

Digital Appendix Systematic Cochrane Review and Meta-Analysis on Psychological Interventions to Foster Resilience in Healthcare Professionals

Appendix 13 Additional Results on Included Studies (Multiple Treatment Groups, Primary and Secondary Outcome Scales, Quantitative Analysis and Risk of Bias, Funding Sources)

Appendix D13.1 Rationale for Selection of Relevant Intervention Groups in Studies With Multiple Treatment Groups

Table D13.1.1

Relevant IG in Studies With Multiple Intervention Arms (Six Studies)

Study and IG relevant for this review	Reasons for selection of respective IG
Cieslak et al. (2016); self-efficacy enhancing module	Participants randomized to three arms; IG1 received a self-efficacy enhancing module and IG2 a social support enhancing module of the same program, while the CG was provided with the educational module of the same intervention; due to high dropout in the social support-enhancing module, only the self-efficacy enhancing module and the CG were analyzed
ISRCTN69644721; new resilience intervention	Participants randomized to to one of three arms; those randomized to new resilience intervention (IG1) received 4 weeks of training comprising four digital modules of 15/20 minutes in length and 2-hour face-to-face group sessions; training program focused on four topics related to maintaining resilience (e.g., dealing with difficult emotions) compared with IG2, which consisted of 4 weeks of reading material about mental health and well-being, and the wait-list CG; new resilience intervention versus CG considered for this review
Medisauskaite and Kamau (2019); treatment group 4	Doctors randomized to one of four IGs or a no intervention control; IG1 to IG3 received one module, respectively, concerning the psychology of stress and burnout as well as the impact of work on stress or burnout (IG1), dealing with a patient's death and different stages of grief (IG2) or how to manage distress and develop resilience (IG3); IG4 completed all of the aforementioned modules; IG4 considered to be relevant for this review as it combined the content of the IG1 to IG3, including an element on fostering resilience
Mistretta et al. (2018); mindfulness-based resilience training (MBRT)	Three-arm study in which IG1 received six weekly sessions of MBRT, IG2 took part in a smartphone resilience training that allowed participants to select one of four topics (sleep, happiness and positivity, energy and focus, productivity) every 7 to 10 days, and CG received no intervention; IG1 (MBRT) versus no intervention control considered in this review; MBRT assessed to be more relevant because, compared to the smartphone-based training, it focused more on resilience factors and less on general issues such as sleep and productivity
Stetz et al. (2007); virtual reality-stress inoculation training (VR-SIT) + coping training (CT)	Four-arm study where IG1 received a virtual reality-stress inoculation training (VR-SIT); IG2 received coping training (CT) consisting of progressive muscle relaxation and controlled breathing techniques; IG3 received a combination of virtual reality and CT and CG participated in no intervention; IG3 versus no intervention CG considered for this review; combination of VR-SIT and CT chosen as this intervention content was

Study and IG relevant for this review	Reasons for selection of respective IG
Tierney and Lavelle (1997); hardiness class	compatible with another included study (Villani et al., 2013), which also considered SIT and relaxation techniques Staff nurses randomized to either 6-hour hardiness class (IG1), 6-hour class about time management (IG2) or no-intervention control; hardiness class preferred over time-management class due to focus on hardiness

Note. IG = intervention group; CG = control group.

In addition to the above six studies, it was unclear for one unpublished study (NCT02603133) whether it only included one intervention arm (sequential *and* non-sequential rollout of resilience tools in cohort 1) or whether these should be considered as separate IGs.

Appendix D13.2

Risk of Bias Assessment of Included Studies

RoB domain	Number of studies judged at low, unclear, and high risk with justification
Allocation (selection bias) – sequence generation	<ul style="list-style-type: none"> • Low risk: 15 studies (investigators described random component in sequence-generation process; e.g., computer-generated random sequence generation) <ul style="list-style-type: none"> ○ 4/15 studies: verified baseline comparability between study groups in sociodemographic characteristics (i.e., potential confounding factors) as well as outcome variables (Fei, 2019; Lin et al., 2019; Medisauskaite & Kamau, 2019; West et al., 2014) ○ 11/15 studies: evidence of a genuine random assignment (e.g., random number generation), but the authors provided no information about potential baseline differences in sociodemographic and outcome measures (Berger & Gelkopf, 2011; Bernburg et al., 2016; Bernburg et al., 2019; Chesak et al., 2015; Duchemin et al., 2015; Lebares et al., 2019; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Poulsen et al., 2015; Strijk et al., 2011) • Unclear risk: 25 studies <ul style="list-style-type: none"> ○ 20/25 studies: no description of the sequence generation process (Alexander et al., 2015; Calder Calisi, 2017; Cieslak et al., 2016; Clemow et al., 2018; Hosseinnajad et al., 2018; Ireland et al., 2017; Khoshnazary et al., 2016; Klatt et al., 2015; Loiselle, 2018; Luthar et al., 2017; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Mistretta et al., 2018; Schroeder et al., 2016; Sood et al., 2011; Stetz et al., 2007; Tierney & Lavelle, 1997; Varker & Devilly, 2012; Villani et al., 2013; Wild, 2016) ○ 13/20 studies: did also not specify the baseline comparability of groups for (some) sociodemographic characteristics or outcomes of interest, or both (Calder Calisi, 2017; Cieslak et al., 2016; Hosseinnajad et al., 2018; Ireland et al., 2017; Klatt et al., 2015; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Sood et al., 2011; Stetz et al., 2007; Tierney & Lavelle, 1997; Varker & Devilly, 2012; Villani et al., 2013; Wild, 2016) ○ 5/25 studies: limited information in the conference abstracts or trial registrations (ISRCTN69644721; NCT02603133; NCT03645798; Smith et al., 2019; West et al., 2015) • High risk: 4 studies <ul style="list-style-type: none"> ○ despite randomization, baseline comparability in sociodemographic characteristics or outcomes (or both) could not be verified on the basis of analysis (Cheung, 2014; Gelkopf et al., 2008; Mirzaeirad et al., 2019; Sood et al., 2014)
Allocation (selection bias) – allocation concealment	<ul style="list-style-type: none"> • Allocation concealment not well reported • Low risk: 2 studies <ul style="list-style-type: none"> - adequate description of the allocation concealment process ○ Clemow et al. (2018) described that randomization was done by calling an off-site person holding the randomization envelopes, using the random-sized randomization blocks provided by the study statistician ○ Strijk et al. (2011) affirmed that randomization was executed by an independent researcher after the baseline assessment; that is, after participant enrolment was completed • Unclear risk: 42 studies <ul style="list-style-type: none"> - 4/42 studies: described that randomization process had been concealed from participants or personnel recruiting participants, or both, but neglected to specify further the method of allocation concealment (Luthar et al., 2017; Medisauskaite & Kamau, 2019; Sood et al., 2014; West et al., 2014) - 1/42 studies (Stetz et al., 2007): additional information received from the original authors ("computed a number with SPSS to randomly select"), which did not match the description in one of the reports (see Stetz 2007; pseudo-randomization based on availability)

RoB domain	Number of studies judged at low, unclear, and high risk with justification
	<ul style="list-style-type: none"> - 3/42 studies (plus West et al., 2014 already mentioned above) affirmed that individuals or units were stratified (e.g., by gender, type of work) and randomly assigned to either the resilience intervention or a control group (Duchemin et al., 2015; Lebares et al., 2019; Wild, 2016); however, study authors did not describe how they designed this process - 29/42 studies: provided either insufficient or no information about the allocation concealment process (Alexander et al., 2015; Berger & Gelkopf, 2011; Bernburg et al., 2016; Bernburg et al., 2019; Calder Calisi, 2017; Chesak et al., 2015; Cheung, 2014; Cieslak et al., 2016; Fei, 2019; Gelkopf et al., 2008; Hosseinnajad et al., 2018; Ireland et al., 2017; Khoshnazary et al., 2016; Klatt et al., 2015; Lin et al., 2019; Loiselle, 2018; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Mirzaeirad et al., 2019; Mistretta et al., 2018; Poulsen et al., 2015; Schroeder et al., 2016; Sood et al., 2011; Tierney & Lavelle, 1997; Varker & Devilly, 2012; Villani et al., 2013) - 5/42 studies: limited information in the conference abstracts or trial registrations to reach a decision on the risk of bias (ISRCTN69644721; NCT02603133; NCT03645798; Smith et al., 2019; West et al., 2015)
Blinding – blinding of participants and personnel	<ul style="list-style-type: none"> • <i>Objective outcomes:</i> <ul style="list-style-type: none"> - 9/44 studies assessed at least one objective outcome (e.g., salivary cortisol, sleep tracking via acceleration sensors or blood pressure; Clemow et al., 2018; Duchemin et al., 2015; Lebares et al., 2019; Luthar et al., 2017; Mistretta et al., 2018; NCT02603133; NCT03645798; Stetz et al., 2007; Strijk et al., 2011); although study personnel not blinded in most of these studies (see next paragraph on subjective outcomes below), studies judged to be at low risk of performance bias in relation to objective outcomes • <i>Subjective outcomes:</i> <ul style="list-style-type: none"> - Unclear risk: 3 studies (Cieslak et al., 2016; Medisauskaite & Kamau, 2019; Villani et al., 2013) <ul style="list-style-type: none"> ○ Cieslak et al. (2016) and Villani et al. (2013) performed (blended) online or mobile-based resilience interventions without specifying blinding of participants and personnel ○ Medisauskaite and Kamau (2019): did not describe the implementation of the training program - High risk: 36 studies <ul style="list-style-type: none"> ○ resilience interventions performed entirely face-to-face (Alexander et al., 2015; Berger & Gelkopf, 2011; Bernburg et al., 2016; Bernburg et al., 2019; Cheung, 2014; Fei, 2019; Gelkopf et al., 2008; Ireland et al., 2017; Khoshnazary et al., 2016; Klatt et al., 2015; Lebares et al., 2019; Lin et al., 2019; Loiselle, 2018; Luthar et al., 2017; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mirzaeirad et al., 2019; Poulsen et al., 2015; Schroeder et al., 2016; Smith et al., 2019; Sood et al., 2011; Strijk et al., 2011; Tierney & Lavelle, 1997; Varker & Devilly, 2012; West et al., 2014; West et al., 2015; Wild, 2016) or included face-to-face elements (Calder Calisi, 2017; Chesak et al., 2015; Duchemin et al., 2015; ISRCTN69644721; Mealer et al., 2014; Mistretta et al., 2018; Sood et al., 2014), resulting in a lack of blinding of personnel ○ Clemow et al. (2018): research staff were also not blinded to group assignment and although the blinding of participants was unclear, the study was rated at high risk of bias due to the face-to-face delivery of resilience training ○ Hosseinnajad et al. (2018): described the study as double-blind clinical study; however, given the trial registration (no blinding specified) and the face-to-face delivery of the intervention, the study was judged to be at high risk of performance bias ○ NCT02603133 and NCT03645798 : outcomes considered to be likely to have been influenced by a lack of blinding, as the studies were described as

RoB domain	Number of studies judged at low, unclear, and high risk with justification
	open-label with no masking (NCT02603133) or as single-blinded in the trial registration (NCT03645798)
	<ul style="list-style-type: none"> Stetz et al. (2007): included a resilience intervention that was performed in a laboratory; although there was no face-to-face contact, the study personnel were not blinded, as verbal communication with participants was possible, and participants were observed by the intervention providers
Blinding – blinding of outcome assessment	<ul style="list-style-type: none"> Objective outcomes: <ul style="list-style-type: none"> Low risk: 9 studies <ul style="list-style-type: none"> All nine studies measuring objective outcomes considered to be at low risk of detection bias; although six of these studies did not adequately describe the blinding of outcome assessment (Duchemin et al., 2015; Lebares et al., 2019; Luthar et al., 2017; Mistretta et al., 2018; Stetz et al., 2007; Strijk et al., 2011), judged to be at low risk of detection bias since the objective outcomes (e.g., physiological parameters) were assessed as unlikely to be influenced by the lack of blinding Same rating applied to two other studies that used objective outcomes, even though there was insufficient information in the trial registrations (NCT02603133; NCT03645798), as well as one study with no general blinding of research staff (Clemow et al., 2018) Subjective outcomes: <ul style="list-style-type: none"> Unclear risk: 7 studies <ul style="list-style-type: none"> Authors did not adequately describe the blinding of the assessment (Cieslak et al., 2016; Lebares et al., 2019; Mache et al., 2016; Medisauskaite & Kamau, 2019; Sood et al., 2014; Stetz et al., 2007; Villani et al., 2013) and the risk of performance bias (i.e., especially blinding of participants) was low or unclear (see blinding of participants and personnel) High risk: 37 studies <ul style="list-style-type: none"> 31/37 studies: due to (potential) performance bias (especially no blinding of participants), it was judged that the participants' responses to questionnaires may be likely to be affected by the lack of blinding (i.e., knowledge and beliefs about intervention they received; Alexander et al., 2015; Berger & Gelkopf, 2011; Bernburg et al., 2016; Bernburg et al., 2019; Calder Calisi, 2017; Chesak et al., 2015; Cheung, 2014; Duchemin et al., 2015; Fei, 2019; Gelkopf et al., 2008; Hosseinnejad et al., 2018; Ireland et al., 2017; Khoshnazary et al., 2016; Klatt et al., 2015; Lin et al., 2019; Loiselle, 2018; Luthar et al., 2017; Mache et al., 2017; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Mirzaeirad et al., 2019; Mistretta et al., 2018; Poulsen et al., 2015; Schroeder et al., 2016; Sood et al., 2011; Strijk et al., 2011; Tierney & Lavelle, 1997; Varker & Devilly, 2012; West et al., 2014; Wild, 2016) 5/37 studies: based on the information available in the conference abstracts or trial registrations, five further studies judged at high risk of detection bias for the same reason (ISRCTN69644721; NCT02603133; NCT03645798; Smith et al., 2019; West et al., 2015) Clemow et al. (2018): blinding of participants, who completed self-report questionnaires, unclear (see blinding of participants and personnel); however, as research staff was not blinded to group assignment in general, the blinding of outcome assessment judged to be unlikely and study was also rated to be at high risk of detection bias
Incomplete outcome data (attrition bias)	<ul style="list-style-type: none"> Low risk: 17 studies because they met at least one of the following criteria: <ul style="list-style-type: none"> no missing outcome data (Alexander et al., 2015; Duchemin et al., 2015; Ireland et al., 2017; Lebares et al., 2019: no missing data for psychological variables and two exclusions from fMRI analysis not related to true outcome; Villani et al., 2013) the losses were similar across intervention and control groups the reasons for missing data were unlikely to be related to true outcome (e.g., health reasons)

RoB domain	Number of studies judged at low, unclear, and high risk with justification
	<ul style="list-style-type: none"> - the losses were not substantial (< 10% from number of randomized participants; e.g., five dropouts from 90 participants in Mache, Vitzthum, et al., 2015) - and/or study authors accounted for dropouts and losses to follow-up by using statistical analyses that aimed to reduce bias (e.g., multiple imputation) or prevent false positive conclusions (e.g., baseline observation carried forward) (Bernburg et al., 2019; Clemow et al., 2018; Gelkopf et al., 2008; Khoshnazary et al., 2016; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Mistretta et al., 2018; Sood et al., 2014; Strijk et al., 2011; Varker & Devilly, 2012) - Intention-to-treat (ITT) analysis performed in four studies (Clemow et al., 2018; Mistretta et al., 2018; Sood et al., 2014; Strijk et al., 2011)
	<ul style="list-style-type: none"> • Unclear risk: 11 studies <ul style="list-style-type: none"> - Stetz et al. (2007): did not fully account for dropout throughout the study or whether this differed between groups - Hosseinnajad et al. (2018): did not specify the number of participants analyzed and it had to be derived indirectly from other statistical values in the report with the help of the statistician (JK) - 3/11 studies reported results for all participants randomized (Berger & Gelkopf, 2011; Fei, 2019; Tierney & Lavelle, 1997), but did not state the amount of potential missing data and potential imputation - Bernburg et al. (2016): described that the dropout rate (loss to follow-up) was very low and analyzed all 54 randomized participants, but did not report the attrition rate - Klatt et al. (2015): the number of participants allocated to each group ($n = 17$) was provided by the original authors; nevertheless, the amount of potential missing data was not further specified - 4/11 studies: risk of attrition bias could not be judged from the information available in the conference abstracts or trial registrations (ISRCTN69644721; NCT02603133; NCT03645798; Smith et al., 2019) • High risk: 16 studies <ul style="list-style-type: none"> - 6/16 studies: reasons for missing data unlikely to be related to true outcome (e.g., similar levels of missing data between groups with difference of \leq two lost individuals); however, reasons were not further specified or study authors did not impute the missing data but performed available case analysis (i.e., participants for whom outcomes were obtained at assessments) or per-protocol analysis (i.e., only participants who complied with allocated intervention or attended a certain number of sessions), or both (Chesak et al., 2015; Lin et al., 2019; Luthar et al., 2017; Mirzaeairad et al., 2019; Schroeder et al., 2016; West et al., 2014) - Calder Calisi (2017): did not provide sufficient information about dropouts such as the number of participants randomized to each group or attrition per group; however, based on the number of participants analyzed, a per-protocol analysis was supposed - 8/16 studies (Cheung, 2014; Loiselle, 2018; Mache et al., 2017; Medisauskaite & Kamau, 2019; Poulsen et al., 2015; Sood et al., 2011; West et al., 2015; Wild, 2016): <ul style="list-style-type: none"> ○ reasons for missing data likely to be related to true outcome due to imbalance in missing data between groups ○ in addition, in six of these studies: available-case or per-protocol analysis (or both) conducted (Cheung, 2014; Loiselle, 2018; Mache et al., 2017; Medisauskaite & Kamau, 2019; Poulsen et al., 2015; Sood et al., 2011) ○ Wild (2016): unclear how many participants were analyzed ○ West et al. (2015): information concerning the number of missing data per group and the available-case analysis received from the study authors ○ Cieslak et al. (2016): missing data in self-efficacy enhancing group and the education module (control) imputed using expectation maximization in

RoB domain	Number of studies judged at low, unclear, and high risk with justification
	order to perform an intent-to-treat analysis; nevertheless, study considered to be at high risk of bias because only two of three groups initially randomized were analyzed, due to high dropout in the social support enhancing module
Selective reporting (reporting bias)	<ul style="list-style-type: none"> For 29 non-registered studies or studies without a pre-published study protocol (Alexander et al., 2015; Berger & Gelkopf, 2011; Bernburg et al., 2016; Bernburg et al., 2019; Calder Calisi, 2017; Chesak et al., 2015; Cieslak et al., 2016; Duchemin et al., 2015; Fei, 2019; Gelkopf et al., 2008; Ireland et al., 2017; Khoshnazary et al., 2016; Klatt et al., 2015; Lin et al., 2019; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Mirzaeirad et al., 2019; Poulsen et al., 2015; Schroeder et al., 2016; Sood et al., 2011; Sood et al., 2014; Stetz et al., 2007; Tierney & Lavelle, 1997; Varker & Devilly, 2012; Villani et al., 2013; West et al., 2015): comparison between outcome measures described in the Methods section of the paper and reported outcomes in the Results section <ul style="list-style-type: none"> Low risk: 25/29 studies <ul style="list-style-type: none"> published results corresponded to those expected in these types of studies (Alexander et al., 2015; Berger & Gelkopf, 2011; Bernburg et al., 2016; Bernburg et al., 2019; Calder Calisi, 2017; Chesak et al., 2015; Fei, 2019; Gelkopf et al., 2008; Ireland et al., 2017; Khoshnazary et al., 2016; Klatt et al., 2015; Lin et al., 2019; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Mirzaeirad et al., 2019; Poulsen et al., 2015; Schroeder et al., 2016; Sood et al., 2011; Sood et al., 2014; Tierney & Lavelle, 1997; Villani et al., 2013; West et al., 2015) High risk: 4/29 studies <ul style="list-style-type: none"> largely because not all of the prespecified outcomes were reported (Cieslak et al., 2016; Duchemin et al., 2015; Stetz et al., 2007; Varker & Devilly, 2012) Cieslak et al. (2016): randomly assigned participants to one of two intervention groups (self-efficacy enhancing module, social support enhancing module) or a control group; however, due to high dropout in the social support enhancing module, only the results for two groups were analyzed and reported 15 studies prospectively or retrospectively registered (Cheung, 2014; Clemow et al., 2018; Hosseinnejad et al., 2018; ISRCTN69644721; Lebares et al., 2019; Loiselle, 2018; Luthar et al., 2017; Medisaukaite & Kamau, 2019; Mistretta et al., 2018; NCT02603133; Smith et al., 2019; Strijk et al., 2011; West et al., 2014; Wild, 2016) and one study with study protocol (Strijk et al., 2011) <ul style="list-style-type: none"> Low risk: 5/15 studies: <ul style="list-style-type: none"> published reports included all expected outcomes in the prespecified way (Cheung, 2014; Lebares et al., 2019; Loiselle, 2018; Medisaukaite & Kamau, 2019; Wild, 2016) Cheung (2014): Although actual helping behaviour as prespecified outcome not reported, study judged to be at low risk of bias as the study authors justified the non-reporting by the small number of participants reporting this outcome and unfeasible statistical analyses Unclear risk: 4/15 studies <ul style="list-style-type: none"> three registered trials (ISRCTN69644721; NCT02603133; NCT03645798): risk of reporting bias could not be determined based on trial registrations, as the studies were completed but unpublished trials or no further information could be provided from the study authors during the publication process; the same applied to one study (Smith et al., 2019), for whom only a conference abstract was available High risk: 6/15 studies <ul style="list-style-type: none"> not all of the prespecified outcomes (Luthar et al., 2017; Strijk et al., 2011; West et al., 2014) or time points (Hosseinnejad et al., 2018; Mistretta et al.,

RoB domain	Number of studies judged at low, unclear, and high risk with justification
	2018) were reported and/or reported outcomes had not been prespecified (Clemow et al., 2018; Luthar et al., 2017; Mistretta et al., 2018; Strijk et al., 2011; West et al., 2014)

Appendix D13.3

Primary Outcome Scales of Included Studies

Outcomes	Number of studies	Studies and instruments
Resilience	21	<ul style="list-style-type: none"> Bernburg et al. (2019): Brief Resilient Coping Scale (BRCS; Sinclair and Wallston, 2004) Chesak et al. (2015): Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) Cheung (2014): CD-RISC (Connor & Davidson, 2003) Cieslak et al. (2016): Posttraumatic Growth Inventory-Short form (Cann et al., 2010) Khoshnazary et al. (2016): CD-RISC (Connor & Davidson, 2003) Klatt et al. (2015): CD-RISC-10 (Connor & Davidson, 2003) Lebares et al. (2019): Block Ego-Resilience scale (Huey & Weisz, 1997; Moffitt et al., 2011) Lin et al. (2019): CD-RISC (Connor & Davidson, 2003; Yu & Zhang, 2007) Loiselle (2018): Brief Resilience Scale (BRS; Smith et al., 2008) Mache, Danzer, et al. (2015): BRCS (Sinclair & Wallston, 2004) Mache, Vitzthum, et al. (2015): BRCS (Sinclair & Wallston, 2004) Mache et al. (2016): BRCS (Sinclair & Wallston, 2004) Mache et al. (2017): BRCS (Sinclair & Wallston, 2004) Mealer et al. (2014): CD-RISC (Connor & Davidson, 2003) Schroeder et al. (2016): BRS (Smith et al., 2008) Smith et al. (2019): CD-RISC-10 (Campbell-Sills & Stein, 2007) Sood et al. (2011): CD-RISC (Connor & Davidson, 2003) Sood et al. (2014): CD-RISC (Connor & Davidson, 2003) Wild (2016): CD-RISC (Connor & Davidson, 2003) ISRCTN69644721 : statements about resilience with Likert response options (reference not specified) NCT03645798 : CD-RISC (Connor & Davidson, 2003; Yu & Zhang, 2007)
Anxiety	12	<ul style="list-style-type: none"> Calder Calisi (2017): State Trait Anxiety Inventory (STAI; Spielberger et al., 1970) Chesak et al. (2015): Generalized Anxiety Disorder 7-item scale (GAD-7; Spitzer et al., 2006) Mealer et al. (2014): anxiety subscale of Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983) Medisauskaite and Kamau (2019): GAD-7 (Spitzer et al., 2006) Mistretta et al. (2018): anxiety subscale of Depression Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995) Sood et al. (2011): Smith Anxiety Scale (SAS; Smith et al., 2007) Sood et al. (2014): SAS (Piiparinen & Smith, 2003; Smith et al., 2007; Smith, 1990) Stetz et al. (2007): anxiety subscale Multiple Affect Adjective Check List-Revised (MAACL-R; Zuckerman & Lubin, 1965) Varker and Devilly (2012): anxiety subscale of DASS-21 (Lovibond & Lovibond, 1995) Villani et al. (2013): STAI (Spielberger et al., 1970) Wild (2016): GAD-7 (Spitzer et al., 2006) ISRCTN69644721 : GAD-7 (Spitzer et al., 2006)
Depression	24	<ul style="list-style-type: none"> Alexander et al. (2015): burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) Maslach Burnout Inventory (MBI; Maslach & Jackson, 1986)

Outcomes	Number of studies	Studies and instruments
		<ul style="list-style-type: none"> Berger and Gelkopf (2011): burnout - burnout subscale of Professional Quality of Life scale (ProQOL; Stamm, 2005) Calder Calisi (2017): depression - VAS/Semantic differential scales (Friborg et al., 2006) Cieslak et al. (2016): burnout - Oldenburg Burnout Inventory (Demerouti et al., 2003) Clemow et al. (2018)^a: burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) MBI (Maslach et al., 1996); depression - Centers for Epidemiological Studies–Depression Scale (CES-D; Radloff, 1977) Duchemin et al. (2015): burnout – burnout subscale of ProQOL (Stamm, 2005); burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) MBI (Maslach et al., 1996) Ireland et al. (2017): burnout - Copenhagen Burnout Inventory (Kristensen, Borritz, et al., 2005) Lebares et al. (2019)^a: burnout - abbreviated MBI (aMBI; McManus et al., 2002); depression - Patient Health Questionnaire (PHQ-9; Kroenke et al., 2001) Loiselle (2018)^a: burnout - MBI subscale for health professionals (Rafferty et al., 1986); depression - Beck Depression Inventory-II (BDI-II; Beck et al., 1996) Luthar et al. (2017)^a: burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) Maslach Burnout Inventory (MBI) (Maslach et al., 1996); depression - BDI (Beck & Beck, 1972) Mache et al. (2017): burnout (emotional exhaustion) - Emotional exhaustion (EE subscale) MBI (Schaufeli et al., 1996) Mealer et al. (2014)^a: burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) MBI (Maslach et al., 1996); depression - depression subscale of HADS (Zigmond & Snaith, 1983) Medisauskaite and Kamau (2019): burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) MBI-Human Services Survey (Maslach & Jackson, 1981) Mistretta et al. (2018)^a: burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) MBI-Human Services Survey (Maslach et al., 1996); depression subscale of DASS-21 (Lovibond & Lovibond, 1995) Schroeder et al. (2016): burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) Maslach Burnout Inventory (Maslach et al., 1996) Smith et al. (2019): burnout - burnout subscale of ProQOL5 (Stamm, 2005) Stetz et al. (2007): depression subscale MAACL-R (Zuckerman & Lubin, 1965) Varker and Devilly (2012): depression subscale of DASS-21 (Lovibond & Lovibond, 1995) West et al. (2014)^b: depression - dichotomous 2-item PRME-MD depression screen (Spitzer et al., 1994; Whooley et al., 1997); burnout - burnout subscales (emotional exhaustion, depersonalization) and overall burnout of MBI (Maslach et al., 1996) West et al. (2015)^b: depression - dichotomous 2-item PRME-MD depression screen (Spitzer et al., 1994; Whooley et al., 1997); burnout - burnout subscales (emotional exhaustion, depersonalization, personal accomplishment) and overall burnout of MBI (Maslach et al., 1996) Wild (2016): PHQ-9 (Kroenke et al., 2001) ISRCTN69644721 : PHQ-9 (Kroenke et al., 2001)

Outcomes	Number of studies	Studies and instruments
Stress or stress perception	22	<ul style="list-style-type: none"> • NCT02603133 ^c: burnout - emotional exhaustion MBI (Maslach et al., 1996); depression - CES-D-10 (Andresen et al., 1994) • NCT03645798 : burnout - MBI-General survey (Li & Shi-Kan, 2003; Maslach & Jackson, 1981; Schaufeli et al., 1996) • Bernburg et al. (2016): perceived stress - Perceived Stress Questionnaire (PSQ; Levenstein et al., 1993) • Bernburg et al. (2019): perceived stress - PSQ (Levenstein et al., 1993) • Calder Calisi (2017): work-related stress - VAS/Semantic differential scales (Friborg et al., 2006) • Chesak et al. (2015): perceived stress - Perceived Stress Scale-14 (PSS-14; Cohen et al., 1983) • Duchemin et al. (2015): stress - stress subscale of DASS-21 (Lovibond & Lovibond, 1995); perceived stress -PSS-14 (Cohen et al., 1983) • Fei (2019): perceived stress - Chinese version of Perceived Stress Scale (Yang et al., 2007) • Ireland et al. (2017): perceived stress - Perceived Stress Scale-10 (PSS-10; Cohen & Williamson, 1988) • Lebares et al. (2019): perceived stress - PSS-10 (Cohen & Williamson, 1988) • Lin et al. (2019): perceived stress - PSS-14 (Cohen et al., 1983) • Loiselle (2018): perceived stress - PSS-10 (Cohen & Williamson, 1988) • Luthar et al. (2017): Parenting Stress Inventory (Abidin, 1990) • Mache, Danzer, et al. (2015): perceived stress - PSQ (Levenstein et al., 1993) • Mache, Vitzthum, et al. (2015): perceived stress - PSQ (Levenstein et al., 1993) • Mache et al. (2016): perceived stress - PSQ (Levenstein et al., 1993) • Mache et al. (2017): perceived stress - PSQ (Levenstein et al., 1993) • Mistretta et al. (2018): stress - stress subscale of DASS-21 (Lovibond & Lovibond, 1995) • Schroeder et al. (2016): perceived stress - PSS-10 (Cohen & Williamson, 1988) • Smith et al. (2019): perceived stress - PSS-10 (Cohen, 2020) • Sood et al. (2011): perceived stress - PSS-14 (Cohen & Williamson, 1988) • Sood et al. (2014): perceived stress - PSS-14 (McEwen, 1998; Smith et al., 2007) • Varker and Devilly (2012): stress subscale of DASS-21 (Lovibond & Lovibond, 1995) • West et al. (2014): perceived stress - PSS-10 (Cohen & Williamson, 1988)
Well-being or quality of life	20	<ul style="list-style-type: none"> • Bernburg et al. (2016): job satisfaction - Copenhagen Psychosocial Questionnaire (COPSOQ; Kristensen, Hannerz, et al., 2005; Nuebling & Hasselhorn, 2010) • Calder Calisi (2017): well-being - VAS/Semantic differential scales (Friborg et al., 2006) • Cheung (2014): life satisfaction - Satisfaction with Life Scale (Diener et al., 1985) • Duchemin et al. (2015) ^d: work satisfaction – scale not specified (results sent from authors); quality of life – single item from satisfaction with life questionnaire (no citation indicated in publication) • Hosseinnejad et al. (2018): job satisfaction - COPSOQ (Kristensen, Hannerz, et al., 2005) • Lin et al. (2019): job satisfaction - McCloskey/Mueller Satisfaction Scale (He et al., 2008; Mueller & McCloskey, 1990) • Mache, Danzer, et al. (2015): job satisfaction - COPSOQ (Kristensen, Hannerz, et al., 2005; Nuebling & Hasselhorn, 2010)

Outcomes	Number of studies	Studies and instruments
		<ul style="list-style-type: none"> • Mache, Vitzthum, et al. (2015): job satisfaction - COPSOQ (Kristensen, Hannerz, et al., 2005; Nuebling & Hasselhorn, 2010) • Mache et al. (2016): job satisfaction - COPSOQ (Kristensen, Hannerz, et al., 2005; Nuebling & Hasselhorn, 2010) • Mache et al. (2017): job satisfaction - COPSOQ (Kristensen, Hannerz, et al., 2005; Nuebling & Hasselhorn, 2010) • Mistretta et al. (2018): well-being - WHO (Five) Well-Being Index (Bech et al., 2003) • Sood et al. (2011): quality of life - Linear Analog Self-Assessment Scale (LASA; Locke et al., 2007) • Sood et al. (2014): quality of life - LASA (Locke et al., 2007; McEwen & Wingfield, 2003) • Strijk et al. (2011)^d: work-related vitality - vitality scale of Utrecht Work Engagement Scale (Schaufeli & Bakker, 2003); general vitality - RAND-36 vitality scale (Van der Zee & Sanderma, 1993) • West et al. (2014)^d: job satisfaction - Physician Job Satisfaction Scale (PJSS; Williams et al., 1999); quality of life - single-item linear analogue question (Gudex et al., 1996) • West et al. (2015)^d: job satisfaction - PJSS (Williams et al., 1999); quality of life - linear analogue self-assessment of overall quality of life (no reference specified) • Wild (2016): well-being - Warwick Edinburgh Mental Wellbeing scale (WEMWBS; Tennant et al., 2007) • ISRCTN69644721 : life satisfaction - statements about life satisfaction with Likert response options; well-being - WEMWBS (Tennant et al., 2007) • NCT02603133 : happiness - Subjective Happiness Scale (Lyubomirsky & Leppern, 1999) • NCT03645798 : job satisfaction - Job Satisfaction Scale (Tao et al., 2010)

Note.

^a For depression, depression scales were preferred over burnout scales if both forms of measure were reported.

^b In two studies (West et al., 2014; West et al., 2015), continuous measures of burnout were preferred over dichotomous measures of depression, as they offered the possibility of being combined with other trials reporting continuous outcomes in meta-analyses.

^c The authors reported that they would measure resilience with the emotional exhaustion subscale of the MBI. However, as this measure aims to assess burnout, the study was grouped under "Depression" in this table.

^d For trials reporting both general measures of well-being or quality of life and work-related assessments (e.g., job satisfaction, work-related vitality), general measures were preferred.

Appendix D13.4

Secondary Outcome Scales of Included Studies

Outcomes	Number of studies	Studies and instruments
Social support (perceived)	3	<ul style="list-style-type: none"> Cheung (2014): Multidimensional Scale of Perceived Social Support (Zhang & Norvilitis, 2002; Zimet et al., 1988) Clemow et al. (2018): social support subscales tangible, belonging, appraisal of Interpersonal Support Evaluation List (ISEL; Cohen & Hoberman, 1983) Varker and Devilly (2012): ISEL-12 (Cohen et al., 1985)
Optimism	3	<ul style="list-style-type: none"> Gelkopf et al. (2008): single item modified from Children's Future Orientation Scale (Bleich et al., 2003; Saigh, 1997) Mache, Danzer, et al. (2015): optimism subscale of Self-Efficacy, Optimism, and Pessimism (SWOP-K9; Scholler et al., 1999) Mache, Vitzthum, et al. (2015): optimism subscale of SWOP-K9 (Scholler et al., 1999)
Self-efficacy	11	<ul style="list-style-type: none"> Berger and Gelkopf (2011): Disaster-Helper Self-Efficacy Scale (DHSE; Gelkopf et al., 2008) Bernburg et al. (2019): self-efficacy subscale of SWOP-K9 (Scholler et al., 1999) Cheung (2014): 13-item self-efficacy scale (self-developed based on literature; Allen et al., 2010; Bandura, 1997) Cieslak et al. (2016): trauma self-efficacy - Secondary Trauma Self-Efficacy Scale (Cieslak et al., 2013); work stress and burnout management self-efficacy - Work Stress and Burnout Management Self-efficacy Scale (Lua, 2008) Gelkopf et al. (2008): personal sense of self-efficacy - single item (Bleich 2003); professional self-efficacy - DHSE (Gelkopf et al., unpublished manuscript) Mache, Danzer, et al. (2015): self-efficacy subscale of SWOP-K9 (Scholler et al., 1999) Mache, Vitzthum, et al. (2015): self-efficacy subscale of SWOP-K9 (Scholler et al., 1999) Mache et al. (2016): self-efficacy subscale of SWOP-K9 (Scholler et al., 1999) Smith et al. (2019): Occupational Coping Self-Efficacy Questionnaire for Nurses (Pisanti et al., 2008) Wild (2016): General Self-Efficacy Scale (Schwarzer & Jerusalem, 1995) NCT03645798 : General Self-Efficacy scale (no citation specified in trial registration)
Active coping	5	<ul style="list-style-type: none"> Cheung (2014): adaptive coping subscale (items from 8 adaptive coping responses) from Brief Coping Orientations to Problems Experience scale (Brief COPE; Carver, 1997) Gelkopf et al. (2008): subscale refocusing on planning of Cognitive Emotion Regulation Questionnaire (Garnefski et al., 2002) Medisauskaite and Kamau (2019): active coping - Coping Mechanisms Scale (see trial registration); Brief COPE according to publication (Carver et al., 1989) Villani et al. (2013): 2 items for active coping of Brief COPE (Carver, 1997) Wild (2016): ability to problem-solve and achieve goals - unpublished questionnaire; active coping - subscale of Brief COPE (Carver et al., 1989)
Self-esteem	1	<ul style="list-style-type: none"> Berger and Gelkopf (2011): Rosenberg self-esteem scale (Rosenberg, 1965)

Outcomes	Number of studies	Studies and instruments
Hardiness	1	<ul style="list-style-type: none"> Tierney and Lavelle (1997): Third Generation Personal Views questionnaire (Personal Views Survey; Dane, unpublished manuscript)
Positive emotions	3	<ul style="list-style-type: none"> Fei (2019): positive affect - positive affect subscale from positive affect subscale from Positive and Negative Affect Schedule (PANAS; Huang et al., 2003; Watson et al., 2005) Lin et al. (2019): positive affect - positive affect subscale from positive affect subscale from PANAS (Huang et al., 2003; Watson et al., 1988) Stetz et al. (2007): positive affect - positive affect subscale MAACL-R (Zuckerman & Lubin, 1965)

Appendix D13.5 Additional Results of Main Analyses (Non-Pooled Studies)

The effects on all *primary outcomes* were analyzed immediately postintervention and at short-term FU. For some outcomes, meta-analyses (i.e., at least two studies) were possible at medium-term (resilience, well-being) and/or long-term FU (resilience, depression, (perceived) stress). Concerning the *secondary outcomes*, pooled analyses could be performed for optimism, self-efficacy, active coping, and positive emotions at posttest and three outcomes (social support, optimism, self-efficacy) at short-term FU. Most secondary outcomes were not measured at medium- and long-term FU or only single-study results were available.

Table D13.5.1

Additional Results Concerning Effects of Resilience-Training Programs on Psychological Outcomes at Different Time Points – Primary Outcomes

Outcome and time point ^a	Number of studies and available data
Resilience posttest	
Studies where outcome was measured	16 studies (three in mixed samples: Cieslak et al., 2016; ISRCTN69644721; Wild, 2016)
Studies with available data for quantitative analysis	12 studies (Bernburg et al., 2019; Khoshnazary et al., 2016; Klatt et al., 2015; Lebares et al., 2019; Lin et al., 2019; Loiselle, 2018; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mealer et al., 2014; Schroeder et al., 2016)
Results of single studies that could not be pooled	NCT03645798 : no data obtainable from study authors
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Cieslak et al., 2016; posttraumatic growth; Wild, 2016) or unpublished data (ISRCTN69644721) • Cieslak et al. (2016; total sample of 168 health and human service professionals; e.g., physicians, nurses, education specialists, police officers): sig. group effect on posttraumatic growth (Posttraumatic Growth Inventory-Short form; $F = 6.10$, $p = .013$) at postintervention, with lower values in the resilience training ($M = 3.0$, $SD = 0.8$) compared with attention control ($M = 3.2$, $SD = 0.8$) • Wild (2016; total sample of employees or volunteers working as front-line or office-based staff in one of four emergency services: police, fire and rescue, ambulance, search and rescue; 430 participants randomized; number analyzed not specified): no sig. difference in level of resilience (Connor-Davidson Resilience Scale, CD-RISC) between resilience training and active control at posttest ($F = 0.42$, $p = .66$; intervention arm: $M = 67.9$, $SD = 17.0$, control arm: $M = 68.5$, $SD = 15.3$)
Resilience short-term follow-up	
Studies where outcome was measured	15 studies (three in mixed samples: Cieslak et al., 2016; ISRCTN69644721; Wild, 2016)
Studies with available data for quantitative analysis	11 studies (Bernburg et al., 2019; Chesak et al., 2015; Cheung, 2014; Lin et al., 2019; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015;

Outcome and time point ^a	Number of studies and available data
Results of single studies that could not be pooled	Mache, Vitzthum, et al., 2015; Schroeder et al., 2016; Sood et al., 2011; Sood et al., 2014) Smith et al. (2019; available as conference abstract): no data obtainable from authors; for 29 nurses, no evidence for a difference in the change of resilience (CD-RISC) between baseline and 1-month follow-up ($p = .84$) or 3-month follow-up ($p = .26$) between resilience training and control
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> Unavailable subgroup data (Cieslak et al., 2016; posttraumatic growth; Wild, 2016) or unpublished data (ISRCTN69644721) Cieslak et al. (2016; total sample of 168 health and human service professionals; e.g., physicians, nurses, education specialists, police officers): no sig. group effect on posttraumatic growth at 1-month follow-up ($F = 3.54$, $p = .06$). Lower scores of posttraumatic growth in intervention arm ($M = 3.0$, $SD = 0.8$) compared with attention control arm ($M = 3.1$, $SD = 0.8$) Wild (2016; total sample including ambulance personnel; 430 randomized; number analyzed not specified): no sig. between-group difference in resilience at 3-month follow-up (F value see Resilience – postintervention; intervention arm: $M = 68.7$, $SD = 16.2$; control arm: $M = 70.2$, $SD = 14.7$)
Resilience medium-term FU	
Studies where outcome was measured	two studies
Studies with available data for quantitative analysis	two studies (Cheung, 2014; Mache et al., 2017)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	/
Resilience long-term FU	
Studies where outcome was measured	two studies
Studies with available data for quantitative analysis	two studies (Bernburg et al., 2019; Lebares et al., 2019)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	/
Anxiety posttest	
Studies where outcome was measured	eight studies (two in mixed samples: ISRCTN69644721; Wild, 2016)
Studies with available data for quantitative analysis	five studies (Calder Calisi, 2017; Mealer et al., 2014; Medisauskaitė & Kamau, 2019; Mistretta et al., 2018; Villani et al., 2013)
Results of single studies that could not be pooled	Stetz et al. (2007): only summary data for Multiple Affect Adjective Check List-Revised (e.g., depression, anxiety, and positive affect subscale) reported; evidence found for group difference in psychological distress ($F = 3.3$, $p < .001$; 63 participants randomized, number analyzed not specified)
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> Unavailable subgroup data (ISRCTN69644721; Wild, 2016) Wild (2016; total sample including ambulance personnel; 430 randomized; number analyzed not specified): no evidence for a between-group difference between resilience training and active control in anxiety (General Anxiety Disorder Scale-7) at posttest (intervention arm: $M = 3.2$, $SD = 3.1$; control arm: $M = 3.3$, $SD = 3.4$) ISRCTN69644721 : unpublished study; no data obtainable from authors
Anxiety short-term FU	

Outcome and time point ^a	Number of studies and available data
Studies where outcome was measured	seven studies (two in mixed samples: ISRCTN69644721; Wild, 2016)
Studies with available data for quantitative analysis	four studies (Chesak et al., 2015; Mistretta et al., 2018; Sood et al., 2011; Sood et al., 2014)
Results of single studies that could not be pooled	Varker and Devilly (2012): evaluated resilience intervention developed for healthcare personnel in individuals from general population (proof-of-concept study; 77 participants); effect of training on anxiety compared to attention control assessed at 1-month follow-up (Depression Anxiety and Stress Scale); however, only summary data (multivariate analysis of variance (MANOVA) results) for depression, anxiety and stress reported with sig. Time × Group interaction ($F = 2.89, p < .05$); posthoc analyses for anxiety not reported
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) or unpublished data (ISRCTN69644721) • Wild (2016; total sample including ambulance personnel: police, fire and rescue, ambulance, search and rescue; 430 participants randomized; number analyzed not specified): no evidence for between-group difference in anxiety at 3-month follow-up (intervention arm: $M = 2.8, SD = 3.3$; control arm: $M = 3.0, SD = 3.8$)
Depression posttest	
Studies where outcome was measured	20 studies (three in mixed samples: Cieslak et al., 2016; ISRCTN69644721; Wild, 2016); assessment of depression or burnout (see Helmreich et al., 2017)
Studies with available data for quantitative analysis	<ul style="list-style-type: none"> • 14 studies (Alexander et al., 2015; Calder Calisi, 2017; Cieslak et al., 2016; Ireland et al., 2017; Lebares et al., 2019; Loiselle, 2018; Luthar et al., 2017; Mache et al., 2017; Mealer et al., 2014; Medisaukaite & Kamau, 2019; Mistretta et al., 2018; Schroeder et al., 2016; West et al., 2014; West et al., 2015) • for Cieslak et al. (2016; mixed sample): relevant subgroup data for HCP received from study authors; comparable to original study, intention-to-treat analysis based on expectation-maximization (EM) imputation for healthcare workers ($n = 134$; e.g., nurses, physicians, psychotherapists, social workers)
Results of single studies that could not be pooled	<ul style="list-style-type: none"> • Duchemin et al. (2015; 32 participants): provided no posttest values for burnout, but only narrative report of no change of burnout scores (emotional exhaustion, depersonalization, personal accomplishment subscales of Maslach Burnout Inventory) between pre- and posttest; number of participants with scores > 26 on emotional exhaustion reduced by 34% in resilience-training group compared to no change in wait-list control (no p value reported) • Stetz et al. (2007): only reported summary outcome data (MANOVA results); insufficient information to estimate intervention effect • Unavailable data for two unpublished studies (NCT02603133; NCT03645798)
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) or unpublished data (ISRCTN69644721) • Wild (2016; total sample including ambulance personnel; 430 randomized; number analyzed not specified): no evidence for between-group difference between resilience training and active control for depression (Patient Health Questionnaire-9) at posttest (intervention arm: $M = 3.5, SD = 3.2$; control arm: $M = 3.8, SD = 4.4$) • ISRCTN69644721 : unpublished study; no data obtainable from authors
Depression short-term FU	
Studies where outcome was measured	13 studies (three in mixed samples: Cieslak et al., 2016; ISRCTN69644721; Wild, 2016)

Outcome and time point ^a	Number of studies and available data
Studies with available data for quantitative analysis	<ul style="list-style-type: none"> • eight studies (Berger et al., 2007; Cieslak et al., 2016; Clemow et al., 2018; Luthar et al., 2017; Mache et al., 2017; Mistretta et al., 2018; Schroeder et al., 2016; West et al., 2014) • for Cieslak et al. (2016; mixed sample): relevant subgroup data for HCP received from study authors; comparable with original study, intention-to-treat analysis based on EM imputation for healthcare workers ($n = 134$; e.g., nurses, physicians, psychotherapists, social workers)
Results of single studies that could not be pooled	<ul style="list-style-type: none"> • Smith et al. (2019; available as conference abstract): for 29 nurses (intervention arm: 16; control arm: 13), sig. difference between resilience training and control in burnout scores (Professional Quality of Life Scale-5; ProQOL5) at 1-month follow-up ($p = .04$) reported • Varker and Devilly (2012): only reported summary data for depression at 1-month follow-up (MANOVA results with anxiety, depression and stress) in individuals of the general population (77 participants); sig. Time \times Group interaction ($F = 2.89, p < .05$): decrease of depression scores in IG versus increase in CG
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • NCT02603133 : unpublished study; no data obtainable from authors • Unavailable subgroup data (Wild, 2016) or unpublished data (ISRCTN69644721) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no evidence for between-group difference for depression at 3-month follow-up (intervention arm: $M = 3.2, SD = 3.6$; control arm: $M = 3.4, SD = 4.1$) • ISRCTN69644721 : unpublished study; no data obtainable from authors
Depression medium-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Mache et al., 2017); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Depression long-term FU	
Studies where outcome was measured	two studies
Studies with available data for quantitative analysis	two studies (Lebares et al., 2019; West et al., 2014)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	/
Stress or stress perception posttest	
Studies where outcome was measured	18 studies
Studies with available data for quantitative analysis	17 studies (Bernburg et al., 2016; Bernburg et al., 2019; Calder Calisi, 2017; Duchemin et al., 2015; Fei, 2019; Ireland et al., 2017; Lebares et al., 2019; Lin et al., 2019; Loiselle, 2018; Luthar et al., 2017; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mistretta et al., 2018; Schroeder et al., 2016; West et al., 2014)
Results of single studies that could not be pooled	Mirzaeirad et al. (2019; 80 participants): only relative proportion of participants with low, moderate, and high (nursing) stress at postintervention presented (intervention arm: low stress = 3 (7.5%), moderate = 33 (82.5%), high = 4 (10%); control arm: low stress = 0, moderate = 22 (55%), high = 18

Outcome and time point ^a	Number of studies and available data
	(45%)); sig. between-group difference favoring resilience training in perceived stress ($p < .001$)
Results of mixed studies that could not be pooled	/
Stress or stress perception short-term FU	
Studies where outcome was measured	17 studies
Studies with available data for quantitative analysis	14 studies (Bernburg et al., 2016; Bernburg et al., 2019; Chesak et al., 2015; Lin et al., 2019; Luthar et al., 2017; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mistretta et al., 2018; Schroeder et al., 2016; Sood et al., 2011; Sood et al., 2014; West et al., 2014)
Results of single studies that could not be pooled	<ul style="list-style-type: none"> • Smith et al. (2019; available as conference abstract): data not obtainable from study authors • Mirzaeirad et al. (2019): results for perceived stress (nursing stress) at 3-month follow-up (80 participants) only reported indirectly by analysis of covariance (ANCOVA) results ($F = 108.14$; $p < .001$) • Varker and Devilly (2012): only reported summary data for stress (MANOVA results with anxiety, depression and stress) in individuals from the general population; sig. Time \times Group interaction ($F = 2.89$, $p < .05$; 77 participants); posthoc tests: larger reduction of stress in IG compared with CG
Results of mixed studies that could not be pooled	/
Stress or stress perception medium-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Mache et al., 2017); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Stress or stress perception long-term FU	
Studies where outcome was measured	three studies
Studies with available data for quantitative analysis	three studies (Bernburg et al., 2019; Lebares et al., 2019; West et al., 2014)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	/
Well-being or quality of life posttest	
Studies where outcome was measured	17 studies (two in mixed samples: ISRCTN69644721; Wild, 2016)
Studies with available data for quantitative analysis	13 studies (Bernburg et al., 2016; Calder Calisi, 2017; Duchemin et al., 2015; Klatt et al., 2015; Lin et al., 2019; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mistretta et al., 2018; Strijk et al., 2011; West et al., 2014; West et al., 2015)
Results of single studies that could not be pooled	Unavailable data for two unpublished studies (NCT02603133; NCT03645798)
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) or unpublished data (ISRCTN69644721) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no sig. difference between

Outcome and time point ^a	Number of studies and available data
	resilience training and active control on well-being (Warwick Edinburgh Mental Wellbeing scale) at posttest ($F = 0.06$, $p = .94$; intervention arm: $M = 50.7$, $SD = 9.4$; control arm: $M = 51.28$, $SD = 9.9$)
	<ul style="list-style-type: none"> • ISRCTN69644721 : unpublished study; no data obtainable from authors
Well-being or quality of life short-term FU	
Studies where outcome was measured	15 studies (two in mixed samples: ISRCTN69644721; Wild, 2016)
Studies with available data for quantitative analysis	12 studies (Bernburg et al., 2016; Cheung, 2014; Hosseinnajad et al., 2018; Lin et al., 2019; Mache et al., 2017; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015; Mistretta et al., 2018; Sood et al., 2011; Sood et al., 2014; West et al., 2014)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) or unpublished data (ISRCTN69644721) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no sig. between-group difference in well-being ($F = 0.06$, $p = .94$; intervention arm: $M = 50.6$, $SD = 9.0$; control arm: $M = 50.9$, $SD = 9.4$) • ISRCTN69644721 : unpublished study; no data obtainable from authors
Well-being or quality of life medium-term FU	
Studies where outcome was measured	three studies
Studies with available data for quantitative analysis	three studies (Cheung, 2014; Mache et al., 2017; Strijk et al., 2011)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	/
Well-being or quality of life long-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (West et al., 2014); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/

Note. CG = control group; F = F value; FU = follow-up; IG = intervention group; M = mean; MD = mean difference; p = p value; SD = standard deviation; sig. = significant.

^a short-term FU: ≤ 3 months after end of training; medium-term FU: > 3 to ≤ 6 months after end of training; long-term FU: > 6 months after end of training.

Table D13.5.2*Additional Results Concerning Effects of Resilience-Training Programs on Psychological Outcomes at**Different Time Points – Secondary Outcomes*

Outcome and time point ^a	Number of studies and available data
Social support posttest	
Studies where outcome was measured	one study in mixed sample
Studies with available data for quantitative analysis	one study in mixed sample (Wild, 2016); no MD calculated since subgroup data not available
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	Wild (2016; total sample of employees/volunteers working as front-line or office-based staff in one of four emergency services: police, fire and rescue, ambulance, search and rescue; 430 participants randomized; number analyzed not specified): no sig. difference between IG and CG in perceived social support (13 items for social support) at home ($F = 0.40, p = .67$) or at work ($F = 0.90, p = .40$) at postintervention (at home: IG: $M = 33.6, SD = 6.4$; CG: $M = 32.8, SD = 7.1$; at work: IG: $M = 27.2, SD = 6.6$; CG: $M = 27.1, SD = 7.2$)
Social support short-term FU	
Studies where outcome was measured	two studies
Studies with available data for quantitative analysis	two studies (Cheung, 2014; Clemow et al., 2018)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no sig. difference between IG and CG in perceived social support (13 items for social support) at home ($F = 0.40, p = .67$) or at work ($F = 0.90, p = .40$) at the 3-month follow-up (at home: IG: $M = 34.2, SD = 6.5$; CG: $M = 33.3, SD = 7.8$; at work: IG: $M = 27.7, SD = 6.6$; CG: $M = 26.8, SD = 7.1$)
Social support medium-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Cheung, 2014); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Optimism posttest	
Studies where outcome was measured	three studies (one in mixed sample; Gelkopf et al., 2008)
Studies with available data for quantitative analysis	<ul style="list-style-type: none"> • three studies (Gelkopf et al., 2008; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015) • for Gelkopf et al. (2008; mixed sample): subgroup data for HCP obtained from study authors
Results of single studies that could not be pooled	/

Outcome and time point ^a	Number of studies and available data
Results of mixed studies that could not be pooled	/
Optimism short-term FU	
Studies where outcome was measured	two studies
Studies with available data for quantitative analysis	two studies (Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015)
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	/
Self-efficacy posttest	
Studies where outcome was measured	eight studies (three in mixed samples: Cieslak et al., 2016; Gelkopf et al., 2008; Wild, 2016)
Studies with available data for quantitative analysis	<ul style="list-style-type: none"> • six studies (Bernburg et al., 2019; Cieslak et al., 2016; Gelkopf et al., 2008; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015) • for Cieslak et al. (2016; mixed sample): relevant subgroup data for HCP received from study authors; comparable with original study, intention-to-treat analysis based on EM imputation for healthcare workers ($n = 134$; e.g., nurses, physicians, psychotherapists, social workers) • for Gelkopf et al. (2008; mixed sample): subgroup data for HCP received from study authors
Results of single studies that could not be pooled	NCT03645798 :unpublished study; no data obtainable from authors
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no sig. significant difference ($F = 1.85$, $p = .16$) between resilience training and active control in self-reported self-efficacy (General Self-Efficacy Scale) at postintervention (IG: $M = 31.7$, $SD = 4.5$; CG: $M = 31.9$, $SD = 4.7$)
Self-efficacy short-term FU	
Studies where outcome was measured	nine studies (two in mixed samples: Cieslak et al., 2016; Wild, 2016)
Studies with available data for quantitative analysis	<ul style="list-style-type: none"> • seven studies (Berger & Gelkopf, 2011; Bernburg et al., 2019; Cheung, 2014; Cieslak et al., 2016; Mache et al., 2016; Mache, Danzer, et al., 2015; Mache, Vitzthum, et al., 2015) • for Cieslak et al. (2016; mixed sample): relevant subgroup data for HCP received from study authors; comparable with original study, intention-to-treat analysis based on EM imputation for healthcare workers ($n = 134$; e.g., nurses, physicians, psychotherapists, social workers)
Results of single studies that could not be pooled	Smith et al. (2019; available as conference abstract): no quantitative findings for self-efficacy (measured by Occupational Coping Self-Efficacy Questionnaire for Nurses; see NCT03017469) mentioned in the conference abstract, data not obtainable data from study authors
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no sig. difference ($F = 1.85$, $p = .16$) between resilience training and active control in self-reported self-efficacy (General Self-Efficacy Scale) at 3-month follow-up (IG: $M = 32.0$, $SD = 4.6$; CG: $M = 32.5$, $SD = 4.30$)
Self-efficacy medium-term FU	
Studies where outcome was measured	one study

Outcome and time point ^a	Number of studies and available data
Studies with available data for quantitative analysis	one study (Cheung, 2014); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Self-efficacy long-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Bernburg et al., 2019); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Active coping posttest	
Studies where outcome was measured	four studies (two in mixed samples: Gelkopf et al., 2008; Wild, 2016)
Studies with available data for quantitative analysis	<ul style="list-style-type: none"> • three studies (Gelkopf et al., 2008; Medisauskaite & Kamau, 2019; Villani et al., 2013) • for Gelkopf et al. (2008; mixed sample): subgroup data for HCP received from study authors
Results of single studies that could not be pooled	/
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no evidence for a between-group difference in active coping at posttest (IG: $M = 5.5$, $SD = 1.5$; CG: $M = 5.4$, $SD = 1.6$; p value not reported)
Active coping short-term FU	
Studies where outcome was measured	two studies (one in mixed sample: Wild, 2016)
Studies with available data for quantitative analysis	one study (Cheung, 2014); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	<ul style="list-style-type: none"> • Unavailable subgroup data (Wild, 2016) • Wild (2016; total sample including ambulance personnel; 430 participants randomized; number analyzed not specified): no evidence for a difference between between resilience training and active control at short-term follow-up (IG: $M = 5.4$, $SD = 1.6$; CG: $M = 5.7$, $SD = 1.6$; p value not presented)
Active coping medium-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Cheung, 2014); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Self-esteem short-term FU	
Studies where outcome was measured	one study

Outcome and time point ^a	Number of studies and available data
Studies with available data for quantitative analysis	one study (Berger & Gelkopf, 2011); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Hardiness posttest	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Tierney & Lavelle, 1997); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Hardiness medium-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Tierney & Lavelle, 1997); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/
Positive emotions posttest	
Studies where outcome was measured	three studies
Studies with available data for quantitative analysis	two studies (Fei, 2019; Lin et al., 2019)
Results of single studies that could not be pooled	Stetz et al. (2007): only reported summary data of analyses (two-way multivariate analysis of variance (MANOVA) results for the Multiple Affect Adjective Check List-Revised, including, for example, depression, anxiety and positive affect); sig. effect of condition for the participants' psychological stress levels ($F = 3.3$, $p < .001$; 63 participants randomized, number analyzed not specified); single results for outcomes not reported
Results of mixed studies that could not be pooled	/
Positive emotions short-term FU	
Studies where outcome was measured	one study
Studies with available data for quantitative analysis	one study (Lin et al., 2019); no pooled analysis, but MD calculated
Results of single studies that could not be pooled	see above
Results of mixed studies that could not be pooled	/

Note. CG = control group; F = F value; FU = follow-up; IG = intervention group; M = mean; MD = mean difference; p = p value; SD = standard deviation; sig. = significant

^a short-term FU: ≤ 3 months after end of training; mediumterm FU: > 3 to ≤ 6 months after end of training; long-term FU: > 6 months after end of training.

Appendix D13.6 Funding Sources of Included Studies

Funding sources for the included studies were various: in five studies respectively, they included different hospitals or hospital grants (e.g., Mayo Clinic), and universities (e.g., certain faculties) and university research funds. In two studies apiece, further funding was provided by the National Institutes of Health (NIH), ministries, different foundations, and state/regional and city initiatives for health care. Single studies were supported by the US army (Stetz et al., 2007), research grants (e.g., for student research; Cheung, 2014), and research programs (e.g., specifically for resilience; Duchemin et al., 2015). Seven studies reported a combination of funding sources (e.g., university and national institute, hospital grant and gift, university and charity, hospital funds and EU grant Horizon 2020, NIH and foundations, hospital and university). For 15 studies, funding sources were not specified or could not be retrieved from the available information (e.g., conference abstract; West et al., 2015). One study received no funding support (Bernburg et al., 2016)

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