning. Other theories (e.g. Recanati, 2006b, 2010) claim that an utterance cannot be assigned a truth-conditional meaning before these processes have taken

[121] The linguistic logical representation of the statement '*Fred finished*' would be '*Fred finished [x]*'. In this case the 'x' would be the implicit argument which affects truth-conditional content and has to be filled by pragmatic processes.

place since these items are strongly context-dependent. These theories do not believe that there are predetermined context-independent truth-conditions of natural language sentences. In addition to this, Bach (2002, p. 72) points out that speech act adverbials do not have a truth-conditional function as well, because they have to do with focus and the organization of the way information is presented.

What is obvious is that the definition of semantic content as LEM and the field of semantics as concerned with truth-conditional content (in the sense of not being influenced by context) cannot be maintained at the same time because context-sensitive expressions and figurative language cannot be accounted for (cf. Carston, 2008). For this reason one would be better off with a framework which can explain the meaning of natural languages at the semantic/pragmatic interface and does not try to consider individual phenomena as either semantic or pragmatic. Such an intermediary position could be an approach which has three levels: semantics, the interface where semantics and pragmatics interact and pragmatics. Another solution could be an approach that does not draw the distinction based on single criteria but considers and defines different criteria (e.g. context and processes that affect meaning) in such a detail that the distinction can be recognized easily.

Pietroski (2005) did for example adopt a quite different approach and suggests that meaning and truth are not as closely connected as most semantic theories assume.[122] He states that "the meaning encoded by a natural language expression is best thought of as an instruction for creating a concept from available mental resources" (Pietroski, 2005; cited in Carston 2008, p. 343).

Grice who pointed out that the logic of natural language has to be distinguished from the one of formal language, did also not draw the distinction based on semantics and pragmatics but on 'what is said' and 'what is implicated' (see also Carston, 1999, p. 97). Nevertheless, the main criteria that are used in the previously introduced accounts to draw the distinction between semantics and pragmatics namely, context-dependence, linguistic meaning and truth-conditions are already used by Grice to distinguish between 'what is said' and 'what is meant'. This suggests that a theory that claims that 'what is meant' emerges from 'what is said' does not necessarily have to be about which parts of an utterance are semantic and which ones are pragmatic. From my point of view, pragmatic principles are not the only contextual factors that may influence the distinction of 'what is said' and 'what is meant'. Other important factors that contribute to the modification of meaning and can be considered as con-

[122] This approach is based on Chomsky (1995, 1996) who stated that natural language has no domain of semantics but only a domain of syntax and pragmatics because he sees little basis for semantics, based on reference for linguistic expressions.

textual attributes (in the wide sense) are the skills as well as different types of knowledge and dispositions the hearer possesses such as Theory of Mind abilities, common sense as well as world and cultural knowledge. (For a more detailed description of what I consider as context see Appendix A.5.) Theories in the framework of Segmented Discourse Structure Theory (SDRT) account for a variety of these factors when explaining the difference between the underspecified meaning of an expression and the conveyed meaning. Discourse representation may then serve as an interface. This theory is shortly outlined in the following section.

A.3.7 Discourse Theoretic approaches

An alternative theory on the semantics/pragmatics interface was suggested by Asher (1999). Asher criticizes that most interface approaches do neither include Grice's Conversational Maxims nor Searle's speech acts, although both of them are important contributions to pragmatics. The author therefore suggests a dynamic account with three levels, namely the compositional and lexical level of semantics, the speech act level and the cognitive level.[123] The motivation behind this is the following: "The key idea is that discourse structure is an essential component in discourse interpretation and results from integrating pragmatic and semantic information together" (Asher, 1999, p. 20). This theory is based on the framework of dynamic semantics (e.g. Kamp & Reyle, 1993) and examines meaning on the sentence level and beyond and considers it as "context change potential" (CCP).[124] In the approach discussed by Asher, conversational implicatures are considered as "byproduct of computing an appropriate discourse relation for the speaker's contribution" that arise as consequence of the calculation of discourse relations for attachment or of expectations of speech acts in SDRT" (Asher, 1999, p. 39).

In SDRT, the level of compositional and lexical semantics is considered to be underspecified. On the next level a "coherent and connected SDRS discourse structure" (Asher, 1999, p. 26) is built. This process is influenced by the consideration of pragmatic principles. Misunderstandings in conversation can arise on this level because each participant interprets the discourse in his or her own way. On the level of cognitive modeling the "discourse participant

[123] Although, some of Grice's Maxims (e.g. the Maxim of Quality and the Cooperative Principle) underlie SDRT as behavioral rules to reconstruct speaker's intentions, SDRT replaced Grice's Maxims by a "precise account of cognitive modeling, discourse structure construction and the interaction between these two processes" (Asher, 1999, p. 20).

[124] Discourse theoretic approaches consider the meaning of each sentence (S) as context change potential (CCP). This means that each S serves as input context background for the following S and builds up a discourse representation structure (DRS). The information conveyed by the following sentences updates the hearer's information and knowledge and gives another DRS as output.

reasons about the mental states of another discourse participant given what they have said" (Asher, 1999, p. 26).

Figure 13 is an attempt to summarize and depict how discourse theories in the framework of SDRT explain how contents that are expressed beyond the word emerge. This illustration is based on the basic assumptions of Discourse Theory as described in the texts that are discussed in this section.

An advantage of Asher's model over the previously discussed interface models is that his framework is incremental and does not only focus on the meaning of utterances on the sentence level but also on the discourse level. Critically, this model does not focus on drawing the distinction between semantics and pragmatics but considers the processes that take place during language comprehension as well. Since sentence meaning is viewed at the discourse level, it considers a much wider range of contextual influences that contribute to the modification of meaning, such as Theory of Mind (TOM), cohesion and coherence as well as several types of knowledge.[125] This indicates that approaches in the framework of SDRT are much more concerned with different types of contextual influences on an utterance.

Asher's model includes for example a variety of axioms that support the interlocutor to reconstruct a speakers communicative intentions in a certain context and contribute to the interaction between the speech act level and the level of cognitive modeling (Asher, 1999). Reconstructed intentions "provide the content for certain discourse relations that relate the new speech act to its context in an SDRS and it is the presence of such relations that generate certain discourse expectations of possible responses" (Asher, 1999, p. 30). As SDRT also considers contextual influences of the proceeding discourse and the relation between speech acts, it can also explain meaning relations between coordinated sentences. SDRT distinguishes between two different discourse topic constructors, namely subordination and coordination. While coordination is a symmetric discourse topic construction, subordination is asymmetric. Moreover, subordination and coordination block or rule each other out. This means that if a coordinating discourse topic relation holds between two segments, then subordination is blocked and the other way round. As the relation between conjuncts is considered in discourse theoretic approaches, this theory is also suitable to explain temporal, causal and other readings associated with *and*.

[125] The term coherence refers to the overall structure of the narrative, such as the content and relations of the individual topics, e.g. in which way they are related to each other and how they are elaborated. The term cohesion refers to specific linguistic devices such as pronouns and connectives that combine sentences with each other and link given with new information. Coherence and cohesion are important contextual attributes because they link given and new information and structure discourse.

As can be seen in Figure 13 the discourse theoretic interface model is quite different than the traditional ones previously discussed because it does not distinguish between the semantic and pragmatic level but between three levels, namely the semantic level, the speech act level and the cognitive level. The speech act level also accounts for other factors that are of importance for the meaning and interpretation of sentences such as stress and intonation. If traditional semantic/pragmatic interface models account for these factors at all, they would probably account for these influences by referring to "context". This is however not precise enough because it is first of all unclear at which level of meaning these processes are at work and secondly it is still unclear what kind of (pragmatic) factors are summarized under the term context (cf. Finkbeiner et al., 2012).

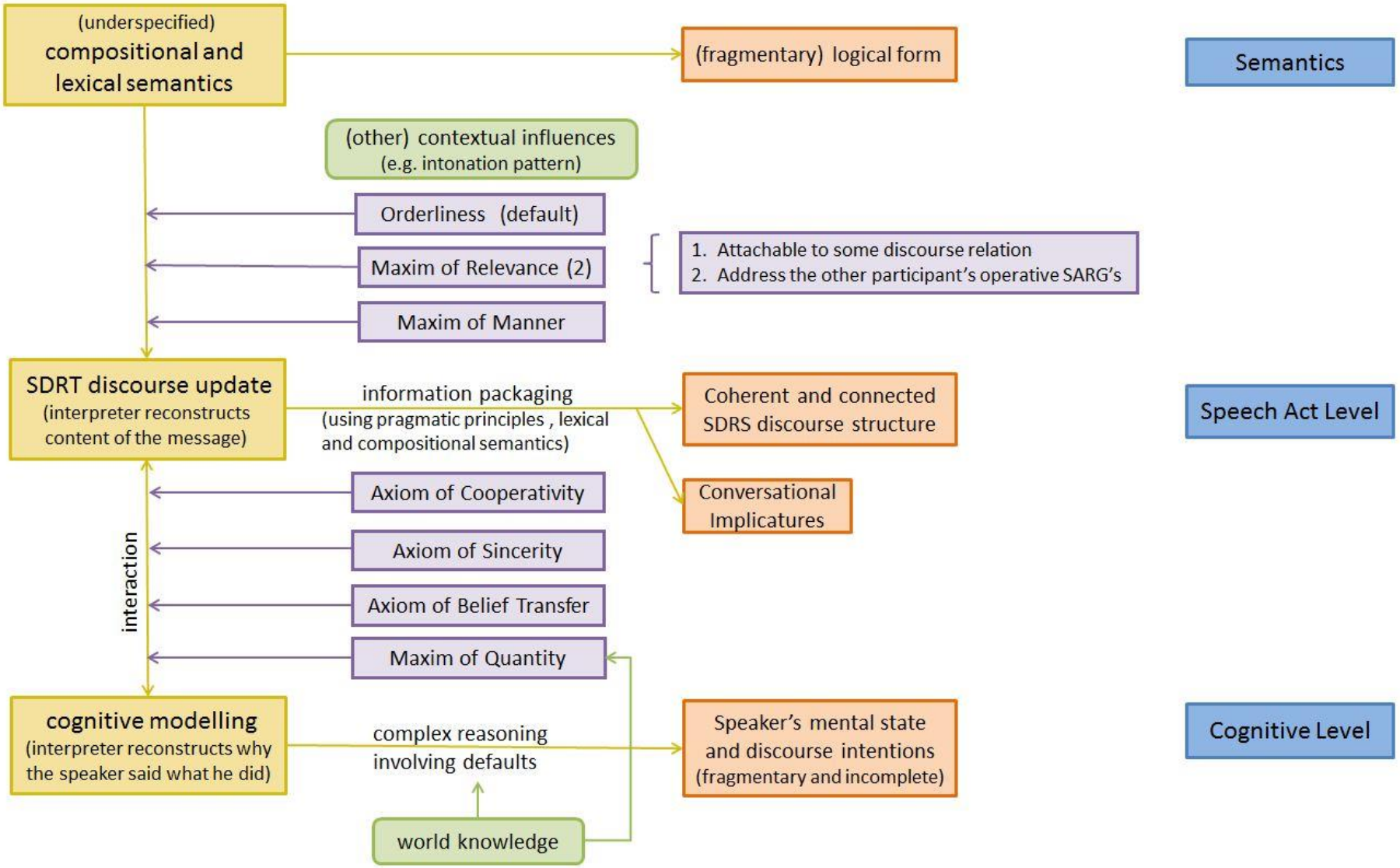

Figure 13: Discourse Theory

SARG – speech act related goal

A.4 Opportunities and challenges at the semantic/pragmatic interface

There are a variety of (linguistic) theories and models on language processing, which postulate quite different and partially controversial predictions. Due to the emergence of experimental pragmatics, which investigates semantic and pragmatic phenomena by means of psycholinguistic and neurolinguistic methods, these models and theories can be tested and compared. An advantage of this is that the variety of theories can be compared with respect to which theory or model can account best for experimental data. Furthermore, some theories can be rejected while others can be modified and developed further based on experimental data of semantic and/or pragmatic phenomena.

However, if one tries to compare the individual models and theories that attempt to explain the interface between semantics and pragmatics, one is confronted with several challenges: One of the main challenges of theories of meaning at the semantic/pragmatic interface is that different approaches working in this area have developed their own terminology to refer to certain things in order to distinguish themselves from other approaches. To give an example, the context independent linguistic encoded meaning is termed 'linguistic encoded meaning' by Carston (2008), while Recanati (2006c) calls it 'semantic schemata'. Moreover, the terms 'character' (Kaplan, 1979), 'formal signification' (Grice, 1989b) and 'what is said' (Bach, 1987, p. 180f.; 2005a) refer to the context independent linguistic meaning of sentences as well.[126] Cappelen and Lepore's (2006) definition of semantic content differs from Bach's 'what is said' and Carston's 'LEM' in the way that pragmatic processes are not necessary because semantic content is always propositional and has determinate truth-conditions.[127] Borg's definition of semantic content even includes features of wide context such as elements that are dependent on the speaker's communicative intentions.

The second challenge, which is closely related to the first one, is that some terms are used ambiguously, which means that in some approaches certain terms are understood and defined differently than in other approaches (for an overview see Bach, 2004; Bach, 2005a). Due to ambiguously used terms, it is more difficult to compare the individual theories and approaches, since the same terms refer to different things depending on the approach. With respect to theories of meaning at the semantic/pragmatic interface this concerns the understanding of

[126] Compared to Carston's *LEM*, Bach's term appears to be a bit wider because his definition of 'what is said' includes context-given values for indexicals. Carston (2008, p. 324) however points out that depending on Bach's understanding of the semantic/pragmatic distinction, Bach's 'what is said' refers to the same notion reflected by LEM.

[127] Moreover, both approaches do not consider semantics as independent of speaker's intentions. This is problematic because what they consider as semantic content of an utterance may consequently vary depending on the context and situation in which they are stated (Carston, 2008, p. 28).

'utterance meaning', 'what is said', 'truth-conditions' and 'context'. While 'utterance meaning' refers from a semanticist's point of view to the meaning of an uttered sentence, pragmatists refer with the same term to what a speaker means when uttering a sentence. This is a crucial difference since the latter has already undergone enrichment processes. Similarly, 'what is said' can from a semanticist's point of view be equated with the semantic content of an utterance and considered as part of the literal meaning of a sentence. From the pragmatist's point of view 'what is said' is the content of an assertion which comprises the literal uses of the constituents that make up a sentence and is part of what the speaker means.

Another challenge arises from the fact that the different approaches consider different levels of meaning when evaluating a statement truth-conditionally. Some theories such as Minimalism and Indexicalism locate truth-conditions at the semantic level while others such as Contextualism locate them at the pragmatic level. Moreover, two different notions of truth-conditions are used in the theories of the semantic/pragmatic interface. The term 'truth-conditions' in Minimalism and Indexicalism refers to semantic truth-conditions while it refers to intuitive truth-conditions (which are part of pragmatics) in Contextualism. The Availability Approach and the Syncretic View use both notions of truth-conditions. What most theories agree upon is that contextual or pragmatic factors influence the meaning of an utterance and affect truth-conditions. The reason why there are different kinds of truth-conditions is that some theories argue that not only indexicals, demonstratives, figurative language require contextual information but that also sentences such as (104) need to undergo (enrichment) processes in order to enable truth-conditions to give the correct evaluation.[128] This kind of argumentation is illustrated in the following. Under enrichment processes I understand pragmatic processes that modify or extend the meaning of an utterance due to contextual influences. Recanati (2006b) defines enrichment as free top-down process, which is linguistically uncontrolled and affects meaning.

(104) *If Anne gets married and gives birth to a child, her grandparents will be happy.*
(105) *If Anne gives birth to a child and gets married, her grandparents will be happy.*

If truth-conditions are applied to sentences (104) before enrichment processes are at work, Anne's grandparents will be happy in both scenarios because *and* in the sense of the logical operator just coordinates two events and gives no information with respect to the order in which the events have taken place. This kind of understanding of truth-conditions is the se-

[128] Assume that Anne's grandparents have a very traditional attitude with respect to getting married and having children. They are happy if their granddaughter gets married before she is having children but less happy if the same events happen in reversed order because it would violate their traditional idea.

mantic one. However, if the conjunction *and* is temporally enriched before truth-conditions are applied, then sentence (104) would be true while (105) would be false, since Anne's grandparents will not be happy if her granddaughter gave birth to a child before she got married under the assumption that the grandparents have very traditional norms and values and hence condemn having children before being married. This understanding of truth-conditions is applied in the approaches that consider truth-conditions as part of pragmatics.

For further illustration see (106) which is an example of figurative language. The truth of this utterance depends on whether truth-conditions are applied to the statement before enrichment processes take place or afterwards.

(106) This guy is a sheep.

Statement (106) would be evaluated as truth-conditionally wrong, if the truth-conditions are applied before enrichment processes take place, because humans cannot be sheep in the sense of animals. After enrichment processes have taken place, the same statement means something like *This guy does not make up his own mind and blindly follows what everyone else does*. If it is the case that the guy to whom the statement refers to does not think independently and follows what everyone else does, then the statement would be true in terms of truth-conditions after enrichment processes have been at work.

Truth-conditional pragmatics is a contextualistic approach (see Appendix A.3.5) according to which truth-conditions are assigned to an utterance after enrichment processes have taken place (e.g. Bezuidenhout, 2002; Chierchia, 2004; Recanati, 2010; Wilson & Carston, 2007). These approaches share the view that "the semantic value of a complex phrase '$\alpha \wedge \beta$' is a function of the pragmatic values of the parts, where the 'pragmatic values' in question are what we get when we subject the literal semantic values of the parts to pragmatic modulation" (Recanati, 2010, p. 223). Based on (radical) Contextualists' point of view, pragmatic processes are always necessary since semantics alone cannot generate complete propositions. They therefore claim that truth-conditions are rather a matter of pragmatics instead of semantics (cf. Bianchi, 2004).

The definition of context also varies from parameters that contribute to the meaning of variable expressions to a more general definition of context as interlocutor's beliefs and presumptions at a certain point in conversation. As Finkbeiner, Meibauer and Schumacher (2012) point out, there is currently also no clear definition of context. In the light of this, clear-cut definitions of the mentioned terms would be desirable. This means that it is essential for any kind of theory or interface model to explicitly define and clarify how they understand and make use of certain terms and definitions. Attempts to define context or to characterize fea-

tures of context were made by Stalnaker (1999), Bach (2005a) and Bosco, Bucciarelli and Bara (2004), Jaszczolt (2010) (see contributions in Finkbeiner et al., 2012). However, the suggested features of context are not coherent and vary in detail. While Stalnaker (1999, p. 35) considers "the semantic relations between the proposition expressed" and other utterances as part of context, Bach (2005a, p. 31) considers "what has just been said" as important. Schumacher (2012) shows on the basis of data from electrophysiological studies what kind of contextual features are involved in language comprehension. The list of context attributes that have an effect on language comprehension and are pointed out by Schumacher (2012) is much more detailed than in the definitions given by the authors mentioned above. Schumacher (2012) shows that the following features trigger contextual effects: co-text (including what has been uttered, rhetorical and intra-textual relations such as coherence and cohesion), different types of knowledge and assumptions (world knowledge, common ground, background knowledge, expert knowledge, stereotypical information, stereotypical assumptions about the speaker and his interests) as well as genre and register (for details see Schumacher, 2012). In the following section, it will be outlined how the terms semantics, pragmatics, truth-conditions and context are understood and used in this work if they are not mentioned and used in the framework of a certain theory.

A.5 Semantics, Pragmatics, Truth-conditions and Context

As shown above, there seems to be no commonly agreed definition of context, truth-conditions, semantics and pragmatics. The use of these terms differs in the literature.

In the current research, I consider LEM to be the core and basis of semantic theory. Semantic processes that are influenced by context and assign values to indexicals and demonstratives are considered to belong to semantics since they make up the semantic content of a sentence which again is the level at which (semantic) truth-conditions are at work. Truth-conditions are just like in the traditional picture considered to be a matter of semantics. They provide truth-conditions for the literal meaning of sentences, which is the minimal proposition of a sentence that is not affected by context in the broad sense.[129] Semantic truth-conditions are based on the semantic content of a sentence and can theoretically be true. They provide information on when a statement is true but cannot check if this is indeed the case. In the case of the conjunction *and* they predict (based on the assumption that it is a general connector, which just con-

[129] I am aware that truth-conditions make the wrong predictions for figurative language. However, figurative language is a special or marked way of expressing things. Its meaning is not the literal one but has to be pragmatically enriched.

joins two conjuncts) that two conjuncts conjoined by *and* are true as long as both of the conjuncts are true, otherwise the whole statement is false. Even if the hearer does not know whether both conjuncts are true (e.g. because both conjuncts are about details of chemical knowledge, which the interlocutor cannot evaluate because he does not have detailed chemical knowledge) he still knows under what kind of circumstances the statement would be true, namely if both conjuncts are true. In this conception semantic truth-conditions only provide the circumstances and criteria that have to hold to be able to evaluate a statement as true. E.g. in *Steffi has bought a wedding-gown* is semantically only true, iff Steffi has bought a wedding-gown. Semantic truth-conditions can only give theoretical values.

Concerning the definition of context one has to distinguish between different kinds of context. Bach distinguished between narrow and broad context. While Bach's definition of context only provided values for the identity of the speaker and the hearer and the time and place of an utterance" (Bach, 2002, p. 72), I think narrow context should be defined slightly broader so that it assigns values to expressions with variable reference such as indexicals and demonstratives but still has no impact on semantic meaning apart from assigning values to expressions with variable reference. I do so because in this way indexical expressions that refer to other people but the speaker and hearer or to time and places differing from the one of the utterances are assigned values as well. Based on this definition narrow context is clearly a matter of semantics because it does not provide any information that is supplementary to semantic content.

With respect to the definition of wide context I agree with Bach's quite general definition that "contextual information in the broad sense is anything that the hearer is to take into account to determine […] the speaker's communicative intention" (Bach, 2002, p. 72). In my opinion broad contextual information comprises all kinds of information and knowledge the interlocutors have such as common knowledge, world knowledge, situational knowledge, information previously mentioned, co-text as well as genre, register, scripts, associations, assumptions and expectations, including the list of context attributes pointed out by Schumacher (2012). These factors trigger and contribute to pragmatic processes. The function of broad context is from my point of view the ability to awaken associations that influence expectations and establish topics, scripts and schemata.[130] The more detailed contextual information is, the stronger and more precise are the expectations it establishes. Therefore, broad context is clearly a matter of pragmatics and is in line with Bianchi's definition of pragmatics:

[130] I consider scripts as pragmatic information because they encode and describe knowledge about (fixed) processes and actions, e.g. the process of visiting somebody in hospital. Pragmatic information such as world knowledge and social knowledge are important and required to establish scripts.

> "Pragmatics […] studies how speakers use context and shared information to convey information that is supplementary to the semantic content of what they say, and who hearers make inferences on the basis of this information." (Bianchi, 2004, p. 1)

What goes along with the definition of the two kinds of context is that different kinds of processes have to be distinguished. Semantic processes that are bottom up processes and use narrow context to operate and pragmatic processes that work with information from broad context and are top-down processes. Other kinds of processes that influence the meaning of the conjunction are the application of conversational principles and theory of mind abilities. These skills are considered to be of pragmatic nature since they have an impact on and modify 'what is communicated'.

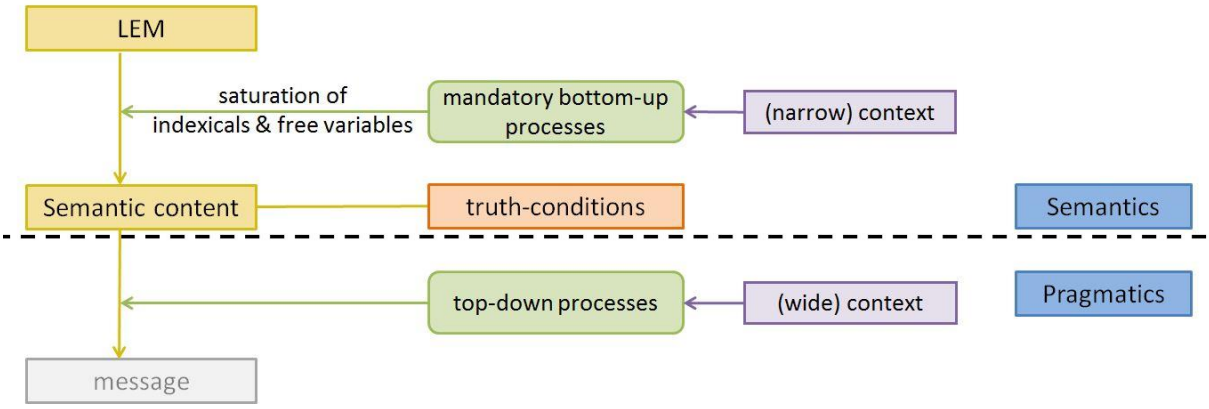

Figure 14: Semantic/Pragmatic Interface Model

Figure 14 illustrates my understanding of the terms truth-conditions, semantics and pragmatics as well as how different contextual effects affect meaning. The conveyed meaning on the pragmatic level is depicted in grey and called message because it is not meant to be used as specific kind of pragmatic meaning but should rather indicate that it is not my intention to illustrate different levels of pragmatic meaning further. This is because I consider language processing and language comprehension as incremental and a complex process which cannot be depicted in such a simple model. Moreover, from my point of view several processes (drawing inferences and reconstructing why the speaker said what he said) in the construction of the complete utterance and additionally conveyed notions of meaning take place under the influence of contextual characteristics in the wide sense. Discourse theoretic models as depicted in Figure 13 are from my point of view able to account for these processes at the cognitive level and the speech act level very well.

A.6 Summary

In the 20th century two groups of philosophers developed: the Ideal Language Philosophers and the Ordinary Language Philosophers. Their common goal was to find criteria for rational agreement to lay grounds for cooperation and the acceptance of conclusions that proved to be true (Sbisà, 2011, p. 12). However, as shown in this chapter, there are still quite a few challenges that have to be solved concerning current theories of meaning at the semantic/pragmatic interface.

One of the most serious challenges, which makes it very difficult to distinguish between semantics and pragmatics, is that there is no commonly agreed upon definition of semantic content, truth-conditions and context. Therefore the meaning and interpretation of the conjunction *und* is discussed in the literature as a phenomenon at the semantic/pragmatic interface. What most theories agree upon is that contextual factors influence the meaning of an utterance and affect truth-conditions. It is however not very clear at which level of meaning this happens and at which level or from which level onwards, these processes are considered to be semantic and when pragmatic. This chapter tried to show and illustrate how the individual approaches use the terms 'semantic meaning', 'truth-conditions' and 'context' and illustrated how the respective approaches draw the semantic/pragmatic distinction. As truth-conditions and context have different notions or are used differently by the individual interface theories, Table 22 summarizes and gives an overview about how these terms are used in the individual theories.

The SDRT-framework differs from the other theories of meaning in the way that it does not distinguish between two levels of meaning (e.g. what is said vs. what is implicated or semantics vs. pragmatics) but between three levels of meaning (semantics, speech act level, and cognitive level). An advantage of the SDRT-framework over the other theories of meaning is, that it can at the same time explain how meaning notions of the conjunction *and* that are beyond the additive reading may arise between two conjuncts (see chapter 3.3.6). Most of the interface models introduced in the previous sections do not explicitly explain the different kind of possible readings of the conjunctions.

Table 22: The role of truth-conditions and context in different interface models

	truth-conditions	context
Minimalism	- part of semantics - influenced by bottom-up processes	- affects context-dependent constituents at the semantic level - triggers tow-down processes at the pragmatic level
Indexicalism	- part of semantics - influenced by bottom-up processes - partially context-dependent (hidden indexicals, context-sensitive items)	- triggers optional top-down processes - fixes values of context-sensitive elements
Availability Approach	- two types: literal truth-conditions (part of semantics) vs. intuitive truth-conditions (part of pragmatics) - "truth-conditions" generally refers to intuitive truth-conditions and is affected by speakers intentions	- triggers primary and secondary pragmatic processes - no influences on semantics
Syncretic View	- two types: genuine truth-conditions (part of semantics) vs. intuitive truth-conditions (part of pragmatics) - "truth-conditions" generally refers to intuitive truth-conditions and is influenced by optional top-down processes and speaker's meaning	- triggers different kind of processes that affect meaning - influences semantics and pragmatics
Contextualism	- intuitive truth-conditions (part of pragmatics) - influenced by top-down processes	- influences all levels of meaning
Discourse Theory	- fragmentary logical form at the semantic level	- a variety of contextual factors affect the speech act and cognitive level

There are a variety of theories on the interpretation of the conjunction. Some of these theories could be matched with one of the discussed interface models. Others would need slight modifications to fit with one of the models. For yet others it is difficult to be assigned to one of these models because the theory is not sketched out in enough detail, e.g. with respect to con-

textual effects and processes that affect the meaning of *and* or with respect to the basic meaning of the conjunction. The following chapter is concerned with specific theories to the meaning and interpretation of the conjunction. The theories that attempt to explain the meaning and interpretation of the conjunction are set apart by the semantic meaning of the conjunction and the influence of contextual factors. For this reason the theories that are introduced in the next chapter are discussed with respect to what they consider as basic meaning of the conjunction and the role of context because contextual influences are a very important and influential factor for the interpretation of utterances.

A.7 Approaches to *and* at the semantic/Pragmatic Interface

The results of the experiments conducted in this work suggest that the interpretation of the conjunction *and* is context-dependent. Depending on the context, specifically what kind of events are conjoined (and whether they are associated with a stereotypical or conventional order or not) participants tend to interpret the conjunction additively or temporally. Theories that try to explain the meaning and interpretation of the conjunction with respect to their consideration of different types of knowledge and related contextual attributes have been discussed in chapter 3. All of the theories discussed there can be located within one of the interface-models. The accounts by Asher and Vieu (2005) as well as the one by Txurruka (2003) are discourse-theoretic approaches. Kitis (2000a) suggests by herself that the inferential processes described by her account could be considered as "GCIs as long as they are systematically constrained in a generalized and predictable fashion" (Kitis, 2000a, p. 378). GCIs can either be located in Grice's interface-approach or in the discourse-theoretical approach (see 3.1). Moreover, Kitis (2000a) explicitly points out that connectives function on several levels by citing one of her earlier papers: "I take the view that connectives function at various levels of language use […]" (Kitis, 2000a, p. 361) and "We need to treat connectives at the distinct levels of language use at which they function" (Kitis, 2000a, p. 398).[131] Based on the description of how inferences related to the conjunction arise in the approach suggested by Kitis (2000a) and the fact that she considers connectors as functioning on several levels, I would categorize Kitis' theory rather in the discourse theoretic interface approach than in the traditional Gricean one. The Relevance theoretic approach is an approach in the framework of Contextualism.

Although all of the discussed theories can be located within an interface-model, they are not directly comparable with each other because their basic assumptions differ. Common to all theories is that they consider language processing as incremental and use knowledge to infer or enrich the meaning expressed by the conjunction *and*. An advantage of the discourse theoretic approaches is that their assumptions about the acquisition of the conjunction are in line with how children acquire the meaning of words and conjunctions, namely via inferences (see chapter 5).

[131] The first citation is taken from Kitis (2000a, p. 361) who cites Kitis (1987).

B Approaches to the Meaning of *and*

The following subsections of the appendix are concerned with how the theories to the meaning and interpretation of *and* that were introduced and discussed in chapter 3 explain other meaning notions of the conjunction.

B.1 Particularized Conversational Implicatures

Just like forward temporal relations between conjuncts conjoined by *and* (as discussed in chapter B.1), cause-consequence relations between *and*-conjoined conjuncts can also be explained with the help of the fourth Maxim of Order. This is because causes typically precede consequences temporally. However, backward-relations such as in (107) do sound natural. The relation between the conjuncts in (107) is a consequence-cause one. If one wants to explain this relation within the framework of particularized conversational implicatures, the conjunction has to be interpreted as explanation for why the Maxim of Order was violated and by showing that the implicature arises due to special contextual features, e.g. marked syntax or a clash of maxims.

(107) *The room was bitter cold and it was Bill who forgot to close the window.*
(108) *The Princess was rich and lonely.*

Principally adversative relations between conjuncts such as in (108) could also be explained with the help of world, situational and linguistic context. The interesting questions however are which maxim triggers the adversative implicature and what kind of special contextual features cancel sequential interpretations and invite adversative or other relations instead. In the case of particularized conversational implicatures, all kinds of relations other than forward temporal relations have to be explained with special contextual features. This makes it difficult to come up with general rules and is not very economical either.

Moreover, the assumption that the sequential relations between conjuncts are due to the order of mention of the events in the utterance, implies that the same relations should arise if the conjuncts are not conjoined by *and* but simply juxtaposed (cf. Posner, 1979). Therefore, this approach can account for statements in which the juxtaposed sentences express the same meaning as the conjoined utterance such as in (109). The disadvantage is that examples such as (110) in which the juxtaposed sentence and the conjoined sentence appear to express different meaning notions or relations between the conjuncts cannot be accounted for.

(109) *Tom fell asleep and he had a nightmare.*
= Tom fell asleep; he had a nightmare.

(110) *Ramona couldn't participate in the volleyball-match; she had to look after the children.*

≠ Ramona couldn't participate in the volleyball-match and she had to look after the children.

The advantage of the particularized conversational implicature account is that it can account for a variety of forward relations between conjuncts. However, this approach cannot explain adversative meaning relations that arise between conjuncts conjoined by *and* as well as cases in which the juxtaposed sentence expresses other things than the respective conjoined sentence. It is also not clear, how cases of sentence-initial occurrences of *and* should be handled, e.g. whether the content of the sentence introduced by *and* should be considered as sequentially connected to a not mentioned event which has to be enriched from world knowledge, situational or other contextual information.

B.2 Generalized Conversational Implicatures

As shown in chapter 3.1.2, this approach can explain forward temporal relations between *and*-conjoined conjuncts. However, it is challenging for approaches that explain forward temporal relations with the help of a principle of iconicity to explain cases in which the same conjuncts are juxtaposed. This is because juxtapositions often suggest backward relations (cf. Meibauer, 1997, p. 246). A possible solution for this challenge would be to argue that juxtaposed sentences are not directly comparable to sentences conjoined by *and* because they possess different syntactic structures and might hence be processed differently. In (111) each sentence might be processed and interpreted separately before an interpretation that establishes the relation between the individual sentences takes place.

(111) *Mary fell. John pushed her.*
(112) *Mary fell and John pushed her.*

In (112) the sentences are coordinated. Hence, the first conjunct is processed but not fully completed because *and* indicates that the sentence is not completed yet. Therefore, the hearer unconsciously establishes expectations, which are influenced e.g. by world knowledge and the Conversational Maxims. The hearer expects further information that can be connected with the first conjunct in a felicitous way, preferably as forward interpretation. These expectations might contribute to the interpretation of the whole sentence. Upon hearing the second conjunct, these expectations are violated because the preferred forward-interpretation (see Zwaan, 1996 and literature cited there) is not compatible with the content of the second conjunct. At the end of the sentence the preferred or expected interpretation has to be cancelled because it

turns out that it does not make sense. Moreover, a reanalysis has to take place to come up with the correct relation that holds between the conjuncts. A reanalysis is costly because it draws on more processing costs. Hence, it is possible that some people try to avoid searching for another interpretation, and rather stick to their first interpretation as long as it makes sense somehow to keep the processing costs as minimal as possible. (For details and psycholinguistic evidence on the comprehension and temporal interpretation of events and narratives see Mandler, 1986; Pyykkönen & Järvikivi, 2012; Zwaan, 1996.)

A generalized conversational implicature approach that is based on a principle of iconicity fails, if one wants to explain conjoined utterances in which other readings than the forward temporal one, e.g. cause-consequence relations or backward relations, arise. A possible solution could be to argue that more than one implicature is conventionally connected with the conjunction *and*.[132] In this instance, it has to be worked out and specified in which case a temporal, adversative, causal or other relation usually arises in connection with the conjunction. With respect to backward relations between conjuncts, Meibauer (1997) suggested that the temporal reading as implicature, could be cancelled because cancellation is just like calculability and variability a characteristic of conversational implicatures. This explanation works for examples in which the context directly cancels the implicature, such as in (113), but not for statements that do not occur in a context that cancels the implicature such as in (114).

(113) *Did Max smash the window? Well the ball hit the window and Max kicked it.*
(114) *The flower died and it was Alice who forgot to water it.*

Meibauer (1997, p. 248) suggests that the latter kind of backward-relations might be explained with world knowledge and rationality but points out that it is questionable whether one should consider a temporal interpretation which is based on world knowledge an implicature. Hence, it is still challenging for the Generalized Conversational Implicature Approach to explain readings of the conjunction other than the forward temporal one.

B.3 Cohen

The advantage of Cohen's approach (1971) is that it can account for all different kinds of meaning relations expressed by a sentence which conjoins two conjuncts with *and* because all of these meaning features are included in semantic meaning of the conjunction suggested by Cohen. Due to this, Cohen's approach can even cope with backward relations expressed by *and* as in (115).

(115) *The soup got sour and it was Peter who forgot to put it in the fridge.*

[132] This would theoretically be possible because Grice did not directly specify how many implicatures can be triggered by a word.

Additionally, Cohen illustrates that his approach can account for statements in which *and* is part of the antecedent of conditionals such as in (116). Example (116) is adapted from Bar-Lev and Palacas (1980: p. 142)

(116) *If the old king has died of a heart attack and a republic has been declared, then Peter will be glad.*

Challenging for Cohen's account is that Carston (2004, pp. 223-225) points out that the juxtaposed sentences in (117) to (119) express exactly the same meaning relations as their counterparts in (120) to (122). Examples are taken over from Carston (2004, pp. 223-225). If juxtaposed sentences can express the same relations between conjuncts, then it is quite unlikely that the conveyed relations are features of the meaning of *and*.

(117) *It's summer in England. It's winter in New Zealand.*
(118) *He handed her the scalpel. She made the incision.*
(119) *We spent the day in town. I went to Harrods.*
(120) *It's summer in England and it's winter in New Zealand.*
(121) *He handed her the scalpel and she made the incision.*
(122) *We spent the day in town and I went to Harrods.*

To conclude it can be said that the advantage of the Semantical Hypothesis is that it can account for all different kinds of meaning relations that can be expresses by the conjunction and, including backward relations but does not explain the relation between juxtaposed sentences and their conjoined counterparts (if both structures express the same relations, nor instances in which the juxtaposed sentence expresses a more specific relation than the conjoined utterance).

B.4 Buscha

As a result of contextual influences and the impact of (world-) knowledge Buscha's ambiguity account (1989) can account for all different kinds of meaning relations that can be expressed by the conjunction *and*, including backward relations. Example (123) illustrates that the relation between the conjuncts is interpreted as backward relation if (and because) the hearer knows that (most) flowers die if they are not watered sufficiently.

(123) *The flower died and it was Alice who forgot to water it.*

Buscha's approach considers (world) knowledge as influential factor and could for this reason even explain why people do not always interpret two conjuncts conjoined by *and* in the same way, even if they are confronted with exactly the same statement.

(124) *Joseph slipped on a banana peel and broke his arm.*
(125) *Tina got sick and went to see the doctor.*

In (124) and (125) the conjunction can be interpreted either as cause-consequence relations, as temporal relation or as both at the same time. People who are confronted with these statements may interpret the conjunction *and* differently because each of them establishes (based on his or her knowledge) a different relation between the conjuncts.[133]

As this approach does not mention how many lexemes and which lexemes exactly the conjunction has, it is theoretically possible that Buscha's ambiguity view can even account for fine grained meaning notions that hold between conjuncts. The only conditions that have to be met for this is that the variety of assumed lexemes is huge and detailed enough to account for the respective detailed meaning notions and it has to be provided that the hearer has the respective kind of detailed world knowledge and picks the respective lexeme. Though a consequence relation is expressed in (126) to (128) the finer grained meaning notion that holds between the conjuncts differs (direct consequence in vs. weak consequence vs. indirect consequence). Examples (126) to (128) are taken from Carston (2004, p. 223f.).

(126) *She shot him in the head and he died instantly.*
(127) *He left her and she took to the bottle.*
(128) *I forgot to hide the cake and the children consumed it.*

Statement (126) expresses a cause-consequence relation, for which the event described in the second conjunct is a direct consequence of the one in the first. In (127) the cause-consequence relation is much weaker because the event of the second conjunct does not logically or naturally follow from the first, but rather describes the woman's reaction to the man's action. In example (128) the cause-consequence relation is even more indirect because forgetting to hide the cake gave the children the opportunity to eat the cake. The assumption of a huge variety of lexemes is not only an advantage of Buscha's theory but can also be considered as a disadvantage because the huge amount of lexemes with detailed meaning notions can become difficult to overlook.

B.5 Relevance Theory

Causal relations between conjuncts are explained similarly as temporal ones: Encyclopedic and general knowledge about events in the world trigger certain assumption schemata. If these assumption schemata are in line with the principle of relevance, the hearer does not need to seek for further possible relations between the events and is not even allowed to look for other interpretations of the statement (Carston, 1993; Wilson & Sperber, 1998). Carston (2002a) points out that beyond the influences mentioned also the organization of information, Theory

[133] In examples (124) and (125) it does not make a great difference whether people pick the temporal or causal meaning feature of the conjunction because it does not change the order of the events as causes logically proceed their consequences.

of Mind as well as coherence factors play a role in text comprehension. Cause-consequence relations and assumption schemata between conjuncts are preferably established when no relation can be recognized between the conjuncts and when new pieces of information are registered. According to Carston, this is because humans look for explanations and try to establish relations between conjuncts (even if these are implausible) as they seek coherence (for details see: Carston, 2002a, p. 241). In contrast to unrelated statements, assumed causal relations help establishing coherence and can hence play an important role in establishing textual coherence (see also Carston, 2002a, p. 238 and literature cited there). This is in line with discourse theoretic approaches (e.g. Asher, 1999; Asher & Vieu, 2005; Lascarides & Asher, 1991; 1993) as well as theories based on constructionist principles (e.g. Graesser, Singer, & Trabasso, 1994; for an overview see Mulder, 2008) specifically the explanation assumption of these approaches, which make predictions about the kind of inferences readers construct between events in order to establish coherence during text comprehension. Carston further supports her view with arguments from a cognitive point of view. She cites findings by Abbott and Black (1986) who showed that people remember causally connected events better than temporally connected ones (Carston, 2002a, p. 238) .[134] Carston (2002a) further argues that humans' tendency to infer cause consequence relations is related to their theory of mind abilities that enable them the attribution of mental states to other people to understand, explain and predict their behaviors. Wilson and Sperber follow a similar approach: "[C]ausal stories are highly relevant, because they enable us to predict the consequences of our own actions and those of others" (Wilson & Sperber, 1998, p. 293).

Specifications that juxtaposed-sentences can communicate while the same specification relations between conjuncts do not seem to arise in conjoined sentences, as illustrated in example (129), can also be explained in the Relevance Theoretic framework. The examples are taken from Bar-Lev and Palacas (1980b).

(129) *(7a) Max fell; he slipped on a banana peel.*

(7b) ≠ Max fell and he slipped on a banana peel.

Similar as for the cause-consequence relations, Wilson and Sperber (1998) suggest the question-answer approach for juxtaposed sentences and explain the different meanings of the corresponding conjoined statement by taking up Blakemore's (1987) suggestion about differences in processing. According to this approach, semantics and syntax of conjoined sentences

[134] A study by Evers-Vermeul and Land (2011) on text comprehension revealed that the presence of connectors generally supports understanding of texts in 2nd graders as well as 13- and 14-year-old pupils.

are processed as a single unit. Consequently, the hearer looks for relevance, based on the conjoined sequence of both events because the conjoined utterance encourages "the hearer to process the two conjuncts jointly and in parallel, looking for implications derivable from both" (Wilson & Sperber, 1998, p. 296). Additionally, highly accessible scripts as well as influences of the natural processing path contribute to the interpretation of conjoined utterances. In juxtaposed sentences however, both events are processed as single units whereby each unit establishes relevance by its own so that the second unit can, for example, serve as explanation for the first unit if the hearer assumes a cause-consequence relation between both units (for details see: Blakemore & Carston, 1999; Carston, 1993; Carston, 2002a; Wilson & Sperber, 1998). Blakemore and Carston (2005) modified the original Relevance Theoretic approach by pointing out that the cognitive effects in conjoined *and*-sentences may also result from the individual conjuncts alone (see 3.3.3). Due to this modification the relevance theoretic approach can explain why conjoined utterances can sometimes express the same and sometimes different relations as juxtapositions.

Relevance Theory explains backward-relations that hold between two conjuncts, such as in (130) and (131), as follows. Example (130) is taken from Blakemore and Carston (2005, p. 571) who got it from Larry Horn and example (131) is taken from Blakemore and Carston (2005, p. 571).

(130) *A: Did John break the vase?*

B: Well, the vase broke and he dropped it.

(131) *A: Bob wants me to get rid of these mats. He says he trips over them all the time. Still, I don't suppose he'll break his neck.*

B: Well, I don't know. JOHN | broke his LEG | and HE | tripped on a PERSian RUG |

According to Relevance Theory, special stress and intonation patterns (as in (131)) as well as formulations that do deliberately not mirror the scripted and hence most accessible order (as in (130)), indicate that the speaker is not communicating a simple narrative (Blakemore & Carston, 2005, p. 578). Hence, extra processing costs are required and the chronological interpretation of the events has to be given up to arrive at the meaning that is intended to be communicated. For more detailed explanations and illustrations see Blakemore and Carston (1999, 2005). As just shown, the difference between juxtaposed sentences and conjoined utterances with respect to temporal relations, backward relations and attitude cases (e.g. adversative cases) arises according to Relevance Theory due to syntactic properties and processing

strategies. In the case of sentence initial *and*, it is assumed that the first conjunct has to be pragmatically enriched and is processed together with the second one as whole conjunct (see Blakemore & Carston, 2005).

It is not clear how Relevance Theory explains cases in which the relation that holds between two conjuncts is of simultaneity, such as in (132). These instances cannot be explained with the help of schemata, the natural processing path or stress and intonation. According to Relevance Theory the events in (132) would be explained as temporal sequence or cause-consequence relations. This however, might not always be the correct interpretation because it is also possible that both events occur simultaneously.

(132) Peter laughed and Mary was ashamed.

However, if the wider context and co-text of the utterances is known, Relevance Theory could explain these examples by referring to the hearer's knowledge. This shows again how important it is for a theory to give a detailed definition of what is considered as context. With respect to definitions, Bott, Frisson and Murphy (2009) challenge Carston's account (Carston, 2002b) by criticizing that it is not explained in detail what exactly is considered as conjoined units:

> "At various times, Carston (2002) refers to *facts*, *propositions*, *utterances*, *events*, and (most prominently) *processing units*. […] That is, *Greg skipped the seminar and he was sick* is being conceptualized as a single event (or single something), and so its parts are not easily decomposable."
>
> (Bott et al., 2009)

The difference between juxtaposed sentences and conjoined utterances with respect to temporal relations, backward relations and attitude cases (e.g. adversative cases) arises due to syntactic properties and processing strategies. In the case of sentence initial *and*, it is assumed that the first conjunct has to be pragmatically enriched and is processed together with the second one as whole conjunct (see Blakemore & Carston, 2005).

To sum up, Relevance Theory can account for a variety of meaning relations between conjuncts conjoined by *and*. However, this approach is also faced with challenges concerning more detailed definitions of terminology.

B.6 Sweetser

The interpretation of the conjunction *and* arise in Sweetser's account due to the influence of pragmatic factors such as context, iconicity, stress and intonation (Sweetser, 1990). Hence, this approach should be able to explain why some of the juxtaposed sentences can express the

same as conjoined clauses and can be interpreted as a sequence of events (cf. Sweetser, 1990, p. 90). Moreover, different interpretations (or finer meaning notions) of exactly the same statement can be explained because this account takes stress and intonation patterns of the clauses into consideration. Since Sweetser includes iconicity of sequence in her approach, she is also able to explain forward directed readings of the conjunction *and* such as temporality and causality. According to Sweetser causality interpretations of the conjunction are similarly as the temporal ones related to the iconicity of sequence but "(secondarily) implied" because earlier events typically cause later ones, rather than the other way round (Sweetser, 1986; 1990, p. 89).

Another kind of interpretation of the conjunction that is affected by the iconicity of sequence is the *and-so* reading of *and* as exemplified in (133). This example is taken from Sweetser (1990, p. 88).

(133) *Why don't you want me to take basketweaving again this quarter?*
Answer: Well, Mary got an MA in basketweaving, and she joined a religious cult. (…so you might go the same way if you take basketweaving).

As in narrative cases, the order of the conjuncts is of importance for the interpretation and affects the meaning of the whole statement because the first conjunct is taken as logically prior in the epistemic-world. However, in contrast to the temporal reading of the conjunction, which conjoins events of the world with each other, the *and-so* reading connects logical premises and "is iconic on the logical process rather than on the real-world events involved" (Sweetser, 1990, p. 88). Apart from these explanations, Sweetser also points out that stress as well as intonation patterns are in some cases important for the interpretation because they help to determine in which domain the conjuncts are conjoined. Sweetser (1990, p. 89) illustrates this with the following example (134):

(134) *The Vietnam War WAS morally wrong, and I'll gladly discuss the reasons why I think so.*

The author points out, that the conjunction would be interpreted on the content level if there was no stress on the first conjunct.

Sweeteser's account (1986, 1990) faces similar challenges as the Semantic Command account: Both accounts cannot explain backward or consequence-cause relations between *and*-conjoined conjuncts. This is because iconicity of sequence and the correspondence of the order of narration to the order in which events happen in the real world suggest forward readings and do not allow backward readings. Moreover, it should be challenging for this approach to explain instances in which the conjunction expresses simultaneity or adversative relations because the relation between the conjuncts suggested by this approach should be a

forward relation. Therefore, further principles or specifications that modify this account are required to explain these relations.

B.7 Kitis

The frame-theoretic characteristics in Kitis' account have the advantage that they do not only constrain the function of the connective on the propositional level but can also explain a variety of different uses of the conjunction such as contrastive/adversative, causal, logical as well as temporal relations.

Causal relations between conjuncts are explained in a similar way as temporal ones: The relation between both conjuncts has to be established actively with the help of the frames and/or believe-schemata that were activated by both conjuncts as illustrated in (135).

(135) *The dog jumped into the lake and got dripping wet.*

It is common knowledge that a lake consists of water. It is also common knowledge that things that come in contact with water do get wet. The link between water and getting wet is a causal one. Hence, the conjunction in (58) is interpreted causally.

Although not explicitly explained and illustrated by Kitis, this frame-theoretic account can handle backward causal or temporal relations such as in (136) and (137).

(136) *Peter went to bed and took of his jumper.*
(137) *They felt cold and the heating was not functioning.*

On the first glance there appears to be a conflict between both conjoined frames or (sub-) frames and the hearer's expected connection of frames or script, e.g. because a forward temporal reading or cause-consequence relation was expected. However, the hearer recognizes this conflict, because he considers his knowledge and beliefs while reflecting on the relation that holds between both frames. Based on this he arrives at the interpretation that the information conveyed in the utterance has to be interpreted as backward temporal or consequence-cause relation respectively because a forward interpretation violates scripts, (sub-)frames and schemata. Backward temporal relations between conjuncts as well as consequence-cause relations can be categorized roughly in the middle of the continuum in Figure 1 (see p. 36) because these kind of statements appear subversive with respect to the expected forward (temporal) reading

The conjunction can however also function as rhetorical and emotional device (Kitis, 2000a, p. 382). This is illustrated with the help of examples in which the conjunction expresses a contrastive or additive relation such as in (138) and (139). Example (139) is taken from Blakemore and Carston (1999, p. 13).

(138) The princess is rich and unhappy.
(139) Her husband was in hospital and she was dating other men.

The adjective *rich* and the noun *princess* in the first conjunct are associated with fairy tales. The typical or stereotypical situation is that the princess is very rich. Being rich is by many people associated with a lot of good and pleasant things. Some people believe that being rich makes people happy. In the second conjunct the adjective *unhappy* however, expresses a negative feeling or something unpleasant. This is not expected or not consistent with the frame activated in the first conjunct. Hence, the information the hearer gets upon hearing this sentence is *conjunct 1, conjunct 2, conflictual*. This conflictual relationship arises because both frames appear to be incompatible and hence suggest an adversative or contrastive interpretation on the propositional level. It is also known that the speaker could have conjoined the same facts with the conjunction *but*. As this was not done, the hearer has to reflect on the relation that holds between the conjuncts by himself and hence interprets the statements as "reflexive evaluation or self-evaluation" (Kitis, 2000a, p. 381).

The function of *and* as rhetorical and emotive device can also be illustrated quite well with the help of example (139). When hearing that somebody's husband is in hospital one does not expect that the wife is dating other men. The second activated frame conflicts with the stereotypical knowledge and belief-systems that are activated by the first frame, namely that people who are in hospital are usually visited by friends and family. As in the previous example the conflict between both conjuncts is not articulated by the conjunction *but* or any other contrastive conjunction. Again, the hearer has to assess the relation that holds between the conjuncts by himself. This automatically triggers a reflexive evaluation or self-evaluation of the incompatible or conflicting frames. The conjunction is also said to function as rhetorical device because the speaker's point of view is indirectly communicated although the speaker's empathy is not directly or linguistically expressed in this example. The rhetorical function of the conjunction *and* is depicted in Figure 15.[135]

[135] This figure is adapted from Kitis (2000a, p. 382).

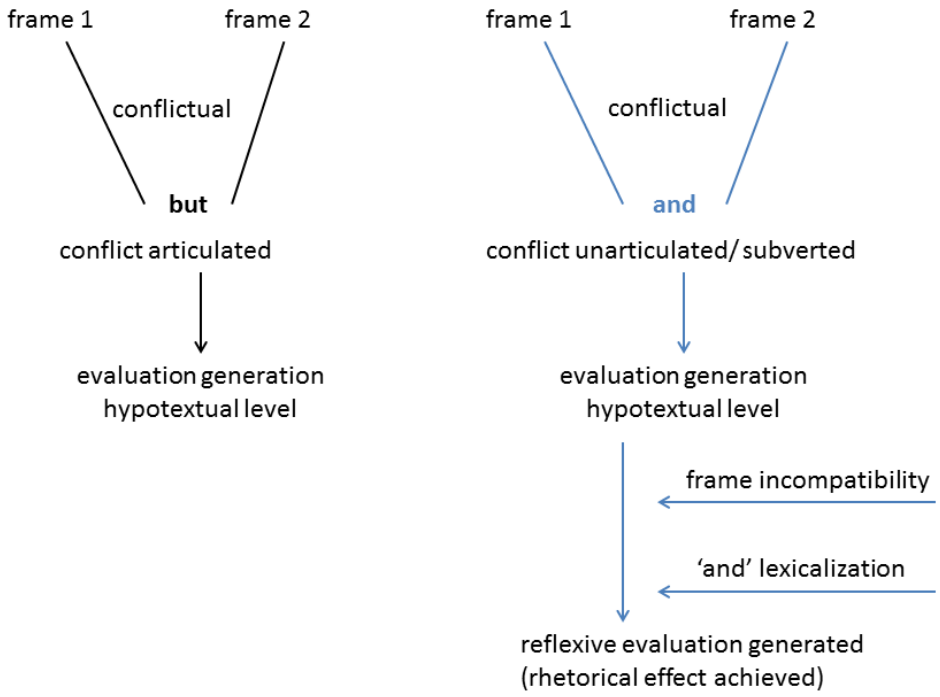

Figure 15 Reflexive evaluation of *and*-rhetorical structures

Although Kitis does not explicitly explain and point out why sentences conjoined by *and* can sometimes express more specific information than utterances in which the statements occur as juxtaposed sentences, her approach to the interpretation of connectives could account for this: A conjunction indicates that a relation between both conjuncts has to be established actively with the help of the frames and/or believe-schemata that were activated by both conjuncts. In juxtaposed sentences however, it is not indicated that the statements have to be connected directly with each other. As the hearer strives for coherence, he or she tries to establish coherence, which does not necessarily have to be on the sentence level but can also be on the textual and discourse level. Depending on which level coherence is established in the juxtaposed sentences, the meaning conveyed by juxtaposed sentences and the respective conjoined utterances might differ. Instances in which two juxtaposed sentences express the same meaning relations as an utterance in which the same statements are conjoined by *and*, can be explained in the same way. If the same coherence relation is established on the same level between juxtaposed sentences and the *and*-conjoined counterpart, the meaning relation expressed between both events should be the same in both statements.

B.8 Discourse Theory

As the account by Asher and colleagues (e.g. Asher, 1999; Asher & Vieu, 2005; Lascarides & Asher, 1991; 1993) was not specifically designed to explain discourse relations expressed by the conjunction *and*, in the following Txurruka's account (2003) is discussed exemplary for the discourse theoretic approaches.

Txurruka (2003) can also account for a variety of meaning relations between *and*-conjoined conjuncts. Parallel, conditional as well as discourse relations that express result are explained in a similar manner as the temporal relation (for details see chapter 3.3.6.2).

Furthermore, Txurruka (2003) explains why some backward relations that are expressed by the conjunction *and* are possible while others are not. Grounded on the fact that discourse relations between speech-acts are inferred from (lexical, semantic or world) knowledge, the discourse topic established by the second conjunct in (140) would be a subtopic of the first one. This is not compatible with the fact that *and* requires a CDT because *and* blocks inferred subordinating discourse relations. This has the consequence that the coordinator is rejected (Txurruka, 2003, p. 269f.).

(140) *The plane took off and the passengers got on board.*

Hence statements such as the one in (140) are not acceptable because coherence is violated since "[…] the semantics of *and* indicates coordination but world- and lexical-knowledge does not allow the construction of a CDT" (Txurruka, 2003, p. 270). In cases where discourse topic relation conflicts with the meaning of the discourse marker and derives two incompatible meanings, the meaning of the discourse marker has priority: "A discourse marker in the linguistic input is severely constraining the construction of the discourse structure" (Txurruka, 2003, p. 271).

This means that the coordinating meaning of the conjunction *and* does not allow a subordinating discourse relation between two speech-act. Hence, *and* blocks the discourse relation of explanation in (141). Accordingly, Txurruka's approach should also rule out statements that express (acceptable) backward relations, such as in (142). Example (141) is taken from Txurruka (2003, p. 272).

(141) *Max fell, and he slipped on a banana peel.*

(142) *If Max fell, and he slipped on a banana peel, and his slipping explains his falling, we don't need to resort to any esoteric or voodoo-related explanation to understand what happened.*

Yet, these kinds of statements occur in natural langue and do not seem odd. In fact, Txurruka, can account for these cases as well because she distinguishes between the level of discourse

structure and information that is not part of the discourse structure but intentionally communicated. She explicitly points out that subordination is blocked on the discourse structure level rather than on the level of the inferred propositional content:

> "It is important to distinguish between the level of discourse structure and the level of other information about the world that can be inferred but it is not intended by the speaker to belong to the discourse structure. This distinction can be captured in SDRT by means of the already introduced distinction between speech acts and propositional content." (Txurruka, 2003, p. 272f.)

The distinction between discourse structure and propositional content helps to explain instances in which the conjuncts of juxtaposed sentences can convey a different meaning than exactly the same conjuncts conjoined by *and*. While (143) expresses a concept – sub-concept relation between the conjuncts on the speech-act level, example (144) expresses coordination of the conjuncts on the content level. These examples are taken from Txurruka (2003, p. 274) who took them from Bar-Lev and Palacas (1980b).

(143) *Wars are breaking out all over; Champaign and Urbana have begun having skirmishes.*
(144) *Wars are braking out all over and Champaign and Urbana have begun having skirmishes.*

Relations of elaboration (e.g. (145)), reformulation (as a subtype of elaboration) (e.g. (146)) and background (e.g. (147)) that appear to hold between the conjuncts in the examples below are explained similarly.[136] Examples (146) and (147) are taken from Txurruka (2003, p. 276). The mentioned relations hold on the discourse topic level while the semantics of the discourse marker is defined as coordination and has priority over meaning. Therefore, the subordinating relations that arise and are inferred based on the hearer's interpretation are blocked.

(145) *We went to the City Centre and bought food at the market-place.*
(146) *Language is rule-governed and it follows regular patterns.*
(147) *He walked into the room and the director was slumped in her chair.*

Instances in which juxtaposed sentences express the same meaning as the respective conjoined sentences can also be explained by this approach because discourse relations can be coordination or subordination for juxtapositions (Txurruka, 2003). *And*-conjoined statements can however only be coordinating. From this follows that cases in which conjoined and juxtaposed sentences express the same meaning must be instances of coordination.

[136] Txurruka (2003) refers to Mann and Thompson (1986) and considers the DR of reformulation as a subtype of elaboration.

Moreover, Txurruka (2003) explains backward-relations that appear to hold between conjuncts with the help of contextual factors, intonation and the distinction between discourse structure level and inferred propositional content. In (148) (taken from Txurruka, 2003, p. 279) content is the information that is explicitly expressed while the backward relation that appears to hold between the conjuncts is calculated on the basis of the information given. Hence, the meaning conveyed in this example has three different layers. "At the level of the assertion, *and* indicates that a Coordinator is required and, thus, Explanation is blocked. Therefore, at the level of discourse structure, there is a semantic requirement to use a Coordinator and build a CDT" (Txurruka, 2003, p. 279). At the level of what is implicated contextual factors are of importance, in the way that the contribution has to make sense with respect to the previous utterance or question. Therefore, the hearer has to calculate the implicature that the relation between the conjuncts in (148) has to be interpreted as backward relation to answer the question sufficiently. In other cases such as in (149) (taken from Txurruka, 2003, p. 259), the hearer can infer a backward relation although this inference is not required or intended by the speaker and can therefore not be considered as part of the discourse structure.

(148) *A: Did John break the vase?*
B: Well the vase broke and he dropped it.

(149) *A: Did she do all of her education in the States?*
B: No, she did her BA in London and she did her A levels in Leeds.

Conditional relations that hold between the conjuncts such as in (150) (from Txurruka, 2003, p. 279) can also be explain with this approach because Txurruka (2003) classifies Conditional as Coordinator.[137]

(150) *Stand up, and I'm going to break your arm.*

Txurruka further points out that her approach is a preliminary study and does not account for adversative cases and leaves sentence initial occurrences of *and* unconsidered. However, an advantage of this approach is that it does not only explain temporal readings and a variety of other readings of the conjunction but also explicitly refers to simultaneous interpretations of the conjunction. The only (possible) shortcoming of Txurrkua's account is that according to Asher and Vieu (2005) it has not been defined or pointed out systematically, what kind of discourse relations are coordinating and which ones are subordinating.

[137] Example (150) is taken from Txurruka (2003).

C Materials

C.1 Instructions adults

"Hallo! Danke, dass Du an der Studie teilnimmst. Deine Aufgabe wird es sein, Dir mehrere kurze Videos von einem Vogel und einer Katze anzuschauen. In diesen Videos erzählt der Vogel jeweils eine kurze Geschichte. Danach versucht die Katze, die gehörte Geschichte wiederzugeben. Anschießend (wenn Du das Symbol einer nachdenkenden Figur siehst), ist es Deine Aufgabe zu beurteilen, ob die Katze die Dinge aus der Geschichte richtig oder falsch wiedergegeben hat. Wenn die Katze etwas sagt, das nicht in der Geschichte vorkam, ist der Satz auf jeden Fall falsch. Antworte mit „richtig", wenn das von der Katze gesagte richtig war und mit „falsch", wenn es falsch war.

Wenn du Anmerkungen zu Deinen Antworten hast, dann solltest Du sie bitte mitteilen. Deine Antworten werden schriftlich protokolliert. Damit du dir vorstellen kannst, wie das Experiment funktioniert, folgen zunächst zwei Beispiele. Danach beginnt die eigentliche Studie. Wenn du noch Fragen hast, kannst Du sie jetzt stellen. Viel Spaß!"

[Hello! Thank you for participating in this study. It will be your task to watch a couple of little video-clips about a bird and a cat. In each of these video-clips the bird will tell a short story. Then the cat, tries to repeat the story. Afterwards (if the symbol of a thinking figure is depicted), it is your task to evaluate, whether the cat repeated the things of the story correctly or wrongly. If the cat says something, which did not happen in the story, the sentence is definitely wrong. Answer with *right* if the cat repeated the things correctly and with *wrong* if it was wrong.

If you have explanatory notes concerning your answers please let me know. Your answers will be noted down in a protocol. In order to give you an impression, how the experiment works, two examples will be given. Afterwards the study will start. If you have any questions, please let me know. Have fun!]

C.2 Instructions children

Hallo (Name des Kindes)!

Du siehst gleich mehrere Videos von einem Vogel (Bild vom Vogel zeigen) und einer Katze (Bild von der Katze zeigen). Der Vogel erzählt dir und der Katze eine kurze Geschichte. Danach versucht die Katze Sachen aus der Geschichte zu wiederholen. Deine Aufgabe ist es, zu sagen, ob die Katze die Sachen richtig oder falsch gesagt hat. Deshalb musst du gut zuhören und dir die Sachen, die in der Geschichte passieren gut merken.

Wenn du dieses Bild siehst (Symbol Frage zeigen), darfst du sagen, ob die Katze die Dinge richtig oder falsch gesagt hat. Antworte mit „richtig", wenn das von der Katze gesagte richtig war und mit „falsch", wenn es falsch war.

Wenn du etwas besser als die Katze sagen kannst, dann darfst du die Katze verbessern. Wenn die Katze etwas sagt, das nicht in der Geschichte vorkam, ist es auf jeden Fall falsch.

Damit du dir vorstellen kannst, wie das Spiel funktioniert, schauen wir uns nun zwei Beispiele gemeinsam an. Danach beginnt das Spiel.

[Hello (name of the child)!

I will show you see a couple of short video-clips about a bird (show picture of the bird) and a cat (show picture of the cat). The bird tells you and the cat a short story. Afterwards the cat tries to repeat things from the story. It is your task to say whether the cat has said these things correctly or wrongly. Therefore you have to listen carefully and try to remember what happened in the story.

When you see this picture (show symbol of a thinking person), you are allowed to say, whether the cat has said it right or wrong. Please say *right* if the cat has said it correctly and *wrong* if the cat has said it wrongly. If you can give a better answer than the cat, you are allowed to say it. If the cat says something that did not happen in the story, the sentence is definitely wrong.

To show you how the game works, we will look at two examples together. Afterwards the game will start.]

C.3 Items for Introduction and Exercise

Jana hat ihrer Mama geholfen. Sie hat den Müll raus gebracht. Dann hat sie die Fensterbank abgewischt. Danach hat sie die Treppe gekehrt.

(1&2) Jana hat den Müll rausgebracht und dann hat sie die Fensterbank abgewischt.
(1&0) Jana hat den Müll rausgebracht und dann hat sie das Geschirr gespült.

Klaus war heute am Teich im Stadtpark. Er hat die Fische gefüttert. Dann hat er die Schwäne beobachtet. Danach hat er die Enten gejagt.

(2&3) Klaus hat die Schwäne beobachtet und dann hat er die Enten gejagt.
(2&0) Klaus hat die Schwäne beobachtet und dann hat er auf einer Bank gesessen.

Mama hat heute Kleidung ausgebessert. Sie hat eine Hose geflickt. Dann hat sie einen Knopf angenäht. Danach hat sie Socken gestopft.

(1&3) Mama hat eine Hose geflickt und dann hat sie Socken gestopft.
(3&0) Mama hat Socken gestopft und dann hat sie einen Reißverschluss eingenäht.

C.4 Material Experiment I

1. Der kleine Tiger ist zum Spielplatz gegangen. Er hat mit Sandförmchen gespielt. Dann hat er eine Burg gebaut. Danach hat er einen Tunnel gegraben.

   (1&2) Der kleine Tiger hat mit Sandförmchen gespielt und eine Burg gebaut.
   (2&1) Der kleine Tiger hat eine Burg gebaut und mit Sandförmchen gespielt.
   (2&3) Der kleine Tiger hat eine Burg gebaut und einen Tunnel gegraben.
   (3&2) Der kleine Tiger hat einen Tunnel gegraben und eine Burg gebaut.
   (1&3) Der kleine Tiger hat mit Sandförmchen gespielt und einen Tunnel gegraben.
   (3&1) Der kleine Tiger hat einen Tunnel gegraben und mit Sandförmchen gespielt.

   (1&0) Der kleine Tiger hat mit Sandförmchen gespielt und eine Mauer errichtet.
   (2&0) Der kleine Tiger hat eine Burg gebaut und eine Mauer errichtet.

2. In der Nacht hat der kleine Bär vom Schlaraffenland geträumt. Er hat dort Schokoladenpudding gegessen. Dann hat er ein Eis geleckt. Danach hat er ein Stück Torte verspeist.

   (1&2) Der kleine Bär hat Schokoladenpudding gegessen und ein Eis geleckt.
   (2&1) Der kleine Bär hat ein Eis geleckt und Schokoladenpudding gegessen.
   (2&3) Der kleine Bär hat ein Eis geleckt und ein Stück Torte verspeist.
   (3&2) Der kleine Bär hat ein Stück Torte verspeist und ein Eis geleckt.
   (1&3) Der kleine Bär hat Schokoladenpudding gegessen und ein Stück Torte verspeist.
   (3&1) Der kleine Bär hat ein Stück Torte verspeist und Schokoladenpudding gegessen.

   (0&1) Der kleine Bär hat Limonade getrunken und Schokoladenpudding gegessen.
   (3&0) Der kleine Bär hat ein Stück Torte verspeist und Limonade getrunken.

3. Paula wollte einen Ausflug mit ihrem neuen Fahrrad machen. Sie hat ihren Teddy in den Kindersitz gesetzt. Dann hat sie ihre Picknickdecke eingepackt. Danach hat sie ihren Rucksack aufgezogen.

   (1&2) Paula hat ihren Teddy in den Kindersitz gesetzt und ihre Picknickdecke eingepackt.
   (2&1) Paula hat ihre Picknickdecke eingepackt und ihren Teddy in den Kindersitz gesetzt.
   (2&3) Paula hat ihre Picknickdecke eingepackt und ihren Rucksack aufgezogen.
   (3&2) Paula hat ihren Rucksack aufgezogen und ihre Picknickdecke eingepackt.
   (1&3) Paula hat ihren Teddy in den Kindersitz gesetzt und ihren Rucksack aufgezogen.
   (3&1) Paula hat ihren Rucksack aufgezogen und ihren Teddy in den Kindersitz gesetzt.

   (2&0) Paula hat ihre Picknickdecke eingepackt und ihren Fahrradhelm aufgesezt.
   (0&3) Paula hat ihren Fahrradhelm aufgesetzt und ihren Rucksack aufgezogen.

4. Lena hat ihr Fahrrad geputzt. Sie hat das Gestell gewaschen. Dann hat sie die Reifen geputzt. Danach hat sie das Fahrradkörbchen abgewischt.

(1&2) Lena hat das Gestell gewaschen und die Reifen geputzt.
(2&1) Lena hat die Reifen geputzt und das Gestell gewaschen
(2&3) Lena hat die Reifen geputzt und das Fahrradkörbchen abgewischt.
(3&2) Lena hat das Fahrradkörbchen abgewischt und die Reifen geputzt.
(1&3) Lena hat das Gestell gewaschen und das Fahrradkörbchen abgewischt.
(3&1) Lena hat das Fahrradkörbchen abgewischt und das Gestell gewaschen.

(1&0) Lena hat das Gestell abgewaschen und die Fahrradklingel ausprobiert.
(0&2) Lena hat die Fahrradklingel ausprobiert und die Reifen geputzt.

5. Franziska ist mit ihrem Opa in den Zoo gegangen. Sie hat die Ziegen gefüttert. Dann hat sie die Elefanten angeschaut. Danach ist sie auf einem Pony geritten.

(1&2) Franziska hat die Ziegen gefüttert und die Elefanten angeschaut.
(2&1) Franziska hat die Elefanten angeschaut und die Ziegen gefüttert.
(2&3) Franziska hat die Elefanten angeschaut und ist auf einem Pony geritten.
(3&2) Franziska ist auf einem Pony geritten und hat die Elefanten angeschaut.
(1&3) Franziska hat die Ziegen gefüttert und ist auf einem Ponny geritten.
(3&1) Franziska ist auf einem Pony geritten und hat die Ziegen gefüttert.

(0&1) Franziska hat die Löwen fotografiert und die Ziegen gefüttert.
(3&0) Franziska ist auf einem Pony geritten und hat die Löwen fotografiert.

6. Der kleine Tiger war heute auf dem Spielplatz. Er ist gerutscht. Dann ist er Karussell gefahren. Danach hat er geschaukelt.

(1&2) Der kleine Tiger ist gerutscht und Karussell gefahren.
(2&1) Der kleine Tiger ist Karussell gefahren und gerutscht.
(2&3) Der kleine Tiger ist Karussell gefahren und hat geschaukelt.
(3&2) Der kleine Tiger hat geschaukelt und ist Karussell gefahren.
(1&3) Der kleine Tiger ist gerutscht und hat geschaukelt.
(3&1) Der kleine Tiger hat geschaukelt und ist gerutscht.

(2&0) Der kleine Tiger ist Karussell gefahren und gewippt.
(0&3) Der kleine Tiger ist gewippt und hat geschaukelt.

7. Beate hat heute im Kindergarten gespielt. Sie hat ihre Puppe ins Bett gebracht. Dann hat sie einen Turm gebaut. Danach hat sie mit dem Teddy gespielt.

(1&2) Beate hat ihre Puppe ins Bett gebracht und einen Turm gebaut.
(2&1) Beate hat einen Turm gebaut und ihre Puppe ins Bett gebracht.
(2&3) Beate hat einen Turm gebaut und mit dem Teddy gespielt.
(3&2) Beate hat mit dem Teddy gespielt und einen Turm gebaut.
(1&3) Beate hat ihre Puppe ins Bett gebracht und mit dem Teddy gespielt.
(3&1) Beate hat mit dem Teddy gespielt und ihre Puppe ins Bett gebracht

(1&0): Beate hat ihre Puppe ins Bett gebracht und mit den Autos gespielt.
(0&2) Beate mit den Autos gespielt und einen Turm gebaut.

8. Der kleine Tiger hat heute ein Konzert veranstaltet. Er hat auf den Kochtöpfen getrommelt. Dann hat er auf dem Tisch getanzt. Danach hat er Gitarre gespielt.

   (1&2) Der kleine Tiger hat auf den Kochtöpfen getrommelt und auf dem Tisch getanzt.
   (2&1) Der kleine Tiger hat auf dem Tisch getanzt und auf den Kochtöpfen getrommelt.
   (2&3) Der kleine Tiger hat auf dem Tisch getanzt und Gitarre gespielt.
   (3&2) Der kleine Tiger hat Gitarre gespielt und auf dem Tisch getanzt.
   (1&3) Der kleine Tiger hat auf den Kochtöpfen getrommelt und Gitarre gespielt.
   (3&1) Der kleine Tiger hat Gitrarre gespielt und auf den Kochtöpfen getrommelt.

   (0&1) Der kleine Tiger hat Trompete gespielt und auf den Kochtöpfen getrommelt.
   (3&0) Der kleine Tiger hat Gitarre gespielt und Trompete gespielt.

9. Auf dem Jahrmarkt ist der kleine Bär Karussell gefahren. Er ist mit dem Feuerwehrauto gefahren. Dann ist er auf dem Pferd geritten. Danach ist er mit dem Hubschrauber geflogen.

   (1&2) Der kleine Bär ist mit dem Feuerwehrauto gefahren und auf dem Pferd geritten.
   (2&1) Der kleine Bär ist auf dem Pferd geritten und mit dem Feuerwehrauto gefahren.
   (2&3) Der kleine Bär ist auf dem Pferd geritten und mit dem Hubschrauber geflogen.
   (3&2) Der kleine Bär ist mit dem Hubschrauber geflogen und auf dem Pferd geritten.
   (1&3) Der kleine Bär ist mit dem Feuerwehrauto gefahren und mit dem Hubschrauber geflogen.
   (3&1) Der kleine Bär ist mit dem Hubschrauber geflogen und mit dem Feuerwehrauto gefahren.

   (2&0) Der kleine Bär ist auf dem Pferd geritten und mit dem Motorrad gefahren.
   (0&3) Der kleine Bär ist mit dem Motorrad gefahren und mit dem Hubschrauber geflogen.

10. Der kleine Bär hat Frühsport gemacht. Er ist durch den Garten gerannnt. Dann hat er an einem Baum Klettern geübt. Danach ist er Seil gesprungen.

    (1&2) Der kleine Bär ist durch den Garten gerannt und hat Klettern geübt.
    (2&1) Der kleine Bär hat Klettern geübt und ist durch den Garten gerannt.
    (2&3) Der kleine Bär hat Klettern geübt und ist Seil gesprungen.
    (3&2) Der kleine Bär ist Seil gesprungen und hat Klettern geübt.
    (1&3) Der kleine Bär ist durch den Garten gerannt und Seil gesprungen.
    (3&1) Der kleine Bär ist Seil gesprungen und durch den Garten gerannt.

    (1&0) Der kleine Bär ist durch den Garten gerannt und hat Kniebeugen gemacht.
    (0&2) Der kleine Bär hat Kniebeugen gemacht und Klettern geübt.

11. Der kleine Tiger wollte etwas Selbstgemachtes verschenken. Er hat etwas ausgeschnitten. Dann hat er ein Bild gemalt. Danach hat er einen Strohstern gebastelt.

    (1&2) Der kleine Tiger hat etwas ausgeschnitten und ein Bild gemalt.
    (2&1) Der kleine Tiger hat ein Bild gemalt und etwas ausgeschnitten.

(2&3) Der kleine Tiger hat ein Bild gemalt und einen Strohstern gebastelt.
(3&2) Der kleine Tiger hat einen Strohstern gebastelt und ein Bild gemalt.
(1&3) Der kleine Tiger hat etwas ausgeschnitten und einen Strohstern gebastelt.
(3&1) Der kleine Tiger hat einen Strohstern gebastelt und etwas ausgeschnitten

(0&1) Der kleine Tiger hat eine Kette aufgefädelt und etwas ausgeschnitten.
(3&0) Der kleine Tiger hat ein Fensterbild gebastelt und eine Kette aufgefädelt.

12. Heute war der kleine Tiger im Schwimmbad. Er hat Wasserball gespielt. Dann hat er Tauchen geübt. Danach ist er ein bisschen geschwommen.

(1&2) Der kleine Tiger hat Wasserball gespielt und Tauchen geübt.
(2&1) Der kleine Tiger hat Tauchen geübt und Wasserball gespielt.
(2&3) Der kleine Tiger hat Tauchen geübt und ist geschwommen.
(3&2) Der kleine Tiger ist geschwommen und hat Tauchen geübt.
(1&3) Der kleine Tiger hat Wasserball gespielt und ist geschwommen.
(3&1) Der kleine Tiger ist geschwommen und hat Wasserball gespielt.

(2&0) Der kleine Tiger hat Tauchen geübt und in der Sonne gelegen.
(0&3) Der kleine Tiger hat in der Sonne gelegen und ist geschwommen.

13. Der kleine Bär hat heute Obstsalat gemacht. Er hat Erdbeeren gepflückt. Dann hat er Äpfel gewaschen. Danach hat er Orangen geschält.

(1&2) Der kleine Bär hat Erdbeeren gepflückt und Äpfel gewaschen.
(2&1) Der kleine Bär hat Äpfel gewaschen und Erdbeeren gepflückt.
(2&3) Der kleine Bär hat Äpfel gewaschen und Orangen geschält.
(3&2) Der kleine Bär hat Orangen geschält und Äpfel gewaschen.
(1&3) Der kleine Bär hat Erdbeeren gepflückt und Orangen geschält.
(3&1) Der kleine Bär hat Orangen geschält und Erdbeeren gepflückt.

(0&2) Der kleine Bär hat Kiwis geschält und Äpfel gewaschen.

14. Heute hat die kleine Katze im Garten gespielt. Sie hat einen Schmetterling beobachtet. Dann hat sie mit ihrem Ball gespielt. Danach hat sie eine Maus gefangen.

(1&2) Die kleine Katze hat einen Schmetterling beobachtet und mit ihrem Ball gespielt.
(2&1) Die kleine Katze hat mit ihrem Ball gespielt und einen Schmetterling beobachtet.
(2&3) Die kleine Katze hat mit ihrem Ball gespielt und eine Maus gefangen.
(3&2) Die kleine Katze hat eine Maus gefangen und mit ihrem Ball gespielt.
(1&3) Die kleine Katze hat einen Schmetterling beobachtet und eine Maus gefangen.
(3&1) Die kleine Katze hat eine Maus gefangen und einen Schmetterling beobachtet.

(3&0) Die kleine Katze hat eine Maus gefangen und den Hund geärgert.

15. Der kleine Bär ist Fahrrad gefahren. Er ist an einer Wiese vorbeigefahren. Dann hat er eine Brücke überquert. Danach ist er durch einen Tunnel gefahren.

(1&2) Der kleine Bär ist an einer Wiese vorbeigefahren und hat eine Brücke überquert.
(2&1) Der kleine Bär hat eine Brücke überquert und ist an einer Wiese vorbeigefahren.
(2&3) Der kleine Bär hat eine Brücke überquert und ist durch einen Tunnel gefahren.
(2&2) Der kleine Bär ist durch einen Tunnel gefahren und hat eine Brücke überquert.
(1&3) Der kleine Bär ist an einer Wiese vorbeigefahren und durch einen Tunnel gefahren.
(3&1) Der kleine Bär ist durch einen Tunnel gefahren und an einer Wiese vorbeigefahren.

(0&3) Der kleine Bär ist durch einen Wald gefahren und an einer Wiese vorbeigefahren.

16. Heute war der kleine Bär in der Stadt. Er hat eine neue Jacke gekauft. Dann hat er ein Buch ausgeliehen. Danach hat er sich einen Sonnenhut gekauft.

(1&2) Der kleine Bär hat eine Jacke gekauft und ein Buch ausgeliehen.
(2&1) Der kleine Bär hat ein Buch ausgeliehen und eine Jacke gekauft.
(2&3) Der kleine Bär hat ein Buch ausgeliehen und einen Sonnenhut gekauft.
(3&2) Der kleine Bär hat einen Sonnenhut gekauft und ein Buch ausgeliehen.
(1&3) Der kleine Bär hat eine Jacke gekauft und einen Sonnenhut gekauft.
(3&1) Der kleine Bär hat einen Sonnenhut gekauft und eine Jacke gekauft.

17. Der kleine Tiger war heute im Musikunterricht. Er hat ein Lied angehört. Dann hat er getrommelt. Danach hat er den Rhythmus mitgeklatscht.

(1&2) Der kleine Tiger hat ein Lied angehört und getrommelt.
(2&1) Der kleine Tiger hat getrommelt und ein Lied angehört.
(2&3) Der kleine Tiger hat getrommelt und den Rhythmus mitgeklatscht.
(3&2) Der kleine Tiger hat den Rhythmus mitgeklatscht und getrommelt.
(1&3) Der kleine Tiger hat ein Lied angehört und den Rhythmus mitgeklatscht.
(3&1) Der kleine Tiger hat den Rhythmus mitgeklatscht und ein Lied angehört.

18. Paul hat einen Ausflug zum Bauernhof gemacht. Er ist zu den Kaninchen gegangen. Dann hat er die Lämmchen angesehen. Danach hat er die Ponys gestreichelt.

(1&2) Paul ist zu den Kaninchen gegangen und hat die Lämmchen angesehen.
(2&1) Paul hat die Lämmchen angesehen und ist zu den Kaninchen gegangen.
(2&3) Paul hat die Lämmchen angesehen und die Ponys gestreichelt.
(3&2) Paul hat die Ponys gestreichelt und die Lämmchen angesehen.
(1&3) Paul ist zu den Kaninchen gegangen und hat die Ponys gestreichelt.
(3&1) Paul hat die Ponys gestreichelt und ist zu den Kaninchen gegangen.

19. Paula hat im Garten geholfen. Sie hat die Blumen gegossen. Dann hat sie die Äpfel gepflückt. Danach hat sie den Gartenweg gekehrt.

(1&2) Paula hat die Blumen gegossen und Äpfel gepflückt.
(2&1) Paula hat Äpfel gepflückt und die Blumen gegossen.
(2&3) Paula hat Äpfel gepflückt und den Gartenweg gekehrt.

(3&2) Paula hat den Gartenweg gekehrt und Äpfel gepflückt.
(1&3) Paula hat die Blumen gegossen und den Gartenweg gekehrt.
(3&1) Paula hat den Gartenweg gekehrt und die Blumen gegossen.

(1&0) Paula hat die Blumen gegossen und Erdbeeren gepflückt.

20. Heute hat es endlich geschneit. Der kleine Tiger ist Schlitten gefahren. Dann hat er einen Schneemann gebaut. Danach hat er mit Schneebällen geworfen.

(1&2) Der kleine Tiger ist Schlitten gefahren und hat einen Schneemann gebaut.
(2&1) Der kleine Tiger hat einen Schneemann gebaut und ist Schlitten gefahren.
(2&3) Der kleine Tiger hat einen Schneemann gebaut und mit Schneebällen geworfen.
(3&2) Der kleine Tiger hat mit Schneebällen geworfen und einen Schneemann gebaut.
(1&3) Der kleine Tiger ist Schlitten gefahren und hat mit Schneebällen geworfen.
(3&1) Der kleine Tiger hat mit Schneebällen geworfen und ist Schlitten gefahren.

(0&1) Der kleine Tiger hat ein Iglu gebaut und ist Schlitten gefahren.

21. Peter musste beim Versteckspiel suchen. Er hat hinter dem Wasserfass nachgeschaut. Dann hat er hinter der Hecke geguckt. Danach hat er im Schuppen gesucht.

(1&2) Peter hat hinter dem Wasserfass nachgeschaut und hinter der Hecke geguckt.
(2&1) Peter hat hinter der Hecke geguckt und hinter dem Wasserfass nachgeschaut.
(2&3) Peter hat hinter der Hecke geguckt und im Schuppen gesucht.
(3&2) Peter hat im Schuppen gesucht und hinter der Hecke geguckt.
(1&3) Peter hat hinter dem Wasserfass nachgeschaut und im Schuppen gesucht.
(3&1) Peter hat im Schuppen gesucht und hinter dem Wasserfass geguckt.

(2&0) Peter hat hinter der Hecke geguckt und im Keller gesucht.

22. Am Schulfest nahm Marie an verschiedenen Angeboten teil. Sie hat eine Stofftasche bemalt. Dann hat sie einen Schmetterling gebastelt. Danach hat sie ein Armband aufgefädelt.

(1&2) Marie hat eine Stofftasche bemalt und einen Schmetterling gebastelt.
(2&1) Marie hat einen Schmetterling gebastelt und eine Stofftasche bemalt.
(2&3) Marie hat einen Schmetterling gebastelt und ein Armband aufgefädelt.
(3&2) Marie hat ein Armband aufgefädelt und einen Schmetterling gebastelt.
(1&3) Marie hat eine Stofftasche bemalt und ein Armband aufgefädelt.
(3&1) Marie hat ein Armband aufgefädelt und eine Stofftasche bemalt.

(1&0) Marie hat eine Stofftasche bemalt und einen Stern ausgeschnitten.
(0&2) Marie hat einen Stern ausgeschnitten und einen Schmetterling gebastelt.

23. Frosch Friedolin war am Teich. Er ist geschwommen. Dann hat er Schmetterlinge beobachtet. Danach hat er in der Sonne gelegen.

(1&2) Friedolin ist geschwommen und hat Schmetterlinge beobachtet.
(2&1) Friedolin hat Schmetterlinge beobachtet und ist geschwommen.
(2&3) Friedolin hat Schmetterlinge beobachtet und in der Sonne gelegen.
(3&2) Friedolin hat in der Sonne gelegen und Schmetterlinge beobachtet.

(1&3) Friedolin ist geschwommen und hat in der Sonne gelegen.
(3&1) Friedolin hat in der Sonne gelegen und ist geschwommen

(0&1) Friedolin hat eine Mücke gefressen und ist geschwommen.
(0&3) Friedolin hat in der Sonne gelegen und eine Mücke gefressen.

24. Der kleine Bär war gestern im Wald. Er hat Blätter gesammelt. Dann hat er Kastanien aufgelesen. Danach hat er Pilze gesucht.

(1&2) Der kleine Bär hat Blätter gesammelt und Kastanien aufgelesen.
(2&1) Der kleine Bär hat Kastanien aufgelesen und Blätter gesammelt.
(2&3) Der kleine Bär hat Kastanien aufgelesen und Pilze gesucht.
(3&2) Der kleine Bär hat Pilze gesucht und Kastanien aufgelesen.
(1&3) Der kleine Bär hat Blätter gesammelt und Pilze gesucht.
(3&1) Der kleine Bär hat Pilze gesucht und Blätter gesammelt.

(2&0) Der kleine Bär hat Kastanien aufgelesen und Rehe gefüttert.
(0&3) Der kleine Bär hat Rehe gefüttert und Pilze gesucht.

C.5 Material Experiment II

1. Der kleine Tiger ist zum Spielplatz gegangen. Er hat mit Sandförmchen gespielt. Dann hat er eine Burg gebaut. Danach hat er einen Tunnel gegraben.

   (1&2) Der kleine Tiger hat mit Sandförmchen gespielt und dann hat er eine Burg gebaut.
   (2&1) Der kleine Tiger hat eine Burg gebaut und dann hat er mit Sandförmchen gespielt.
   (2&3) Der kleine Tiger hat eine Burg gebaut und dann hat er einen Tunnel gegraben.
   (3&2) Der kleine Tiger hat einen Tunnel gegraben und dann hat er eine Burg gebaut.
   (1&3) Der kleine Tiger hat mit Sandförmchen gespielt und dann hat er einen Tunnel gegraben.
   (3&1) Der kleine Tiger hat einen Tunnel gegraben und dann hat er mit Sandförmchen gespielt.

   (1&0) Der kleine Tiger hat mit Sandförmchen gespielt und dann hat er eine Mauer errichtet.
   (0&2) Der kleine Tiger hat eine Burg gebaut und dann hat er eine Mauer errichtet.

2. In der Nacht hat der kleine Bär vom Schlaraffenland geträumt. Er hat dort Schokoladenpudding gegessen. Dann hat er ein Eis geleckt. Danach hat er ein Stück Torte verspeist.

   (1&2) Der kleine Bär hat Schokoladenpudding gegessen und dann hat er ein Eis geleckt.
   (2&1) Der kleine Bär hat ein Eis geleckt und dann hat er Schokoladenpudding gegessen.
   (2&3) Der kleine Bär hat ein Eis geleckt und dann hat er ein Stück Torte verspeist.
   (3&2) Der kleine Bär hat ein Stück Torte verspeist und dann hat er ein Eis geleckt.
   (1&3) Der kleine Bär hat Schokoladenpudding gegessen und dann hat er ein Stück Torte verspeist.
   (3&1) Der kleine Bär hat ein Stück Torte verspeist und dann hat er Schokoladenpudding gegessen.

   (0&1) Der kleine Bär hat Limonade getrunken und dann hat er Schokoladenpudding gegessen.
   (3&0) Der kleine Bär hat ein Stück Torte verspeist und dann hat er Limonade getrunken.

3. Paula wollte einen Ausflug mit ihrem neuen Fahrrad machen. Sie hat ihren Teddy in den Kindersitz gesetzt. Dann hat sie ihre Picknickdecke eingepackt. Danach hat sie ihren Rucksack aufgezogen.

   (1&2) Paula hat ihren Teddy in den Kindersitz gesetzt und dann hat sie ihre Picknickdecke eingepackt.
   (2&1) Paula hat ihre Picknickdecke eingepackt und dann hat sie ihren Teddy in den Kindersitz gesetzt.
   (2&3) Paula hat ihre Picknickdecke eingepackt und dann hat sie ihren Rucksack aufgezogen.

(3&2) Paula hat ihren Rucksack aufgezogen und dann hat sie ihre Picknickdecke eingepackt.
(1&3) Paula hat ihren Teddy in den Kindersitz gesetzt und dann hat sie ihren Rucksack aufgezogen.
(3&1) Paula hat ihren Rucksack aufgezogen und dann hat sie ihren Teddy in den Kindersitz gesetzt.

(2&0) Paula hat ihre Picknickdecke eingepackt und dann hat sie ihren Fahrradhelm aufgesetzt.
(0&3) Paula hat ihren Fahrradhelm aufgesetzt und dann hat sie ihren Rucksack aufgezogen.

4. Lena hat ihr Fahrrad geputzt. Sie hat das Gestell gewaschen. Dann hat sie die Reifen geputzt. Danach hat sie das Fahrradkörbchen abgewischt.

   (1&2) Lena hat das Gestell gewaschen und dann hat sie die Reifen geputzt.
   (2&1) Lena hat die Reifen geputzt und dann hat sie das Gestell gewaschen
   (2&3) Lena hat die Reifen geputzt und dann hat sie das Fahrradkörbchen abgewischt.
   (3&2) Lena hat das Fahrradkörbchen abgewischt und dann hat sie die Reifen geputzt.
   (1&3) Lena hat das Gestell gewaschen und dann hat sie das Fahrradkörbchen abgewischt.
   (3&1) Lena hat das Fahrradkörbchen abgewischt und dann hat sie das Gestell gewaschen.

   (1&0) Lena hat das Gestell abgewaschen und dann hat sie die Fahrradklingel ausprobiert.
   (0&2) Lena hat die Fahrradklingel ausprobiert und dann hat sie die Reifen geputzt.

5. Franziska ist mit ihrem Opa in den Zoo gegangen. Sie hat die Ziegen gefüttert. Dann hat sie die Elefanten angeschaut. Danach ist sie auf einem Pony geritten.

   (1&2) Franziska hat die Ziegen gefüttert und dann hat sie die Elefanten angeschaut.
   (2&1) Franziska hat die Elefanten angeschaut und dann hat sie die Ziegen gefüttert.
   (2&3) Franziska hat die Elefanten angeschaut und dann ist sie auf einem Pony geritten.
   (3&2) Franziska ist auf einem Pony geritten und dann hat sie die Elefanten angeschaut.
   (1&3) Franziska hat die Ziegen gefüttert und dann ist sie auf einem Pony geritten.
   (3&1) Franziska ist auf einem Pony geritten und dann hat sie die Ziegen gefüttert.

   (0&1) Franziska hat die Löwen fotografiert und dann hat sie die Ziegen gefüttert.
   (3&0) Franziska ist auf einem Pony geritten und dann hat sie die Löwen fotografiert.

6. Der kleine Tiger war heute auf dem Spielplatz. Er ist gerutscht. Dann ist er Karussell gefahren. Danach hat er geschaukelt.

   (1&2) Der kleine Tiger ist gerutscht und dann ist er Karussell gefahren.
   (2&1) Der kleine Tiger ist Karussell gefahren und dann ist er gerutscht.
   (2&3) Der kleine Tiger ist Karussell gefahren und dann hat er geschaukelt.
   (3&2) Der kleine Tiger hat geschaukelt und dann ist er Karussell gefahren.

(1&3) Der kleine Tiger ist gerutscht und dann hat er geschaukelt.
(3&1) Der kleine Tiger hat geschaukelt und dann ist er gerutscht.

(2&0) Der kleine Tiger ist Karussell gefahren und dann ist er gewippt.
(0&3) Der kleine Tiger ist gewippt und dann hat er geschaukelt.

7. Beate hat heute im Kindergarten gespielt. Sie hat ihre Puppe ins Bett gebracht. Dann hat sie einen Turm gebaut. Danach hat sie mit dem Teddy gespielt.

   (1&2) Beate hat ihre Puppe ins Bett gebracht und dann hat sie einen Turm gebaut.
   (2&1) Beate hat einen Turm gebaut und dann hat sie ihre Puppe ins Bett gebracht.
   (2&3) Beate hat einen Turm gebaut und dann hat sie mit dem Teddy gespielt.
   (3&2) Beate hat mit dem Teddy gespielt und dann hat sie einen Turm gebaut.
   (1&3) Beate hat ihre Puppe ins Bett gebracht und dann hat sie mit dem Teddy gespielt.
   (3&1) Beate hat mit dem Teddy gespielt und dann hat sie ihre Puppe ins Bett gebracht

   (1&0) Beate hat ihre Puppe ins Bett gebracht und dann hat sie mit den Autos gespielt.
   (0&2) Beate hat mit den Autos gespielt und dann hat sie einen Turm gebaut.

8. Der kleine Tiger hat heute ein Konzert veranstaltet. Er hat auf den Kochtöpfen getrommelt. Dann hat er auf dem Tisch getanzt. Danach hat er Gitarre gespielt.

   (1&2) Der kleine Tiger hat auf den Kochtöpfen getrommelt und dann hat er auf dem Tisch getanzt.
   (2&1) Der kleine Tiger hat auf dem Tisch getanzt und dann hat er auf den Kochtöpfen getrommelt.
   (2&3) Der kleine Tiger hat auf dem Tisch getanzt und dann hat er Gitarre gespielt.
   (3&2) Der kleine Tiger hat Gitarre gespielt und dann hat er auf dem Tisch getanzt.
   (1&3) Der kleine Tiger hat auf den Kochtöpfen getrommelt und dann hat er Gitarre gespielt.
   (3&1) Der kleine Tiger hat Gitarre gespielt und dann hat er auf den Kochtöpfen getrommelt.

   (0&1) Der kleine Tiger hat Trompete gespielt und dann hat er auf den Kochtöpfen getrommelt.
   (3&0) Der kleine Tiger hat Gitarre gespielt und dann hat er Trompete gespielt.

9. Auf dem Jahrmarkt ist der kleine Bär Karussell gefahren. Er ist mit dem Feuerwehrauto gefahren. Dann ist er auf dem Pferd geritten. Danach ist er mit dem Hubschrauber geflogen.

   (1&2) Der kleine Bär ist mit dem Feuerwehrauto gefahren und dann ist er auf dem Pferd geritten.
   (2&1) Der kleine Bär ist auf dem Pferd geritten und dann ist er mit dem Feuerwehrauto gefahren.
   (2&3) Der kleine Bär ist auf dem Pferd geritten und dann ist er mit dem Hubschrauber geflogen.
   (3&2) Der kleine Bär ist mit dem Hubschrauber geflogen und dann ist er auf dem Pferd geritten.
   (1&3) Der kleine Bär ist mit dem Feuerwehrauto gefahren und dann ist er mit dem Hubschrauber geflogen.

(3&1) Der kleine Bär ist mit dem Hubschrauber geflogen und dann ist er mit dem Feuerwehrauto gefahren.

(2&0) Der kleine Bär ist auf dem Pferd geritten und dann ist er mit dem Motorrad gefahren.
(0&3) Der kleine Bär ist mit dem Motorrad gefahren und dann ist er mit dem Hubschrauber geflogen.

10. Der kleine Bär hat Frühsport gemacht. Er ist durch den Garten gerannt. Dann hat er an einem Baum Klettern geübt. Danach ist er Seil gesprungen.

(1&2) Der kleine Bär ist durch den Garten gerannt und dann hat er Klettern geübt.
(2&1) Der kleine Bär hat Klettern geübt und dann ist er durch den Garten gerannt.
(2&3) Der kleine Bär hat Klettern geübt und dann ist er Seil gesprungen.
(3&2) Der kleine Bär ist Seil gesprungen und dann hat er Klettern geübt.
(1&3) Der kleine Bär ist durch den Garten gerannt und dann ist er Seil gesprungen.
(3&1) Der kleine Bär ist Seil gesprungen und dann ist er durch den Garten gerannt.

(1&0) Der kleine Bär ist durch den Garten gerannt und dann hat er Kniebeugen gemacht.
(0&2) Der kleine Bär hat Kniebeugen gemacht und dann hat er Klettern geübt.

11. Der kleine Tiger wollte etwas Selbstgemachtes verschenken. Er hat etwas ausgeschnitten. Dann hat er ein Bild gemalt. Danach hat er einen Strohstern gebastelt.

(1&2) Der kleine Tiger hat etwas ausgeschnitten und dann hat er ein Bild gemalt.
(2&1) Der kleine Tiger hat ein Bild gemalt und dann hat er etwas ausgeschnitten.
(2&3) Der kleine Tiger hat ein Bild gemalt und dann hat er einen Strohstern gebastelt.
(2&2) Der kleine Tiger hat einen Strohstern gebastelt und dann hat er ein Bild gemalt.
(1&3) Der kleine Tiger hat etwas ausgeschnitten und dann hat er einen Strohstern gebastelt.
(3&1) Der kleine Tiger hat einen Strohstern gebastelt und dann hat er etwas ausgeschnitten

(0&1) Der kleine Tiger hat eine Kette aufgefädelt und dann hat er etwas ausgeschnitten.
(3&0) Der kleine Tiger hat ein Fensterbild gebastelt und dann hat er eine Kette aufgefädelt.

12. Heute war der kleine Tiger im Schwimmbad. Er hat Wasserball gespielt. Dann hat er Tauchen geübt. Danach ist er ein bisschen geschwommen.

(1&2) Der kleine Tiger hat Wasserball gespielt und dann hat er Tauchen geübt.
(2&1) Der kleine Tiger hat Tauchen geübt und dann hat er Wasserball gespielt.
(2&3) Der kleine Tiger hat Tauchen geübt und dann ist er geschwommen.
(3&2) Der kleine Tiger ist geschwommen und dann hat er Tauchen geübt.
(1&3) Der kleine Tiger hat Wasserball gespielt und dann ist er geschwommen.
(3&1) Der kleine Tiger ist geschwommen und dann hat er Wasserball gespielt.

(2&0) Der kleine Tiger hat Tauchen geübt und dann hat er in der Sonne gelegen.

(0&3) Der kleine Tiger hat in der Sonne gelegen und dann ist er geschwommen.

13. Der kleine Bär hat heute Obstsalat gemacht. Er hat Erdbeeren gepflückt. Dann hat er Äpfel gewaschen. Danach hat er Orangen geschält.

    (1&2) Der kleine Bär hat Erdbeeren gepflückt und dann hat er Äpfel gewaschen.
    (2&1) Der kleine Bär hat Äpfel gewaschen und dann hat er Erdbeeren gepflückt.
    (2&3) Der kleine Bär hat Äpfel gewaschen und dann hat er Orangen geschält.
    (3&2) Der kleine Bär hat Orangen geschält und dann hat er Äpfel gewaschen.
    (1&3) Der kleine Bär hat Erdbeeren gepflückt und dann hat er Orangen geschält.
    (3&1) Der kleine Bär hat Orangen geschält und dann hat er Erdbeeren gepflückt.

    (0&2) Der kleine Bär hat Kiwis geschält und dann hat er Äpfel gewaschen.

14. Heute hat die kleine Katze im Garten gespielt. Sie hat einen Schmetterling beobachtet. Dann hat sie mit ihrem Ball gespielt. Danach hat sie eine Maus gefangen.

    (1&2) Die kleine Katze hat einen Schmetterling beobachtet und dann hat sie mit ihrem Ball gespielt.
    (2&1) Die kleine Katze hat mit ihrem Ball gespielt und dann hat sie einen Schmetterling beobachtet.
    (2&3) Die kleine Katze hat mit ihrem Ball gespielt und dann hat sie eine Maus gefangen.
    (3&2) Die kleine Katze hat eine Maus gefangen und dann hat sie mit ihrem Ball gespielt.
    (1&3) Die kleine Katze hat einen Schmetterling beobachtet und dann hat sie eine Maus gefangen.
    (3&1) Die kleine Katze hat eine Maus gefangen und dann hat sie einen Schmetterling beobachtet.

    (3&0) Die kleine Katze hat eine Maus gefangen und dann hat sie den Hund geärgert.

15. Der kleine Bär ist Fahrrad gefahren. Er ist an einer Wiese vorbeigefahren. Dann hat er eine Brücke überquert. Danach ist er durch einen Tunnel gefahren.

    (1&2) Der kleine Bär ist an einer Wiese vorbeigefahren und dann hat er eine Brücke überquert.
    (2&1) Der kleine Bär hat eine Brücke überquert und dann ist er an einer Wiese vorbeigefahren.
    (2&3) Der kleine Bär hat eine Brücke überquert und dann ist er durch einen Tunnel gefahren.
    (3&2) Der kleine Bär ist durch einen Tunnel gefahren und dann hat er eine Brücke überquert.
    (1&3) Der kleine Bär ist an einer Wiese vorbeigefahren und dann ist er durch einen Tunnel gefahren.
    (3&1) Der kleine Bär ist durch einen Tunnel gefahren und dann ist er an einer Wiese vorbeigefahren.

    (0&3) Der kleine Bär ist durch einen Wald gefahren und dann ist er an einer Wiese vorbeigefahren.

16. Heute war der kleine Bär in der Stadt. Er hat eine neue Jacke gekauft. Dann hat er ein Buch ausgeliehen. Danach hat er einen Sonnenhut gekauft.

    (1&2) Der kleine Bär hat eine Jacke gekauft und dann hat er ein Buch ausgeliehen.
    (2&1) Der kleine Bär hat ein Buch ausgeliehen und dann hat er eine Jacke gekauft.
    (2&3) Der kleine Bär hat ein Buch ausgeliehen und dann hat er einen Sonnenhut gekauft.
    (3&2) Der kleine Bär hat einen Sonnenhut gekauft und dann hat er ein Buch ausgeliehen.
    (1&3) Der kleine Bär hat eine Jacke gekauft und dann hat er einen Sonnenhut gekauft.
    (3&1) Der kleine Bär hat einen Sonnenhut gekauft und dann hat er eine Jacke gekauft.

17. Der kleine Tiger war heute im Musikunterricht. Er hat ein Lied angehört. Dann hat er getrommelt. Danach hat er den Rhythmus mitgeklatscht.

    (1&2) Der kleine Tiger hat ein Lied angehört und dann hat er getrommelt.
    (2&1) Der kleine Tiger hat getrommelt und dann hat er ein Lied angehört.
    (2&3) Der kleine Tiger hat getrommelt und dann hat er den Rhythmus mitgeklatscht.
    (3&2) Der kleine Tiger hat den Rhythmus mitgeklatscht und dann hat er getrommelt.
    (1&3) Der kleine Tiger hat ein Lied angehört und dann hat er den Rhythmus mitgeklatscht.
    (3&1) Der kleine Tiger hat den Rhythmus mitgeklatscht und dann hat er ein Lied angehört.

18. Paul hat einen Ausflug zum Bauernhof gemacht. Er ist zu den Kaninchen gegangen. Dann hat er die Lämmchen angesehen. Danach hat er die Ponys gestreichelt.

    (1&2) Paul ist zu den Kaninchen gegangen und dann hat er die Lämmchen angesehen.
    (2&1) Paul hat die Lämmchen angesehen und dann ist er zu den Kaninchen gegangen.
    (2&3) Paul hat die Lämmchen angesehen und dann hat er die Ponys gestreichelt.
    (3&2) Paul hat die Ponys gestreichelt und dann hat er die Lämmchen angesehen.
    (1&3) Paul ist zu den Kaninchen gegangen und dann hat er die Ponys gestreichelt.
    (3&1) Paul hat die Ponys gestreichelt und dann ist er zu den Kaninchen gegangen.

19. Paula hat im Garten geholfen. Sie hat die Blumen gegossen. Dann hat sie die Äpfel gepflückt. Danach hat sie den Gartenweg gekehrt.

    (1&2) Paula hat die Blumen gegossen und dann hat sie Äpfel gepflückt.
    (2&1) Paula hat Äpfel gepflückt und dann hat sie die Blumen gegossen.
    (2&3) Paula hat Äpfel gepflückt und dann hat sie den Gartenweg gekehrt.
    (3&2) Paula hat den Gartenweg gekehrt und dann hat sie Äpfel gepflückt.
    (1&3) Paula hat die Blumen gegossen und dann hat sie den Gartenweg gekehrt.
    (3&2) Paula hat den Gartenweg gekehrt und dann hat sie die Blumen gegossen.

    (1&0) Paula hat die Blumen gegossen und dann hat sie Erdbeeren gepflückt.

20. Heute hat es endlich geschneit. Der kleine Tiger ist Schlitten gefahren. Dann hat er einen Schneemann gebaut. Danach hat er mit Schneebällen geworfen.

(1&2) Der kleine Tiger ist Schlitten gefahren und dann hat er einen Schneemann gebaut.
(2&1) Der kleine Tiger hat einen Schneemann gebaut und dann ist er Schlitten gefahren.
(2&3) Der kleine Tiger hat einen Schneemann gebaut und dann ist er mit Schneebällen geworfen.
(3&2) Der kleine Tiger hat mit Schneebällen geworfen und dann hat er einen Schneemann gebaut.
(1&3) Der kleine Tiger ist Schlitten gefahren und dann hat er mit Schneebällen geworfen.
(3&1) Der kleine Tiger hat mit Schneebällen geworfen und dann ist er Schlitten gefahren.

(0&1) Der kleine Tiger hat ein Iglu gebaut und dann ist er Schlitten gefahren.

21. Peter musste beim Versteckspiel suchen. Er hat hinter dem Wasserfass nachgeschaut. Dann hat er hinter der Hecke geguckt. Danach hat er im Schuppen gesucht.

(1&2) Peter hat hinter dem Wasserfass nachgeschaut und dann hat er hinter der Hecke geguckt.
(2&1) Peter hat hinter der Hecke geguckt und dann hat er hinter dem Wasserfass nachgeschaut.
(2&3) Peter hat hinter der Hecke geguckt und dann hat er im Schuppen gesucht.
(3&2) Peter hat im Schuppen gesucht und dann hat er hinter der Hecke geguckt.
(1&3) Peter hat hinter dem Wasserfass nachgeschaut und dann hat er im Schuppen gesucht.
(3&1) Peter hat im Schuppen gesucht und dann hat er hinter dem Wasserfass geguckt.

(2&0) Peter hat hinter der Hecke geguckt und dann hat er im Keller gesucht.

22. Am Schulfest nahm Marie an verschiedenen Angeboten teil. Sie hat eine Stofftasche bemalt. Dann hat sie einen Schmetterling gebastelt. Danach hat sie ein Armband aufgefädelt.

(1&2) Marie hat eine Stofftasche bemalt und dann hat sie einen Schmetterling gebastelt.
(2&1) Marie hat einen Schmetterling gebastelt und dann hat sie eine Stofftasche bemalt.
(2&3) Marie hat einen Schmetterling gebastelt und dann hat sie ein Armband aufgefädelt.
(3&2) Marie hat ein Armband aufgefädelt und dann hat sie einen Schmetterling gebastelt.
(1&3) Marie hat eine Stofftasche bemalt und dann hat sie ein Armband aufgefädelt.
(3&1) Marie hat ein Armband aufgefädelt und dann hat sie eine Stofftasche bemalt.

(1&0) Marie hat eine Stofftasche bemalt und dann hat sie einen Stern ausgeschnitten.
(0&2) Marie hat einen Stern ausgeschnitten und dann hat sie einen Schmetterling gebastelt.

23. Frosch Friedolin war am Teich. Er ist geschwommen. Dann hat er Schmetterlinge beobachtet. Danach hat er in der Sonne gelegen.

(1&2) Friedolin ist geschwommen und dann hat er Schmetterlinge beobachtet.
(2&1) Friedolin hat Schmetterlinge beobachtet und dann ist er geschwommen.
(2&3) Friedolin hat Schmetterlinge beobachtet und dann hat er in der Sonne gelegen.
(3&2) Friedolin hat in der Sonne gelegen und dann hat er Schmetterlinge beobachtet.
(1&3) Friedolin ist geschwommen und dann hat er in der Sonne gelegen.
(3&1) Friedolin hat in der Sonne gelegen und dann ist er geschwommen

(0&1) Friedolin hat eine Mücke gefressen und dann ist er geschwommen.
(0&3) Friedolin hat in der Sonne gelegen und dann hat er eine Mücke gefressen.

24. Der kleine Bär war gestern im Wald. Er hat Blätter gesammelt. Dann hat er Kastanien aufgelesen. Danach hat er Pilze gesucht.

(1&2) Der kleine Bär hat Blätter gesammelt und dann hat er Kastanien aufgelesen.
(2&1) Der kleine Bär hat Kastanien aufgelesen und dann hat er Blätter gesammelt.
(2&3) Der kleine Bär hat Kastanien aufgelesen und dann hat er Pilze gesucht.
(3&2) Der kleine Bär hat Pilze gesucht und dann hat er Kastanien aufgelesen.
(1&3) Der kleine Bär hat Blätter gesammelt und dann hat er Pilze gesucht.
(3&1) Der kleine Bär hat Pilze gesucht und dann hat er Blätter gesammelt.

(2&0) Der kleine Bär hat Kastanien aufgelesen und dann hat er Rehe gefüttert.
(0&3) Der kleine Bär hat Rehe gefüttert und dann hat er Pilze gesucht.

C.6 Material Experiment III

1. Der kleine Tiger wollte spazieren gehen. Er hat Turnschuhe angezogen. Dann hat er die Schuhe zugebunden. Danach ist er raus gegangen.

   (1&2) Der kleine Tiger hat Turnschuhe angezogen und hat die Schuhe zugebunden.
   (2&1) Der kleine Tiger hat die Schuhe zugebunden und Turnschuhe angezogen.
   (2&3) Der kleine Tiger hat die Schuhe zugebunden und ist raus gegangen.
   (3&2) Der kleine Tiger ist raus gegangen und hat die Schuhe zugebunden.
   (1&3) Der kleine Tiger hat Turnschuhe angezogen und ist raus gegangen.
   (3&1) Der kleine Tiger ist raus gegangen und hat Turnschuhe angezogen.

   (1&0) Der kleine Tiger hat Turnschuhe angezogen und seine Jacke geholt.

2. Der kleine Bär war heute angeln. Er hat die Angel ausgeworfen. Dann hat er einen Fisch aus dem Wasser gezogen. Danach ist er nach Hause gegangen.

   (1&2) Der kleine Bär hat die Angel ausgeworfen und einen Fisch aus dem Wasser gezogen.
   (2&1) Der kleine Bär hat einen Fisch aus dem Wasser gezogen und die Angel ausgeworfen.
   (2&3) Der kleine Bär hat einen Fisch aus dem Wasser gezogen und ist nach Hause gegangen.
   (3&2) Der kleine Bär ist nach Hause gegangen und hat einen Fisch aus dem Wasser gezogen.
   (1&3) Der kleine Bär hat die Angel ausgeworfen und ist nach Hause gegangen.
   (3&1) Der kleine Bär ist nach Hause gegangen und hat die Angel ausgeworfen.

   (0&1) Der kleine Bär hat Enten beobachtet und einen Fisch gefangen.

3. Der kleine Tiger wollte seiner Oma einen Geburtstagsbrief schreiben. Er hat Briefpapier gekauft. Dann hat er den Brief geschrieben. Danach hat er den Brief in einen Umschlag gesteckt.

   (1&2) Der kleine Tiger hat Briefpapier gekauft und den Brief geschrieben.
   (2&1) Der kleine Tiger hat den Brief geschrieben und Briefpapier gekauft.
   (2&3) Der kleine Tiger hat den Brief geschrieben und den Brief in einen Umschlag gesteckt.
   (3&2) Der kleine Tiger hat den Brief in einen Umschlag gesteckt und den Brief geschrieben.
   (1&3) Der kleine Tiger hat Briefpapier gekauft und den Brief in einen Umschlag gesteckt.
   (3&1) Der kleine Tiger hat den Brief in einen Umschlag gesteckt und Briefpapier gekauft.

   (2&0) Der kleine Tiger hat den Brief in den Umschlag gesteckt und ein Bild gemalt.

4. Heute hat der kleine Bär einen Ausflug gemacht. Er ist zur Haltestelle gelaufen. Dann hat er auf den Bus gewartet. Danach ist er mit dem Bus weggefahren

   (1&2) Der kleine Bär ist zur Haltestelle gelaufen und hat auf den Bus gewartet.

(2&1) Der kleine Bär hat auf den Bus gewartet und ist zur Haltestelle gelaufen.
(2&3) Der kleine Bär hat auf den Bus gewartet und ist mit dem Bus weggefahren.
(3&2) Der kleine Bär ist mit dem Bus weggefahren und hat auf den Bus gewartet.
(1&3) Der kleine Bär ist zur Haltestelle gelaufen und mit dem Bus weggefahren.
(3&1) Der kleine Bär ist mit dem Bus weggefahren und zur Haltestelle gelaufen.

(0&3) Der kleine Bär hat den Fahrplan gelesen und auf den Bus gewartet.

5. Jörg war im Baumarkt. Er hat einen Schrank gekauft. Dann ist er nach Hause gegangen. Danach hat er den Schrank aufgebaut.

(1&2) Jörg hat einen Schrank gekauft und ist nach Hause gegangen.
(2&1) Jörg ist nach Hause gegangen und hat einen Schrank gekauft.
(2&3) Jörg ist nach Hause gegangen und hat einen Schrank aufgebaut.
(3&2) Jörg hat einen Schrank aufgebaut und ist nach Hause gegangen.
(1&3) Jörg hat einen Schrank gekauft und den Schrank aufgebaut.
(3&1) Jörg hat einen Schrank aufgebaut und den Schrank gekauft.

(3&0) Jörg hat den Schrank aufgebaut und ein Regal gekauft.

6. Der kleine Tiger war müde. Er hat seinen Schlafanzug angezogen. Dann ist er ins Bett gegangen. Danach ist er eingeschlafen.

(1&2) Der kleine Tiger hat seinen Schlafanzug angezogen und ist ins Bett gegangen.
(2&1) Der kleine Tiger ist ins Bett gegangen und hat seinen Schlafanzug angezogen.
(2&3) Der kleine Tiger ist ins Bett gegangen und ist eingeschlafen.
(3&2) Der kleine Tiger ist eingeschlafen und ins Bett gegangen.
(1&3) Der kleine Tiger hat seinen Schlafanzug angezogen und ist eingeschlafen.
(3&1) Der kleine Tiger ist eingeschlafen und hat seinen Schlafanzug angezogen.

(0&3) Der kleine Tiger hat das Licht ausgemacht und ist eingeschlafen.

7. Vor dem Schlafengehen durfte der kleine Bär fernsehen. Er hat den Fernseher eingeschaltet. Dann hat er das Sandmännchen geschaut. Danach ist er schlafen gegangen.

(1&2) Der kleine Bär hat den Fernseher eingeschaltet und Sandmännchen geschaut.
(2&1) Der kleine Bär hat Sandmännchen geschaut und den Fernseher eingeschaltet.
(2&3) Der kleine Bär hat Sandmännchen geschaut und ist schlafen gegangen.
(3&2) Der kleine Bär ist schlafen gegangen und hat Sandmännchen geschaut.
(1&3) Der kleine Bär hat den Fernseher eingeschaltet und ist schlafen gegangen.
(3&1) Der kleine Bär ist schlafen gegangen und hat den Fernseher eingeschaltet.

(1&0) Der kleine Bär hat den Fernseher angeschaltet und Nachrichten geschaut.

8. Der kleine Tiger ist heute in den Zirkus gegangen. Er hat Eintritt bezahlt. Dann hat er einen Sitzplatz gesucht. Danach hat er die Vorstellung angeschaut.

(1&2) Der kleine Tiger hat Eintritt bezahlt und einen Sitzplatz gesucht.
(2&1) Der kleine Tiger hat einen Sitzplatz gesucht und Eintritt bezahlt.
(2&3) Der kleine Tiger hat einen Sitzplatz gesucht und die Vorstellung angeschaut.

(3&2) Der kleine Tiger hat die Vorstellung angeschaut und einen Sitzplatz gesucht.
(1&3) Der kleine Tiger hat Eintritt bezahlt und die Vorstellung angeschaut.
(3&1) Der kleine Tiger hat die Vorstellung angeschaut und Eintritt bezahlt.

(0&1) Der kleine Tiger hat geklatscht und Eintritt bezahlt.

9. Der kleine Bär wollte saubermachen. Er hat den Besen geholt. Dann hat er die Küche gefegt. Danach hat er den Schmutz auf die Kehrschaufel gekehrt.

(1&2) Der kleine Bär hat den Besen geholt und die Küche gefegt.
(2&1) Der kleine Bär hat die Küche gefegt und den Besen geholt.
(2&3) Der kleine Bär hat die Küche gefegt und den Schmutz auf die Kehrschaufel gekehrt.
(3&2) Der kleine Bär hat den Schmutz auf die Handschippe gekehrt und die Küche gefegt.
(1&3) Der kleine Bär hat den Besen geholt und den Schmutz auf die Kehrschaufel gekehrt.
(3&1) Der kleine Bär hat den Schmutz auf die Kehrschaufel gekehrt und den Besen geholt.

(2&0) Der klein Bär hat die Küche gefegt und Geschirr gespült.

10. Der kleine Tiger ist heute sehr früh aufgewacht. Er ist aufgestanden. Dann ist er ins Bad gegangen. Danach hat er seine Zähne geputzt.

(1&2) Der kleine Tiger ist aufgestanden und ins Bad gegangen.
(2&1) Der kleine Tiger ist ins Bad gegangen und aufgestanden.
(2&3) Der kleine Tiger ist ins Bad gegangen und hat seine Zähne geputzt.
(3&2) Der kleine Tiger hat seine Zähne geputzt und ist ins Bad gegangen.
(1&3) Der kleine Tiger ist aufgestanden und hat seine Zähne geputzt.
(3&1) Der kleine Tiger hat seine Zähne geputzt und ist aufgestanden.

(0&2) Der kleine Tiger hat sich geduscht und ist ins Bad gegangen.

11. Hanna wollte mit ihrer Freundin telefonieren. Sie hat den Hörer abgenommen. Dann hat sie die Nummer gewählt. Danach hat sie mit ihrer Freundin gesprochen.

(1&2) Hanna hat den Hörer abgenommen und die Nummer gewählt.
(2&1) Hanna hat die Nummer gewählt und den Hörer abgenommen.
(2&3) Hanna hat die Nummer gewählt und mit ihrer Freundin gesprochen.
(3&2) Hanna hat mit ihrer Freundin gesprochen und die Nummer gewählt.
(1&3) Hanna hat den Hörer abgenommen und mit ihrer Freundin gesprochen.
(3&1) Hanna hat mit ihrer Freundin gesprochen und den Hörer abgenommen.

(0&3) Hanna hat den Hörer aufgelegt und mit ihrer Freundin gesprochen.

12. Peter ist ins Bad gegangen. Er hat Zahnpasta auf die Zahnbürste getan. Dann hat er seine Zähne geputzt. Danach hat er seinen Mund ausgespült.

(1&2) Peter hat Zahnpasta auf die Zahnbürste getan und seine Zähne geputzt.
(2&1) Peter hat seine Zähne geputzt und Zahnpasta auf die Zahnbürste getan.

(2&3) Peter hat seine Zähne geputzt und seinen Mund ausgespült.
(3&2) Peter hat seinen Mund ausgespült und Zähne geputzt.
(1&3) Peter hat Zahnpasta auf die Zahnbürste getan und seinen Mund ausgespült.
(3&1) Peter hat seinen Mund ausgespült und Zahnpasta auf die Zahnbürste getan.

(0&3) Peter hat geduscht und seinen Mund ausgespült.

13. Annika wollte ihre Kaninchen füttern. Sie ist zum Stall gegangen. Dann hat sie die Stalltür geöffnet. Danach hat sie das Gras in den Futternapf gelegt.

(1&2) Annika ist zum Stall gegangen und hat die Stalltür geöffnet.
(2&1) Annika hat die Stalltür geöffnet und ist zum Stall gegangen.
(2&3) Annika hat die Stalltür geöffnet und das Gras in den Futternapf gelegt.
(3&2) Annika hat das Gras in den Futternapf gelegt und die Stalltür geöffnet.
(1&3) Annika ist zum Stall gegangen und hat das Gras in den Futternapf gelegt.
(3&1) Annika hat das Gras in den Futternapf gelegt und ist zum Stall gegangen.

(1&0) Annika hat die Stalltür geöffnet und den Kaninchen Wasser gegeben.
(3&0) Annika hat das Gras in den Futternapf gelegt und die Kaninchen gestreichelt.

14. Eva war heute im Schwimmbad. Sie hat eine Eintrittskarte gekauft. Dann hat sie ihren Badeanzug angezogen. Danach ist sie geschwommen.

(1&2) Eva hat eine Eintrittskarte gekauft und ihren Badeanzug angezogen
(2&1) Eva hat ihren Badeanzug angezogen und eine Eintrittskarte gekauft.
(2&3) Eva hat ihren Badeanzug angezogen und ist geschwommen.
(3&2) Eva ist geschwommen und hat ihren Badeanzug angezogen.
(1&3) Eva hat eine Eintrittskarte gekauft und ist geschwommen.
(3&1) Eva ist geschwommen und hat eine Eintrittskarte gekauft.

(0&1) Eva hat Wasserball gespielt und hat Eintritt bezahlt.
(3&0) Eva ist geschwommen und hat Wasserball gespielt.

15. Christoph hat Kakao gekauft. Er hat den Kakao in den Einkaufswagen gelegt. Dann ist er zur Kasse gegangen. Danach hat er den Kakao bezahlt.

(1&2) Christoph hat den Kakao in den Einkaufswagen gelegt und ist zur Kasse gegangen.
(2&1) Christoph ist zur Kasse gegangen und hat den Kakao in den Einkaufswagen gelegt.
(2&3) Christoph ist zur Kasse gegangen und hat den Kakao bezahlt.
(3&2) Christoph hat den Kakao bezahlt und ist zur Kasse gegangen.
(1&3) Christoph hat den Kakao in den Einkaufswagen gelegt und hat den Kakao bezahlt.
(3&1) Christoph hat den Kakao bezahlt und den Kakao in den Einkaufswagen gelegt.

(2&0) Christoph ist zur Kasse gegangen und hat Apfelsaft gekauft.
(0&3) Christoph hat Apfelsaft gekauft und den Kakao bezahlt.

16. Paul hat Tee gekocht. Er hat Wasser in den Wasserkocher getan. Dann hat er den Wasserkocher angestellt. Danach hat er den Tee aufgebrüht.

    (1&2) Paul hat Wasser in den Wasserkocher getan und den Wasserkocher angestellt.
    (2&1) Paul hat den Wasserkocher angestellt und Wasser in den Wasserkocher getan.
    (2&3) Paul hat den Wasserkocher angestellt und hat den Tee aufgebrüht.
    (3&2) Paul hat den Tee aufgebrüht und den Wasserkocher angestellt.
    (1&3) Paul hat Wasser in den Wasserkocher getan und den Tee aufgebrüht.
    (3&1) Paul hat den Tee aufgebrüht und Wasser in den Wasserkocher getan.

    (0&2) Paul hat Kaffee gekocht und den Wasserkocher angestellt.
    (2&0) Paul hat den Wasserkocher angestellt und Kaffee gekocht.

17. Flora ist heute Schlitten gefahren. Sie hat ihren Schlitten geholt. Dann hat sie den Schlitten den Berg hochgezogen. Danach ist sie losgefahren.

    (1&2) Flora hat ihren Schlitten geholt und hat den Schlitten den Berg hochgezogen.
    (2&1) Flora hat den Schlitten den Berg hochgezogen und ihren Schlitten geholt.
    (2&3) Flora hat den Schlitten den Berg hochgezogen und ist losgefahren.
    (3&2) Flora ist losgefahren und hat den Schlitten den Berg hochgezogen.
    (1&3) Flora hat ihren Schlitten geholt und ist losgefahren.
    (3&1) Flora ist losgefahren und hat ihren Schlitten geholt.

    (3&0) Flora ist losgefahren und hat einen Schneemann gebaut.
    (0&1) Flora hat einen Schneemann gebaut und ihren Schlitten geholt.

18. Petra hat Pizza zubereitet. Sie die Pizza aus dem Ofen geholt. Dann hat sie die Pizza in Stücke geschnitten. Danach hat sie gegessen.

    (1&2) Petra hat die Pizza aus dem Ofen geholt und die Pizza in Stücke geschnitten.
    (2&1) Petra hat die Pizza in Stücke geschnitten und die Pizza aus dem Ofen geholt.
    (2&3) Petra hat die Pizza in Stücke geschnitten und gegessen.
    (3&2) Petra hat gegessen und die Pizza in Stücke geschnitten.
    (1&3) Petra hat die Pizza aus dem Ofen geholt und gegessen.
    (3&1) Petra hat gegessen und die Pizza aus dem Ofen geholt.

    (0&3) Petra hat den Tisch gedeckt und Pizza gegessen.
    (1&0) Petra hat die Pizza aus dem Ofen geholt und den Tisch gedeckt.

19. Sven hat gezeltet. Er hat sein Zelt aufgebaut. Dann ist er in seinen Schlafsack gekrochen. Danach ist er eingeschlafen.

    (1&2) Sven hat sein Zelt aufgebaut und ist in seinen Schlafsack gekrochen.
    (2&1) Sven ist in seinen Schlafsack gekrochen und hat sein Zelt aufgebaut.
    (2&3) Sven ist in seinen Schlafsack gekrochen und ist eingeschlafen.
    (3&2) Sven ist eingeschlafen und in seinen Schlafsack gekrochen.
    (1&3) Sven hat sein Zelt aufgebaut und ist eingeschlafen.
    (3&1) Seven ist eingeschlafen und hat sein Zelt aufgebaut.

    (0&3) Sven hat die Luftmatratze aufgepumpt und ist eingeschlafen.
    (1&0) Sven hat sein Zelt aufgebaut und die Luftmatratze aufgepumpt.

20. Klara hat den Tisch gedeckt. Sie hat den Tisch abgewischt. Dann hat sie eine Decke auf den Tisch gelegt. Danach hat sie die Teller auf den Tisch gestellt.

    (1&2) Klara hat den Tisch abgewischt und eine Decke auf den Tisch gelegt.
    (2&1) Klara hat eine Decke auf den Tisch gelegt und den Tisch abgewischt.
    (2&3) Klara hat eine Decke auf den Tisch gelegt und die Teller auf den Tisch gestellt.
    (3&2) Klara hat die Teller auf den Tisch gestellt und eine Decke auf den Tisch gelegt.
    (1&3) Klara hat den Tisch abgewischt und die Teller auf den Tisch gestellt.
    (3&1) Klara hat die Teller auf den Tisch gestellt und den Tisch abgewischt.

    (0&3) Klara hat das Besteck aus dem Schrank geholt und Teller auf den Tisch gestellt.
    (0&1) Klara hat das Besteck aus dem Schrank geholt und eine Decke auf den Tisch gelegt.

21. Nadine hat Schnupfen. Sie hat ein Taschentuch geholt. Dann hat sie ihre Nase geputzt. Danach hat sie das Taschentuch weggeschmissen.

    (1&2) Nadine hat ein Taschentuch geholt und hat ihre Nase geputzt.
    (2&1) Nadine hat ihre Nase geputzt und ein Taschentuch geholt.
    (2&3) Nadine hat ihre Nase geputzt und das Taschentuch weggeschmissen.
    (3&2) Nadine hat das Taschentuch weggeschmissen und ihre Nase geputzt.
    (1&3) Nadine hat ein Taschentuch geholt und das Taschentuch weggeschmissen.
    (3&1) Nadine hat das Taschentuch weggeschmissen und ein Taschentuch geholt.

    (0&2) Nadine hat gehustet und ihre Nase geputzt.
    (2&0) Nadine hat ihre Nase geputzt und gehustet.

22. Mama hat heute Kleidung gewaschen. Sie hat die Wäsche in die Waschmaschine getan. Dann hat sie die Waschmaschine angestellt. Danach hat sie die Wäsche aufgehängt.

    (1&2) Mama hat die Wäsche in die Waschmaschine getan und die Waschmaschine angestellt.
    (2&1) Mama hat die Waschmaschine angestellt und die Wäsche in die Waschmaschine getan.
    (2&3) Mama hat die Waschmaschine angestellt und die Wäsche aufgehängt.
    (3&2) Mama hat die Wäsche aufgehängt und die Waschmaschine angestellt.
    (1&3) Mama hat die Wäsche in die Waschmaschine getan und die Wäsche aufgehängt.
    (3&1) Mama hat die Wäsche aufgehängt und die Wäsche in die Waschmaschine getan.

    (2&0) Mama hat die Waschmaschine angestellt und Waschpulver gekauft.
    (0&2) Mama hat Waschpulver gekauft und die Waschmaschine angestellt.

23. Der kleine Tiger hat heute Plätzchen gebacken. Er hat Teig zubereitet. Dann hat er Plätzchen ausgestochen. Danach hat er die Plätzchen in den Ofen geschoben.

    (1&2) Der kleine Tiger hat Teig zubereitet und Plätzchen ausgestochen.

(2&1) Der kleine Tiger hat Plätzchen ausgestochen und Teig zubereitet.
(2&3) Der kleine Tiger hat Plätzchen ausgestochen und die Plätzchen in den Ofen geschoben.
(3&2) Der kleine Tiger hat die Plätzchen in den Ofen geschoben und Plätzchen ausgestochen.
(1&3) Der kleine Tiger hat Teig zubereitet und die Plätzchen in den Ofen geschoben.
(3&1) Der kleine Tiger hat die Plätzchen in den Ofen geschoben und Teig zubereitet.

(0&1) Der kleine Tiger hat das Rezept gelesen und Teig zubereitet.
(3&0) Der kleine Tiger hat die Plätzchen in den Ofen getan und das Rezept gelesen.

24. Der kleine Bär hat einen Ausflug mit dem Auto gemacht. Er ist in das Auto eingestiegen. Dann hat er den Motor angestellt. Danach ist er losgefahren.

(1&2) Der kleine Bär ist in das Auto eingestiegen und hat den Motor angestellt.
(2&1) Der kleine Bär hat den Motor angestellt und ist in das Auto eingestiegen.
(2&3) Der kleine Bär hat den Motor angestellt und ist losgefahren.
(3&2) Der kleine Bär ist losgefahren und hat den Motor angestellt.
(1&3) Der kleine Bär ist in das Auto eingestiegen und ist losgefahren.
(3&1) Der kleine Bär ist losgefahren und in das Auto eingestiegen.

(1&0) Der kleine Bär ist in das Auto eingestiegen und hat sich angeschnallt.
(0&3) Der kleine Bär hat sich angeschnallt und ist in das Auto eingestiegen.

C.7 Test on working memory capacity (PGN-Test)

Protokoll - Phonologisches Arbeitsgedächtnis für Nichtwörter

Vom Versuchsleiter auszufüllen:
Datum: _____
VP-Nr.: _____
Experiment: _____
Liste: _____
Version: _____

Instruktion:

„Jetzt möchte ich mit dir ein Wortspiel machen. Ich sage dir gleich ein paar lustige Wörter, die du bestimmt noch nicht kennst. Hör mir ganz genau zu und sag mir dann diese Wörter nach. Jetzt probieren wir das erst einmal aus. Pass auf, ich sage dir jetzt das erste Wort vor: ‚Maluk' (…) Jetzt du!"

Aufgaben:
(Übungsaufgabe: Maluk)

Wort	1	Billop	_____	R	F
Wort	2	Kalifeng	_____	R	F
Wort	3	Defsal	_____	R	F
Wort	4	Ronterklabe	_____	R	F
Wort	5	Toschlander	_____	R	F
Wort	6	Entiergent	_____	R	F
Wort	7	Gattwutz	_____	R	F
Wort	8	Glösterkeit	_____	R	F
Wort	9	Dilecktichkeit	_____	R	F
Wort	10	Krapselistong	_____	R	F
Wort	11	Nebatsubst	_____	R	F
Wort	12	Seregropist	_____	R	F
Wort	13	Skatagurp	_____	R	F
Wort	14	Waltikosander	_____	R	F
Wort	15	Pristobierichkeit	_____	R	F
Wort	16	Kabusaniker	_____	R	F
Wort	17	Ippazeumerink	_____	R	F
Wort	18	Vominlapertust	_____	R	F

Summe:

C.8 AQ-Questionnaire

Vom Versuchsleiter auszufüllen:
Datum: _____
VP-Nr.: _____
Experiment: _____
Liste: _____
Version: _____

Fragebogen zum kommunikativen Verhalten

In diesem Fragebogen geht es um Ihr individuelles kommunikatives Verhalten. Lesen Sie bitte die folgenden Fragen sorgfältig durch und entscheiden Sie: Trifft diese Aussage auf Sie zu? Oder eher nicht? Bitte kreuzen Sie dann auf der Skala – „ich stimme voll zu“ – „ich stimme eher zu“ – „ich stimme eher nicht zu“ – „ich stimme überhaupt nicht zu“ - das entsprechende Feld an.

Vielen Dank!!

Nr.		**Ich stimme:**			
		voll zu	**eher zu**	**eher nicht zu**	**überhaupt nicht zu**
1	Ich unternehme Dinge lieber gemeinsam mit anderen statt allein.				
2	Ich tue alles vorzugsweise immer auf die gleiche Art und Weise.				
3	Wenn ich mir etwas Bestimmtes vorstelle, fällt es mir leicht, mir davon ein inneres Bild zu machen.				
4	Es passiert mir häufig, dass ich so sehr in eine Sache vertieft bin, dass ich darüber alles andere aus den Augen verliere.				
5	Ich nehme oft kleinste Geräusche wahr, wenn andere nichts hören.				
6	Autokennzeichen oder ähnliche Aneinanderreihungen von Informationen erregen öfters meine Aufmerksamkeit.				

Nr.		Ich stimme:			
		voll zu	eher zu	eher nicht zu	überhaupt nicht zu
7	Andere Leute weisen mich häufig darauf hin, dass ich etwas Unhöfliches gesagt habe, obwohl ich es höflich gemeint habe.				
8	Wenn ich eine Geschichte lese, entwickle ich schnell eine Vorstellung davon, wie die einzelnen Personen aussehen.				
9	Ich bin fasziniert von Daten.				
10	In einer Gruppe kann ich mehreren Gesprächen problemlos folgen.				
11	Es fällt mir leicht, mit sozialen Situationen umzugehen.				
12	Ich neige dazu, Details zu bemerken, die anderen nicht auffallen.				
13	Ich gehe lieber in eine Bibliothek als auf eine Party.				
14	Ich kann mir mühelos Geschichten ausdenken.				
15	Ich interessiere mich eher für Menschen als für Dinge.				
16	Ich habe sehr ausgeprägte Interessen und es setzt mir zu, wenn ich ihnen nicht nachgehen kann.				
17	Ich habe Spaß an zwanglosen Gesprächen.				
18	Wenn ich einmal das Wort ergriffen habe, kommen andere häufig kaum zum Zug.				
19	Ich finde Zahlen faszinierend.				
20	Wenn ich eine Geschichte lese, fällt es mir schwer die Absichten einzelner Personen herauszufinden.				
21	Ich lese nicht gerne erfundene Geschichten (Romane u. ä.).				

Nr.		Ich stimme:			
		voll zu	eher zu	eher nicht zu	überhaupt nicht zu
22	Es fällt mir schwer, neue Freunde zu finden.				
23	Ich bemerke immer wieder bestimmte Muster in den Dingen und Ereignissen.				
24	Ich gehe lieber ins Theater als in Museum.				
25	Es regt mich nicht auf, wenn mein gewohnter Tagesablauf gestört wird.				
26	Ich stelle oft fest, dass ich Mühe habe, ein Gespräch in Gang zu halten.				
27	Es fällt mir leicht „zwischen den Zeilen zu lesen“, wenn jemand mit mir spricht.				
28	Ich konzentriere mich eher auf das Ganze als auf Details.				
29	Ich kann mir Telefonnummern nicht besonders gut merken.				
30	Mir fällt es gewöhnlich gar nicht auf, wenn sich Situationen oder das Erscheinungsbild von Personen ein klein wenig verändern.				
31	Ich merke es, wenn sich jemand in einem Gespräch zu langweilen beginnt.				
32	Es bereitet mir keine Schwierigkeiten, mehrere Sachen gleichzeitig zu tun.				
33	Beim Telefonieren bin ich unsicher, wann ich wieder mit dem Sprechen dran bin.				
34	Ich handle gern spontan.				
35	Ich bin oft der Letzte, der einen Witz versteht.				
36	Ich erkenne schnell, was jemand denkt oder fühlt, indem ich einfach seine Mimik beobachte.				

Nr.		Ich stimme:			
		voll zu	eher zu	eher nicht zu	überhaupt nicht zu
37	Nach einer Unterbrechung fällt es mit leicht, gleich wieder mit der Sache fortzufahren, mit der ich zuletzt beschäftigt war.				
38	Ich bin gut in Smalltalk.				
39	Man sagt mir öfter, dass ich zu ständigen Wiederholungen neige.				
40	Als Kind hat es mir Spaß gemacht, beim Spielen mit anderen in verschiedene Rollen zu schlüpfen und „so zu tun, als ob“.				
41	Ich sammle gern Informationen über verschiedene Gruppen oder Kategorien (z.B. über Autotypen, Vogelarten, Zugtypen, Pflanzenarten etc.).				
42	Es fällt mir schwer, mich in andere Menschen hineinzuversetzen.				
43	Ich bereite mich gern gründlich auf alle Aktivitäten vor, an denen ich teilnehme.				
44	Gesellige Veranstaltungen machen mir Spaß.				
45	Es fällt mir schwer, die Absichten anderer Menschen einzuschätzen.				
46	Unbekannte Situationen machen mir Angst.				
47	Ich lerne gern neue Leute kennen.				
48	Ich bin ein guter Diplomat.				
49	Ich kann mir die Geburtstage anderer Leute nur schwer merken.				
50	Es fällt mir leicht, mit Kindern Spiele zu spielen, bei denen man sich verstellen muss.				

C.9 Protocol for experiments I to III

Vom Versuchsleiter auszufüllen:
Datum: _____
VP-Nr.: _____
Experiment: _____
Liste: _____
Version: _____

Protokoll

Übung

Nr.	Antwort	Anmerkungen
Ü1	□ richtig □ falsch	
Ü2	□ richtig □ falsch	

Experiment

Nr.	Antwort	Anmerkungen
1	□ richtig □ falsch	
2	□ richtig □ falsch	
3	□ richtig □ falsch	
4	□ richtig □ falsch	
5	□ richtig □ falsch	
6	□ richtig □ falsch	
7	□ richtig □ falsch	
8	□ richtig □ falsch	
9	□ richtig □ falsch	
10	□ richtig □ falsch	

Nr.	Antwort	Anmerkungen
11	□ richtig □ falsch	
12	□ richtig □ falsch	
13	□ richtig □ falsch	
14	□ richtig □ falsch	
15	□ richtig □ falsch	
16	□ richtig □ falsch	
17	□ richtig □ falsch	
18	□ richtig □ falsch	
19	□ richtig □ falsch	
20	□ richtig □ falsch	
21	□ richtig □ falsch	
22	□ richtig □ falsch	
23	□ richtig □ falsch	
24	□ richtig □ falsch	

D Results

D.1 PGN Experiment I

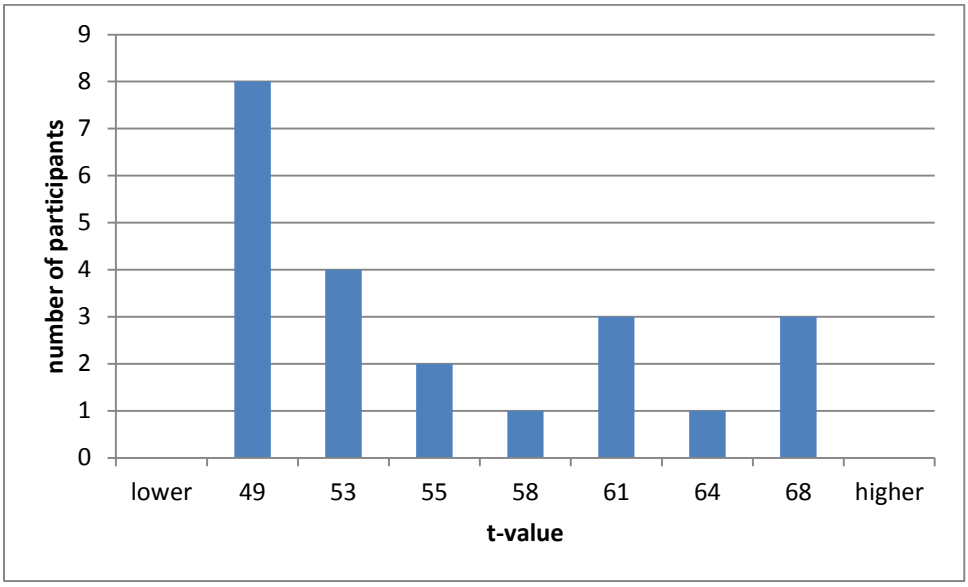

Figure 16: Performance of the 5-year-old participants in the memory-test (n=22).
T-values from 40 to 60 indicate that participants performed on average in the memory-test. Participants with t-values higher than 60 performed above average while those with t-values lower than 40 performed worse than average. All of the t-values are normed values with a mean of 50 and a standard deviation of 10.

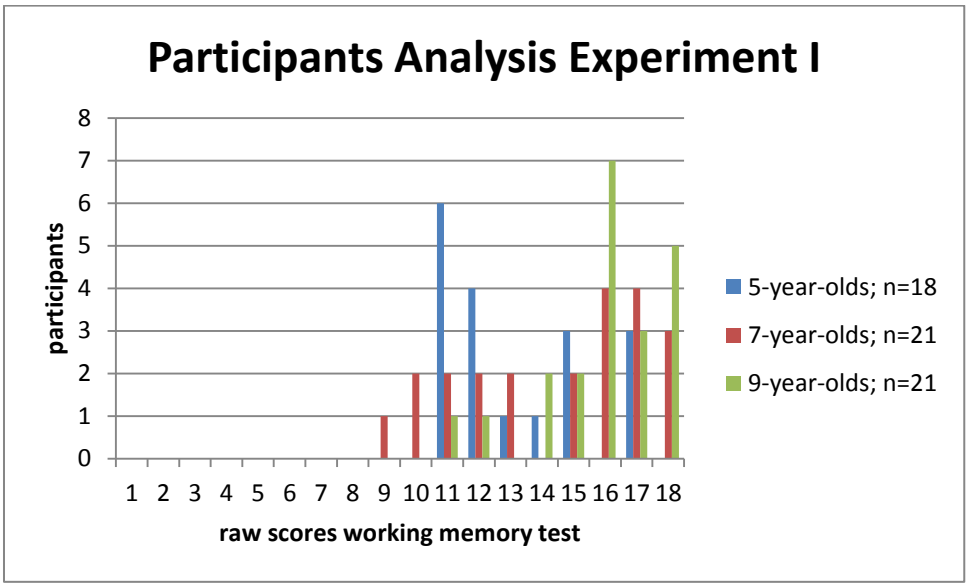

Figure 17: Participants performance in the working memory test (Experiment I)
The figure shows the performance in the working memory test of the participants whose data entered in the analysis of the experiment.

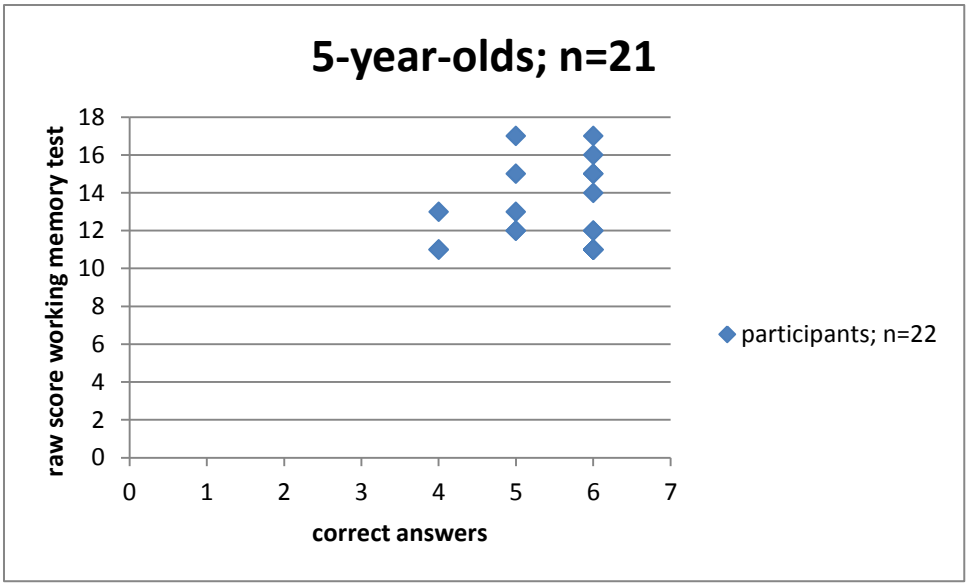

Figure 18: Correlation answers and results in the *PGN*-test (5-year-olds; Experiment I)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 5-year-olds participants.

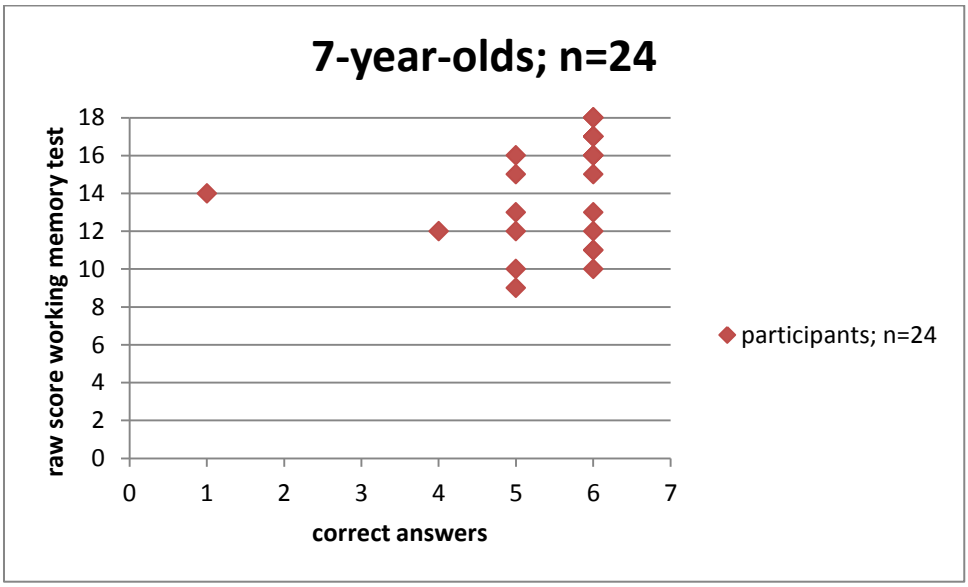

Figure 19: Correlation answers and results in the PGN-test (7-year-olds; Experiment I)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 7-year-olds participants.

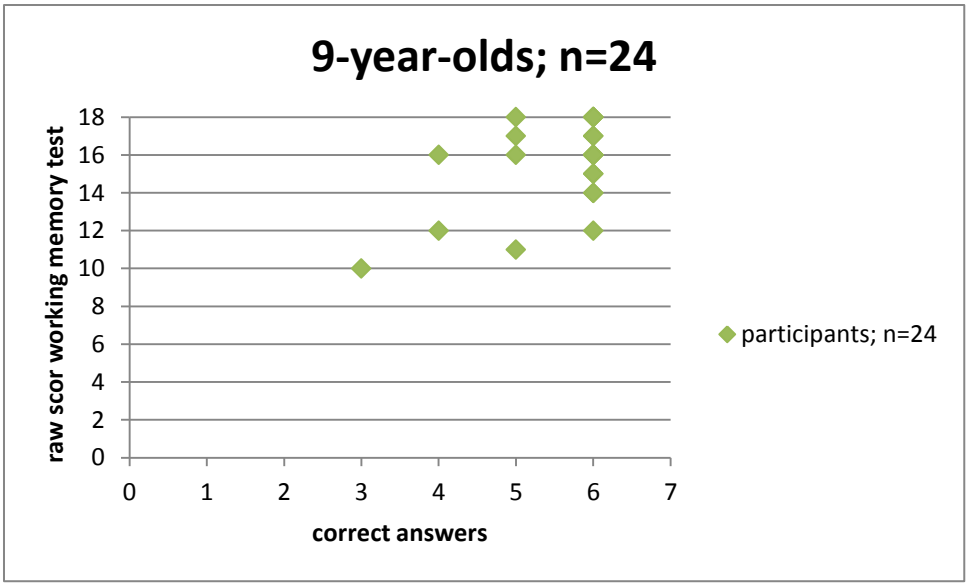

Figure 20: Correlation answers and results in the PGN-test (9-year-olds; Experiment I)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 9-year-olds participants.

D.2 PGN Experiment II

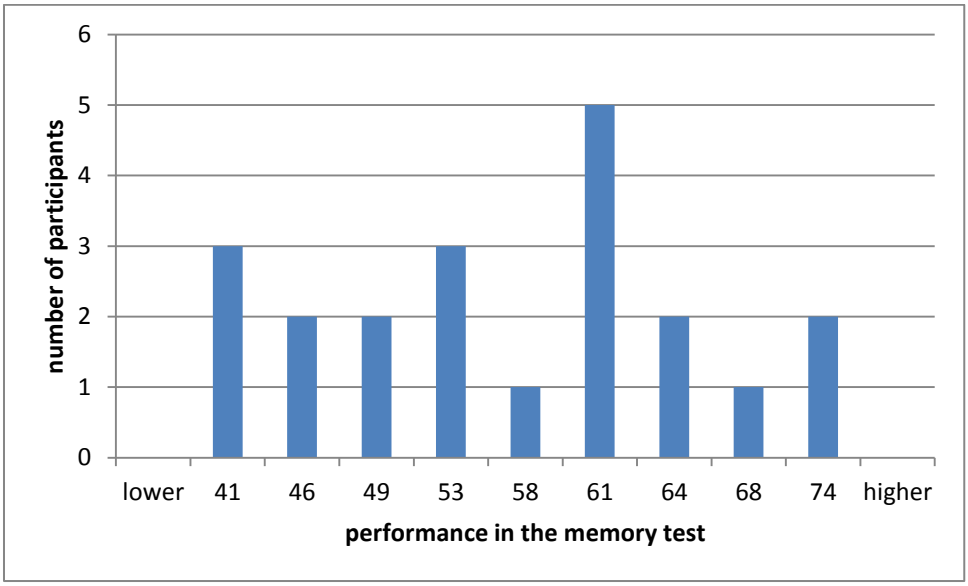

Figure 21: Performance of the 5-year-old participants in the memory-test (n=21).
T-values from 40 to 60 indicate that participants performed on average in the memory-test. Participants with t-values higher than 60 performed above average while those with t-values lower than 40 performed worse than average. All of the t-values are normed values with a mean of 50 and a standard deviation of 10.

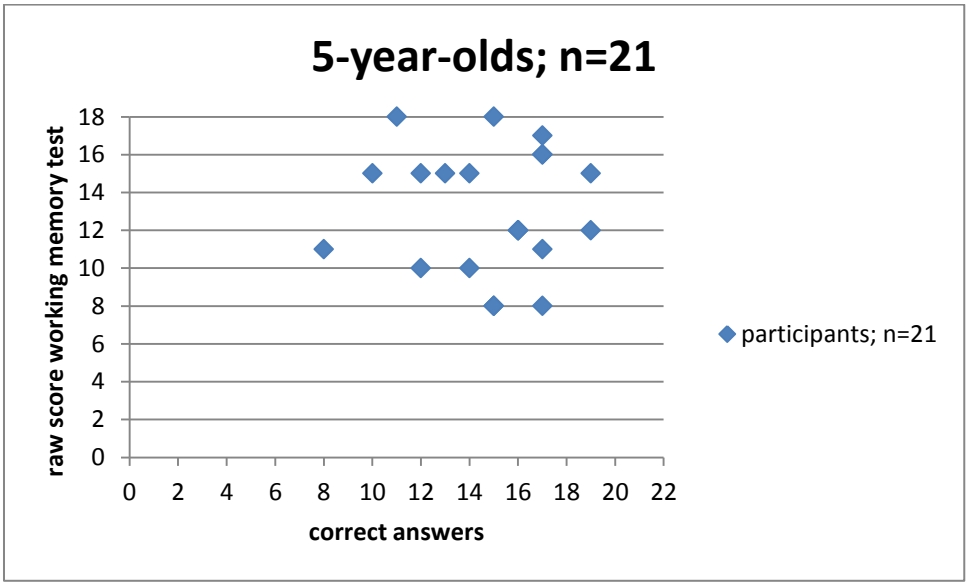

Figure 22: Correlation answers and results in the PGN-test (5-year-olds; Experiment II)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 5-year-olds participants.

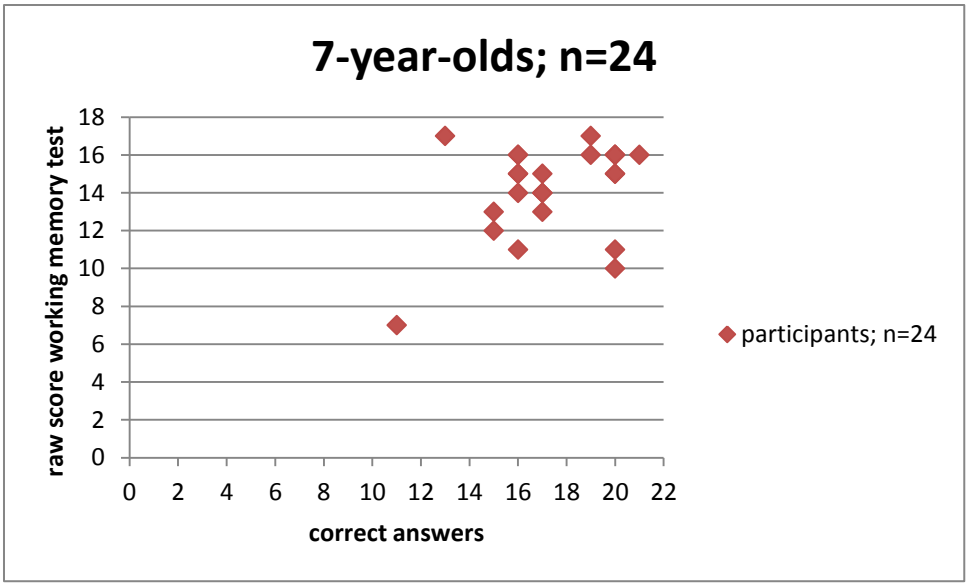

Figure 23: Correlation answers and results in the PGN-test (7-year-olds; Experiment II)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 7-year-olds participants.

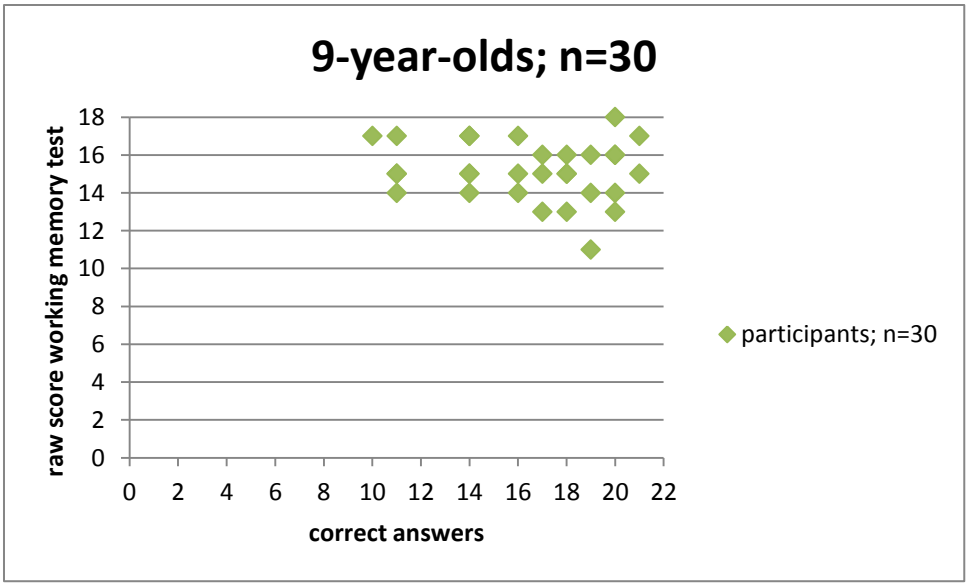

Figure 24: Correlation answers and results in the PGN-test (9-year-olds; Experiment II)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 9-year-olds participants.

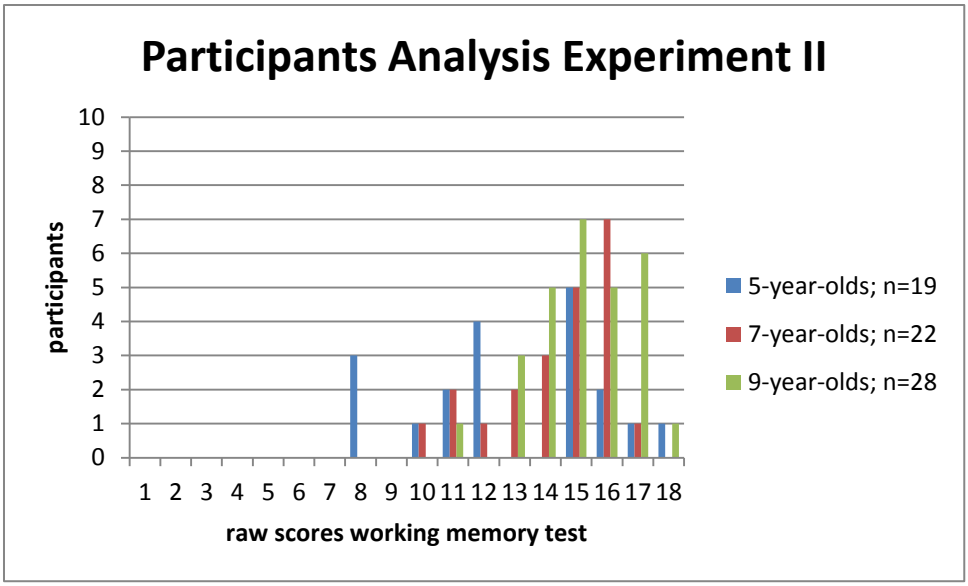

Figure 25: Participants performance in the working memory test (Experiment II)
Performance in the working memory test of the participants whose data entered in the analysis of the experiment.

D.3 PGN Experiment III

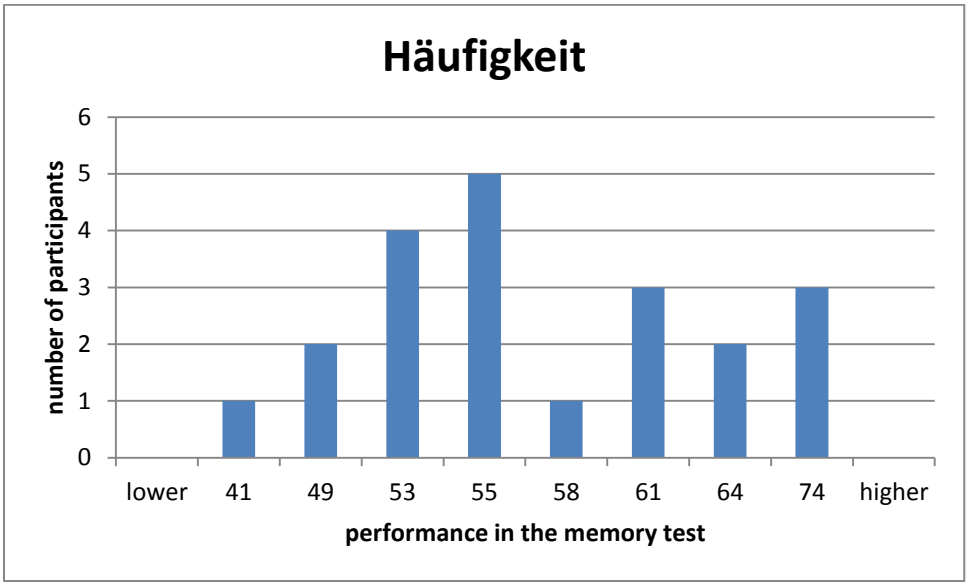

Figure 26: Performance of the 5-year-old participants in the memory-test (n=21).
T-values from 40 to 60 indicate that participants performed on average in the memory-test. Participants with t-values higher than 60 performed above average while those with t-values lower than 40 performed worse than average. All of the t-values are normed values with a mean of 50 and a standard deviation of 10.

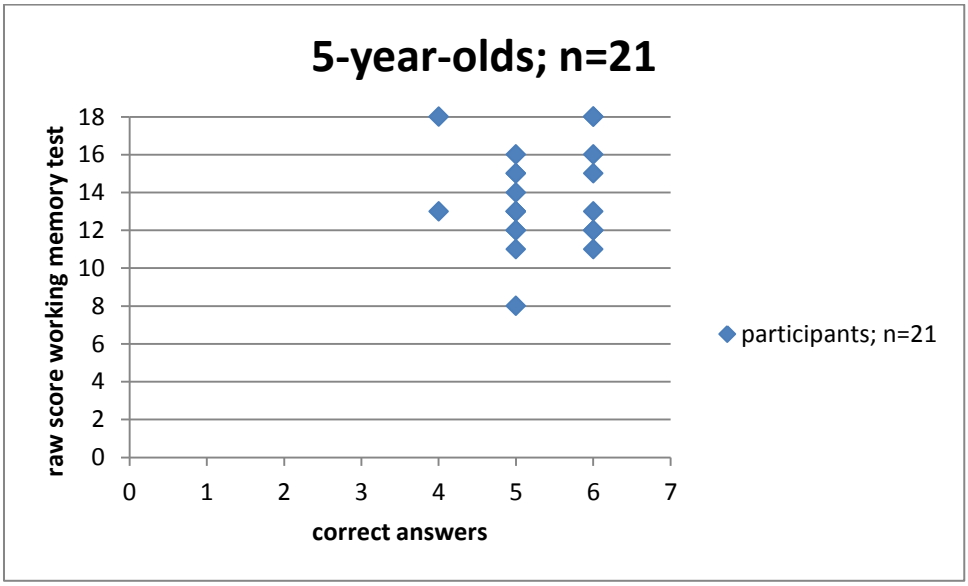

Figure 27: Correlation answers and results in the PGN-test (5-year-olds; Experiment III)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 5-year-olds participants.

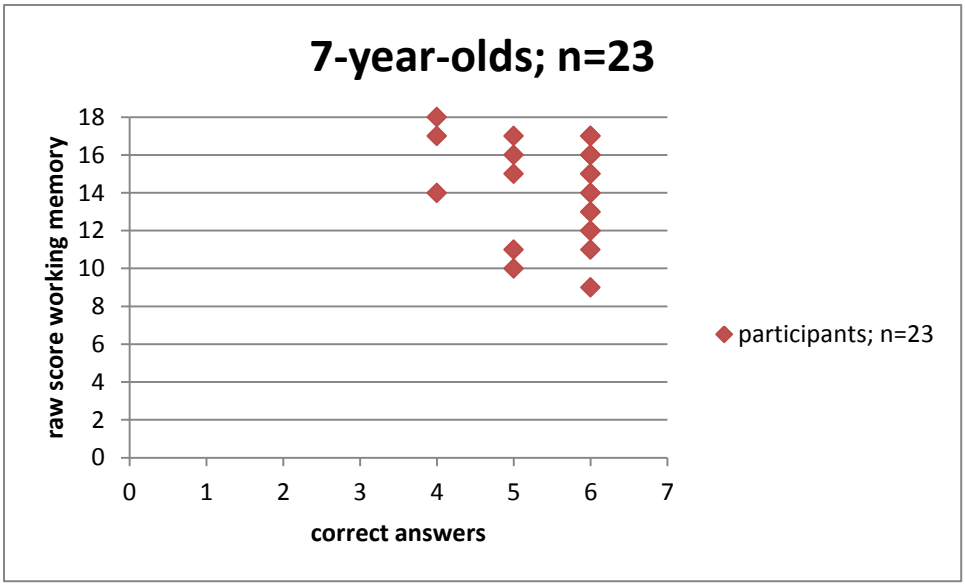

Figure 28: Correlation answers and results in the PGN-test (7-year-olds; Experiment III)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 7-year-olds participants.

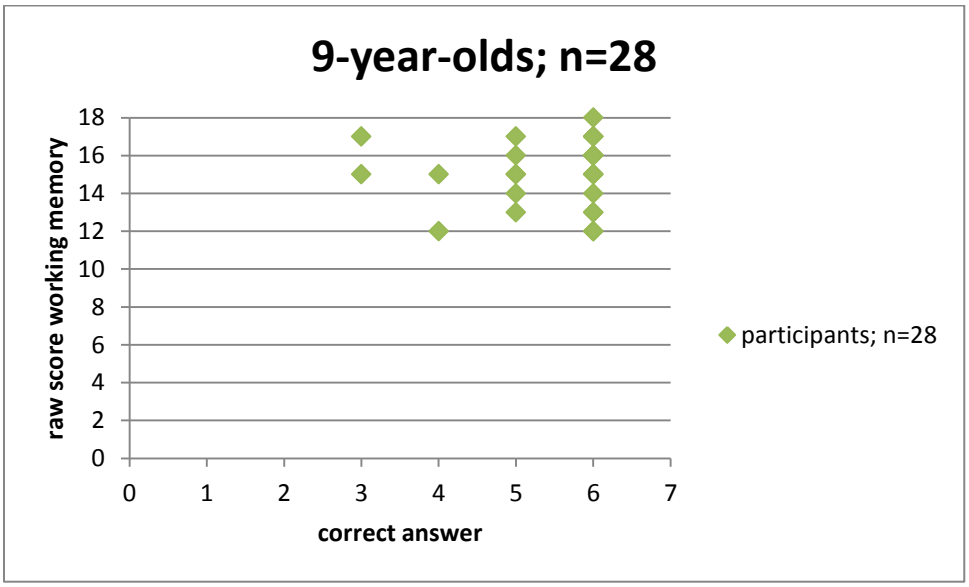

Figure 29: Correlation answers and results in the PGN-test (9-year-olds; Experiment III)
Correlation between participants' performance in the working memory test and amount of correct answers in all unequivocal conditions of the experiment for the 9-year-olds participants.

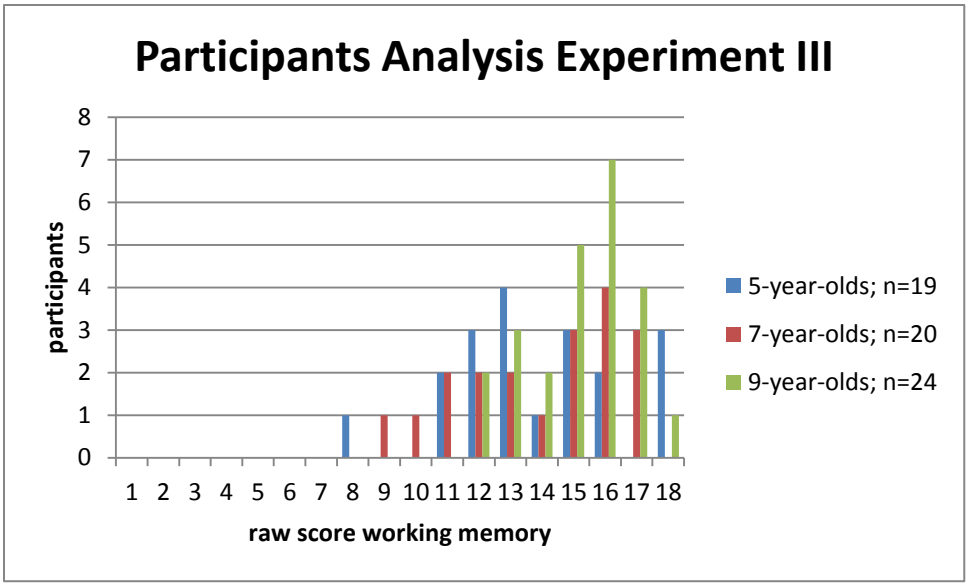

Figure 30: Participants performance in the working memory test (Experiment III)
Performance in the working memory test of the participants whose data entered in the analysis of the experiment.

D.4 Overview Results Experiments

Table 23: Overview results Experiemnts I, II and III
The table gives an overview of the main effects and interactions found in the data of Experiment I, II and III. The F-value for each effect and interaction is only listed if the effect or interaction was significant. The respective p-values are given in brackets.

Effect/ Interaction	F-value		
	Experiment I	Experiment II	Experiment III
age	3.05 (p < .04)	16.49 (p < .001)	6.19 (*p* <.001)
order	333.13 (p < .03)	4.64 (p < .035	9.20 (p < .004)
event	n.s.	3.49 (p < .033)	3.44 (p < .04)
order x event	n.s.	3.68 (p < .029)	5.07 (p < .008)
age x order	n.s.	n.s.	n.s.
age x event	n.s.	n.s.	n.s.
age x order x event	2.65 (p < .02)	n.s.	n.s.

D.4.1 Overview of Resolved Interactions of Experiment I

Table 24: 3-way interaction of Experiment I resolved by age-group
The table shows the results of resolving the 3-way-interaction (age x order x event) found in the data of Experiment I. The F-value for each effect and interaction is only listed if the effect or interaction was significant. The respective p-values are given in brackets.

	F-value			
	5-year-olds	7-year-olds	9-year-olds	adults
order	11.67 (*p* < .004)	63.08 (*p* < .001)	180.0 (*p* < .001)	15176.86 (*p* < .001)
event	n.s.	n.s.	n.s.	n.s.
order x event	14.82 (*p* < .001)	4.34 (*p* < .025)	4.57 (*p* < .002)	n.s.
age x order	n.s.	n.s.	n.s.	n.s.
age x event	n.s.	n.s.	n.s.	n.s.

Table 25: 2-way interaction of Experiment I resolved by event
The table shows the results of resolving the 2-way-interaction (order x event) found in the data of 5-year-old, 7-year-old and 9-year-old participants of Experiment I. The F-value for each effect and interaction is only listed if the effect or interaction was significant. The respective p-values are given in brackets.

	F-value		
	5-year-olds	7-year-olds	9-year-olds
1und2* vs. *2und1 **'1and2 vs. 2and1'**	n.s.	16.67 ($p < .001$)	22.19 ($p < .001$)
2und3* vs. *3und2 **'2and3 vs. 3and2'**	36.09 ($p < .001$)	65.22 ($p < .001$)	155.19 ($p < .001$)
1und3* vs. *3und1 **'1and3 vs. 3and1'**	16 ($p < .001$)	77.18 ($p < .001$)	84.00 ($p < .0.001$)

D.4.2 Overview of Resolved Effects and Interactions of Experiment II

Table 26: 2-way interaction of Experiment II resolved by event
The table shows the results of resolving the 2-way-interaction (order x event) found in the data of Experiment II. The F-value for each effect and interaction is only listed if the effect or interaction was significant. The respective p-values are given in brackets.

	F-value
1und2* vs. *2und1 **'1and2 vs. 2and1'**	n.s.
2und3* vs. *3und2 **'2and3 vs. 3and2'**	n.s.
1und3* vs. *3und1 **'1and3 vs. 3and1'**	7.76 ($p < .007$)

D.4.3 Overview of Resolved Effects and Interactions of Experiment III

Table 27: 2-way interaction of Experiment III resolved by event
The table shows the results of resolving the 2-way-interaction (order x event) found in the data of Experiment III. The F-value for each effect and interaction is only listed if the effect or interaction was significant. The respective p-values are given in brackets.

	F-value
1und2* vs. *2und1 **'1and2 vs. 2and1'**	4.51 $p < .01$
2und3* vs. *3und2 **'2and3 vs. 3and2'**	18.37 $p < .001$
1und3* vs. *3und1 **'1and3 vs. 3and1'**	n.s.

E Abbreviation

ANOVA	Analysis of Variance
ASD	Autism Spectrum Disorders
AQ	Autism-Spectrum Quotient
AQ_{Comm}	subsection 'Communication' of the AQ-test
AQ-test	Autism Spectrum Quotient Test
BK	Background knowledge
CCP	Context Changing Potential
CDT	Coordinating Discourse Topic
CMCAs	Current Mutual Contextual Assumptions
CP	Cooperative Principle
DR	Discourse Relation
DRT	Discourse Representation Theory
ec_1	combination of event 1 and event 2 mentioned in the story
ec_2	combination of event 2 and event 3 mentioned in the story
ec_3	combination of event 1 and event 3 mentioned in the story
F	female
GCI	Generalized conversational Implicatures
LAD	Language Acquisition Device
LK	linguistic knowledge
M	Mean
PCI	Particularized Conversational Implicature
PGN-test	
PL	Plural
PRS	Present
PREP	Preposition
PST	Simple Past
PTCP	Participle
REFL	Reflexive
S	Sentence
SARG	Speech Act Related Goal
SBKBs	Standing Background Knowledge and Beliefs
SD	Standard Deviation
SDRT	Segmented Discourse Representation Theory
SG	Singular
TOM	Theory of Mind
TVJ	truth value judgment

WK	World Knowledge
π	speech act
$\wedge$	logical connector ‘and’

Summary

In contrast to formal semantics, the conjunction *and* is nonsymmetrical in pragmatics. The events in *Marc went to bed and fell asleep* seem to have occurred chronologically although no explicit time reference is given. As the temporal interpretation appears to be weaker in *Mia ate chocolate and drank milk*, it seems that the kind and nature of events presented in a context influences the interpretation of the conjunction. This work focuses on contextual influences on the interpretation of the German conjunction *und* ('and').

A variety of theoretic approaches are concerned with whether *and* contributes to the establishment of discourse coherence via pragmatic processes or whether the conjunction has complex semantic meaning. These approaches are discussed with respect to how they explain the temporal and additive interpretation of the conjunction and the role of context in the interpretation process. It turned out that most theoretic approaches do not consider the importance of different kinds of context in the interpretation process.

In experimental pragmatics there are currently only very few studies that investigate the interpretation of the conjunction. As there are no studies that investigate contextual influences on the interpretation of *und* systematically or investigate preschoolers interpretation of the conjunction, research questions such as *How do (preschool) children interpret 'und'?* and *Does the kind of events conjoined influence children's and adults' interpretation?* are yet to be answered. Therefore, this dissertation systematically investigates how different types of context influence children's interpretation of *und*.

Three auditory comprehension studies were conducted in German. Of special interest was whether and how the order of events introduced in a context contributes to the temporal reading of the conjunction *und*. Results indicate that the interpretation of *und* is – at least in German – context-dependent: The conjunction is interpreted temporally more often when events that typical occur in a certain order are connected (typical contexts) compared to events without typical event order (neutral contexts). This suggests that the type of events conjoined influences the interpretation process. Moreover, older children and adults interpret the conjunction temporally more often than the younger cohorts if the conjoined events typically occur in a certain order. In neutral contexts, additive interpretations increase with age. 5-year-olds reject reversed order statements more often in typical contexts compared to neutral contexts. However, they have more difficulties with reversed order statements in typical contexts where they perform at chance level. This suggests that not only the type of event but also other age-dependent factors such as knowledge about scripts influence children's performance. The type of event conjoined influences children's and adults' interpretation of the conjunction. Therefore, the influence of different event types and script knowledge on the interpretation process does not only have to be considered in future experimental studies on language acquisition and pragmatics but also in experimental pragmatics in general. In linguistic theories, context has to be given a central role and a commonly agreed definition of context that considers the consequences arising from different event types has to be agreed upon.

Zusammenfassung

Im Gegensatz zur formalen Semantik betrachtet die Pragmatik die Konjunktion *und* als asymmetrisch. Die Ereignisse *Marc ist ins Bett gegangen und eingeschlafen*, scheinen in chronologischer Reihenfolge stattgefunden zu haben, obwohl keine explizite Zeitabfolge gegeben ist. Die temporale Interpretation drängt sich weniger stark auf in *Mia hat Schokolade gegessen und Milch getrunken*. Deshalb scheint die Art des Ereignisses, welches in einem Kontext präsentiert wird, einen Einfluss auf die Interpretation der Konjunktion zu haben. Der Fokus dieser Arbeit liegt auf dem Einfluss von Kontext auf die Interpretation der deutschen Konjunktion *und.*

Eine Reihe von theoretischen Ansätzen beschäftigt sich damit, ob *und* durch pragmatische Prozesse zur Etablierung von Diskurskohärenz beiträgt, oder ob die Konjunktion komplexe semantische Bedeutung hat. Diese Theorien werden bezüglich ihrer Erklärungen für temporale und additive Interpretationen der Konjunktion und der Rolle von Kontext im Interpretationsprozess diskutiert. Es stellte sich heraus, dass die meisten theoretischen Ansätze die Wichtigkeit verschiedener Kontexte für den Interpretationsprozess nicht beachten.

Derzeit gibt es im Bereich der Experimentellen Pragmatik nur sehr wenige Studien, welche sich mit der Interpretation der Konjunktion beschäftigen. Da es keine Studien gibt, welche systematisch die kontextuellen Einflüsse auf die Interpretation von *und* untersuchen oder sich damit beschäftigen, wie Vorschulkinder die Konjunktion interpretieren, gibt es noch eine Reihe an unbeantworteten Forschungsfragen, wie beispielsweise *Wie interpretieren Vorschulkinder ‚und'*? oder *Beeinflusst die Art der verbundenen Ereignisse die Interpretation von Kindern und Erwachsenen?* Aufgrund dessen untersucht diese Arbeit systematisch wie verschiedene Arten von Kontext die Interpretation von *und* bei Kindern beeinflussen.

Es wurden drei auditive Studien, die Verständnis testeten, durchgeführt. Von besonderem Interesse war, ob und wie die Reihenfolge, in der Ereignisse in einen Kontext eingeführt werden, einen Einfluss auf die Interpretation der Konjunktion *und* hat. Ergebnisse zeigen, dass die Interpretation von *und* – zumindest im Deutschen- kontextabhängig ist: Im Vergleich zu Ereignissen, welche nicht typischerweise in einer bestimmten Reihenfolge stattfinden (neutrale Kontexte), wird die Konjunktion häufiger temporal interpretiert, wenn die genannten Ereignisse typischerweise in einer bestimmten Reihenfolge stattfinden (typische Kontexte). Dies deutet darauf hin, dass die Art der verbunden Ereignisse den Interpretationsprozess beeinflusst. Des Weiteren interpretieren ältere Kinder und Erwachsene die Konjunktion häufiger temporal als die jüngeren Teilnehmer, wenn die verbundenen Ereignisse typischerweise in einer bestimmten Reihenfolge stattfinden. In neutralen Kontexten nehmen die additiven Interpretationen mit dem Alter zu. Fünfjährige lehnen Sätze, welche Ereignisse in umgekehrter Reihenfolge präsentieren, häufiger in typischen als in neutralen Kontexten ab. Dennoch haben sie größere Schwierigkeiten bei Sätzen mit falscher Ereignisreihenfolge, bei denen sie scheinbar zufällig antworten. Das legt nahe, dass nicht nur die Art des Ereignisses, sondern auch andere altersbedingte Faktoren, wie beispielsweise Skriptwissen, das Ergebnis der Kinder beeinflusst. Die Art der verbundenen Ereignisse beeinflusst die Interpretation der Konjunktion bei Kindern und Erwachsenen. Aus diesem Grund muss der Einfluss von Skriptwissen und verschiedenen Arten von Kontexten auf den Interpretationsprozess nicht nur in zukünftigen Studien zum Sprach- und Pragmatikerwerb berücksichtigt werden, sondern auch im Bereich der experimentellen Pragmatik im Allgemeinen. In linguistischen Theorien sollte Kontext eine zentrale Rolle einnehmen und die Forschungsliteratur muss sich auf eine allgemein akzeptierte Definition von Kontext einigen, welche die Konsequenzen, die verschiedene Ereignistypen mit sich bringen, beachtet.

Lebenslauf

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Studium

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10/2005 - 07/2007	Zusatzqualifikation Deutsch als Fremdsprache
11/2009	1. Staatsexamen für das Lehramt an Gymnasien
12/2009-10/2013	Promotionsstudium an der Johannes Gutenberg-Universität Mainz
14.10.2013	Disputation an der Johannes Gutenberg-Universität Mainz

Studienbegleitende Tätigkeiten

04/2009 – 10/2009	studentische Hilfskraft in der Abteilung Linguistik am Seminar der Englischen Philologie der Georg-August-Universität Göttingen

Berufspraxis

06/2012 - 03/2013	Wissenschaftliche Mitarbeiterin an der Johannes Gutenberg-Universität Mainz (Fach- und Arbeitsrichtung: Allgemeine Sprachwissenschaft)

Lehraufträge

10/2010- 03/2012	Lehrbeauftragte am Deutschen Institut der Johannes Gutenberg- Universität Mainz
04/2013-09/2013	Lehrbeauftragte am Deutschen Institut der Universität zu Köln

Publikationen und Vorträge

2010	*The Acquisition of Scalar Implicatures*. Göttinger Schriften zur Englischen Philologie - Band 3. Göttingen: Universitätsverlag.
2010	*The Acquisition of Scalar Implicatures*. In: Proceedings of the JSM'10 France/ Nancy.
2011	*Early Implicatures by Children and the Acquisition of Scalar Implicatures*. In: Reich, Ingo et al. (eds.) (2011): Proceedings of Sinn & Bedeutung 15. Saarbrücken: Saarland University Press, S. 499-514.
2011	*The role of context for the interpretation of the conjunction 'und'*. 4th Biennial Conference of Experimental Pragmatics, Barcelona, 02-

	04.06.2011 (http://parles.upf.edu/llocs/glif/pub/xprag2011/Posters/Roehrig.pdf)
2013	*Evidence for context-dependent interpretation of 'und*'; In: Abstracts Booklet 19th International Congress of Linguistics July 21-27 2013. Geneva Switzerland.

Sonstiges

12/2009 - 05/2012	Stipendium im Rahmen der Initiative "PRO Geistes- und Sozialwissenschaften 2015"