

An exploratory, person-centered study on motivation and physical self-concept profile in primary school children and their relation to physical performance and interest

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ABSTRACT

To gain knowledge about children's needs, the present study aimed to investigate the sport-related types of children using an exploratory, person-centered approach. In a multi-stage data analysis motivational orientation, physical self-concept, physical performance, and sport-related interest of 147 German children (9.46 years) were examined. First, three distinctive motivation and physical self-concept profiles based on motivation and physical self-concept were identified using cluster analysis ('High self-concept, high motivation'; 'Positive self-concept, self-determined motivation'; 'Low self-concept, low motivation'). Motivation and physical self-concept profiles did not differ in physical performance significantly. In a second cluster analysis, four profiles of interest were identified and their relation to the motivation and physical self-concept profiles was examined. Among others it could be shown that half of children with low self-concept and motivation belong to an interest profile labelled „Little interested, sports and court games dislike“. Our findings suggest that various sports offers are needed based on three basic psychological needs, and children should be supported in making positive experiences to develop interest.

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In early childhood most children like to move and to be active (Lohbeck et al., 2022), what is great as physical activity is important for healthy development (Dimitri et al., 2020; Bull et al., 2020; Zeng et al., 2017) and is associated with increased physical activity in adult life (Rauner et al., 2018). Still there are children who don't meet recommendations on daily physical activity (Finger et al., 2018) and already suffer from negative symptoms associated with inactivity, such as obesity (Kumar & Kelly, 2017). This should be viewed critically, as physical activity continues to decline, and dropout rates increase during childhood and adolescence (Finger et al., 2018; Rauner et al., 2018). A match between child and sports programme favours entry and thus long-term participation (Güllich & Emrich, 2014; J. Schmid et al., 2021; Schorno et al., 2021; Sudeck et al., 2011). As the entry phase to sport is important for long-term sport participation – both in informal or popular sport settings and in the competitive domain (Klostermann & Nagel, 2011; Telama et al., 1997) – sport offers must be tailored to the children's needs in order to motivate them to participate.

Characteristics for sports participation in childhood

Both physical-motor as well as psychological characteristics should be taken into account during entry phase and when investigating the fit between a person and a sport (Pion, 2015; J. Schmid et al., 2021). According to the holistic approach for the entry phase into sport by Spies et al. (2022), the development of sport participation depends on individual profiles from personal characteristics that are based on an interplay of coordinative and conditional abilities (The Ability) as well as interests, motivation and self-concept (The Will). Empirical studies show that *motivation*, *physical self-concept* and *physical performance* are important factors for children's sporting activity (Babic et al., 2014; Fenton et al., 2016; Lopes et al., 2011; Owen et al., 2014). Behaviour, including the performance of sporting activities, is seen as the result of a motivational process. Motivation has been widely studied along the lines of Ryan and Deci's (2000) self-determination theory (SDT) in both sport psychology and sport pedagogy (van den Berghe et al., 2014).

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According to SDT, motivational orientation is located on a continuum from high self-determination (autonomous motivation) to low self-determination (controlled motivation) (Ryan & Deci, 2008). Autonomously motivated people perceive themselves as self-determined and attribute their own behaviour to themselves (Ryan & Deci, 2000). A controlled-motivated individual, on the other hand, feels pressure to behave, think or feel in a certain way. The individual does not have the feeling of being the cause of their own behaviour and perceives themselves as being controlled from the outside. The behaviour is shown in order to receive an external reward or to avoid punishment – the significance of such external motives increases (Ryan & Deci, 2000). However, more autonomous forms of motivation (intrinsic, identified) are not only associated with higher physical activity (Fenton et al., 2016), but also with greater commitment, willingness to learn and well-being (Inoue et al., 2015; Pelletier et al., 2001; Ryan & Deci, 2020; Standage et al., 2012). In addition, compared to non-self-determined motivation (introjected, external), they are attributed an important role in the prevention of negative developments in sports participation such as athlete burnout (Eklund & DeFreese, 2015; Francisco et al., 2020; Gustafsson et al., 2018). Furthermore, physical self-concept is often studied when it comes to children's physical activity. Physical self-concept refers to the cognitive evaluation of one's own physical abilities (e.g., strength, endurance) and appearance and was conceptualized by Marsh and Redmayne (1994). A positive physical self-concept is associated with increased physical activity (Babic et al., 2014). Earlier studies on children of primary school age show a significant, but on average low positive correlation between motivational items and a physical self-concept (Lohbeck et al., 2021; Pavlović et al., 2023). Lohbeck et al. (2021) derive from their findings that school-based or extracurricular interventions to increase children's physical performance are only successful if the children's physical self-concept and intrinsic motivation are included. Beside self-perceived competence, 'actual' competence in terms of physical performance is also an influencing factor on physical activity (Robinson et al., 2015): sport motor skills are a predictor of physical activity in general (Lopes et al., 2011) as well as in competitive sport (Hohmann & Siener, 2021; Siener et al., 2021; Zibung et al., 2016). In studies, no to at most medium correlative effects were observed between physical performance or physical fitness and items of physical self-concept and motivation at primary school age (Carraro et al., 2010; Lohbeck et al., 2021; Mayorga et al., 2012). In addition, interest in the subject matter is relevant for sports participation (J.

Schmid et al., 2017; Spies et al., 2023). Being interested in something is associated with benefits as positive feelings (Renninger & Hidi, 2022) and can lead to meaningful engagement and changes in one's own behaviour (Renninger & Hidi, 2015): for most active children having fun is a central motive for participating in sports (Cope et al., 2013; Crane & Temple, 2015). The person-object theory states that interest can arise in the confrontation between an individual and a specific object (Krapp, 1998; Prenzel et al., 1986): e.g., when a child goes ice skating. According to the four-phase model by Hidi and Renninger (2006), interest develops in phases from triggered to maintained situational interest as a psychological state to emerging up to well-developed individual interest as a stable trait (Harackiewicz & Knogler, 2017). Phases of situational interest reflect an initially unique and joyful experience that is triggered by an environmental stimulus and arouses attention in a specific object, e.g., in ice skating because of a visit to the ice ring during a school excursion. Concerning phases of individual interest, the interaction is characterised by the fact that the object is perceived as individually valuable (value-related component), object-related knowledge and possibilities for action are developed (cognitive component) and positive emotions are experienced in the interaction (emotional-affective component). For example, an individually interested child would participate regularly, voluntarily and with pleasure in ice hockey or figure skating and know the specific rules.

Previous research approaches to the problem

Previous studies on children's physical activity have produced valuable findings on motivation, physical self-concept, physical fitness and interest and have shown that the four constructs are each important in their own right. But if you look at the children from a holistic perspective, the behaviour is based on a combination of these personal characteristics. However, the empirical findings indicate that the correlations between the items of the four constructs in childhood are low or inconsistent, especially if a nomothetic perspective is adopted and general (average) correlations are examined, e.g., using correlation- or regression-based methods (structural equation modelling and regression analysis, confirmatory factor analysis). This approach (variable-centered) assumes that all individuals in a sample are drawn from a single population for which a single set of 'averaged' parameters can be estimated (Saqr et al., 2024; Woo et al., 2018). In contrast, the so called person-centered approaches with a number of variations, such as person-oriented or person-centric, take a more

relaxed view of this assumption and allow for the possibility that the sample may include multiple subpopulations characterised by different sets of parameters (Lars Bergman et al., 2014; Morin et al., 2018). The approach considers patterns or configurations of variables and aims to describe different types of people by conducting (statistical) clustering methods (Lanza & Cooper, 2016). This research strategy is therefore referred to as pattern-orientated, configurative or typological. Person clusters are usually derived from empirical quantitative data using statistical methods that follow a model of inductive theory building (Woo et al., 2018). In this sense, person-centred approaches can be a useful complement to traditional variable-centred methods and allow researchers to model complex processes in a more heuristic way.

The number of person-centered studies (looking for group-specificity/type-specificity) in sports science has increased in recent years, with cluster analysis, latent profile and class analyses being predominantly used: for example, in competitive sports, both entry (childhood training in soccer) (Zibung & Conzelmann, 2013) and career trajectories of retiring Olympic athletes (M. Schmid et al., 2023) have been studied. Other studies have used this approach to gain insight into personality traits such as motivation (Lohbeck et al., 2022) or athlete burnout (Gustafsson et al., 2017; Sorkkila et al., 2017).

In the study by Lohbeck et al. (2022), they were able to identify three profiles in primary school children with regard to motivation and thus clarify the relationship to physical fitness and self-concept in a much more differentiated way. Spies et al. (2022) used a mixed-method approach (two-phase sequential design) to investigate the interest and physical abilities of primary school children. The results of the first phase (cluster analysis) revealed five clusters of children that exhibited significant differences in terms of ability and interests. In the field of motivation research, Tapia-Serrano et al. (2024) assumed that children exhibit a certain behaviour that is simultaneously guided by several combinations of motivational forms. One of their objectives was to identify the optimal number of motivational profiles in a sample of Primary School children. Following a person-centered approach, the authors were able to identify five motivation profiles in 10- to 12-year-old primary school children in Spain.

At this it should be noted that sport is not homogeneous in terms of its requirements structure (J. Schmid et al., 2017, see ESM1): participation in darts, for example, is hardly comparable to participation in soccer. In sport, the individual with its abilities and personality traits faces tasks with different requirements under different circumstances and opportunities (Nitsch, 2009).

Different sports also make different demands on athletes' abilities (e.g., sprinting performance, hand-eye coordination) and personality traits (e.g., willingness to take risks, capacity for teamwork, hope for success). However, it is not only that one sport is not like the other: children differ in their personality traits and needs as well as in their physical abilities. It is not possible to speak of 'the one' personality structure and characteristics of children, just as it is not possible to speak of 'the one' demand structure of sports. Consequently, it can be deduced that there is not 'the one' sports programme that suits all children: some are already intrinsically motivated, others are active due to external circumstances. Some children perceive themselves as fast, others see their strength in endurance and still others see themselves as less competent in sport. Some children love free play, while others are looking to improve their performance and compete. Still others prefer compositional sports to ball sports or combat sports. Some are low performers, while others are best movers. Accordingly, an understanding of the motivation and self-concept latent profiles and their relation to sport characteristics like physical abilities or interests in certain sports is required to be able to make suitable offers and promote long-term participation.

Current research shows the importance of the characteristic areas of motivation, physical self-concept, physical performance and interest for children's sporting participation and evidence of relationships between the individual areas (Ensrud-Skraastad & Haga, 2020; Lohbeck et al., 2021; Roure & Lentillon-Kaestner, 2022). Especially motivational orientation and physical self-concept have been examined many times and are of great importance for long-term engagement in sport. As already mentioned, the complexity of relations between motivation, physical self-concept and physical performance has not yet been sufficiently clarified using variable-centered approaches. A holistic view of children is still lacking in this field of research. The potential to identify 'common types' (L. R. Bergman & Magnusson, 1997, p. 293) makes the *person-centered approach* a particularly suitable research strategy for designing needs-based sports programmes aimed at promoting sustainable sports participation. According to Charbonnet and Conzelmann (2023, p. 64) this approach allows researchers to 'make broader statements that go beyond individual cases while still maintaining a focus on understanding specific individuals'. As findings on holistic profiles can contribute to a better understanding of children's sport participation, they can be used in the entry phase and design of sports offers. However, in order to create group-specific sport programmes, it is important to consider these psychological

characteristics in connection with physical performance and interest (Pion, 2015; Spies et al., 2022). Rather than assuming a general (nomothetic) relationship between these characteristics, we use the person-centered approach to focus group-specific profiles ('All people are like some other people' Charbonnet & Conzelmann, 2023, p. 57) as a lack of studies examining whether there are different types can be stated.

The present study

Based on the framework of Spies et al. (2022), the aim of the study is to investigate 1. whether different psychological profiles can be identified in children based on psychological characteristics (motivation and physical self-concept) and 2. how these relate to physical performance and interest in specific sports. These findings should contribute to the development of more targeted sports programmes to promote sustainable sports participation in the future. For this purpose, data from a field intervention study were analysed. Using a non-probability sampling method, schools were selected according to predefined criteria (including all-day schooling, a balanced ratio of urban and rural schools, and school size) (purposive and homogeneous sampling). However, the selection of participating children was carried out by the schools without any control. The original purpose of the study was to investigate the effects of a sports intervention on sports preferences and subsequent participation in sports among primary school children (confirmatory testing) (Döringer et al., 2025).

In the study described here, the data (motivation, self-concept, athletic performance and interest) from the prä-test were analysed to answer a research question that emerged during the study. This is therefore an exploratory approach, based on the classification and recommendations of Ditroilo et al. (2025). In the context of discovery, the data are explored with the aim of detecting patterns and associations that may lead to the generation of new hypotheses. Standardised and established measurement and analysis methods were used to identify patterns (clusters) and relations relevant to the scientific community. The analyses are inspired by a strong prior based on the literature, results from previous exploratory analyses or other studies (including confirmatory studies). Exploratory statistic tests yield the same quantitative results – p-values and effect sizes – as confirmatory tests, but the error rates are not controlled and the findings are interpreted and presented accordingly (Ditroilo et al., 2025). Methods typical of exploratory approaches, e.g., cluster analyses to identify patterns or inferential statistical testing of group

effects, were carried out. The results are supported by appealing tables and graphics. Overall, we follow the recommendations for reporting an exploratory study by Ditroilo et al. (2025).

For the exploratory study we examine third and fourth grade primary school children in two stages. Since it is assumed that motivational orientation and physical self-concept are particularly influential for sports participation, we first investigate motivation and physical self-concept profiles taking them into account. Afterwards we will examine the relationship of motivation and physical self-concept profiles with physical performance and sport-related interest.

Research question 1): What motivation and physical self-concept profiles based on motivational orientation in sport and physical self-concept can be identified in children of primary school age using cluster analysis?

Research question 2): Can relationships be found within the identified motivation and physical self-concept profiles to a) physical performance and b) sport-related interest?

Method

Participants

In the present study data of $N = 147$ children was examined. They were aged 8.1 to 11.1 years ($M = 9.46$; $SD = .58$) and $n = 57$ (38.8%) children of the study sample were girls, while $n = 90$ (61.2%) were boys. The children visited third and fourth grade in nine elementary schools in Rhineland-Palatinate and participated in a project to promote physical activity.

Procedures

All data was collected standardised in terms of setup, instruction, and implementation on several days by trained research assistants before the physical activity programme started. The sport motor performance diagnostics were carried out in small groups in the schools' sports halls, while survey on interest took place in a one-to-one-interview situation. Additionally, the children completed a questionnaire by themselves on motivation and physical self-concept. They could ask questions or have the items read out to them at any time. Informed and written consent was given to the children in advance. The parents or legal guardians of the participating children were informed in advance in writing about the course of the project, the voluntary nature of participation and the anonymity of the data collected. All documents were distributed via the schools. Parents confirmed receipt of this information

in writing and gave their consent for their children to participate in the study by signing the consent form. They also completed a questionnaire about their children's physical abilities. All children whose parents or guardians had signed the consent form were allowed to participate. They could withdraw from the study at any time without giving reasons and without any disadvantages. The children's consent was not obtained in writing. However, the researchers verbally pointed out during all tests that the participation was voluntary and that the children did not have to take part. Approval to the proposed study was given by the Ethics Committee of department 02 from the Johannes Gutenberg-University Mainz (Decl. No.: 2023-01) and the 'Aufsichts- und Dienstleistungsdirektion', the relevant school supervisory body in Rhineland-Palatinate. Any investigation is in accordance with the Declaration of Helsinki 1964.

Measures

Motivation

To measure motivation four scales of a questionnaire for children aged 8 to 13 by Kohake and Lehnert (2018) were used. The motivation subscales were intrinsic (e.g., 'I do sports because I find it interesting'), and identified (e.g., 'I do sports because I want to exercise regularly to improve') for self-determined motivation and introjected (e.g., 'I do sports because I would feel bad if I did not') and external (e.g., 'I do sports because I think my parents want me to') for non-self-determined motivation. Each motivation type was measured with three items to which the children gave their agreement on a four-point rating scale (1 = not true at all, 4 = totally true), except for intrinsic motivation, which is measured by only two items (see Supplement 1). The scale was visually supported by different thumbs (e.g., 4 = thumbs up). A 4-factor model showed in confirmatory factor analysis (CFA) a good fit ($\chi^2 = 77.1$, $df = 48$; comparative fit index [CFI] = .950, Tucker-Lewis index [TLI] = .93, root mean square error of approximation [RMSEA] = .06) and supports the four motivation dimensions (subscales).

Physical self-concept

Physical self-concept was measured by the PSK-K by Dreiskämper et al. (2015) for elementary school children. The six subscales coordination (e.g., 'I can do two exercises together like shooting a ball while running'), endurance (e.g., 'I can run for a long time without stopping'), flexibility (e.g., 'I can bend well in all directions'), speed (e.g., 'I am fast'), sport competence (e.g., 'I am good at sports') and strength (e.g., 'I have a lot of power in my

body') were used. As for motivation each subscale comprised three items on a four-point rating scale (see Supplement 1). CFA confirmed the subscales of the questionnaire ($\chi^2 = 210$, $df = 120$; CFI = .904, TLI = .878, RMSEA = .711) and the reliability was acceptable ($\alpha = .717$ to .783), except for flexibility ($\alpha = .65$) and coordination ($\alpha = .59$).

Physical performance

The physical performance was assessed by seven motor skill tests, most adapted from the standardised German Motor Skills Test 6–18 (Bös & Schlenker, 2009). The tests assessed the motor skills of sprinting ability (20-m-sprint, Witty Microgate), flexibility (standing torso bend forward), coordination (for upper extremities wall volley test; for lower extremities sideward jumping), explosive strength ability (for upper extremities: medicine ball throw 1.5 kg, Davis et al. (2008); for lower extremities: standing long jump) and endurance (shuttle-run, Mayorga-Vega et al. (2015)). As all tests, except the shuttle run, were performed twice, Cronbach's alpha was calculated for reliability analyses. The internal consistency was high to excellent ($\alpha = .86 - .97$), except for 20-m-sprint ($\alpha = .69$) (Blanz, 2021).

Interest

Interest is a complex construct according to the phase-model (Hidi & Renninger, 2006). As both phases of situational and individual interest are characterised by positive feelings, in the present study sport interest is operationalised by its emotional-affective component, taking children's language into account, as 'fun'. As previously explained sport as an object is very heterogeneous in itself, this is why we decided to investigate the perception of fun in various sports. First step children watched 21 video sequences in which children performed athletic activities and sports (e.g., sprint, gymnastics, basketball). In a second step, they were asked to classify pictures of those activities on a scale according to how much they enjoy what they have seen. The scale had seven levels (1 = not at all fun, 4 = neutral, 7 = lots of fun) and was visually supported by smileys.

Data preparation

For *motivation* and *physical self-concept*, the mean value for each scale was calculated using the three items. The measurement of *interest* comprises 21 ratings of athletic activities and sports. Prior to the analyses the reliability of the questionnaire-scales was tested by CFA and all variables were z-standardised. To conduct variables for *physical performance* the best values from the two attempts for each motor skill test

were adjusted for age and then z-standardised separately by gender.

Data analysis

To answer the research questions (RQ) a multi-stage data analysis was used, which is shown in [Figure 1](#). In the first phase (1), motivation and physical self-concept profiles (MSs) were identified using clustering methods, with physical self-concept and motivation as variables. In the second stage, the effect of the MSs on physical performance is investigated using multivariate analysis of variance (MANOVA) (2a). Finally, clustering methods were used to create interest profiles (IPs) and examine their relationship to the MSs using the χ^2 test (2b). The profiles (MSs & IPs) were identified in a two-phase process based on the literature as follows (Gore, 2000; Rayward et al., 2017): 1. To identify possible cluster solutions a hierarchical cluster analysis (Ward's method, squared Euclidean distances) was performed. Decision for possible cluster solutions was made based on the dendrogram, agglomeration schedule and F-values. The smaller the F-value, the smaller the scattering is within a cluster (F-values should not be > 1). The cluster solutions deemed suitable in the first step based on the evaluation criteria were then used for the actual classification (numbers of clusters only). 2. The SPSS package 'two-step cluster analysis' (SPSS Statistics Version 27.0, log-likelihood) was used to identify MSs and IPs, whereby the final cluster solutions were determined based on the Bayesian information criterion (BIC), Ratio of Distance Measures and content considerations. Although the classification of objects or cases into clusters is deterministic in this procedure, it is based on a probability model. The SPSS two-step cluster analysis is therefore a model-based approach and has similar advantages (e.g., more reliable test statistics for determining the number of clusters) to latent profile analysis (LPA), for example. Especially when only continuous variables (ordinal or interval scaled) are classified, SPSS two-step cluster analysis delivers results that are just as good as those obtained using LPA methods (Bacher et al., 2004; Gelbard et al., 2007; Kent et al., 2014). This is one of the main reasons why this two-stage variant has been used for several years in various scientific disciplines such as medicine (Lee et al., 2025; Vavougiou et al., 2016), psychology (Benassi et al., 2020; Fleury et al., 2015), social sciences (Harantová et al., 2023) and sports sciences (Fraboni et al., 2022; Hautbois et al., 2019; Mumcu & Lough, 2022; Rayward et al., 2017; Rundle-Thiele et al., 2015). MANOVA was run to check whether clusters of the final solutions differ statistically in the

individual variables. According to Cohen (1988) effect sizes from $f = .10$ are interpreted as weak, from $f = .25$ as medium and from $f = .40$ as strong. To characterise the profiles z-values are interpreted as follows: high ($M \geq .80$), moderate high ($M = .45$ to $.79$), average ($M = -.44$ to $.44$), moderate low ($M = -.45$ to $-.79$) and low ($M \leq -.80$). Cut-off values were chosen based on content-related considerations and oriented to the work of Lohbeck and Frenzel (2022), Lohbeck et al. (2022) and Wazir et al. (2020). All data preparation, cluster and variance analyses were performed using *IBM SPSS Statistics Version 27.0* (IBM Corp [IBM], 2020). CFAs to test the questionnaire scales for reliability were conducted in Jamovi ([The jamovi project](#)). Missing data were not available.

Results

Research question 1: Motivation and physical self-concept profiles

Descriptive analysis revealed mean values for the total sample based on raw scores for the physical self-concept between $M = 2.19$ (strength) and 2.42 (sport competence), which correspond to high values. Means for self-determined forms of motivation are also on a high level ($M_{\text{intrinsic}} = 2.36$, $M_{\text{identified}} = 2.42$), while values for non-self-determined motivation are low ($M_{\text{introjected}} = .75$, $M_{\text{external}} = .77$) ([Table 1](#)). Using hierarchical cluster analysis (Ward's method, Euclidian distance) two, three or four-cluster solutions were possible concerning the dendrogram and increase in agglomeration schedule. As the F-values of the three and four-cluster solution were lower than those of the two-cluster solution, only these solutions were further investigated in the two-step procedure. The solutions showed identical ratio of distance measures. Due to a lower BIC ($\text{BIC}_{3\text{Clusters}} = 1021.46$, $\text{BIC}_{4\text{Clusters}} = 1069.81$) and content considerations a three-cluster solution was finally selected. A one-way MANOVA confirmed the three-cluster solution by showing a statistically significant difference between the clusters on the motivational and physical self-concept variables, $F(20, 270) = 28.296$, $p < .001$, partial $\eta^2 = .677$, Wilk's $\Lambda = .104$. Post-hoc univariate ANOVAs were conducted for every dependent variable. Results show statistically significant difference between the clusters for all variables ($p < .001$) and strong effects ($f = 0.44$ to 1.34) (Cohen, 1988). Children in cluster 1 (19.73%, $n = 29$) are predominantly boys (82.76%) and show high levels for non-self-determined motivation, especially introjected motivation. All values for physical self-concept and intrinsic and identified motivation are on a moderate high level. For this reason, motivation and

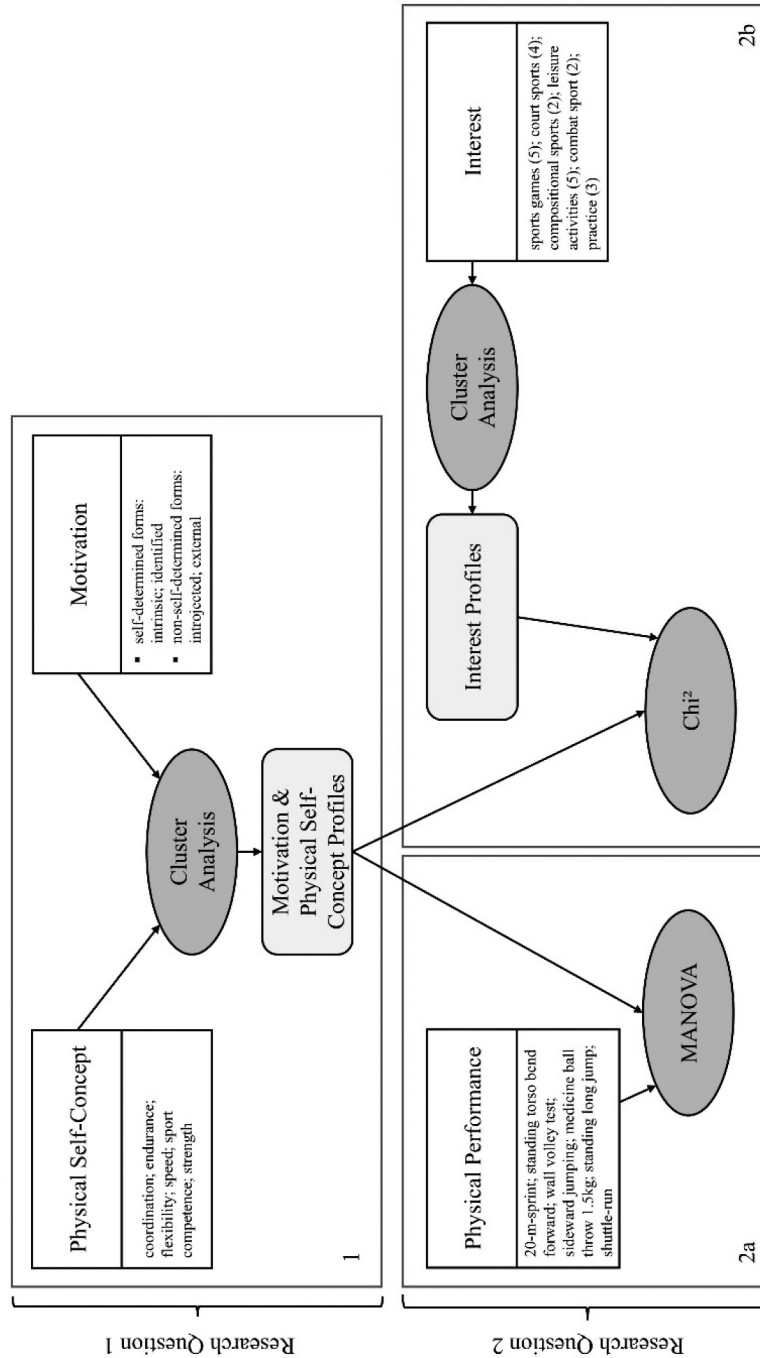


Figure 1. Multi-stage data analysis of this study. *Note.* Variables for physical self-concept, motivation and interest were z-standardised, variables for physical performance were adjusted for age and then z-standardised separately by gender. Variables for interest are for sports games: baseball, basketball, football, hockey, soccer; for court games: badminton, volleyball, table tennis, tennis; for compositional sports: dancing, gymnastics; for leisure activities: climbing, frisbee, inline skating, scooter riding, skateboarding; for combat sport: with body contact, without body contact; for practice: endurance training, sprint, strength training.

Table 1. Mean z-scores and raw scores, and SDs of motivational orientation and physical self-concept for motivation and physical self-concept profiles.

Characteristic	Expression of characteristic	Total Sample	MSP1 'High self-concept, high motivation'		MSP2 'Positive self-concept, self-determined motivation'		MSP3 'Low self-concept, low motivation'	
		N = 147	n = 29 (19.73%)		n = 71 (48.30%)		n = 47 (31.97%)	
Gender	Female	57	5		30		22	
	Male	90	24		41		25	
		raw scores	z-scores	raw scores	z-scores	raw scores	z-scores	raw scores
Self-determined motivation	Intrinsic	2.36 ± 0.77	0.54 ± 0.48	2.78 ± 0.37	0.20 ± 0.93	2.51 ± 0.71	−0.63 ± 1.04	1.88 ± 0.80
	Identified	2.42 ± 0.62	0.61 ± 0.58	2.81 ± 0.36	0.28 ± 0.75	2.60 ± 0.47	−0.79 ± 1.06	1.93 ± 0.66
Non-self-determined motivation	Introjected	0.75 ± 0.91	1.34 ± 0.74	1.97 ± 0.68	−0.55 ± 0.42	0.25 ± 0.39	0.00 ± 0.98	0.75 ± 0.89
	External	0.77 ± 0.88	0.96 ± 1.05	1.62 ± 0.93	−0.45 ± 0.65	0.38 ± 0.57	0.08 ± 0.98	0.84 ± 0.87
Physical Self-Concept	Coordination	2.29 ± 0.60	0.54 ± 0.72	2.61 ± 0.43	0.31 ± 0.74	2.47 ± 0.44	−0.81 ± 1.01	1.81 ± 0.60
	Endurance	2.28 ± 0.61	0.66 ± 0.63	2.68 ± 0.38	0.32 ± 0.72	2.47 ± 0.44	−0.90 ± 0.94	1.73 ± 0.57
	Flexibility	2.30 ± 0.58	0.66 ± 0.63	2.68 ± 0.36	0.19 ± 0.86	2.40 ± 0.50	−0.69 ± 0.99	1.89 ± 0.57
	Speed	2.29 ± 0.61	0.73 ± 0.59	2.74 ± 0.36	0.34 ± 0.74	2.50 ± 0.45	−0.96 ± 0.82	1.71 ± 0.50
	Sport Competence	2.42 ± 0.57	0.70 ± 0.48	2.82 ± 0.28	0.48 ± 0.52	2.70 ± 0.30	−1.16 ± 0.76	1.76 ± 0.43
		2.19 ± 0.64	0.48 ± 1.16	2.49 ± 0.74	0.18 ± 0.72	2.30 ± 0.46	−0.56 ± 1.03	1.83 ± 0.66

Note. Means ± SD of z-scores and raw scores for motivation and physical self-concept profiles based on final three-cluster solution, which was found performing cluster analysis using the z-scores. MSP = Motivation and Physical Self-Concept Profile.

physical self-concept profile 1 is labelled as 'High self-concept, high motivation'. Around half of the sample belongs to cluster 2 (48.30%, $n = 71$), which consists of girls and boys in comparable proportions (42.25% girls). The values are predominantly average with exception of moderately high levels for sport competence and moderately low levels for controlled forms of motivation. As average levels of physical self-concept and autonomous motivation represent high values and the values of controlled motivation are lowest in comparison, this motivation and physical self-concept profile is called 'Positive self-concept, self-determined motivation'. Cluster 3 ($n = 47$) involved 31.97% of the sample and is balanced in terms of gender (53.19% boys). Children in this motivation and physical self-concept profile are characterised by average levels of controlled and low levels of autonomous forms of motivation. Their values for physical self-concept range between moderate low and low. As raw data indicates that average levels of controlled motivation imply low values this motivation and physical self-concept profile is labelled as 'Low self-concept, low motivation'. Figure 2 shows the final three-cluster solution for the motivation and physical self-concept profiles of the present study based on z-scores, while Table 1 presents the exact means and SDs (raw and z-scores) for the motivation and physical self-concept profiles as well as for the total sample.

Research question 2a: Motivation and physical self-concept profiles x physical performance

A one-way MANOVA found no statistically significant difference between the motivation and physical self-

concept profiles (MSs) on the physical performance in seven tests, $F(14, 276) = 1.128$, $p = .333$, partial $\eta^2 = .054$, Wilk's $\Lambda = .895$.

Research question 2b: Motivation and physical self-concept profiles x interest profiles

For descriptive analysis, mean interest values for the total sample based on raw scores (possible range 1 to 7) can be summed up in three categories: negative ($M < 3.5$), neutral ($M = 3.5\text{--}4.5$) and positive ($M > 4.5$). Most sports are rated neutral (football, volleyball, tennis, badminton, dancing, skateboarding, combat sport with and without body contact, strength training) or positive (soccer, basketball, table tennis, gymnastics, frisbee, inline skating, sprint, endurance training, climbing and scooter riding), only values for baseball and hockey are negative. SDs vary between 1.33 (climbing) and 2.31 (dancing), already indicating different interest profiles (see Supplement 2). Based on the selection criteria two- to four-cluster solutions were initially possible in hierarchical cluster analysis. Due to insufficient differentiation in terms of content, the two-cluster solution was excluded. In two-step procedure three- and four-cluster solution showed comparable values in BIC and ratio of distance values. Because of content considerations decision was made for four-cluster solution. MANOVA showed a statistically significant differences between the clusters on the 21 sports, $F(63, 367,995) = 11.29$, $p < .001$, partial $\eta^2 = .657$, Wilk's $\Lambda = .040$. Results of post-hoc ANOVAs show statistically significant difference between the clusters for all sports ($p \leq .015$) and medium

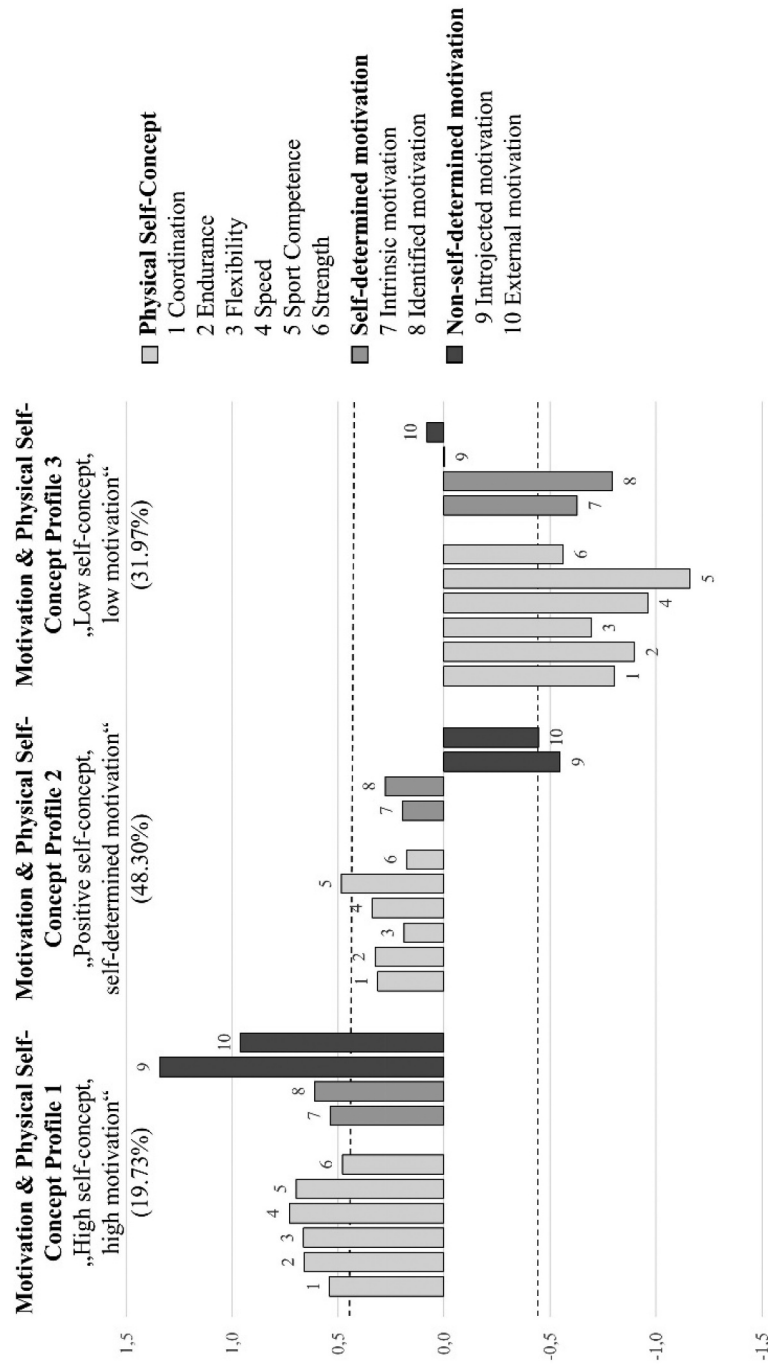


Figure 2. Final motivation and physical self-concept profiles of this study. *Note.* Values represent z-scores with a mean of 0 and a standard deviation of 1. The dashed line shows the cut-offs for values considered as (moderate) high ($\geq .45$) and (moderate) low ($\leq -.45$) as described in Chapter 'Data Analysis'.

to strong effects ($f = 0.27$ to 1.01) (Cohen, 1988). Cluster 1 ($n = 33$) is balanced in terms of gender (57.58% boys) and includes children who are characterized by average levels on most of the sports (18 of 21 sports), which represent neutral to positive values. They show moderate low to low ratings on variables that describe practice ($M_{\text{sprint}} = -1.17$, $M_{\text{endurance training}} = -1.06$, $M_{\text{strength training}} = -.72$), which is why the first interest profile (IP) is labelled 'Average positive interested, practice dislike'. Children in cluster 2 ($n = 47$) are mostly girls (63.83%) and show moderate low to low levels on all sport and court games (e.g., soccer $M = -.82$, table tennis $M = -.65$). Ratings for the other 12 sports are on an average level, but only values for dancing ($M = .13$) and inline skating ($M = .32$) are in a positive range. Ratings for strength training ($M = -.42$), combat sports with and without body contact ($M = -.44$, $M = -.35$) underline the trend towards low values. Especially in comparison with other IPs and total sample the ratings of IP2 are more often in a neutral to negative range. As this can be underlined by significant lower values in 18 of 21 MANOVA post-hoc tests, IP2 is labelled 'Little interested, sports and court games dislike'. Children in cluster 3 ($n = 44$) are predominantly boys (70.46%) and show moderate high levels on most sports (15 of 21 sports). Other sports are on average levels and still in a positive range (soccer, gymnastics, inline skating, scooter, combat sports with body contact). They show significant higher values compared to other profiles in all MANOVA post-hoc tests. No sport is rated on a low level or even a negative value range, because of this the third IP is labelled as 'Overall high interested'. Only boys belong to cluster 4 ($n = 23$), which is characterized by moderate high levels on basketball and practice variables and even high ratings on soccer. They show average levels in ratings on half of the sports, of which only football ($M = .22$) and combat sports with body contact ($M = .38$) are in a positive value range, while other sports ratings are in a negative value range (e.g., gymnastics $M = -.40$, volleyball $M = -.37$). Sports that might be characterized as leisure time activities (climbing, dancing, skateboarding, frisbee, tennis, inline skating) are rated on moderate low to low levels. IP4 is labelled as 'Differentiated interested, soccer and practice preference'. Figure 3 displays the four interest profiles (IPs) of this study. Exact means and SDs (raw and z-scores) for the IPs as well as for the total sample are provided in Supplement 2. Chi² test was used to investigate the relationship between motivation and physical self-concept profiles (MSs) and interest profiles (IPs). No expected cell frequencies were below

5, except for one cell (8.3%) with an expected frequency of 4.54. Results show a significant correlation between the profiles, $\chi^2(6) = 22.12$, $p = .001$, $\phi = 0.39$, which corresponds to a medium effect (Cohen, 1988). Figure 4 shows the proportions to which the motivation and physical self-concept profiles are composed of which interest profile. Most children in MSP1 ('High self-concept, high motivation') belong to the IP3 ('Overall high interested'; 44.8%) and IP4 ('Differentiated interested, soccer and practice preference'; 31%). Children in the second MSP ('Positive self-concept, self-determined motivation') are divided roughly equally between the IPs (25.5 – 32.4%), with exception of only 13.8% belonging to IP4 ('Differentiated interested, soccer and practice preference'). Half of the children in MSP3 ('Low self-concept, low motivation') correspond to IP2 ('Little interested, sport and court games dislike'; 51.1%), while 23.4% belong to IP1 ('Average positive interested, practice dislike').

Discussion

Based on the holistic framework of Spies et al. (2022), the aim of the present study was to gain knowledge about different sport-related types of children by using a person-centered approach. It was possible to identify three motivation and physical self-concept profiles (MSPs), using motivational orientation and physical self-concept as variables (RQ1), labelled as MSP1 'High self-concept, high motivation' (19.73%), MSP2 'Positive self-concept, self-determined motivation' (48.30%) and MSP3 'Low self-concept, low motivation' (31.97%). Values of physical self-concept and self-determined motivation are similarly distinctive in the three motivation and physical self-concept profiles (e.g., low-low in MSP3), while values of non-self-determined motivation are more contradictory in motivation and physical self-concept profile 2 and 3, which makes sense in two ways. On the one hand, raw scores for total sample and profiles indicate a trend towards high levels of self-determined motivation and physical self-concept and low levels of non-self-determined motivation for children of third and fourth grade, which is in line with values reported in the construction of the questionnaires used in the present study (Dreiskämper et al., 2015; Kohake & Heemsoth, 2021; Kohake & Lehnert, 2018) and findings of meta-analysis (Babic et al., 2014). On the other hand, there is evidence for a positive relationship between physical self-concept and self-determined motivation

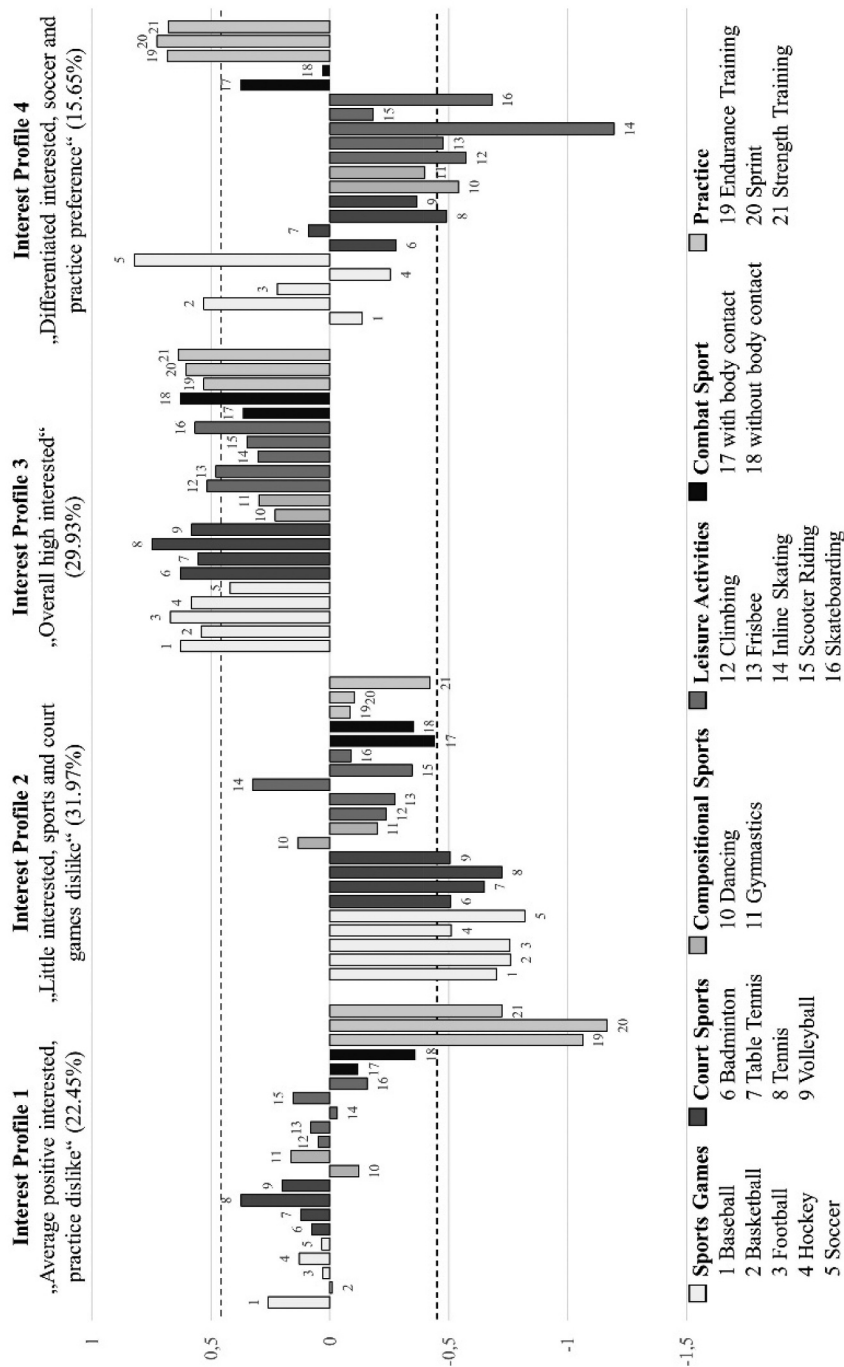


Figure 3. Final interest profiles of this study. *Note.* Values represent z-scores with a mean of 0 and a standard deviation of 1. The dashed line shows the cut-offs for values considered as (moderate) high ($\geq .45$) and (moderate) low ($\leq -.45$) as described in Chapter 'Data Analysis'.

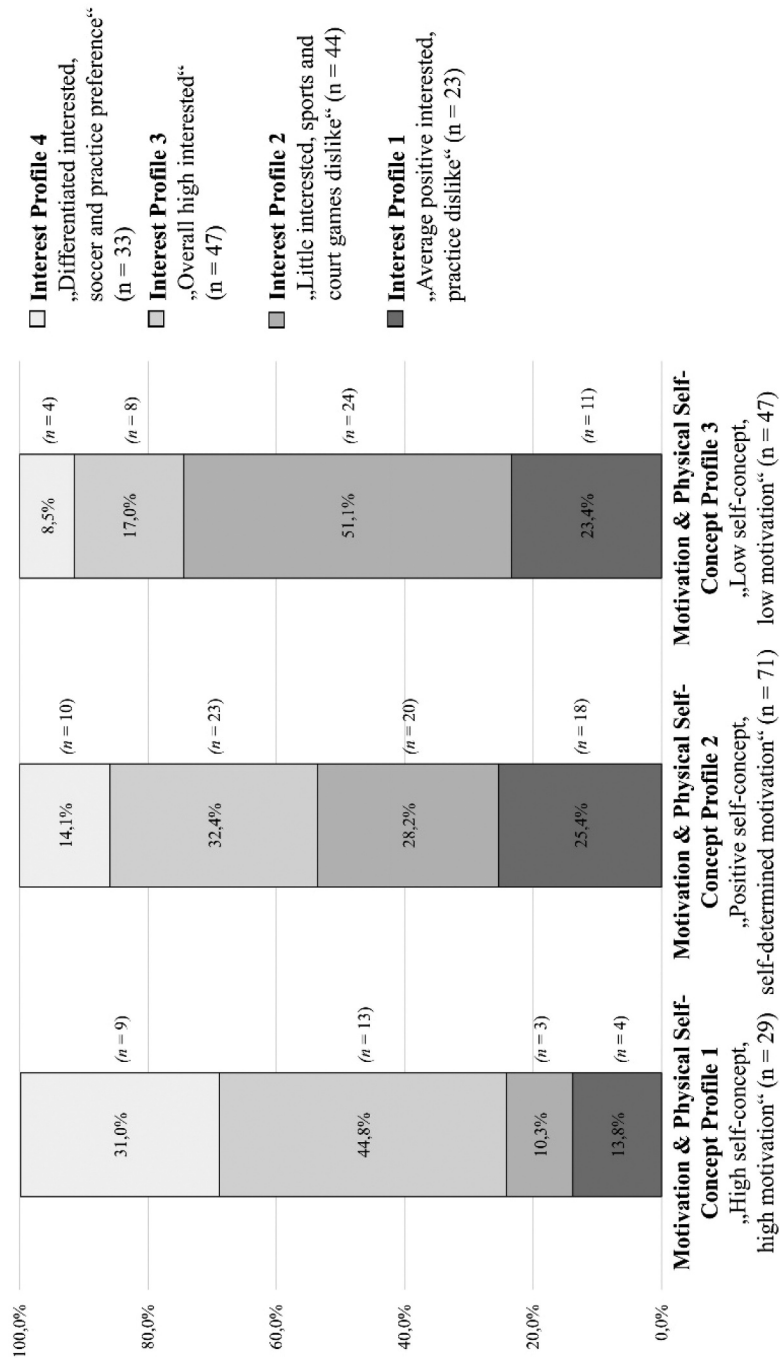


Figure 4. Relationship of motivation and physical self-concept profiles and interest profiles. Note. Proportion of the four interest profiles with the three motivation and physical self-concept profiles of the present study. Motivation and physical self-concept profiles were conducted first.

(Chatzisarantis et al., 2003; Lohbeck et al., 2021; Vasconcellos et al., 2020). Most studies with a person-centered approach report a profile similar to MSP2 showing moderate to high levels of self-determined motivation and low levels of non-self-determined motivation (Bechter et al., 2018; Lohbeck et al., 2022; Moreno-Murcia et al., 2013; Wang et al., 2016) or moderate to high levels of physical self-concept (De Meester et al., 2016; Guijarro-Romero et al., 2020; Lawson et al., 2022; Wang et al., 2015) in children and adolescents. As in our study, these profiles usually represent the largest proportion of children – what supports the assumption of children having generally a positive self-perception and motivational orientation in sports and can be seen as a favourable initial position for sports engagement. There is further evidence for MSP3 ‘Low self-concept, low motivation’: Lohbeck et al. (2022) characterize a „non-self-determined” profile with (moderate) low levels of both self-determined and non-self-determined motivation, while Bechter et al. (2018) report a ‘moderately controlled’ profile with low levels of self-determined motivation and average levels of non-self-determined motivation with similar size (27.2%) to MSP3. This represents an alarming result as physical self-concept and motivation are important influencing factors for physical activity and sports engagement (Babic et al., 2014; Owen et al., 2014) and could be due to a lack of or poor experience in sport. Motivation and physical self-concept profile 1 in contrast is characterized by high levels of all forms of motivation, with introjected values being most pronounced, highest levels of physical self-concept and a higher percentage of boys (82.76%). Studies with adolescent samples (Bechter et al., 2018; Wang et al., 2016) report similar motivation profiles but no differences in terms of gender, while there is no such profile in an examination with children in early childhood (Lohbeck et al., 2022). Gender-specific differences in perceived competence favouring boys occur first in adolescence (De Meester et al., 2016; Lawson et al., 2022; Wang et al., 2015), which could be due to the fact that not only the ability to differentiate but also gender differences change in the course of development (Harter, 2015). Previous research with adolescent and adult athletes has further investigated the relationships between such profiles and adaptive resp. maladaptive outcomes (e.g., flow, burnout). The findings are ambiguous but suggest a certain buffering function of autonomous motivation (Gustafsson et al., 2018; Langan et al., 2016). To gain

understanding for prevention, athletes of all ages should be investigated particularly with regard to maladaptive outcomes in future research. According to previous research (Lohbeck et al., 2021; Stodden et al., 2008) it can be assumed that the relationship between physical self-concept resp. self-determined motivation and physical performance develops during middle childhood and children in more favourable motivation and physical self-concept profiles (MSPs 1,2) would show higher performance. Contrary to this assumption, motivation and physical self-concept profiles identified in the present study did not differ significantly in physical performance in seven motor skills tests (RQ2a). In previous research only children with an amotivated profile showed significantly lower scores in performance (Lohbeck et al., 2022) and motor competence had a low positive correlation with physical self-concept, but non with motivation (Ensrud-Skraastad & Haga, 2020). Because of this, we assume that in childhood distinct motivation and physical self-concept profiles do not differ significantly in performance and that this can therefore be seen as an opportunity for the sporting development of all children and the talent development. Besides physical performance, relationship of motivation and physical self-concept profiles and interest was conducted (RQ2b). Four interest profiles (IPs) based on perceptions of fun in 21 sports were identified: half of the sample belong to an IP characterized by a positive average to high amount of interest in most sports (IP1 ‘Average positive interested, practice dislike’, 22.45%; IP3 ‘Overall high interested’, 29.93%), whereas one third shows little interest (IP2 ‘Little interested, sport and court games dislike’, 31.97%) and smallest proportion of the sample (IP1, 15.65%) is assumed to be already more differentiated interested by showing high z-scores in soccer and basketball as well as in practice variables. Our research results indicate a positive relationship between physical self-concept, self-determined motivation and interest and therefore supports the framework of Spies et al. (2022) empirically: in the two favourable motivation and physical self-concept profiles (MSPs 1, 2), the largest proportion of children belong to IP3 ‘Overall high interested’ (MSP1 44.8%; MSP2 32.4%), while half (51.5%) of ‘Low self-concept, low motivation’-children (MSP3) are also characterized as ‘Little interested, sport and court games dislike’ (IP2). This result is worrying as the unfavourable motivation and physical self-concept profile is associated with a lack of interest in sport for 16.32% of the total sample and it can be assumed that sport participation and the

development of an active lifestyle will be particularly challenging for these children, what is associated with health risks. 15.64% of the sample belong to the same motivation and physical self-concept profile but to a more favourable interest profile (IPs 1,3,4). One might interpret that these children have had little experience in sport so far and are not very active in sport, but are generally openminded. Offers that enable varied and positive experiences could strengthen their motivation and physical self-concept and support them developing an active lifestyle. One third of the children in MSP1 ('High self-concept, high motivation') belong to IP4 ('Differentiated interested, soccer and practice preference'). The high simultaneous expression of all forms of motivation in combination with the preference for practice variables may indicate a preference for sports associated with performance improvement and competition. This assumption might be confirmed by a comparable profile based on physical performance and interest by Spies et al. (2023): '[...] can be characterised as sport enthusiasts, performance-oriented and ambitious [...] want challenges, competitions, victories, fun and performance improvements in sport and score above average in the sport-related motor skills tests'. The larger proportion of boys could be due to boys' gender-specific preference for soccer.

Limitations and future directions

Results of the present study contribute to the understanding of children's sport-related types by investigating relationships of motivational orientation, physical self-concept, physical performance and interest – at the same time some limitations must be pointed out. First, the small sample size with an unequal ratio of girls and boys represents a limitation. In addition, cross-sectional data was examined, which means that no statements can be made about causality and the development of children. This should be addressed by longitudinal studies and intervention studies in the future. Second, although physical performance was investigated, no other variables regarding children's physical and sporting activity were included. Information on sports participation (e.g., club membership, type(s) of sport, recreational sports behaviour, competitive sports involvement) could contribute to an even deeper understanding of different sport-related types. Third, amotivation was not surveyed with regard to motivational orientation (Kohake & Lehnert, 2018). This scale is part of the further development of the questionnaire used (Kohake &

Heemsoth, 2021) and, in our opinion, is important in order to gain insight into how many children are amotivated and what correlations exist with other factors (e.g., physical self-concept or interest) and how these children can be supported in being physically active and enjoying it. Fourth, the operationalisation of interest via the emotional-affective component (fun) does not allow any assignment to an interest phase and does not fully represent the construct (Renninger & Hidi, 2015). It is therefore not possible to differ between phases of situational or individual interest. Existing questionnaires determine interest in sport either via characteristics such as aggressiveness, competition or community (J. Schmid et al., 2017) or are sport-specific (Roure & Lentillon-Kaestner, 2022 e.g., swimming) – and have not been developed for children. In this respect, a lack of suitable survey instruments can be stated and should be subject of future research.

Implications

Results of this study indicate a need for various sports programmes and measures in different areas. Especially for competitive sports, the lack of difference in physical performance between motivation and physical self-concept (MSs) profiles gives rise to the recommendation to select and support not only best movers in this age group in talent development. Rather, interest should be taken into account as recommended by Spies et al. (2023), which can be promoted by offering sampling experiences. In this context, current research suggests that it may be beneficial to consider generational differences in needs, values, and preferences when designing sports programmes. Each generation has its own distinct life-worlds, and tailoring these offerings to the specific characteristics of each generation could potentially enhance motivation and engagement, contributing to long-term participation and development in physical activities (Piepiora et al., 2024).

A particular concern arises from the finding that a high proportion of children possess both an unfavourable MSs and IPs (MSP3 & IP2; 16.32%), which may put them at risk of leading an inactive lifestyle. Even though the results of the present study show no significant differences in physical performance, results of other studies with a slightly older sample show such differences and also a higher BMI (Lohbeck et al., 2022) – which may indicate an unfavourable developmental direction. This suggests the need for preventive and supportive measures: Due to the great importance of a positive physical self-concept and motivation for physical activity and healthy

development, the promotion of the three basic psychological needs (competence, autonomy, relatedness) should be seen as a foundation (Ryan & Deci, 2017). This focus in the design of sport offers is also considered important for children with a motivation and physical self-concept profile with simultaneous high levels of self-determined and non-self-determined motivation as such a profile reflects motivation profiles of elite athletes, who are at risk of maladaptive outcomes as athlete-burnout (Gustafsson et al., 2018).

Conclusions

In summary, results of our study show that there are different types of children in sport who distinguish in their motivation and physical self-concept profiles and interest profiles. To support different types of children, offers in organised sport and school – both in physical education and extracurricular activities – should be designed in line with basic psychological needs and sampling, to create positive experiences and promote healthy long-term participation. To achieve this, it is important to educate teachers and coaches accordingly and raise awareness of different needs.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Ethical statement

The treatment of human participants was in accordance with established ethical standards.

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