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Psychological interventions for resilience enhancement in adults (Protocol)

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[Intervention Protocol]

Psychological interventions for resilience enhancement in adults

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ABSTRACT

This is a protocol for a Cochrane Review (Intervention). The objectives are as follows:

To assess the effects of resilience-enhancing interventions in clinical and non-clinical populations.

BACKGROUND

Description of the condition

Since the introduction of a salutogenic orientation (focusing on factors that promote health and well-being), as a basis for health promotion (Antonovsky 1979), and the Ottawa Charter for Health Promotion (WHO 1986), the concept of resilience has stimulated extensive research. Resilience describes the empirically observable phenomenon under which an individual does not or only temporarily, experiences mental health problems despite being subjected to psychological or physical stressors of short (acute) or long (chronic) duration (Kalisch 2015). By definition, resilience always presupposes the exposure to substantial risk or adversity (Earvolino-Ramirez 2007; Jackson 2007; Luthar 2000; Masten 2001). Thus, the psychological resilience of a person can only be determined if the individual was exposed to previous or current stress or trauma.

In the literature, three different resilience definitions are discussed: trait resilience, resilience as an outcome and resilience as a process (Hu 2015; Kalisch 2015). Trait resilience refers to resilience defined as personal resources or static, positive personality characteristics that enhance individual adaptation (Block 1996; Nowack 1989; Wagnild 1993). This approach has largely been superceded by a view of resilience as an outcome rather than a static personality trait (Kalisch 2015; Mancini 2009), that is, psychological adaptation (for example, mental health, well-being, quality of life), despite significant stress or trauma. According to this outcome-oriented definition, the positive outcome resilience is partially de-

termined by several resilience factors (Kalisch 2015). To date, a large range of genetic, psychological, social and environmental factors have been discussed in resilience research that often overlap or may interact (Bengel 2012; Bonanno 2013; Carver 2010; Connor 2006; Earvolino-Ramirez 2007; Feder 2011; Forgeard 2012; Haglund 2007; Iacoviello 2014; Kuiper 2012; Mancini 2009; Michael 2003; Ozbay 2007; Rutten 2013; Sapienza 2011; Sarkar 2014; Southwick 2005; Southwick 2012; Stewart 2011; Wu 2013; Zauszniewski 2010). Psychosocial resilience factors that are well-evidenced according to the current state of knowledge and are thought to be modifiable include meaning or purpose in life, sense of coherence, positive emotions, hardiness, self-esteem, active coping, self-efficacy, optimism, social support, cognitive flexibility (including positive reappraisal and acceptance) and religiosity or spirituality or religious coping (see Appendix 1; level 1). Most recently, resilience has even been conceptualised as a multidimensional, dynamic and variable process (Johnston 2015; Kalisch 2015; Kent 2014; Mancini 2009; Norris 2009; Rutten 2013; Sapienza 2011; Southwick 2012). This resilient process is characterised by either a trajectory of undisturbed mental health during or after adversities or temporary dysfunctions followed by successful recovery (Kalisch 2015). In general, resilience is viewed as the outcome of an interaction between the individual and his or her environment (Cicchetti 2012; Rutten 2013), which may be influenced through personal (e.g. optimism) as well as environmental (e.g. social support) resources (Haglund 2007; Iacoviello 2014; Kalisch 2015; Southwick 2005; Wu 2013). As such, resilience is modifiable and can be improved by interventions (Bengel 2012; Connor 2006; Southwick 2011).

The development and evaluation of interventions that aim to foster or enhance psychological resilience and prevent stress-related mental dysfunctions are the focus of the third wave of resilience research (Bengel 2012; Waite 2004). Resilience-training programmes have been developed for, and conducted in, a variety of clinical and non-clinical populations using various formats, such as multimedia programmes or face-to-face settings, and delivered in a group or individual context (see Bengel 2012 and Southwick 2011 for an overview). However, the empirical evidence regarding the efficacy of these interventions is still unclear and requires further research.

Description of the intervention

Despite increasing interest worldwide in the development and evaluation of resilience interventions for different groups, there is little consensus about when to consider a programme as 'resilience training' or what components are needed for effective programmes (Leppin 2014). The diversity across resilience-training programmes in their theoretical assumptions, the operationalisation of their construct, and inclusion of core components reflect the current state of knowledge (Leppin 2014; Macedo 2014; Robertson 2015). Leading guidelines on definition, conceptualisation, intervention design and assessment of resilience are still under discussion (compare Kalisch 2015; Robertson 2015).

Most training programmes, whether individual- or group-based, are implemented face-to-face. Alternatively used formats include online-based interventions or multimodal training combining different formats (e.g. face-to-face and coaching via telephone). Resilience-training programmes often use methods such as discussions, role plays, practical exercises and homework to reinforce training contents. Moreover, they mostly contain a psychoeducative element to provide information on the concept of resilience or specific training elements (e.g. cognitive restructuring).

Different psychotherapeutic procedures and methods provide the basis for resilience interventions: cognitive-behavioural therapy (e.g. Abbott 2009; Songprakun 2012), acceptance and commitment therapy (e.g. Ryan 2014), mindfulness-based therapy (e.g. Geschwind 2011), attention and interpretation therapy (e.g. Loprinzi 2011; Sood 2014), problem-solving therapy (e.g. Bekki 2013; Sahler 2013), as well as stress inoculation (e.g. Farchi 2010). Besides, a number of training programmes focus on fostering single or multiple psychosocial resilience factors (e.g. Kanekar 2009; Sadow 1993), without being assignable to a certain approach. Few interventions base their work on a defined resilience model (e.g. Schachman 2004; Steinhardt 2008).

How the intervention might work

Depending on the underlying resilience concept, resilience interventions target different resources and competences. The theoretical foundations of resilience-training programmes and the hypotheses on how they might maintain or regain mental health are as diverse as their contents. Currently, no empirically validated theoretical framework exists that outlines the mode of action of resilience interventions (Bengel 2012; Leppin 2014).

As resilience as an outcome is determined by several, potentially modifiable resilience factors (see Description of the condition), resilience interventions might work by strengthening these factors in interventions. Appendix 2 presents examples of possible training methods to foster well-evidenced resilience factors. However, depending on the theoretical foundation of resilience training programmes, there are different theories of change on how certain resilience factors and hence resilience might be affected.

From the 'cognitive-behavioural perspective', stress-related mental dysfunctions (e.g. depression, anxiety disorder, substance abuse) can be considered as a result of dysfunctional thinking (Beck 2011; Benjamin 2011). When confronted with stress or adversity, people show maladaptive behavioural responses or experience negative mood states, or both, due to irrational cognitions (Beck 1976; Ellis 1975). This is in line with other stress and resilience theories assuming that not the stressor itself, but its cognitive appraisal may lead to stress reactions (e.g. Kalisch 2015; Lazarus 1987). Therefore, modifying cognitive processes into more adaptive patterns of thought will probably produce more adaptive emotional and

behavioural responses to stress (Beck 1964). By challenging an individual's maladaptive thoughts and by teaching new problem-solving coping strategies, resilience interventions based on cognitive behavioural therapy might be beneficial in promoting the resilience factors of cognitive flexibility and active coping, for example.

'Stress inoculation therapy', as a form of cognitive behavioural therapy, is based on the assumption that exposing individuals to milder forms of stress can strengthen coping strategies and the individual's confidence in using his or her coping repertoire (Meichenbaum 2007). Therefore, resilience training programmes grounded in stress inoculation therapy might foster resilience by enhancing factors such as self-efficacy.

According to 'acceptance and commitment therapy' (Hayes 2004; Hayes 2006), psychopathology is primarily the consequence of psychological inflexibility (i.e. inability to persist or change behaviour according to long-term values due to language and cognition skills) (Hayes 2006), which is also relevant when an individual is confronted with stress or adversity. By teaching acceptance and mindfulness skills on the one hand (e.g. being in contact with the present moment, acceptance, cognitive defusion), and commitment and behavior-change skills on the other hand (e.g. values, committed action), several resilience factors might be fostered in resilience interventions based on acceptance and commitment therapy (e.g. cognitive flexibility, purpose in life). In particular, the acceptance of a full range of emotions taught in acceptance and commitment therapy might result in a better adjustment to stressful conditions (i.e. resilience).

In 'mindfulness-based therapy' (e.g. mindfulness-based stress reduction (e.g. Stahl 2010); attention and interpretation therapy (Sood 2010)), mindfulness is characterised by the non-judging awareness of the present moment and its accompanying mental phenomena (i.e. body sensations, perceptions, thoughts and emotions). Since practitioners learn to accept whatever occurs in the present moment, they are thought to adapt more efficiently to stress (Grossman 2004; Shapiro 2005). As being more aware of the 'here and now' possibly enhances the sensitivity for positive aspects in life, mindfulness-based resilience interventions might help participants to gain a brighter outlook for the future (i.e. the resilience factor of optimism) or to experience positive emotions more regularly. Besides, teaching mindfulness might also increase the participants' cognitive flexibility by learning to accept negative situations and emotions.

Based on the 'problem-solving' model of stress and adaptation, effective problem-solving can attenuate the negative effects of stress and adversity on well-being by moderating or mediating (or both) the effects of stressors on emotional distress (Nezu 2013). For example, deficient problem-solving was found to be related to psychological maladaptation to stress in several populations, whereas other studies identified a moderator or mediator function of efficient problem-solving (Nezu 2013). Resilience interventions based on problem-solving that enhance an individual's positive problem orientation as well as his or her planful problem solving (i.e. analysing the problem and setting goals, generating possible solutions, choosing the best solution and creating an action plan, implementing the solution and reviewing the problem-solving process) might foster the participants' psychological adaptation to stress (i.e. resilience) by increasing the resilience factor of active coping, especially.

Independent of the underlying theory, resilience training might work differently depending on the respective 'delivery format' and 'intervention setting' (Robertson 2015; Vanhove 2015). For example, interventions implemented face-to-face could work better than online interventions in increasing resilience due to the more direct contact between trainers and participants (Vanhove 2015), which might also increase the compliance of participants. Resilience training in an individual setting could be more efficient than group-based interventions as trainers might be better able to attend to participants' individual needs and provide feedback more easily (Vanhove 2015). On the other hand, group-based interventions could also enhance the participants' social resources.

Vanhove 2015 already hypothesised on varying effects of resilience interventions in different populations. Although different target groups (e.g. employees, patient populations, military or police, general population) may experience similar daily stressors, they could, nevertheless, differ in other sources of stress exposure (e.g. combat experience in the military, organisational restructuring in employees) (Vanhove 2015). Moreover, the stressor load (i.e. number of experienced stressors) might vary between groups. As populations at a greater risk of experiencing stress or with a higher stressor load could require more resilience factors to overcome adversities, they might profit more from resilience training programmes.

Why it is important to do this review

To date, two systematic reviews (Macedo 2014; Robertson 2015) and two meta-analyses (Leppin 2014; Vanhove 2015) have investigated the efficacy of resilience interventions in adults, each concluding that resilience interventions can improve personal resilience, mental health and performance.

However, all four publications suffer from methodological weaknesses, which the present review seeks to address. Each publication focused on different aspects of resilience training, using different definitions of resilience, different samples and settings, as well as different inclusion and exclusion criteria for studies. Each review varies in the extent to which it describes the search strategy used, and the reporting of 'Risk of bias' assessments also differs for those studies that are common amongst the publications (Leppin 2014; Macedo 2014; Robertson 2015). One review reports no 'Risk of bias' assessment (Vanhove 2015). The absence of a published protocol for these reviews also reduces the transparency and comparability in the reviews' procedures, leads to possible biases and potentially restricts the evidence found. In addition, to date, only Leppin 2014 and Vanhove 2015 were able to perform a meta-

analysis, whereby Vanhove 2015 focused on resilience-building programmes for the workplace only.

In the present review, we are particularly interested in psychological resilience interventions offered to clinical as well as to non-clinical populations in different contexts (i.e. the workplace as well as a student or military context). The interventions have to be scientifically founded, that is, they have to address one or more of the resilience factors stated above that are known to be associated with resilience in adults according to current state of research (compare Appendix 1; level 1). In addition, the trained population has to fulfil the condition of stress or trauma exposure (concept implication of resilience), in order to clearly distinguish genuine resilience interventions from other interventions focused on fostering associated constructs such as mental health (Windle 2011a). Since resilience as a prevention concept is highly up-to-date, and there is increasing interest worldwide in promoting mental health and preventing disease (WHO 1986; WHO 2004), the present review will provide further and more detailed evidence on which interventions are most likely to foster resilience and to prevent stress-related mental health problems. In this way, practitioners as well as policy makers will profit from the present work.

OBJECTIVES

To assess the effects of resilience-enhancing interventions in clinical and non-clinical populations.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCT), including cluster-randomised trials.

Types of participants

Adults aged 18 years and older, irrespective of employment or health status, who have been exposed to stress or trauma in the past, or who are facing substantial stress or trauma currently or will be in the future (see Data synthesis).

We will include studies involving participants less than 18 years of age, as well as those aged 18 years and older, if data for participants aged 18 years and above are reported separately or can be obtained by contacting the study authors.

Types of interventions

Any psychological resilience intervention, irrespective of content, duration, setting or delivery model.

For the purpose of this review, psychological resilience interventions are defined as follows: interventions focused on fostering resilience or the related concepts of hardiness or post-traumatic growth by strengthening well-evidenced resilience factors that are thought to be modifiable by training (see above and Appendix 1; level 1).

We will only consider studies on pharmacological (e.g. treatment with antidepressants) and physical (e.g. exercise) interventions, as well as relaxation techniques (e.g. progressive muscle relaxation), if these interventions are part of psychological resilience training. We will not include studies that merely examine the efficacy of disorder-specific psychotherapy (e.g. cognitive behavioural therapy for depression). We will include broader, health-promoting interventions (e.g. well-being therapy) providing they focus on resilience and they address any of the resilience factors described above.

Types of outcome measures

Due to the different ways in which resilience has been operationalised, as well as the possible inclusion of broader, health-promoting interventions, resilience as an intervention outcome cannot always be guaranteed in trials. Therefore, we will also define assessments on psychological adaptation (e.g. mental health) as primary outcomes.

Secondary outcomes include a range of psychological factors associated with resilience according to the current state of knowledge that are selected based on conceptual clarity and measurability (level 1a and 1b; see Appendix 1). We may include additional secondary outcomes after the full literature review has been conducted.

Measures for the assessment of psychological resilience and psychological adaptation as well as resilience factors are specified on the basis of previous reviews on resilience interventions (Leppin 2014; Macedo 2014; Robertson 2015; Vanhove 2015) and reviews on resilience measurements (Pangallo 2015; Windle 2011b) (see Appendix 3, Appendix 4, Appendix 5, respectively). We will examine the influence of the differing underlying concept in resilience scales in a sensitivity analysis (intervention outcome versus personality characteristic) (see Sensitivity analysis).

We will consider self-rated and observer- or clinician-rated measures as well as study outcomes at all time frames. The missing reporting of the above described primary or secondary outcomes is not an exclusion criterion in this review.

Primary outcomes

- Resilience*, as measured by improvements in specific resilience scales (Bengel 2012; Earvolino-Ramirez 2007; Pangallo

2015; Windle 2011b) such as the Resilience Scale for Adults (Friborg 2003).

- Mental health and well-being, subsumed into the categories below, and as measured by improvements in the respective assessment scales such as the Depression Anxiety and Stress Scale (DASS-21) (Lovibond 1995) (see Appendix 4 for further examples).
    - Anxiety*.
    - Depression*.
    - Stress or stress perception*.
    - Well-being or quality of life* (e.g. well-being, life satisfaction, (health-related) quality of life, vitality, vigour).

Secondary outcomes

- Resilience factors* (e.g. Bengel 2012; Haglund 2007; Iacoviello 2014; Southwick 2005; Southwick 2012; Wu 2013), whenever they are available as outcomes, as assessed by an increase in the respective instruments (e.g. Life Orientation Test - Revised (LOT-R); Scheier 1994) (for further examples see Appendix 5).
    - Social support.
    - Optimism.
    - Self-efficacy.
    - Active coping.
    - Self-esteem.
    - Hardiness[1].
    - Positive emotions.

We will extract and report secondary outcomes whenever they are assessed. If possible, we will calculate and report effect sizes.
We will note any adverse outcomes reported in a trial. Where data are available, we will use outcomes marked by an asterisk (*) to generate a 'Summary of findings' table. In case of insufficient information, we will provide a narrative description of the evidence.
[1]Although hardiness is often used as synonym for resilience in the literature, we will conceptualise it as resilience factor (see Appendix 1).

Search methods for identification of studies

Electronic searches

We will retrieve relevant trials from the electronic sources listed below.

- Cochrane Central Register of Controlled Trials (CENTRAL; current issue) in the Cochrane Library, which includes the Cochrane Developmental, Psychosocial and Learning Problems Specialised Register.
- MEDLINE Ovid (1946 to present).
- Embase Ovid (1980 to present).
- PsycINFO EBSCOhost (1840 to present).
- CINAHL EBSCOhost (Cumulative Index to Nursing and Allied Health Literature; 1981 to present).
- PSYNDEX EBSCOhost (1977 to present).
- Science Citation Index Web of Science (SCI; 1970 to present).
- Social Science Citation Index Web of Science (SSCI; 1970 to present).
- Conference Proceedings Citation Index - Social Science & Humanities Web of Science (CPCI-SSH; 1990 to present).
- Conference Proceedings Citation Index - Science Web of Science (CPCI-S; 1990 to present).
- International Bibliography of the Social Sciences ProQuest (IBSS; 1951 to present).
- Applied Social Sciences Index & Abstracts ProQuest (ASSIA; 1987 to present).
- ProQuest Dissertations & Theses (PQDT; 1743 to present).
- *Cochrane Database of Systematic Reviews* (CDSR; current issue) in the Cochrane Library.
- Database of Abstracts of Reviews of Effects (DARE; current issue) in the Cochrane Library.
- Epistemonikos (epistemonikos.org; all available years).
- ERIC EBSCOhost (Education Resources Information Center Institute of Education Sciences; 1966 to present).
- Current Controlled Trials (controlled-trials.com; all available years).
- ClinicalTrials.gov (clinicaltrials.gov; all available years).
- World Health Organization International Clinical Trials Registry Platform (WHO ICTRP; who.int/trialsearch; all available years).

The search strategy for MEDLINE is presented in Appendix 6, and we will adapt the search terms and syntax for other databases. We will not restrict the searches to language, publication status or publication format. We will limit our search to the period 1 January 1990 to present, to account for the fact that the resilience concept and its operationalisation have developed significantly over the past decades (Fletcher 2013; Hu 2015; Kalisch 2015; Pangallo 2015). Because of the lack of homogeneity for the period 1990 to 2014 (Robertson 2015), it is likely that using a broader time frame would make it even more difficult to detect resilience-training studies with similar resilience concepts and assessments. Moreover, it appears plausible to concentrate on the period 1990 to present since the idea of resilience as an outcome and modifiable process only emerged in recent years, and paved the way for the development of resilience-promoting interventions (Bengel 2009; Southwick 2011). Therefore, the idea of promoting resilience by specific training is relatively new (Leppin 2014), which can also be seen in the review of Macedo 2014, who searched for studies on resilience-enhancing interventions every year until 2013 but only found RCTs published after 1990.
As resilience-training programmes should be adapted to scientific

findings on a regular basis, and with the current research focusing on the detection of general resilience mechanisms (Kalisch 2015; Luthar 2000), the last two years will be especially important in synthesising the evidence on newly developed resilience training.

Searching other resources

In addition to the electronic search, we will inspect the reference lists of all identified RCTs and reviews, and contact researchers in the field as well as the authors of selected trials to check if there are any unpublished or ongoing studies. If data are missing or unclear, we will contact the respective author. We will also search for grey literature (for example, conference proceedings) in appropriate databases (see Electronic searches).

Data collection and analysis

Selection of studies

Two review authors (AK, IH) will independently screen titles and abstracts in order to determine eligible studies. Clearly irrelevant papers will be excluded immediately. At full-text level, eligibility will be also inspected in duplicate by the same two review authors (AK, IH) working independently. We will calculate inter-rater reliability at both stages of screening (title and abstract screening and full-text screening). We will record our decisions in a PRISMA flow diagram (Moher 2009).

We will assess the feasibility of the selection criteria a priori by screening a small number (50) of studies in order to attain acceptable inter-rater reliability. In case screening results in poor feasibility of the eligibility criteria, we will revise the criteria based on a mutual team discussion.

Data extraction and management

We will develop a data extraction sheet (Appendix 7), based on Cochrane guidelines (Higgins 2011c), and test it on 10 randomly-selected included studies. If the initial test of the data extraction sheet fails (e.g. insufficient agreement between review authors AK and IH), we will adapt the extraction sheet on the basis of a mutual team discussion. Review authors AK and IH will independently extract the data in duplicate. The extraction sheet will contain the following aspects: source and eligibility, study methods (e.g. design), allocation process, participant characteristics, interventions and comparators, outcomes and assessment instruments (means and standard deviations in any standardised scale), results and miscellaneous aspects. Both review authors will resolve any disagreements in data collection by discussion; where they cannot reach a consensus, a third review author (AC or KL) will arbitrate. If necessary, we will contact the study authors to seek additional information.

Assessment of risk of bias in included studies

Two review authors (AK, IH) will independently assess the risk of bias of the included studies. We will check the risk of bias for each trial using the criteria presented in the *Cochrane Handbook for Systematic Reviews of Interventions*, hereafter referred to as the Cochrane*Handbook* (Higgins 2011d) (see Appendix 8). Any disagreements will be resolved by discussion or by consulting a third review author. In accordance with Cochrane's tool for assessing risk of bias (Higgins 2011b), we will critically assess the following domains: sequence generation and allocation concealment (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), and selective outcome reporting (reporting bias). In the first part of the assessment, we will describe what was reported to have happened in the study for each domain before assigning a judgment regarding the risk of bias (low, high or unclear) for that entry.

Measures of treatment effect

Dichotomous data

We will analyse dichotomous outcomes by calculating the risk ratio (RR) of a successful outcome (i.e. improvement in relevant variables) for each trial. We will express uncertainty in each result using 95% confidence intervals (CIs).

Continous data

Because it is unlikely that most resilience-training studies use the same measurement scale to assess resilience and related constructs (Leppin 2014; Macedo 2014; Robertson 2015), we will use standardised mean difference (SMD) effect sizes (Cohen's d) and their 95% CIs for continuous data in pair-wise meta-analysis. We will calculate effect sizes on the basis of means, standard deviations and sample sizes for each trial condition. In case respective data are not provided, we will compute Cohen's d from alternative statistics (e.g. t test).

Unit of analysis issues

Cluster-randomised trials

As allocation of individuals to different conditions in resilience intervention studies partly occurs by groups (e.g. work sites, army platoons), we intend to include cluster-randomised trials along with individually-randomised trials. If the clustering is ignored and the unit of analysis is different from the unit of allocation ('unit-of-analysis error') (Whiting-O'Keefe 1984), P values may be artificially small and result in false positive conclusions (Higgins

2011e). Therefore, we will account for the clustering in the data and follow the recommendations given in the literature (Higgins 2011e; White 2005). For those cluster-randomised trials that do not report correct standard errors, we will first try to recover correct standard errors by applying the usual formula for the variance inflation factor 1 + (M - 1) ICC, where M is the average cluster size and ICC the intracluster correlation coefficient (Higgins 2011e). If it is not possible to extract ICC values from the study, we will use the ICC of all cluster-randomised trials in our review that investigate the same primary outcome scale in a similar setting. If this is not available, we use the average ICC of all other cluster-randomised trials in our review. If no such studies are available, we will use ICC = 0.05 as a mildly conservative guess for the primary analysis, and add a sensitivity analysis using ICC = 0.10. We will conduct sensitivity analyses based on the unit of randomisation as well as the ICC estimate in cluster-randomised trials (see Sensitivity analysis).

Repeated observations on participants

If there are longitudinal designs with repeated observations on participants, we will define several outcomes based on different periods of follow-up and conduct separate analyses, as recommended in the *Cochrane Handbook* (Higgins 2011e). One analysis will include all studies with measurement at the end of intervention (post-test), other analyses will be based on the period of follow-up (short-term: three months or less; medium-term: more than three to six months; and long-term follow-up: more than six months).

Studies with multiple treatment groups

If selected studies contain more than two intervention groups, two review authors will determine which group is relevant to the systematic review and the particular meta-analysis based on the inclusion criteria for interventions (see Types of interventions). In case multiple groups in a study are relevant, we will account for the correlation between the effect sizes from multi-arm studies in a pair-wise meta-analysis (Higgins 2011e).

We will formally treat each comparison between a control group and a treatment group as an independent study. We will multiply the standard errors of the effect estimates by an adjustment factor to account for correlation between effect estimates. In doing so, we acknowledge heterogeneity between different treatment groups. If there is an adequate evidence base, we will consider performing a network meta-analysis (see Data synthesis).

Dealing with missing data

If there are missing data within the RCTs, we will contact the original researchers to provide the missing information (e.g. outcome data). We will compute missing standard deviations of continuous outcomes on the basis of other statistical information (e.g. CIs, standard errors, t values, P values, F values) (Higgins 2011e).

If standard deviations can neither be recovered from reported results nor obtained from the authors, we will consider single imputation by the means of pooled within-treatment standard deviations from all other studies, providing less than five studies have missing standard deviations. If more than five studies have missing standard deviations, we will perform multiple imputation on the basis of the hierarchical model fitted to the non-missing standard deviations. We expect to find enough information in all papers to restore standard deviations from the reported results.

We will record missing data and attrition levels for each included trial in the 'Risk of bias' tables (beneath the 'Characteristics of included studies' tables). Moreover, we will conduct a sensitivity analysis to examine the consequences of excluding trials with high levels of missing data on the conclusions of the review (see Sensitivity analysis).

Assessment of heterogeneity

We will assess the presence of clinical heterogeneity by comparing the trial and study population characteristics across all eligible trials (e.g. by generating descriptive statistics). In accordance with the *Cochrane Handbook* (Deeks 2011), we will explore if studies are sufficiently homogenous in terms of participant characteristics, interventions and outcomes.

We will assess methodological diversity by inspecting included studies for variability in study design and risk of bias. In accordance with previous reviews, which have already described the great heterogeneity in resilience intervention studies (Leppin 2014; Macedo 2014; Robertson 2015; Vanhove 2015), we will also discuss different forms of diversity in full in our review.

To assess statistical heterogeneity between included trials within each pair-wise meta-analysis (i.e. heterogeneity in observed treatment effects that exceeds sampling error alone), we will rely on forest plots, Chi^2 test, tau^2 statistic and I^2 statistic, as suggested by Deeks 2011. In addition, we will consider G^2, to take small-study effects into account (Rücker 2011). Significant statistical heterogeneity will be indicated by a P value on the Chi^2 test lower than 0.10. Since resilience-training studies are often conducted with relatively small sample sizes (e.g. Loprinzi 2011; Sood 2014), we acknowledge that the Chi^2 test has only limited power in such cases. The I^2 is a descriptive statistic, which equally reflects the percentage of total variation across studies that is due to heterogeneity rather than chance. In accordance with the guidelines of Deeks 2011, we will suppose substantial heterogeneity if an I^2 is greater than 50%. G^2 indicates the proportion of unexplained variance, after having allowed for possible small-study effects (Rücker 2011). No statistical heterogeneity is indicated by a G^2 near zero.

Assessment of reporting biases

We will assess potential publication bias by inspecting funnel plots (plotting the effect estimates of trials against their standard errors on reversed scales) (Sterne 2011). We acknowledge the fact

that funnel plot asymmetry does not necessarily reflect publication bias, but can stem from a number of reasons (Sterne 2011). To differ between real asymmetry and chance, we will follow the recommendations in Sterne 2011 and use Egger's test (Egger 1997) to test for funnel plot asymmetry, providing there are at least 10 studies included in the meta-analysis.

Data synthesis

We will synthesise results by describing the resilience interventions, their theoretical concept (when possible), as well as the populations and outcomes studied. We will summarise results in narrative and tabular form. We will perform statistical analyses either in RevMan 2014 or R (R 3.2.2 2015), when appropriate. We will attempt to combine the outcome measures of trials through a pair-wise meta-analysis (any resilience training versus control), in order to determine summary (pooled) intervention effects of resilience-training programmes. The decision to summarise numerical results of RCTs in a pair-wise meta-analysis will depend on the number of studies found as well as the heterogeneity of included trials with regard to content or components of resilience interventions, outcomes measured as well as the methodological quality (risk of bias) of selected studies. If intervention studies differ excessively regarding their content, outcomes are too diverse or individual studies are predominantly at high risk of bias, we will not perform a meta-analysis.

In case a trial reports more than one resilience scale, we will use the scale with better psychometric qualities (as specified in Appendix 3) to calculate effect sizes. If a study reports results for more than one instrument for mental health and well-being outcomes or for a specific resilience factor, we will select the measure used most often among included studies to calculate effect sizes. In case a study provides data of two instruments used equally frequently in the included RCTs, two review authors (AK, IH) will identify the appropriate measure through discussion (compare Stoffers 2013). For interventions conducted as preparation for a pre-defined upcoming stressor or trauma (e.g. military deployment), the stress exposure has to be finished when intervention outcomes are assessed (post-test or follow-up) or the stress exposure has to be simulated (e.g. scenarios, video simulation, laboratory stress test) in order to include these studies in the meta-analysis. This guarantees that the study can be considered as the evaluation of a resilience training and not an intervention fostering related constructs such as mental health.

Since we expect a certain degree of heterogeneity between trials, as indicated by the results of previous reviews (Leppin 2014; Macedo 2014; Robertson 2015), we intend to perform a random-effects, pair-wise meta-analysis using an inverse variance approach, specifically the restricted maximum likelihood method (Veroniki 2015), which is implemented in R (Schwarzer 2015; Viechtbauer 2010). As part of our sensitivity analyses, we will perform both fixed-effect and random-effects analyses (see Sensitivity analysis).

Once we have produced a summary of the evidence to date, and only if a pair-wise meta-analysis (any resilience training versus control) is possible, we will examine if data are also suitable for a network meta-analysis (NMA). Network meta-analyses will be merely exploratory and will only be conducted if the review results in a sufficient and adequate evidence base.

Network meta-analyses offer the possibility of comparing multiple treatments simultaneously (Caldwell 2005). They combine both direct (head-to-head) and indirect evidence (Caldwell 2005; Mills 2012), by using direct comparisons of interventions within RCTs, as well as indirect comparisons across trials on the basis of a common reference group (e.g. an identical control group) (Li 2011). Up to now, a network meta-analysis on resilience-training programmes does not exist.

According to Mills 2012, Linde 2016 and the *Cochrane Handbook* (Higgins 2011e), there are three important conditions for the conduction of NMAs (transitivity, homogeneity, consistency). If a NMA is possible (i.e. the three conditions are fulfilled), we will conduct an analysis - with expert statistical support as suggested by Cochrane (Higgins 2011e) - using a frequentist approach in R (Rücker 2015; Viechtbauer 2015). For sensitivity analyses, the same models will be fitted by the restricted maximum likelihood method (Piepho 2012; Piepho 2014; Rücker 2015). We will consider categorising resilience training into seven groups, based on the underlying training concept: (1) cognitive behavioural therapy, (2) acceptance and commitment therapy, (3) mindfulness-based therapy, (4) attention and interpretation therapy, (5) problem-solving therapy, (6) stress inoculation therapy and (7) multimodal resilience training. We may include additional groups after the full literature search has been conducted. Reference groups that will possibly be included in the network meta-analysis are: attention control, wait-list, treatment as usual or no intervention. We will investigate inconsistency and flow of evidence in accordance with recommendations in the literature (e.g. Dias 2008; Higgins 2011a; König 2013; Krahn 2013; Krahn 2014; Lu 2006; Lumley 2002; Rücker 2015; Salanti 2008; White 2012a).

Summary of findings

In the review, we will create a 'Summary of findings' table per comparison using the software developed by the GRADE Working Group: GRADEpro: Guideline Development Tool (GRADEpro GDT 2015). To create the table, we will consider the comparison between resilience-training programmes and control group. We will include in the 'Summary of findings' table all primary outcomes (resilience, anxiety, depression, stress or stress perception, well-being or quality of life). Depending on the assessment of heterogeneity and possible effect modifiers (see Subgroup analysis and investigation of heterogeneity), we will create several 'Summary of findings' tables, for example, with regard to the clinical status of study populations or the comparator group. We will assess the quality of the body of evidence using the GRADE ap-

proach proposed by the GRADE working group (Schünemann 2011; Schünemann 2013).

We will assess the quality of the evidence using the five GRADE considerations: limitations in the design and implementation of available studies (i.e. high risk of bias of studies contributing to the respective outcome), indirectness of evidence (i.e. indirect population, intervention, control, outcomes), unexplained heterogeneity or inconsistency of results (i.e. heterogeneity exists but the subgroup analyses fail to identify a plausible explanation), imprecision of results (i.e. wide CIs) and high probability of publication bias (i.e. high risk of selective outcome reporting bias for studies contributing to the outcome) (Schünemann 2011). The quality assessment will be performed in duplicate, by two review authors (AK, IH), working independently. They will resolve any disagreements by discussion or by consulting a third review author.

Subgroup analysis and investigation of heterogeneity

If substantial heterogeneity is detected, we will examine characteristics of studies that may be associated with this diversity (Deeks 2011). The selection of potential effect modifiers is based on experiences from previous reviews (Leppin 2014; Robertson 2015; Vanhove 2015). We plan to perform the following subgroup analyses:

- setting of resilience interventions (group setting versus individual setting versus combined setting);
- delivery format of resilience interventions (face-to-face versus online versus bibliotherapy versus multimodal delivery);
- target group of resilience-training programmes (employees versus patient populations versus military or police versus general population)[3];
- theoretical foundation of resilience-training programmes (cognitive behavioural therapy versus acceptance and commitment therapy versus mindfulness-based therapy versus attention and interpretation therapy versus problem-solving training versus stress inoculation versus multimodal resilience training)[3]; and
- comparator group in intervention studies (attention control versus wait-list control versus treatment as usual versus no intervention).

We will only conduct subgroup analyses if we identify 10 or more studies in the review process (Deeks 2011). Moreover, we will restrict the subgroup analyses to our primary outcomes.

[3]We will provide details in the 'Differences between protocol and review' section of the review if the literature search reveals further relevant groups.

Sensitivity analysis

Comparable to the planned subgroup analyses, we will perform sensitivity analyses on the condition that more than 10 RCTs are included in the review. We will also restrict the sensitivity analyses to the primary outcomes.

With regard to intervention studies assessing resilience via resilience scales, we will perform a sensitivity analysis on the basis of the underlying concept (state versus trait) in these measures and limit the analysis to scales assessing resilience as an outcome of an intervention.

In order to examine the impact of the risk of bias of included trials, we will limit the studies to be included in the sensitivity analysis to those whose risk of bias was rated as low or unclear. We will exclude studies assessed at high risk of bias. For studies with low or unclear risk of bias, we will conduct subgroup analyses.

We also plan to consider the restriction to registered studies. We will identify registration both by recording whether we found a study in a trial registry and by noting whether the author claimed to have registered it.

We will perform sensitivity analyses moreover by limiting analysis to those studies with low levels of missing data (less than 10% missing primary outcome). With regards to coping with missing data, we will limit the analysis to studies where missing data were imputed or accounted for by fitting a model for longitudinal data, or where the proportion of missing primary outcome data was less than 10%.

In addition, we intend to check the robustness of our findings, by performing both fixed-effect and random-effects analyses in our sensitivity analyses.

We also plan to perform sensitivity analyses based on the ICC estimate in cluster-randomised trials without adjustment for clustering by excluding cluster-RCTs where standard errors were not corrected or corrected only on the basis of an externally-estimated ICC. In an additional sensitivity analysis, we will replace all externally-estimated ICCs that were less than 0.10, by 0.10.

Finally, we will conduct a sensitivity analysis with regard to the unit of randomisation by limiting the analysis to individually-randomised trials.

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REFERENCES

Additional references

Abbott 2009
Abbott JA, Klein B, Hamilton C, Rosenthal A. The impact of online resilience training for sales managers on wellbeing and performance. *Journal of Applied Psychology* 2009;**5**(1): 89–95. [DOI: 10.7790/ejap.v5i1.145]

Abel 2002a
Abel MH. Humor, stress, and coping strategies. *Humor: International Journal of Humor Research* 2002;**15**(4):365-81. [DOI: 10.1515/humr.15.4.365]

Abel 2002b
Abel MH, Maxwell D. Humor and affective consequences of a stressful task. *Journal of Social and Clinical Psychology* 2002;**21**(2):165–90. [DOI: 10.1521/jscp.21.2.165.22516]

Ahern 2004
Ahern J, Galea S, Fernandez WG, Koci B, Waldman R, Vlahov D. Gender, social support, and posttraumatic stress in postwar Kosovo. *Journal of Nervous and Mental Disease* 2004;**192**(11):762–70. [PUBMED: 15505520]

Ahmad 2010
Ahmad S, Feder A, Lee EJ, Wang Y, Southwick SM, Schlackman E, et al. Earthquake impact in a remote South Asian population: psychosocial factors and posttraumatic symptoms. *Journal of Traumatic Stress* 2010;**23**(3):408–12. [DOI: 10.1002/jts.20535; PUBMED: 20564375]

Al-Yagon 2009
Al-Yagon M, Margalit M. Positive and negative affect among mothers of children with intellectual disabilities. *British Journal of Developmental Disabilities* 2009;**55**(2): 109–27. [DOI: 10.1179/096979509799103070]

Alessandri 2007
Alessandri G, Vecchio GM, Steca P, Caprara MG, Caprara GV. A revised version of Kremen and Block's Ego Resiliency Scale in an Italian sample. *Testing, Psychometrics, Methodology in Applied Psychology* 2007;**14**(3-4):165–83.

Alexander 2001
Alexander DA. Ambulance personnel and critical incidents: impact of accident and emergency work on mental health and emotional well-being. *British Journal of Psychiatry* 2001; **178**(1):76–81. [PUBMED: 11136215]

Alim 2008
Alim TN, Feder A, Graves RE, Wang Y, Weaver J, Westphal M, et al. Trauma, resilience, and recovery in a high-risk African-American population. *American Journal of Psychiatry* 2008;**165**(12):1566–75. [PUBMED: 19015233]

Allart 2013
Allart P, Soubeyran P, Cousson-Gélie F. Are psychosocial factors associated with quality of life in patients with haematological cancer? A critical review of the literature. *Psycho-oncology* 2013;**22**(2):241–9. [DOI: 10.1002/pon.3026; PUBMED: 22287503]

Andrew 2008
Andrew ME, McCanlies EC, Burchfiel CM, Charles LE, Hartley TA, Fekedulegn D, et al. Hardiness and psychological distress in a cohort of police officers. *International Journal of Emergency Mental Health* 2008;**10** (2):137–47. [PUBMED: 18788348]

Aniţei 2012
Aniţei M, Chraif M, Chiriac G. Resilience to stress evidence-based improvements in integrative psychotherapy working groups. *Procedia - Social and Behavioral Sciences* 2012;**33**:1042–6. [DOI: 10.1016/j.sbspro.2012.01.281]

Ano 2005
Ano GG, Vasconcelles EB. Religious coping and psychological adjustment to stress: a meta-analysis. *Journal of Clinical Psychology* 2005;**61**(4):461–80. [DOI: 10.1002/jclp.20049; PUBMED: 15503316]

Antonovsky 1979
Antonovsky A. *Health, Stress and Coping: New Perspectives on Mental and Physical Well-being*. San Francisco: Jossey-Bass, 1979.

Arnetz 1985
Arnetz B, Fjellner B, Eneroth P, Kallner A. Stress and psoriasis: psychoendocrine and metabolic reactions in psoriatic patients during standardized stressor exposure. *Psychosomatic Medicine* 1985;**47**(6):528-41. [PUBMED: 4070523]

Atal 2016
Atal S, Cheng C. Socioeconomic health disparities revisited: coping flexibility enhances health-related quality of life for individuals low in socioeconomic status. *Health and Quality of Life Outcomes* 2016;**14**:7. [DOI: 10.1186/s12955-016-0410-1; PMC4709869; PUBMED: 26758624]

Atri 2007a
Atri A. *Role of Social Support, Hardiness and Acculturation as Predictors of Mental Health Among the International Students of Asian Indian Origin in Ohio [MS thesis]*. Cincinnati (OH): University of Cincinnati, 2007.

Atri 2007b
Atri A, Sharma M, Cottrell R. Role of social support, hardiness, and acculturation as predictors of mental health among international students of Asian Indian origin. *International Quarterly of Community Health Education* 2007;**27**(1):59–73. [DOI: 10.2190/IQ.27.1.e; PUBMED: 18039629]

Bailey 2013
Bailey A, Sharma M, Jubin M. The mediating role of social support, cognitive appraisal, and quality health care in black mothers' stress-resilience process following loss to gun violence. *Violence and Victims* 2013;**28**(2):233–47. [PUBMED: 23763109]

Barry 2003

Barry LC, Guo Z, Kerns RD, Duong BD, Reid MC. Functional self-efficacy and pain-related disability among older veterans with chronic pain in a primary care setting. *Pain* 2003;**104**(1-2):131–7. [DOI: 10.1016/S0304-3959(02)00471-2; PUBMED: 12855322]

Bartone 1989

Bartone PT, Ursano RJ, Wright KM, Ingraham LH. The impact of a military air disaster on the health of assistance workers: a prospective study. *Journal of Nervous and Mental Disease* 1989;**177**(6):317–28. [PUBMED: 2723619]

Bauer-Wu 2005

Bauer-Wu S, Farran CJ. Meaning in life and psycho-spiritual functioning: a comparison of breast cancer survivors and healthy women. *Journal of Holistic Nursing* 2005;**23**(2):172–90. [DOI: 10.1177/0898010105275927; PUBMED: 15883465]

Beck 1961

Beck AT, Ward CH, Mendelson M, Mock J, Erbaugh J. An inventory for measuring depression. *Archives of General Psychiatry* 1961;**4**(6):561–71. [PUBMED: 13688369]

Beck 1964

Beck AT. Thinking and depression. II. Theory and therapy. *Archives of General Psychiatry* 1964;**10**(6):561–71. [DOI: 10.1001/archpsyc.1964.01720240015003; PUBMED: 14159256]

Beck 1976

Beck AT. *Cognitive Therapy and the Emotional Disorders*. New York (NY): International Universities Press, 1976.

Beck 1993

Beck AT, Steer RA. *Beck Anxiety Inventory Manual*. San Antonio (TX): Psychological Corporation, 1993.

Beck 1996

Beck AT, Steer RA, Brown G. *Manual for the Beck Depression Inventory-II*. San Antonio (TX): Psychological Corporation, 1996.

Beck 2011

Beck JS. *Cognitive Behavior Therapy. Basics and Beyond*. Second Edition. New York (NY): The Guilford Press, 2011.

Bekki 2013

Bekki JM, Smith ML, Bernstein BL, Harrison C. Effects of an online personal resilience training program for women in stem doctoral programs. *Journal of Women and Minorities in Science and Engineering* 2013;**19**(1):17–35. [DOI: 10.1615/JWomenMinorScienEng.2013005351]

Bengel 2009

Bengel J, Meinders-Lücking F, Rottmann N. *Schutzfaktoren bei Kindern und Jugendlichen: Stand der Forschung zu Psychosozialen Schutzfaktoren für Gesundheit*. Köln: BzgA, 2009.

Bengel 2012

Bengel J, Lyssenko L. *Resilienz und Psychologische Schutzfaktoren im Erwachsenenalter*. Köln: BzgA, 2012.

Benjamin 2011

Benjamin CL, Puleo CM, Settipani CA, Brodman DM, Edmunds JM, Cummings CM, et al. History of cognitive-behavioral therapy in youth. *Child and Adolescent Psychiatric Clinics of North America* 2011;**20**(2):179–89. [DOI: 10.1016/j.chc.2011.01.011; PMC3077930; PUBMED: 21440849]

Bernas 2000

Bernas KH, Major DA. Contributors to stress resistance: testing a model of women's work-family conflict. *Psychology of Women Quarterly* 2000;**24**(2):170–8. [DOI: 10.1111/j.1471-6402.2000.tb00198.x]

Besser 2014

Besser A, Weinberg M, Zeigler-Hill V, Neria Y. Acute symptoms of posttraumatic stress and dissociative experiences among female Israeli civilians exposed to war: the roles of intrapersonal and interpersonal sources of resilience. *Journal of Clinical Psychology* 2014;**70**(12):1227–39. [DOI: 10.1002/jclp.22083; PUBMED: 24619400]

Bjørkløf 2013

Bjørkløf GH, Engedal K, Selbæk G, Kouwenhoven SE, Helvik AS. Coping and depression in old age: a literature review. *Dementia and Geriatric Cognitive Disorders* 2013;**35**(3-4):121–54. [DOI: 10.1159/000346633; PUBMED: 23392253]

Blackburn 2015

Blackburn L, Owens GP. The effect of self efficacy and meaning in life on posttraumatic stress disorder and depression severity among veterans. *Journal of Clinical Psychology* 2015;**71**(3):219–28. [DOI: 10.1002/jclp.22133; PUBMED: 25270887]

Block 1996

Block J, Kremen AM. IQ and ego-resiliency: conceptual and empirical connections and separateness. *Journal of Personality and Social Psychology* 1996;**70**(2):349–61. [PUBMED: 8636887]

Bonanno 2004

Bonanno GA, Papa A, Lalande K, Westphal M, Coifman K. The importance of being flexible: the ability to both enhance and suppress emotional expression predicts long-term adjustment. *Psychological Science* 2004;**15**(7):482–7. [DOI: 10.1111/j.0956-7976.2004.00705.x; PUBMED: 15200633]

Bonanno 2011

Bonanno GA, Pat-Horenczyk R, Noll J. Coping flexibility and trauma: The Perceived Ability to Cope With Trauma (PACT) scale. *Psychological Trauma: Theory, Research, Practice, and Policy* 2011;**3**(2):117–29. [DOI: 10.1037/a0020921]

Bonanno 2013

Bonanno GA, Diminich ED. Annual Research Review: positive adjustment to adversity--trajectories of minimal-impact resilience and emergent resilience. *Journal of Child Psychology and Psychiatry, and Allied Disciplines* 2013;**54**(4):378–401. [DOI: 10.1111/jcpp.12021; PMC3606676; PUBMED: 23215790]

Bookwala 2014

Bookwala J. Spouse health status, depressed affect, and resilience in mid and late life: a longitudinal study. *Developmental Psychology* 2014;**50**(4):1241–9. [DOI: 10.1037/a0035124; PUBMED: 24364828]

Brandt 1981

Brandt PA, Weinert C. The PRQ - a social support measure. *Nursing Research* 1981;**30**(5):277–80. [PUBMED: 7027186]

Bromley 2006

Bromley E, Johnson JG, Cohen P. Personality strengths in adolescence and decreased risk of developing mental health problems in early adulthood. *Comprehensive Psychiatry* 2006; **47**(4):315–24. [DOI: 10.1016/j.comppsych.2005.11.003; PUBMED: 16769307]

Brooks 2003

Brooks MV. Health-related hardiness and chronic illness: a synthesis of current research. *Nursing Forum* 2003;**38**(3): 11–20. [PUBMED: 14603637]

Burton 2012

Burton CL, Yan OH, Pat-Horenczyk R, Chan IS, Ho S, Bonanno GA. Coping flexibility and complicated grief: a comparison of American and Chinese samples. *Depression and Anxiety* 2012;**29**(1):16–22. [DOI: 10.1002/da.20888; PMC3242921; PUBMED: 21898713]

Butler 2009

Butler LD, Koopman C, Azarow J, Blasey CM, Magdalene JC, DiMiceli S, et al. Psychosocial predictors of resilience after the September 11, 2001 terrorist attacks. *Journal of Nervous and Mental Disease* 2009;**197**(4):266–73. [DOI: 10.1097/NMD.0b013e31819d9334; PUBMED: 19363383]

Caldwell 2005

Caldwell DM, Ades AE, Higgins JPT. Simultaneous comparison of multiple treatments combining direct and indirect evidence. *BMJ* 2005;**331**:897–900. [DOI: 10.1136/bmj.331.7521.897]

Campbell-Sills 2007

Campbell-Sills L, Stein MB. Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): validation of a 10-item measure of resilience. *Journal of Traumatic Stress* 2007;**20**(6):1019–28. [DOI: 10.1002/jts.20271; PUBMED: 18157881]

Carver 1997

Carver CS. You want to measure coping but your protocol's too long: consider the brief COPE. *International Journal of Behavioural Medicine* 1997;**4**(1):92–100. [DOI: 10.1207/s15327558ijbm0401_6; PUBMED: 16250744]

Carver 2010

Carver CS, Scheier MF, Segerstrom SC. Optimism. *Clinical Psychology Review* 2010;**30**(7):879–89. [DOI: 10.1016/j.cpr.2010.01.006; NIHMS174994; PMC4161121; PUBMED: 20170998]

Casale 2013

Casale M, Wild L. Effects and processes linking social support to caregiver health among HIV/AIDS-affected carer-child dyads: a critical review of the empirical evidence. *AIDS and Behavior* 2013;**17**(5):1591–611. [DOI: 10.1007/s10461-012-0275-1; PUBMED: 22878789]

Chen 2004

Chen G, Goddard TG, Casper WJ. Examination of the relationships among general and work-specific self-evaluations, work-related control beliefs, and job attitudes. *Applied Psychology* 2004;**53**(3):349–70. [DOI: 10.1111/j.1464-0597.2004.00175.x]

Cheng 2014

Cheng C, Lau HP, Chan MP. Coping flexibility and psychological adjustment to stressful life changes: a meta-analytic review. *Psychological Bulletin* 2014;**140** (6):1582–607. [DOI: 10.1037/a0037913; PUBMED: 25222637]

Chesney 2003

Chesney MA, Chambers DB, Taylor JM, Johnson LM, Folkman S. Coping effectiveness training for men living with HIV: results from a randomized clinical trial testing a group-based intervention. *Psychosomatic Medicine* 2003;**65** (6):1038-46. [PUBMED: 14645783]

Cicchetti 2012

Cicchetti D, Rogosch FA. Gene x environment interaction and resilience: effects of child maltreatment and serotonin, corticotropin releasing hormone, dopamine, and oxytocin genes. *Development and Psychopathology* 2012;**24** (2):411–27. [DOI: 10.1017/S0954579412000077; PMC3684053; PUBMED: 22559122]

Cohen 1983

Cohen S, Hoberman HM. Positive events and social supports as buffers of life change stress. *Journal of Applied Social Psychology* 1983;**13**(2):99–125. [DOI: 10.1111/j.1559-1816.1983.tb02325.x]

Cohen 1988

Cohen S, Williamson G. Perceived stress in a probability sample of the United States. In: Spacapan, S, Oskamp, S editor(s). *The Social Psychology of Health*. Newbury Park (CA): Sage, 1988.

Cohen 2003

Cohen O, Savaya R. Sense of coherence and adjustment to divorce among Muslim Arab citizens of Israel. *European Journal of Personality* 2003;**17**(4):309–26. [DOI: 10.1002/per.493]

Cohen 2006

Cohen S, Alper CM, Doyle WJ, Treanor JJ, Turner RB. Positive emotional style predicts resistance to illness after experimental exposure to rhinovirus or influenza a virus. *Psychosomatic Medicine* 2006;**68**(6):809–15. [DOI: 10.1097/01.psy.0000245867.92364.3c; PUBMED: 17101814]

Connor 2003

Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety* 2003;**18**(2):76–82. [DOI: 10.1002/da.10113; PUBMED: 12964174]

Connor 2006
Connor KM, Zhang W. Resilience: determinants, measurement, and treatment responsiveness. *CNS Spectrums* 2006;**11**(Suppl S12):5–12. [DOI: 10.1017/S1092852900025797]

Cruz 2016
Cruz JP, Colet PC, Qubeilat H, Al-Otaibi J, Coronel EI, Suminta RC. Religiosity and health-related quality of life: a cross-sectional study on Filipino Christian hemodialysis patients. Journal of Religion and Health 2016; Vol. 55, issue 3:895–908. [DOI: 10.1007/s10943-015-0103-9; PUBMED: 26289995]

Cushway 1996
Cushway D, Tyler PA, Nolan P. Development of a stress scale for mental health professionals. *British Journal of Clinical Psychology* 1996;**35**(2):279–95. [DOI: 10.1111/j.2044-8260.1996.tb01182.x]

Cutrona 1987
Cutrona CE, Russell DW. The provisions of social relationships and adaptation to stress. In: Jones WH, Perlman D editor(s). *Advances in Personal Relationships*. Greenwich (CT): JAI Press, 1987:37–67.

Deeks 2011
Deeks, JJ, Higgins JPT Altman DG on behalf of the Cochrane Statistical Methods Group. Chapter 9: Analysing data and undertaking meta-analyses. In: Higgins JP, Green S, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.

Demerouti 2010
Demerouti E, Mostert K, Bakker AB. Burnout and work engagement: a thorough investigation of the independency of both constructs. *Journal of Occupational Health Psychology* 2010;**15**(3):209–22. [DOI: 10.1037/a0019408; PUBMED: 20604629]

DeRoon-Cassini 2010
deRoon-Cassini TA, Mancini AD, Rusch MD, Bonanno G. Psychopathology and resilience following traumatic injury: a latent growth mixture model analysis. *Rehabilitation Psychology* 2010;**55**(1):1–11. [DOI: 10.1037/a0018601; PUBMED: 20175629]

Dias 2008
Dias S, Welton NJ, Caldwell DM, Ades AE. Checking consistency in mixed treatment comparison meta-analysis. *Statistics in Medicine* 2008;**29**(7-8):932–44. [DOI: 10.1002/sim.3767; PUBMED: 20213715]

Dias 2015
Dias R, Santos RL, Sousa MF, Nogueira MM, Torres B, Belfort T, et al. Resilience of caregivers of people with dementia: a systematic review of biological and psychosocial determinants. *Trends in Psychiatry and Psychotherapy* 2015;**37**(1):12–9. [DOI: 10.1590/2237-6089-2014-0032; PUBMED: 25860562]

Diener 1985
Diener E, Emmons RA, Larsen RJ, Griffin S. The Satisfaction With Life Scale. *Journal of Personality Assessment* 1985;**49**(1):71–5. [PUBMED: 16367493]

Dolan 2006
Dolan CA, Adler AB. Military hardiness as a buffer of psychological health on return from deployment. *Military Medicine* 2006;**171**(2):93–8. [PUBMED: 16578974]

Duits 1997
Duits AA, Boeke S, Taams MA, Passchier J, Erdman RA. Prediction of quality of life after coronary artery bypass graft surgery: a review and evaluation of multiple, recent studies. *Psychosomatic Medicine* 1997;**59**(3):257–68. [PUBMED: 9178337]

Dyrbye 2010
Dyrbye LN, Power DV, Massie FS, Eacker A, Harper W, Thomas MR, et al. Factors associated with resilience to and recovery from burnout: a prospective, multi-institutional study of US medical students. *Medical Education* 2010;**44**(10):1016–26. [DOI: 10.1111/j.1365-2923.2010.03754.x; PUBMED: 20880371]

Dörfel 2008
Dörfel D, Rabe S, Karl A. Coping strategies in daily life as protective and risk factors for post traumatic stress in motor vehicle accident survivors. *Journal of Loss and Trauma* 2008;**13**(5):422–40. [DOI: 10.1080/15325020701742136]

Earvolino-Ramirez 2007
Earvolino-Ramirez M. Resilience: a concept analysis. *Nursing Forum* 2007;**42**(2):73–82. [DOI: 10.1111/j.1744-6198.2007.00070.x; PUBMED: 17474940]

Egger 1997
Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple, graphical test. *BMJ* 1997;**315**(7109):629–34. [DOI: 10.1136/bmj.315.7109.629]

Ellis 1957
Ellis A. Rational psychotherapy and individual psychology. *Journal of Individual Psychology* 1957;**13**(1):38–44.

Ellis 1975
Ellis A, Harper RA. *A New Guide to Rational Living*. Chatsworth (CA): Wilshire Book Company, 1975.

Eriksson 2006
Eriksson M, Lindström B. Antonovsky's sense of coherence scale and the relation with health: a systematic review. *Journal of Epidemiology and Community Health* 2006;**60**(5):376–81. [DOI: 10.1136/jech.2005.041616; PMC2563977; PUBMED: 16614325]

Eschleman 2010
Eschleman KJ, Bowling NA, Alarcon GM. A meta-analytic examination of hardiness. *International Journal of Stress Management* 2010;**17**(4):277–307. [DOI: 10.1037/a0020476.supp]

Farber 2000
Farber EW, Schwartz JA, Schaper PE, Moonen DJ, McDaniel JS. Resilience factors associated with adaptation

to HIV disease. *Psychosomatics* 2000;**41**(2):140–6. [DOI: 10.1176/appi.psy.41.2.140; PUBMED: 10749952]

Farber 2003

Farber EW, Mirsalimi H, Williams KA, McDaniel JS. Meaning of illness and psychological adjustment to HIV/AIDS. *Psychosomatics* 2003;**44**(6):485–91. [DOI: 10.1176/appi.psy.44.6.485; PUBMED: 14597683]

Farchi 2010

Farchi M, Gidron Y. The effects of "psychological inoculation" versus ventilation on the mental resilience of Israeli citizens under continuous war stress. *Journal of Nervous and Mental Disease* 2010;**198**(5):382–4. [DOI: 10.1097/NMD.0b013e3181da4b67; PUBMED: 20458203]

Feder 2011

Feder A, Charney D, Collins K. Neurobiology of resilience. In: Southwick SM, Litz BT, Charney D, Friedman MJ editor(s). *Resilience and Mental Health: Challenges Across the Lifespan*. Cambridge: Cambridge University Press, 2011.

Feder 2013

Feder A, Ahmad S, Lee EJ, Morgan JE, Singh R, Smith BW, et al. Coping and PTSD symptoms in Pakistani earthquake survivors: purpose in life, religious coping and social support. *Journal of Affective Disorders* 2013;**147**(1-3):156–63. [DOI: 10.1016/j.jad.2012.10.027; PUBMED: 23196198]

Fernández-Lansac 2012

Fernández-Lansac V, Crespo López M, Cáceres R, Rodríguez-Poyo M. Resilience in caregivers of patients with dementia: a preliminary study. *Revista Española de Geriatría y Gerontología* 2012;**47**(3):102–9. [DOI: 10.1016/j.regg.2011.11.004; PUBMED: 22579610]

Fletcher 2013

Fletcher D, Sarkar M. Psychological resilience: a review and critique of definitions, concepts, and theory. *European Psychologist* 2013;**18**(1):12–23. [DOI: 10.1027/1016-9040/a000124]

Folkman 1988

Folkman S, Lazarus R. *Ways of Coping Questionnaire Manual*. Palo Alto (CA): Consulting Psychologists Press Inc, 1988.

Forgeard 2012

Forgeard MJC, Seligman MEP. Seeing the glass half full: a review of the causes and consequences of optimism. *Pratiques Psychologiques* 2012;**18**(2):107–20. [DOI: 10.1016/j.prps.2012.02.002]

Forstmeier 2009

Forstmeier S, Kuwert P, Spitzer C, Freyberger HJ, Maercker A. Posttraumatic growth, social acknowledgment as survivors, and sense of coherence in former German child soldiers of World War II. *American Journal of Geriatric Psychiatry* 2009;**17**(12):1030–9. [DOI: 10.1097/JGP.0b013e3181ab8b36; PUBMED: 20104060]

Fredrickson 2003

Fredrickson BL, Tugade MM, Waugh CE, Larkin GR. What good are positive emotions in crises? A prospective study of resilience and emotions following the terrorist attacks on the United States on September 11th, 2001. *Journal of Personality and Social Psychology* 2003;**84**(2):365-76. [NIHMS141511; PMC2755263; PUBMED: 12585810]

Fresco 2006

Fresco DM, Alloy LB, Reilly-Harrington N. Association of attributional style for negative and positive events and the occurrence of life events with depression and anxiety. *Journal of Social and Clinical Psychology* 2006;**25**(10):1140–60.

Friborg 2003

Friborg O, Hjemdal O, Rosenvinge JH, Martinussen M. A new rating scale for adult resilience: what are the central protective resources behind healthy adjustment?. *International Journal of Methods in Psychiatric Research* 2003;**12**(2):65–76. [PUBMED: 12830300]

Friborg 2005

Friborg O, Barlaug D, Martinussen M, Rosenvinge JH, Hjemdal O. Resilience in relation to personality and intelligence. *International Journal of Methods in Psychiatric Research* 2005;**14**(1):29–42. [PUBMED: 16097398]

Frommberger 1999

Frommberger U, Stieglitz RD, Straub S, Nyberg E, Schlickewei W, Kuner E, et al. The concept of "sense of coherence" and the development of posttraumatic stress disorder in traffic accident victims. *Journal of Psychosomatic Research* 1999;**46**(4):343–8. [DOI: 10.1016/S0022-3999(98)00117-2]

Fuller-Iglesias 2008

Fuller-Iglesias H, Sellars B, Antonucci TC. Resilience in old age: social relations as a protective factor. *Research in Human Development* 2008;**5**(3):181–93. [DOI: 10.1080/15427600802274043]

Galatzer-Levy 2012

Galatzer-Levy IR, Burton CL, Bonanno GA. Coping flexibility, potentially traumatic life events, and resilience: a prospective study of college student adjustment. *Journal of Social and Clinical Psychology* 2012;**31**(6):542–67. [DOI: 10.1521/jscp.2012.31.6.542]

Geschwind 2010

Geschwind N, Peeters F, Jacobs N, Delespaul P, Derom C, Thiery E, et al. Meeting risk with resilience: high daily life reward experience preserves mental health. *Acta Psychiatrica Scandinavica* 2010;**122**(2):129–38. [DOI: 10.1111/j.1600-0447.2009.01525.x; PUBMED: 20064128]

Geschwind 2011

Geschwind N, Peeters F, Drukker M, Van Os J, Wichers M. Mindfulness training increases momentary positive emotions and reward experience in adults vulnerable to depression: a randomized controlled trial. *Journal of Consulting and Clinical Psychology* 2011;**79**(5):618–28. [DOI: 10.1037/a0024595; PUBMED: 21767001]

Gloria 2016
Gloria CT, Steinhardt MA. Relationships among positive emotions, coping, resilience and mental health. *Stress Health* 2016;**32**(2):145–56. [DOI: 10.1002/smi.2589]

GRADEpro GDT 2015 [Computer program]
McMaster University. GRADEpro GDT: GRADEpro Guideline Development Tool. McMaster University, 2015.

Grossman 2004
Grossman P, Niemann L, Schmidt S, Walach H. Mindfulness-based stress reduction and health benefits. A meta-analysis. *Journal of Psychosomatic Research* 2004; **57**(1):35–43. [DOI: 10.1016/S0022-3999(03)00573-7; PUBMED: 15256293]

Grote 2007
Grote NK, Bledsoe SE, Larkin J, Lemay EP Jr, Brown C. Stress exposure and depression in disadvantage women: the protective effects of optimism and perceived control. *Social Work Research* 2007;**31**(1):19–33. [DOI: 10.1093/swr/31.1.19]

Guardino 2013
Guardino CM, Schetter CD. Coping during pregnancy: a systematic review and recommendations. *Health Psychology Review* 2013;**8**(1):70–94. [DOI: 10.1080/17437199.2012.752659; PMC3904449; PUBMED: 24489596]

Guest 2015
Guest R, Craig A, Nicholson Perry KN, Tran Y, Ephraums C, Hales A, et al. Resilience following spinal cord injury: a prospective controlled study investigating the influence of the provision of group cognitive behavior therapy during inpatient rehabilitation. *Rehabilitation Psychology* 2015; **60**(4):311–21. [DOI: 10.1037/rep0000052; PUBMED: 26348699]

Haglund 2007
Haglund ME, Nestadt PS, Cooper NS, Southwick SM, Charney DS. Psychobiological mechanisms of resilience: relevance to prevention and treatment of stress-related psychopathology. *Development and Psychopathology* 2007; **19**(3):889–920. [DOI: 10.1017/S0954579407000430; PUBMED: 17705907]

Hartley 2008
Hartley SM, Vance DE, Elliott TR, Cuckler JM, Berry JW. Hope, self-efficacy, and functional recovery after knee and hip replacement surgery. *Rehabilitation Psychology* 2008;**53** (4):521–9. [DOI: 10.1037/a0013121]

Harvey 2003
Harvey MR, Liang B, Harney PA, Koenen K, Tummala-Narra P, Lebowitz L. A multidimensional approach to the assessment of trauma impact, recovery and resiliency. *Journal of Aggression, Maltreatment & Trauma* 2003;**6**(2): 87–109. [DOI: 10.1300/J146v06n02_05]

Hasson 2005
Hasson D, Arnetz BB. Validation and findings comparing VAS vs. Likert scales for psychosocial measurements. *International Electronic Journal Health Education* 2005;**8**: 178-92.

Hayes 2004
Hayes SC, Follette VM, Linehan MM. *Mindfulness and Acceptance. Expanding the Cognitive-Behavioral Tradition*. New York (NY): The Guilford Press, 2004.

Hayes 2006
Hayes SC, Luoma JB, Bond FW, Masuda A, Lillis J. Acceptance and commitment therapy: model, processes and outcomes. *Behaviour Research and Therapy* 2006;**44** (1):1–25. [DOI: 10.1016/j.brat.2005.06.006; PUBMED: 16300724]

Hayter 2014
Hayter MR, Dorstyn DS. Resilience, self-esteem and self-compassion in adults with spina bifida. *Spinal Cord* 2014; **52**(2):167–71. [DOI: 10.1038/sc.2013.152; PUBMED: 24322213]

Hebert 2007
Hebert RS, Dang Q, Schulz R. Religious beliefs and practices are associated with better mental health in family caregivers of patients with dementia: findings from the REACH study. *American Journal of Geriatric Psychiatry* 2007;**15**(4):292–300. [DOI: 10.1097/01.JGP.0000247160.11769.ab; PUBMED: 17158632]

Helgeson 2006
Helgeson VS, Reynolds KA, Tomich PL. A meta-analytic review of benefit finding and growth. *Journal of Consulting and Clinical Psychology* 2006;**74**(5):797–816. [DOI: 10.1037/0022-006X.74.5.797; PUBMED: 17032085]

Hernandez 2013
Hernandez M, Barrio C, Yamada AM. Hope and burden among Latino families of adults with schizophrenia. *Family Process* 2013;**52**(4):697–708. [DOI: 10.1111/famp.12042; PMC5032651; PUBMED: 24329411]

Higgins 2011a
Higgins JPT, Green S (editors). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]. The Cochrane Collaboration, 2011. Available from www.cochrane-handbook.org.

Higgins 2011b
Higgins JPT, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. *BMJ* 2011;**343**: d5928. [DOI: 10.1136/bmj.d5928]

Higgins 2011c
Higgins JPT, Deeks JJ. Chapter 7: Selecting studies and collecting data. In: Higgins JPT, Green S, editor (s). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.

Higgins 2011d
Higgins JPT, Altman DG, Sterne JAC on behalf of the Cochrane Statistical Methods Group and the Cochrane Bias Methods Group. Chapter 8: Assessing risk of bias in included studies. In: Higgins JPT, Green S, editor (s). Cochrane Handbook for Systematic Reviews of

Interventions Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.

Higgins 2011e
Higgins JPT, Deeks JJ, Altman DG on behalf of the Cochrane Statistical Methods Group. Chapter 16: Special topics in statistics. In: Higgins JPT, Green S, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.

Hjemdal 2001
Hjemdal O, Friborg O, Martinussen M, Rosenvinge JH. Preliminary results from the development and validation of a Norwegian scale for measuring adult resilience [Mestring og psykologisk motstandsdyktighet hos voksne: utvikling og foreløpig validering av et nytt instrument]. *Tidsskrift for Norsk Psykologforening* 2001;**38**:310–7.

Ho 2010
Ho SM, Ho JW, Bonanno GA, Chu AT, Chan EM. Hopefulness predicts resilience after hereditary colorectal cancer genetic testing: a prospective outcome trajectories study. *BMC Cancer* 2010;**10**:279. [DOI: 10.1186/1471-2407-10-279; PMC2891641; PUBMED: 20537192]

Hu 2015
Hu T, Zhang D, Wang J. A meta-analysis of the trait resilience and mental health. *Personality and Individual Differences* 2015;**76**:18–27. [DOI: 10.1016/j.paid.2014.11.039]

Hurtes 2001
Hurtes KP, Allen LR. Measuring resiliency in youth: the Resiliency Attitudes and Skills Profile. *Therapeutic Recreation Journal* 2001;**35**(4):333–47.

Hystad 2011
Hystad SW, Eid J, Brevik JI. Effects of psychological hardiness, job demands, and job control on sickness absence: a prospective study. *Journal of Occupational Health Psychology* 2011;**16**(3):265–78. [DOI: 10.1037/a0022904; PUBMED: 21728435]

Iacoviello 2014
Iacoviello BM, Charney DS. Psychosocial facets of resilience: implications for preventing posttrauma psychopathology, treating trauma survivors, and enhancing community resilience. *European Journal of Psychotraumatology* 2014;**5**:1–10. [PMC4185137]

Jackson 2007
Jackson D, Firtko A, Edenborough M. Personal resilience as a strategy for surviving and thriving in the face of workplace adversity: a literature review. *Journal of Advanced Nursing* 2007;**60**(1):1–9. [DOI: 10.1111/j.1365-2648.2007.04412.x; PUBMED: 17824934]

Jackson 2014
Jackson T, Wang Y, Wang Y, Fan H. Self-efficacy and chronic pain outcomes: a meta-analytic review. *Journal of Pain* 2014;**15**(8):800–14. [DOI: 10.1016/j.jpain.2014.05.002; PUBMED: 24878675]

Jennings 2013
Jennings PA, Frank JL, Snowberg KE, Coccia MA, Greenberg MT. Improving classroom learning environments by Cultivating Awareness and Resilience in Education (CARE): results of a randomized controlled trial. *School Psychology Quarter* 2013;**28**(4):374–90. [DOI: 10.1037/spq0000035; PUBMED: 24015983]

Johnson 2009
Johnson RJ, Canetti D, Palmieri PA, Galea S, Varley J, Hobfoll SE. A prospective study of risk and resilience factors associated with posttraumatic stress symptoms and depression symptoms among Jews and Arabs exposed to repeated acts of terrorism in Israel. *Psychological Trauma: Theory, Research, Practice, and Policy* 2009;**1**(4):291–311. [DOI: 10.1037/a0017586]

Johnson 2010
Johnson J, Gooding PA, Wood AM, Tarrier N. Resilience as positive coping appraisals: testing the schematic appraisals model of suicide (SAMS). *Behaviour Research and Therapy* 2010;**48**(3):179–86. [DOI: 10.1016/j.brat.2009.10.007; PUBMED: 19906364]

Johnson 2015
Johnson AJ, Tottenham N. Regulatory skill as a resilience factor for adults with a history of foster care: a pilot study. *Developmental Psychobiology* 2015;**57**(1):1–16. [DOI: 10.1002/dev.21227; PMC4302248; PUBMED: 25270099]

Johnston 2015
Johnston MC, Porteous T, Crilly MA, Burton CD, Elliott A, Iversen L, et al. Physical disease and resilient outcomes: a systematic review of resilience definitions and study methods. *Psychosomatics* 2015;**56**(2):168–80. [DOI: 10.1016/j.psym.2014.10.005; PUBMED: 25620566]

Judkins 2005
Judkins S, Rind R. Hardiness, job satisfaction, and stress among home health nurses. *Home Health Care Management & Practice* 2005;**17**(2):113–8. [DOI: 10.1177/10848223042700201]

Kalisch 2015
Kalisch R, Müller MB, Tüscher O. A conceptual framework for the neurobiological study of resilience. *Behavioral and Brain Sciences* 2015;**38**:e92. [DOI: 10.1017/S0140525X1400082X; PUBMED: 25158686]

Kanekar 2009
Kanekar A, Sharma M, Atri A. Enhancing social support, hardiness, and acculturation to improve mental health among Asian Indian international students. *International Quarterly of Community Health Education* 2009;**30**(1):55–68. [DOI: 10.2190/IQ.30.1.e; PUBMED: 20353927]

Karstoft 2015
Karstoft KI, Armour C, Elklit A, Solomon Z. The role of locus of control and coping style in predicting longitudinal PTSD-trajectories after combat exposure. *Journal of Anxiety Disorders* 2015;**32**:89–94. [DOI: 10.1016/j.janxdis.2015.03.007; PUBMED: 25890288]

Kasen 2014

Kasen S, Wickramaratne P, Gameroff MJ. Religiosity and longitudinal change in psychosocial functioning in adult offspring of depressed parents at high risk for major depression. *Depression and Anxiety* 2014;**31**(1):63–71. [DOI: 10.1002/da.22131; PUBMED: 23720386]

Kaspersen 2003

Kaspersen M, Matthiesen SB, Götestam KG. Social network as a moderator in the relation between trauma exposure and trauma reaction: a survey among UN soldiers and relief workers. *Scandinavian Journal of Psychology* 2003;**44**(5):415–23. [DOI: 10.1046/j.1467-9450.2003.00362.x; PUBMED: 15030107]

Kent 2011

Kent M, Davis MC, Stark SL, Stewart LA. A resilience-oriented treatment for posttraumatic stress disorder: results of a preliminary randomized clinical trial. *Journal of Trauma Stress* 2011;**24**(5):591–5. [DOI: 10.1002/jts.20685; PUBMED: 21898603]

Kent 2014

Kent M, Davis MC, Reich JW. *The Resilience Handbook: Approaches to Stress and Trauma*. New York: Routledge, 2014.

Kilic 2013

Kilic SA, Dorstyn DS, Guiver NG. Examining factors that contribute to the process of resilience following spinal cord injury. *Spinal Cord* 2013;**51**(7):553–7. [DOI: 10.1038/sc.2013.25; PUBMED: 23689391]

King 1998

King LA, King DW, Fairbank JA, Keane TM, Adams GA. Resilience-recovery factors in post-traumatic stress disorder among female and male Vietnam veterans: hardiness, postwar social support, and additional stressful life events. *Journal of Personality and Social Psychology* 1998;**74**(2):420–34. [PUBMED: 9491585]

Kivimäki 2005

Kivimäki M, Vahtera J, Elovainio M, Helenius H, Singh-Manoux A, Pentti J. Optimism and pessimism as predictors of change in health after death or onset of severe illness in family. *Health Psychology* 2005;**24**(4):413–21. [DOI: 10.1037/0278-6133.24.4.413; PUBMED: 16045377]

Klohnen 1996

Klohnen EC. Conceptual analysis and measurement of the construct of ego-resiliency. *Journal of Personality and Social Psychology* 1996;**70**(5):1067–79. [PUBMED: 8656335]

Kneebone 2003

Kneebone II, Martin PR. Coping and caregivers of people with dementia. *British Journal of Health Psychology* 2003;**8**(1):1–17. [DOI: 10.1348/135910703762879174; PUBMED: 12643813]

Koenen 2003

Koenen KC, Stellman JM, Stellman SD, Sommer JF Jr. Risk factors for course of posttraumatic stress disorder among Vietnam veterans: a 14-year follow-up of American Legionnaires. *Journal of Consulting and Clinical Psychology* 2003;**71**(6):980–6. [DOI: 10.1037/0022-006X.71.6.980; PUBMED: 14622073]

Koenig 2007

Koenig HG. Religion and remission of depression in medical inpatients with heart failure/pulmonary disease. *Journal of Nervous and Mental Disease* 2007;**195**(5):389–95. [DOI: 10.1097/NMD.0b013e31802f58e3; PUBMED: 17502804]

Korpershoek 2011

Korpershoek C, Van der Bijl J, Hafsteinsdóttir TB. Self-efficacy and its influence on recovery of patients with stroke: a systematic review. *Journal of Advanced Nursing* 2011;**67**(9):1876–94. [DOI: 10.1111/j.1365-2648.2011.05659.x; PUBMED: 21645040]

Krahn 2013

Krahn U, Binder H, König J. A graphical tool for locating inconsistency in network meta-analyses. *BMC Medical Research Methodology* 2013;**13**:35. [DOI: 10.1186/1471-2288-13-35; PMC3644268; PUBMED: 23496991]

Krahn 2014

Krahn U, Binder H, König J. Visualizing inconsistency in network meta-analysis by independent path decomposition. *BMC Medical Research Methodology* 2014;**14**:131. [DOI: 10.1186/1471-2288-14-131]

Krause 2007

Krause N. Evaluating the stress-buffering function of meaning in life among older people. *Journal of Aging and Health* 2007;**19**(5):792–812. [DOI: 10.1177/0898264307304390; PUBMED: 17827448]

Kuiper 1992

Kuiper NA, Martin RA, Dance KA. Sense of humour and enhanced quality of life. *Personality and Individual Differences* 1992;**13**(12):1273–83. [DOI: 10.1016/0191-8869(92)90169-P]

Kuiper 2012

Kuiper NA. Humor and resiliency: towards a process model of coping and growth. *Europe's Journal of Psychology* 2012;**8**(3):475–91. [DOI: 10.5964/ejop.v8i3.464]

Kvillemo 2014

Kvillemo P, Bränström R. Coping with breast cancer: a meta-analysis. *PLoS One* 2014;**9**(11):e112733. [DOI: 10.1371/journal.pone.0112733; PMC4244095; PUBMED: 25423095]

König 2013

König J, Krahn U, Binder H. Visualizing the flow of evidence in network meta-analysis and characterizing mixed treatment comparisons. *Statistics in Medicine* 2013;**32**(30):5414–29. [DOI: 10.1002/sim.6001; PUBMED: 24123165]

Landy 1991

Landy FJ, Rastegary H, Thayer J, Colvin C. Time urgency: the construct and its measurement. *Journal of Applied Psychology* 1991;**76**(5):644–57. [PUBMED: 1960139]

Lawler 1992

Lawler KA, Schmied LA. A prospective study of women's health: the effects of stress, hardiness, locus of control,

Type A behavior, and physiological reactivity. *Women Health* 1992;**19**(1):27–41. [DOI: 10.1300/J013v19n01_02; PUBMED: 1475994]

Lazarus 1987
Lazarus RS, Folkman S. Transactional theory and research on emotions and coping. *European Journal of Personality* 1987;**1**(3):141–69. [DOI: 10.1002/per.2410010304]

Lechner 2007
Lechner L, Bolman C, Van Dalen A. Definite involuntary childlessness: associations between coping, social support and psychological distress. *Human Reproduction* 2007;**22**(1):288–94. [DOI: 10.1093/humrep/del327; PUBMED: 16920722]

Lee 2013
Lee JH, Nam SK, Kim AR, Kim B, Lee MY, Lee SM. Resilience: a meta-analytic approach. *Journal of Counseling & Development* 2013;**91**(3):269–79. [DOI: 10.1002/j.1556-6676.2013.00095.x]

Leppin 2014
Leppin AL, Bora PR, Tilburt JC, Gionfriddo MR, Zeballos-Palacios C, Dulohery MM, et al. The efficacy of resiliency training programs: a systematic review and meta-analysis of randomized trials. *PLoS One* 2014;**9**(10):e111420. [DOI: 10.1371/journal.pone.0111420; PMC4210242; PUBMED: 25347713]

Li 2011
Li T, Puhan MA, Vedula SS, Singh S, Dickersin K, The Ad Hoc Network Meta-analysis Methods Meeting Working Group. Network meta-analysis-highly attractive but more methodological research is needed. *BMC Medicine* 2011;**9**:79. [DOI: 10.1186/1741-7015-9-79; PMC3159133; PUBMED: 21707969]

Liebenberg 2012
Liebenberg L, Ungar M, Van de Vijver F. Validation of the Child and Youth Resilience Measure-28 (CYRM-28) among Canadian youth. *Research on Social Work Practice* 2012;**22**(2):219–26. [DOI: 10.1177/1049731511428619]

Liebenberg 2013
Liebenberg L, Ungar M, LeBlanc JC. The CYRM-12: a brief measure of resilience. *Canadian Journal of Public Health* 2013;**104**(2):e131–5. [PUBMED: 23618205]

Linde 2016
Linde K, Rücker G, Schneider A, Kriston L. Questionable assumptions hampered interpretation of a network meta-analysis of primary care depression treatments. *Journal of Clinical Epidemiology* 2016;**71**:86–96. [DOI: 10.1016/j.jclinepi.2015.10.010; PUBMED: 26524496]

Locke 2007
Locke DE, Decker PA, Sloan JA, Brown PD, Malec JF, Clark MM, et al. Validation of single-item linear analog scale assessment of quality of life in neuro-oncology patients. *Journal of Pain and Symptom Management* 2007;**34**(6):628–38. [DOI: 10.1016/j.jpainsymman.2007.01.016; PMC2732111; PUBMED: 17703910]

Loprinzi 2011
Loprinzi CE, Prasad K, Schroeder DR, Sood A. Stress Management and Resilience Training (SMART) program to decrease stress and enhance resilience among breast cancer survivors: a pilot randomized clinical trial. *Clinical Breast Cancer* 2011;**11**(6):364–8. [DOI: 10.1016/j.clbc.2011.06.008; PUBMED: 21831722]

Lovibond 1995
Lovibond PF, Lovibond SH. The structure of negative emotional states: comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy* 1995;**33**(3):335–43. [DOI: 10.1016/0005-7967(94)00075-U; PUBMED: 7726811]

Lu 2006
Lu G, Ades AE. Assessing evidence inconsistency in mixed treatment comparisons. *Journal of the American Statistical Association* 2006;**101**(474):447–59. [DOI: 10.1198/016214505000001302]

Lumley 2002
Lumley T. Network meta-analysis for indirect treatment comparisons. *Statistics in Medicine* 2002;**21**(16):2313–24. [DOI: 10.1002/sim.1201; PUBMED: 12210616]

Luo 2015
Luo T, Cheng X, Xiong Y. Relationship among resilience, coping style and mental health of newly recruited workers born after 1990 in manufacturing industry of Shenzhen City. *Journal of Hygiene Research* 2015;**44**(2):252–6. [PUBMED: 25997229]

Luszczynska 2009
Luszczynska A, Benight CC, Cieslak R. Self-efficacy and health-related outcomes of collective trauma. *European Psychologist* 2009;**14**(1):51–62. [DOI: 10.1027/1016-9040.14.1.51]

Luthar 2000
Luthar SS, Cicchetti D, Becker B. The construct of resilience: a critical evaluation and guidelines for future work. *Child Development* 2000;**71**(3):543–62. [NIHMS21559; PMC1885202]

Lyon 2001
Lyon DE, Younger JB. Purpose in life and depressive symptoms in persons living with HIV disease. *Journal of Nursing Scholarship* 2001;**33**(2):129–33. [PUBMED: 11419307]

Macedo 2014
Macedo T, Wilheim L, Gonçalves R, Coutinho ESF, Vilete L, Figueira I, et al. Building resilience for future adversity: a systematic review of interventions in non-clinical samples of adults. *BMC Psychiatry* 2014;**14**:227. [DOI: 10.1186/s12888-014-0227-6]

Maddi 1987
Maddi SR. Hardiness training at Illinois Bell Telephone. In: Opatz J editor(s). *Health Promotion Evaluation*. Stephens Point (WI): National Wellness Institute, 1987:101–15.

Maddi 1998
Maddi SR, Kahn S, Maddi KL. The effectiveness of hardiness training. *Consulting Psychology Journal: Practice and Research* 1998;**50**(2):78–86. [DOI: 10.1037/1061-4087.50.2.78]

Maddi 2001
Maddi SR, Khoshaba DM. *HardiSurvey III-R: Test Development and Internet Instruction Manual*. Irvine (CA): Hardiness Institute, 2001.

Maddi 2009
Maddi SR, Harvey RH, Khoshaba DM, Fazel M, Resurreccion N. Hardiness training facilitates performance in college. *Journal of Positive Psychology* 2009;**4**(6):566–77. [DOI: 10.1080/17439760903157133]

Madsen 2010
Madsen MD, Abell N. Trauma Resilience Scale: validation of protective factors associated with adaptation following violence. *Research on Social Work Practice* 2010;**20**(2):223–33. [DOI: 10.1177/1049731509347853]

Mancini 2009
Mancini AD, Bonanno GA. Predictors and parameters of resilience to loss: toward an individual differences model. *Journal of Personality* 2009;**77**(6):1805–32. [DOI: 10.1111/j.1467-6494.2009.00601.x; PMC4224188; PUBMED: 19807863]

Martin-Krumm 2003
Martin-Krumm CP, Sarrazin PG, Peterson C, Famose J-P. Explanatory style and resilience after sports failure. *Personality and Individual Differences* 2003;**35**(7):1685–95. [DOI: 10.1016/S0191-8869(02)00390-2]

Marty 2010
Marty MA, Segal DL, Coolidge FL. Relationships among dispositional coping strategies, suicidal ideation, and protective factors against suicide in older adults. *Aging and Mental Health* 2010;**14**(8):1015–23. [DOI: 10.1080/13607863.2010.501068; PUBMED: 21069608]

Maslach 1997
Maslach C, Jackson SE, Leiter MP. Maslach burnout inventory. In: Zalaquett CP, Wood RJ editor(s). *Evaluating Stress: A Book of Resources*. Lanham (MD): Scarecrow Education, 1997:191–218.

Masten 2001
Masten AS. Ordinary magic: resilience processes in development. *Amercian Psychologist* 2001;**56**(3):227–38. [PUBMED: 11315249]

McCann 2013
McCann CM, Beddoe E, McCormick K, Huggard P, Kedge S, Adamson C, et al. Resilience in the health professions: a review of recent literature. *International Journal of Wellbeing* 2013;**3**(1):60–81. [DOI: 10.5502/ijw.v3i1.4]

McIntosh 2012
McIntosh RC, Rosselli M. Stress and coping in women living with HIV: a meta-analytic review. *AIDS Behavior* 2012;**16**(8):2144–59. [DOI: 10.1007/s10461-012-0166-5; PUBMED: 22434282]

McLarnon 2013
McLarnon MJW, Rothstein MG. Development and initial validation of the Workplace Resilience Inventory. *Journal of Personnel Psychology* 2013;**12**(2):63–73. [DOI: 10.1027/1866-5888/a000084]

Meichenbaum 2007
Meichenbaum D. Stress inoculation training: a preventative and treatment approach. In: Lehrer PM, Woolfolk RL, Sime WS editor(s). *Principles and Practice of Stress Management*. Third Edition. New York (NY): The Guilford Press, 2007:497–518.

Michael 2003
Michael ST, Crowther MR, Schmid B, Allen RS. Widowhood and spirituality: coping responses to bereavement. *Journal of Women & Aging* 2003;**15**(2-3):145-65; discussion 185-7. [DOI: 10.1300/J074v15n02_09; PUBMED: 14604006]

Mills 2012
Mills EJ, Ioannidis JP, Thorlund K, Schünemann HJ, Puhan MA, Guyatt GH. How to use an article reporting a multiple treatment comparison meta-analysis. *JAMA* 2012;**308**(12):1246–53. [DOI: 10.1001/2012.jama.11228; PUBMED: 23011714]

Milte 2015
Milte CM, Luszcz MA, Ratcliffe J, Masters S, Crotty M. Influence of health locus of control on recovery of function in recently hospitalized frail older adults. *Geriatrics & Gerontology International* 2015;**15**(3):341–9. [DOI: 10.1111/ggi.12281; PUBMED: 24674154]

Min 2013
Min JA, Yu JJ, Lee CU, Chae JH. Cognitive emotion regulation strategies contributing to resilience in patients with depression and/or anxiety disorders. *Comprehensive Psychiatry* 2013;**54**(8):1190–7. [DOI: 10.1016/j.comppsych.2013.05.008]

Moher 2009
Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group. Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *BMJ* 2009;**339**:b2535. [DOI: 10.1136/bmj.b2535]

Morris 2013
Morris MC, Rao U. Psychobiology of PTSD in the acute aftermath of trauma: integrating research on coping, HPA function and sympathetic nervous system activity. *Asian Journal of Psychiatry* 2013;**6**(1):3–21. [DOI: 10.1016/j.ajp.2012.07.012; PMC3565157; PUBMED: 23380312]

Moskowitz 2009
Moskowitz JT, Hult JR, Bussolari C, Acree M. What works in coping with HIV? A meta-analysis with implications for coping with serious illness. *Psychological Bulletin* 2009;**135**(1):121–41. [DOI: 10.1037/a0014210; PUBMED: 19210056]

Myhren 2010
Myhren H, Ekeberg O, Tøien K, Karlsson S, Stokland O. Posttraumatic stress, anxiety and depression symptoms

in patients during the first year post intensive care unit discharge. *Critical Care* 2010;**14**(1):R14. [DOI: 10.1186/cc8870; PMC2875529; PUBMED: 20144193]

Natvik 2011
Natvik S, Bjorvatn B, Moen BE, Magerøy N, Sivertsen B, Pallesen S. Personality factors related to shift work tolerance in two- and three-shift workers. *Applied Ergonomics* 2011;**42**(5):719–24. [DOI: 10.1016/j.apergo.2010.11.006; PUBMED: 21172694]

Nezu 1988
Nezu AM, Nezu CM, Blissett SE. Sense of humor as a moderator of the relation between stressful events and psychological distress: a prospective analysis. *Journal of Personality and Social Psychology* 1988;**54**(3):520–5. [PUBMED: 3361423]

Nezu 2013
Nezu AM, Nezu CM, D' Zurilla TJ. *Problem-Solving Therapy. A Treatment Manual.* New York (NY): Springer Publishing Company, 2013.

Norris 2009
Norris FH, Tracy M, Galea S. Looking for resilience: understanding the longitudinal trajectories of responses to stress. *Social Science and Medicine* 2009;**68**(12):2190–8. [PUBMED: 19403217]

Northouse 2002
Northouse LL, Mood D, Kershaw T, Schafenacker A, Mellon S, Walker J, et al. Quality of life of women with recurrent breast cancer and their family members. *Journal of Clinical Oncology* 2002;**20**(19):4050–64. [DOI: 10.1200/JCO.2002.02.054; PUBMED: 12351603]

Nowack 1989
Nowack KM. Coping style, cognitive hardiness, and health status. *Journal of Behavioral Medicine* 1989;**12**(2):145–58. [PUBMED: 2760920]

Nowack 1990
Nowack KM. Initial development of an inventory to assess stress and health risk. *American Journal of Health Promotion* 1990;**4**(3):173–80. [DOI: 10.4278/0890-1171-4.3.173; PUBMED: 22204462]

Nowlan 2015
Nowlan JS, Wuthrich VM, Rapee RM. Positive reappraisal in older adults: a systematic literature review. *Aging and Mental Health* 2015;**19**(6):475–84. [DOI: 10.1080/13607863.2014.954528; PUBMED: 25204368]

Nugent 1993
Nugent WR, Thomas JW. Validation of a clinical measure of self-esteem. *Research on Social Work Practice* 1993;**3**(2):191–207.

Ong 2006
Ong AD, Bergeman CS, Bisconti TL, Wallace KA. Psychological resilience, positive emotions, and successful adaptation to stress in later life. *Journal of Personality and Social Psychology* 2006;**91**(4):730–49. [DOI: 10.1037/0022-3514.91.4.730; PUBMED: 17014296]

Orengo 2001
Orengo CA, Wei SH, Molinari VA, Hale DD, Kunik ME. Functioning in rheumatoid arthritis: the role of depression and self-efficacy. *Clinical Gerontologist* 2001;**23**(3-4):45–56. [DOI: 10.1300/J018v23n03_05]

Oshio 2002
Oshio A, Nakaya N, Kaneko H, Nagamine S. Development and validation of an Adolescent Resilience Scale. *Japanese Journal of Counseling Science* 2002;**35**:57–65.

Oshio 2003
Oshio A, Kaneko H, Nagamine S, Nayaka M. Construct validity of the Adolescent Resilience Scale. *Psychological Reports* 2003;**93**(3 Pt 2):1217–22. [PUBMED: 14765593]

Owens 2009
Owens GP, Steger MF, Whitesell AA, Herrera CJ. Posttraumatic stress disorder, guilt, depression, and meaning in life among military veterans. *Journal of Traumatic Stress* 2009;**22**(6):654–7. [DOI: 10.1002/jts.20460; PUBMED: 19924820]

Ozbay 2007
Ozbay F, Johnson DC, Dimoulas E, Morgan CA, Charney D 3rd, Southwick SM. Social support and resilience to stress. *Psychiatry* 2007;**4**(5):35–40. [PMC2921311]

Ozer 2003
Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychological Bulletin* 2003;**129**(1):52–73. [PUBMED: 12555794]

Page 2005
Page K. *Subjective Wellbeing in the Workplace [BA thesis].* Geelong, Victoria: Deakin University, 2005.

Pangallo 2015
Pangallo A, Zibarras L, Lewis R, Flaxman P. Resilience through the lens of interactionism: a systematic review. *Psychological Assessment* 2015;**27**(1):1–20. [DOI: 10.1037/pas0000024; PUBMED: 25222438]

Pargament 2000
Pargament KI, Koenig HG, Perez L. The many methods of religious coping: development and initial validation of the RCOPE. *Journal of Clinical Psychology* 2000;**56**(4):519–43. [PUBMED: 10775045]

Park 2008
Park CL, Edmondson D, Fenster JR, Blank TO. Meaning making and psychological adjustment following cancer: the mediating roles of growth, life meaning, and restored just-world beliefs. *Journal of Consulting and Clinical Psychology* 2008;**76**(5):863–75. [DOI: 10.1037/a0013348; PUBMED: 18837603]

Park 2015
Park M, Chang ER, You S. Protective role of coping flexibility in PTSD and depressive symptoms following trauma. *Personality and Individual Differences* 2015;**82**:102–6. [DOI: 10.1016/j.paid.2015.03.007]

Paterson 2013
Paterson C, Jones M, Rattray J, Lauder W. Exploring the relationship between coping, social support and health-related quality of life for prostate cancer survivors: a review of the literature. *European Journal of Oncology Nursing* 2013;**17**(6):750–9. [DOI: 10.1016/j.ejon.2013.04.002; PUBMED: 23732014]

Peter 2012
Peter C, Müller R, Cieza A, Geyh S. Psychological resources in spinal cord injury: a systematic literature review. *Spinal Cord* 2012;**50**(3):188–201. [DOI: 10.1038/sc.2011.125; PUBMED: 22124343]

Petree 2012
Petree RD, Broome KM, Bennett JB. Exploring and reducing stress in young restaurant workers: results of a randomized field trial. *American Journal of Health Promotion* 2012;**26**(4):217–24. [DOI: 10.4278/ajhp.091001-QUAN-321; PUBMED: 22375571]

Piepho 2012
Piepho HP, Williams ER, Madden LV. The use of two-way linear mixed models in multitreatment meta-analysis. *Biometrics* 2012;**68**(4):1269–77. [DOI: 10.1111/j.1541-0420.2012.01786.x; PUBMED: 22845838]

Piepho 2014
Piepho HP. Network-meta analysis made easy: detection of inconsistency using factorial analysis-of-variance models. *BMC Medical Research Methodology* 2014;**14**:61. [DOI: 10.1186/1471-2288-14-61; PMC4049370; PUBMED: 24885590]

Pietrzak 2013
Pietrzak RH, Cook JM. Psychological resilience in older U.S. veterans: results from the national health and resilience in veterans study. *Depression and Anxiety* 2013;**30**(5):432–43. [DOI: 10.1002/da.22083; PUBMED: 23468170]

Pragodpol 2013
Pragodpol P, Ryan C. Critical review of factors predicting health-related quality of life in newly diagnosed coronary artery disease patients. *Journal of Cardiovascular Nursing* 2013;**28**(3):277–84. [DOI: 10.1097/JCN.0b013e31824af56e; PUBMED: 22495801]

Prati 2009
Prati G, Pietrantoni L. Optimism, social support, and coping strategies as factors contributing to posttraumatic growth: a meta-analysis. *Journal of Loss and Trauma* 2009;**14**(5):364–88. [DOI: 10.1080/15325020902724271]

Quale 2010
Quale AJ, Schanke AK. Resilience in the face of coping with a severe physical injury: a study of trajectories of adjustment in a rehabilitation setting. *Rehabilitation Psychology* 2010;**55**(1):12–22. [DOI: 10.1037/a0018415; PUBMED: 20175630]

R 3.2.2 2015 [Computer program]
R Development Core Team. R: a language and environment for statistical computing. Vienna, Austria: the R Foundation for statistical computing. Version 3.2.2. Available from http://www.r–project.org, 2015.

Radloff 1977
Radloff LS. The CES-D scale: a self report depression scale for research in the general population. *Applied Psychological Measurement* 1977;**1**(3):385–401. [DOI: 10.1177/014662167700100306]

RevMan 2014 [Computer program]
The Nordic Cochrane Centre, The Cochrane Collaboration. Review Manager (Revman). Version 5.3. Copenhagen: The Nordic Cochrane Centre, The Cochrane Collaboration, 2014.

Robertson 2015
Robertson IT, Cooper CL, Sarkar M, Curran T. Resilience training in the workplace from 2003 to 2014: a systematic review. *Journal of Occupational and Organizational Psychology* 2015;**88**(3):533–62. [DOI: 10.1111/joop.12120]

Rose 2013
Rose RD, Buckey JC Jr, Zbozinek TD, Motivala SJ, Glenn DE, Cartreine JA, et al. A randomized controlled trial of a self-guided, multimedia, stress management and resilience training program. *Behaviour Research and Therapy* 2013;**51**(2):106–12. [DOI: 10.1016/j.brat.2012.11.003; PUBMED: 23262118]

Rosenberg 1965
Rosenberg M. *Society and the Adolescent Self-Image*. Princeton (NJ): Princeton University Press, 1965.

Rutten 2013
Rutten BP, Hammels C, Geschwind N, Menne-Lothmann C, Pishva E, Schruers K, et al. Resilience in mental health: linking psychological and neurobiological perspectives. *Acta Psychiatrica Scandinavica* 2013;**128**(1):3–20. [DOI: 10.1111/acps.12095; PMC3746114; PUBMED: 23488807]

Ryan 2014
Ryan A. *ACT and be READY: Evaluation of an ACT-based Resilience Training Program Delivered to People with Diabetes [Doctoral thesis]*. Brisbane: School of Psychology, The University of Queensland, 2014.

Ryff 1989
Ryff CD. Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology* 1989;**57**(6):1069–81.

Rücker 2011
Rücker G, Schwarzer G, Carpenter JR, Binder H, Schumacher M. Treatment-effect estimates adjusted for small-study effects via a limit meta-analysis. *Biostatistics* 2011;**12**(1):122–42. [DOI: 10.1093/biostatistics/kxq046; PUBMED: 20656692]

Rücker 2015 [Computer program]
Rücker G, Schwarzer G, Krahn U, König J. Netmeta: network meta-analysis using frequentist methods. R package version 0.8-0. Available from: http://CRAN.R–project.org/package=netmeta, 2015.

Sadow 1993
Sadow D, Hopkins B. Resiliency training and empowerment among homeless, substance-abusing veterans. Increasing a

sense of self-efficacy and internal attribution of control as a result of resiliency training. *Research Communications in Psychology, Psychiatry and Behavior* 1993;**18**(3):121–34.

Sahler 2013
Sahler OJ, Dolgin MJ, Phipps S, Fairclough DL, Askins MA, Katz ER, et al. Specificity of problem-solving skills training in mothers of children newly diagnosed with cancer: results of a multisite randomized clinical trial. *Journal of Clinical Oncology* 2013;**31**(10):1329–35. [DOI: 10.1200/JCO.2011.39.1870; PMC3607672; PUBMED: 23358975]

Saksvik 2011
Saksvik IB, Bjorvatn B, Hetland H, Sandal GM, Pallesen S. Individual differences in tolerance to shift work--a systematic review. *Sleep Medicine Reviews* 2011;**15**(4): 221–35. [DOI: 10.1016/j.smrv.2010.07.002; PUBMED: 20851006]

Salanti 2008
Salanti G, Higgins JPT, Ades AE, Ioannidis JPA. Evaluation of networks of randomized trials. *Statistical Methods in Medical Research* 2008;**17**(3):279–301. [DOI: 10.1177/0962280207080643; PUBMED: 17925316]

Salsman 2015
Salsman JM, Pustejovsky JE, Jim HS, Munoz AR, Merluzzi TV, George L, et al. A meta-analytic approach to examining the correlation between religion/spirituality and mental health in cancer. *Cancer* 2015;**121**(21):3769–78. [DOI: 10.1002/cncr.29350; PMC4618157; PUBMED: 26258536]

Sapienza 2011
Sapienza JK, Masten AS. Understanding and promoting resilience in children and youth. *Current Opinion in Psychiatry* 2011;**24**(4):267–73. [DOI: 10.1097/YCO.0b013e32834776a8; PUBMED: 21546838]

Sarkar 2014
Sarkar M, Fletcher D. Psychological resilience in sport performers: a review of stressors and protective factors. *Journal of Sports Sciences* 2014;**32**(15):1419–34. [DOI: 10.1080/02640414.2014.901551; PUBMED: 24716648]

Sattler 2014
Sattler DN, Boyd B, Kirsch J. Trauma-exposed firefighters: relationships among posttraumatic growth, posttraumatic stress, resource availability, coping and critical incident stress debriefing experience. *Stress and Health* 2014;**30**(5): 356–65. [DOI: 10.1002/smi.2608; PUBMED: 25476961]

Schachman 2004
Schachman KA, Lee RK, Lederman RP. Baby boot camp: facilitating maternal role adaptation among military wives. *Nursing Research* 2004;**53**(2):107–15. [PUBMED: 15084995]

Schaefer 2013
Schaefer SM, Morozink Boylan J, Van Reekum CM, Lapate RC, Norris CJ, Ryff CD, et al. Purpose in life predicts better emotional recovery from negative stimuli. *PLoS One* 2013; **8**(11):e80329. [DOI: 10.1371/journal.pone.0080329; PMC3827458; PUBMED: PMC3827458]

Schaufeli 2002
Schaufeli WB, Salanova M, González-Romá V, Bakker AB. The measurement of engagement and burnout: a two sample confirmatory factor analytic approach. *Journal of Happiness Studies* 2002;**3**(1):71–92.

Scheier 1994
Scheier MF, Carver CS, Bridges MW. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a re-evaluation of the Life Orientation Test. *Journal of Personality and Social Psychology* 1994;**67**(6): 1063–78. [PUBMED: 7815302]

Schnyder 2008
Schnyder U, Wittmann L, Friedrich-Perez J, Hepp U, Moergeli H. Posttraumatic stress disorder following accidental injury: rule or exception in Switzerland?. *Psychotherapy and Psychosomatics* 2008;**77**(2):111–8. [DOI: 10.1159/000112888; PUBMED: 18230944]

Schumm 2006
Schumm JA, Briggs-Phillips M, Hobfoll SE. Cumulative interpersonal traumas and social support as risk and resiliency factors in predicting PTSD and depression among inner-city women. *Journal of Traumatic Stress* 2006;**19**(6): 825–36. [DOI: 10.1002/jts.20159; PUBMED: 17195981]

Schwarzer 2008
Schwarzer R, Hallum S. Perceived teacher self-efficacy as a predictor of job stress and burnout: mediation analyses. *Applied Psychology* 2008;**57**(s1):152–71. [DOI: 10.1111/j.1464-0597.2008.00359.x]

Schwarzer 2015 [Computer program]
Schwarzer G. Meta. Available from http://CRAN.R–project.org/package=meta, 2015.

Schünemann 2011
Schünemann H, Oxman AD, Vist GE, Higgins JPT, Deeks JJ, Glasziou P, et al. Chapter 12: Interpreting results and drawing conclusions. In: Higgins JP, Green S, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.

Schünemann 2013
Schünemann H, Broż ek J, Guyatt G, Oxman A (editors). *GRADE Handbook for Grading the Quality of Evidence and the Strength of Recommendations*. The GRADE Working Group, 2013.

Segovia 2012
Segovia F, Moore JL, Linnville SE, Hoyt RE, Hain RE. Optimism predicts resilience in repatriated prisoners of war: A 37-year longitudinal study. *Journal of Traumatic Stress* 2012;**25**(3):330–6. [PUBMED: 22615194]

Senra 2015
Senra H, Barbosa F, Ferreira P, Vieira CR, Perrin PB, Rogers H, et al. Psychologic adjustment to irreversible vision loss in adults: a systematic review. *Ophthalmology* 2015; **122**(4):851–61. [DOI: 10.1016/j.ophtha.2014.10.022; PUBMED: 25573719]

Shand 2015
Shand LK, Cowlishaw S, Brooker JE, Burney S, Ricciardelli LA. Correlates of post-traumatic stress symptoms and growth in cancer patients: a systematic review and meta-analysis. *Psycho-oncology* 2015;**24**(6):624–34. [DOI: 10.1002/pon.3719; PUBMED: 25393527]

Shapiro 2005
Shapiro SL, Astin JA, Bishop SR, Cordova M. Mindfulness-based stress reduction for health care professionals: results from a randomized trial. *International Journal of Stress Management* 2005;**12**(2):164–76. [DOI: 10.1037/1072-5245.12.2.164]

Sherbourne 1991
Sherbourne CD, Stewart AL. The MOS social support survey. *Social Science and Medicine* 1991;**32**(6):705–14. [PUBMED: 2035047]

Sherer 1982
Sherer M, Maddux JE, Mercandante B, Prentice-Dunn S, Jacobs B, Rogers RW. The Self-efficacy Scale: construction and validation. *Psychological Reports* 1982;**51**(2):663–71. [DOI: 10.2466/pr0.1982.51.2.663]

Silver 2002
Silver RC, Holman EA, McIntosh DN, Poulin M, Gil-Rivas V. Nationwide longitudinal study of psychological responses to September 11. *JAMA* 2002;**288**(10):1235–44. [PUBMED: 12215130]

Sinclair 2004
Sinclair VG, Wallston KA. The development and psychometric evaluation of the Brief Resilient Coping Scale. *Assessment* 2004;**11**(1):94–101. [PUBMED: 14994958]

Smith 2007
Smith C, Hancock H, Blake-Mortimer J, Eckert K. A randomised comparative trial of yoga and relaxation to reduce stress and anxiety. *Complementary Therapies in Medicine* 2007;**15**(2):77–83. [DOI: 10.1016/j.ctim.2006.05.001; PUBMED: 17544857]

Smith 2008
Smith BW, Dalen J, Wiggins K, Tooley E, Christopher P, Bernard J. The Brief Resilience Scale: assessing the ability to bounce back. *International Journal of Behavioral Medicine* 2008;**15**(3):194–200. [DOI: 10.1080/10705500802222972; PUBMED: 18696313]

Smith 2009
Smith BW, Tooley EM, Montague EQ, Robinson AE, Cosper CJ, Mullins PG. The role of resilience and purpose in life in habituation to heat and cold pain. *Journal of Pain* 2009;**10**(5):493–500. [DOI: 10.1016/j.jpain.2008.11.007; PUBMED: 19345153]

Solomon 1988
Solomon Z, Mikulincer M, Avitzur E. Coping, locus of control, social support, and combat-related posttraumatic stress disorder: a prospective study. *Journal of Personality and Social Psychology* 1988;**55**(2):279–85. [PUBMED: 3171908]

Songprakun 2012
Songprakun W, McCann TV. Effectiveness of a self-help manual on the promotion of resilience in individuals with depression in Thailand: a randomised controlled trial. *BMC Psychiatry* 2012;**12**:12. [DOI: 10.1186/1471-244X-12-12; PMC3298500; PUBMED: 22339984]

Sood 2010
Sood A. *Train Your Brain. Engage Your Heart. Transform Your Life. A Two Step Program to Enhance Attention; Decrease Stress; Cultivate Peace, Joy and Resilience; and Practice Presence with Love. A course in Attention & Interpretation Therapy (AIT)*. Rochester (MN): Morning Dew Publications, 2010.

Sood 2011
Sood A, Prasad K, Schroeder D, Varkey P. Stress management and resilience training among Department of Medicine faculty: a pilot randomized clinical trial. *Journal of General Internal Medicine* 2011;**26**(8):858–61. [DOI: 10.1007/s11606-011-1640-x; PMC3138987; PUBMED: 21279454]

Sood 2014
Sood A, Sharma V, Schroeder DR, Gorman B. Stress Management and Resiliency Training (SMART) program among Department of Radiology faculty: a pilot randomized clinical trial. *Explore* 2014;**10**(6):358–63. [DOI: 10.1016/j.explore.2014.08.002; PUBMED: 25443423]

Southwick 2005
Southwick SM, Vythilingam M, Charney DS. The psychobiology of depression and resilience to stress: implications for prevention and treatment. *Annual Review of Clinical Psychology* 2005;**1**:255–91. [DOI: 10.1146/annurev.clinpsy.1.102803.143948; PUBMED: 17716089]

Southwick 2011
Southwick SM, Pietrzak RH, White G. Interventions to enhance resilience and resilience-related constructs in adults. In: Southwick SM, Litz BT, Charney DS, Friedman MJ editor(s). *Resilience and Mental Health: Challenges Across the Lifespan*. Cambridge: Cambridge University Press, 2011: 289–306. [DOI: 10.1017/CBO9780511994791.022]

Southwick 2012
Southwick SM, Charney DS (editors). *Resilience: The Science of Mastering Life's Greatest Challenges*. Cambridge: Cambridge University Press, 2012.

Spielberger 1970
Spielberger CD, Gorsuch RL, Lushene RE. *STAI Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press, 1970.

Spitzer 1999
Spitzer RL, Kroenke K, Williams JBW, and the Patient Health Questionnaire Primary Study Group. Validation and utility of a self-report version of PRIME-MD: the PHQ Primary Care Study. *JAMA* 1999;**282**(18):1737–44. [DOI: 10.1001/jama.282.18.1737; PUBMED: 10568646]

Stahl 2010
Stahl B, Goldstein E. *A Mindfulness-Based Stress Reduction Workbook*. Oakland (CA): New Harbinger Publications, Inc, 2010.

Steinhardt 2008
Steinhardt MA, Dolbier CL. Evaluation of a resilience intervention to enhance coping strategies and protective factors and decrease symptomatology. *Journal of American College Health* 2008;**56**(4):445–53. [DOI: 10.3200/JACH.56.44.445-454; PUBMED: 18316290]

Sterne 2011
Sterne JAC, Egger M, Moher D on behalf of the Cochrane Bias Methods Group. Chater 10: Addressing reporting biases. In: Higgins JP, Green S, editor(s). Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 (updated March 2011). The Cochrane Collaboration, 2011. Available from handbook.cochrane.org.

Stewart 2011
Stewart DE, Yuen T. A systematic review of resilience in the physically ill. *Psychosomatics* 2011;**52**(3):199–209. [DOI: 10.1016/j.psym.2011.01.036; PUBMED: 21565591]

Stoffers 2013
Stoffers JM, Völlm BA, Rücker G, Timmer A, Huband N, Lieb K. Psychological therapies for people with borderline personality disorder. *Cochrane Database of Systematic Reviews* 2012, Issue 8. [DOI: 10.1002/14651858.CD005652.pub2]

Strand 2006
Strand EB, Zautra AJ, Thoresen M, Ødegård S, Uhlig T, Finset A. Positive affect as a factor of resilience in the pain-negative affect relationship in patients with rheumatoid arthritis. *Journal of Psychosomatic Research* 2006;**60**(5):477–84. [PUBMED: 16650588]

Sumer 2005
Sumer N, Karanci AN, Berument SK, Gunes H. Personal resources, coping self-efficacy, and quake exposure as predictors of psychological distress following the 1999 earthquake in Turkey. *Journal of Traumatic Stress* 2005;**18**(4):331–42. [DOI: 10.1002/jts.20032; PUBMED: 16281230]

Tan 2016
Tan KK, Chan SW, Wang W, Vehviläinen-Julkunen K. A salutogenic program to enhance sense of coherence and quality of life for older people in the community: a feasibility randomized controlled trial and process evaluation. *Patient Education and Counseling* 2016;**99**(1):108–16. [DOI: 10.1016/j.pec.2015.08.003; PUBMED: 26293542]

Tedeschi 1996
Tedeschi RG, Calhoun LG. The Posttraumatic Growth Inventory: measuring the positive legacy of trauma. *Journal of Traumatic Stress* 1996;**9**(3):455–71. [PUBMED: 8827649]

Tilden 1990
Tilden VP, Nelson CA, May BA. The IPR inventory: development and psychometric characteristics. *Nursing Research* 1990;**39**(6):337–43. [PUBMED: 2092307]

Truitt 2012
Truitt M, Biesecker B, Capone G, Bailey T, Erby L. The role of hope in adaptation to uncertainty: the experience of caregivers of children with Down syndrome. *Patient Education and Counseling* 2012;**87**(2):233–8. [DOI: 10.1016/j.pec.2011.08.015; PMC3816013; PUBMED: 21937189]

Tsai 2015
Tsai J, El-Gabalawy R, Sledge WH, Southwick SM, Pietrzak RH. Post-traumatic growth among veterans in the USA: results from the National Health and Resilience in Veterans Study. *Psychological Medicine* 2015;**45**(1):165–79. [DOI: 10.1017/S0033291714001202; PUBMED: 25065450]

Tsai 2016
Tsai J, Sippel LM, Mota N, Southwick SM, Pietrzak RH. Longitudinal course of posttraumatic growth among US military veterans: results from the National Health and Resilience in Veterans Study. *Depression and Anxiety* 2016;**33**(1):9–18. [DOI: 10.1002/da.22371; PUBMED: 25914061]

Tschannen-Moran 2001
Tschannen-Moran M, Woolfolk Hoy A. Teacher efficacy: capturing an elusive construct. *Teaching and Teacher Education* 2001;**17**(7):783–805. [DOI: 10.1016/S0742-051X(01)00036-1]

Ungar 2008
Ungar M, Liebenberg L, Boothroyd R, Kwong WM, Lee TY, Leblanc J, et al. The study of youth resilience across cultures: lessons from a pilot study of measurement development. *Research in Human Development* 2008;**5**(3):166–80. [DOI: 10.1080/15427600802274019]

Van der Kleij 2011
Van der Kleij R, Molenaar D, Schraagen JM. Making teams more resilient: effects of shared transformational leadership training on resilience. Proceedings of the Human Factors and Ergonomics Society 55th Annual Meeting, 2011 September 19-23; Las Vegas (NV). 2011; Vol. 55 (1):2158–62. [DOI: 10.1177/1071181311551450]

Van Kessel 2013
Van Kessel G. The ability of older people to overcome adversity: a review of the resilience concept. *Geriatric Nursing* 2013;**34**(2):122–7. [DOI: 10.1016/j.gerinurse.2012.12.011; PUBMED: 23332474]

Van Leeuwen 2012
Van Leeuwen CM, Kraaijeveld S, Lindeman E, Post MW. Associations between psychological factors and quality of life ratings in persons with spinal cord injury: a systematic review. Spinal Cord 2012; Vol. 50, issue 3:174–87. [DOI: 10.1038/sc.2011.120; PUBMED: 22042298]

Vanhove 2015
Vanhove AJ, Herian MN, Perez ALU, Harms PD, Lester PB. Can resilience be developed at work? A meta-analytic

review of resilience-building programme effectiveness. *Journal of Occupational and Organizational Psychology* 2015; **89**(2):278–307. [DOI: 10.1111/joop.12123]

Veroniki 2015
Veroniki AA, Jackson D, Viechtbauer W, Bender R, Bowden J, Knapp G, et al. Methods to estimate the between-study variance and its uncertainty in meta-analysis. Research Synthesis Methods 2015 September 2 [Epub ahead of print]. [DOI: 10.1002/jrsm.1164]

Viechtbauer 2010
Viechtbauer W. Conducting meta-analyses in R with the metafor package. *Journal of Statistical Software* 2010;**36**(3): 1–48. [DOI: 10.18637/jss.v036.i03]

Viechtbauer 2015 [Computer program]
Viechtbauer W. Metafor: meta-analysis package for R. R package version 1.9.8. Available from: https://cran.r–project.org/web/packages/metafor/index.html, 2015.

Visser 2010
Visser A, Garssen B, Vingerhoets A. Spirituality and well-being in cancer patients: a review. *Psycho-oncology* 2010; **19**(6):565–72. [DOI: 10.1002/pon.1626; PUBMED: 19916163]

Wade 2001
Wade SL, Borawski EA, Taylor HG, Drotar D, Yeates KO, Stancin T. The relationship of caregiver coping to family outcomes during the initial year following pediatric traumatic injury. *Journal of Consulting and Clinical Psychology* 2001;**69**(3):406–15. [PUBMED: 11495170]

Wagnild 1993
Wagnild GM, Young HM. Development and psychometric evaluation of the Resilience Scale. *Journal of Nursing Measurement* 1993;**1**(2):165–78. [PUBMED: 7850498]

Wagnild 2010
Wagnild GM. *The Resilience Scale User's Guide for the US English Version of the Resilience Scale and the 14-Item Resilience Scale (RS-14)*. Worden (MT): The Resilience Center, 2010.

Waite 2004
Waite PJ, Richardson GE. Determining the efficacy of resiliency training in the work site. *Journal of Allied Health* 2004;**33**(3):178–83. [PUBMED: 15503750]

Walker 1987
Walker S, Sechrist KR, Pender NJ. The Health-Promoting Lifestyle Profile: development and psychometric characteristics. *Nursing Research* 1987;**36**(2):76–81. [PUBMED: 3644262]

Walsh 2002
Walsh K, King M, Jones L, Tookman A, Blizard R. Spiritual beliefs may affect outcome of bereavement: prospective study. *BMJ* 2002;**324**(7353):1551. [DOI: PMC116607; PUBMED: 12089091]

Wang 2014
Wang F, Liu J, Liu L, Wang F, Ma Z, Gao D, et al. The status and correlates of depression and anxiety among breast-cancer survivors in Eastern China: a population-based, cross-sectional case-control study. *BMC Public Health* 2014;**14**:326. [DOI: 10.1186/1471-2458-14-326; PMC3997219; PUBMED: 24708474]

Ware 1994
Ware JE, Kosinski M, Keller SD. *SF-36 Physical and Mental Health Summary Scales: A User's Manual*. Boston (MA): The Health Institute, New England Medical Center, 1994.

Watson 1988
Watson D, Clark LA, Tellegen A. Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology* 1988;**54**(6):1063–70. [PUBMED: 3397865]

Watson 1994
Watson D, Clark LA. *The PANAS-X: Manual for the Positive and Negative Affect Schedule-Expanded Form*. Ames: The University of Iowa, 1994.

Waysman 2001
Waysman M, Schwarzwald J, Solomon Z. Hardiness: an examination of its relationship with positive and negative long term changes following trauma. *Journal of Traumatic Stress* 2001;**14**(3):531–48. [DOI: 10.1023/A: 1011112723704; PUBMED: 11534884]

Weiss 2002
Weiss MJ. Hardiness and social support as predictors of stress in mothers of typical children, children with autism, and children with mental retardation. *Autism* 2002;**6**(1): 115–30. [PUBMED: 11918107]

White 2005
White IR, Thomas J. Standardized mean differences in individually-randomized and cluster-randomized trials, with applications to meta-analysis. *Clinical Trials* 2005;**2** (2):141–51. [PUBMED: 16279136]

White 2012
White JH, Magin P, Attia J, Sturm J, Carter G, Pollack M. Trajectories of psychological distress after stroke. *Annals of Family Medicine* 2012;**10**(5):435–42. [DOI: 10.1370/ afm.1374; PMC3438211; PUBMED: 22966107]

White 2012a
White IR, Barrett JK, Jackson D, Higgins JPT. Consistency and inconsistency in network meta-analysis: model estimation using multivariate meta-regression. *Reseacrh Synthesis Methods* 2012;**3**(2):111–25. [DOI: 10.1002/ jrsm.1045]

Whiting-O'Keefe 1984
Whiting-O'Keefe QE, Henke C, Simborg DW. Choosing the correct unit of analysis in medical care experiments. *Medical Care* 1984;**22**(12):1101–14. [PUBMED: 6513619]

WHO 1986
World Health Organization. *Ottawa Charter of Health Promotion*. Geneva: World Health Organization, 1986.

WHO 2004
World Health Organization. *Promoting Mental Health: Concepts, Emerging Evidence, Practice: Summary Report*. Geneva: World Health Organization, 2004.

WHOQOL Group 1998
WHOQOL Group. Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychological Medicine* 1998;**28**(3):551–8. [PUBMED: 9626712]

Williams 1997
Williams RA. *Psychometrics of the Coping Styles Questionnaire (CSQ)*. Ann Arbo (MI): University of Michigan, 1997.

Windle 2008
Windle G, Markland DA, Woods RT. Examination of a theoretical model of psychological resilience in older age. *Aging and Mental Health* 2008;**12**(3):285–92. [DOI: 10.1080/13607860802120763; PUBMED: 18728940]

Windle 2011a
Windle G. What is resilience? A review and concept analysis. *Reviews in Clinical Gerontology* 2011;**21**(2): 152–69. [DOI: 10.1017/S0959259810000420]

Windle 2011b
Windle G, Bennett KM, Noyes J. A methodological review of resilience measurement scales. *Health and Quality of Life Outcomes* 2011;**9**:8. [DOI: 10.1186/1477-7525-9-8; PMC3042897]

Winger 2016
Winger JG, Adams RN, Mosher CE. Relations of meaning in life and sense of coherence to distress in cancer patients: a meta-analysis. *Psycho-oncology* 2016;**25**(1):2–10. [DOI: 10.1002/pon.3798; PMC4575247; PUBMED: 25787699]

Winwood 2013
Winwood PC, Colon R, McEwen K. A practical measure of workplace resilience: developing the resilience at work scale. *Journal of Occupational and Environmental Medicine* 2013;**55**(10):1205–12. [DOI: 10.1097/JOM.0b013e3182a2a60a; PUBMED: 24064782]

Wolfe 2004
Wolfe F. Fatigue assessments in rheumatoid arthritis: comparative performance of visual analog scales and longer fatigue questionnaires in 7760 patients. *Journal of Rheumatology* 2004;**31**(10):1896–902. [PUBMED: 15468350]

Wolpe 1958
Wolpe J. *Psychotherapy by Reciprocal Inhibition*. Stanford (CA): Stanford University Press, 1958.

Wright 2008
Wright LJ, Zautra AJ, Going S. Adaptation to early knee osteoarthritis: the role of risk, resilience, and disease severity on pain and physical functioning. *Annals of Behavioral Medicine* 2008;**36**(1):70–80. [DOI: 10.1007/s12160-008-9048-5; PMC2613296; PUBMED: 18716855]

Wu 2013
Wu G, Feder A, Cohen H, Kim JJ, Calderon S, Charney DS, et al. Understanding resilience. *Frontiers in Behavioral Neuroscience* 2013;**7**:10. [DOI: 10.3389/fnbeh.2013.00010; PMC3573269]

Zauszniewski 2010
Zauszniewski J, Bekhet A, Suresky MJ. Resilience in family members of persons with serious mental illness. *Nursing Clinics of North America* 2010;**45**(4):613–26. [DOI: 10.1016/j.cnur.2010.06.007; PUBMED: 20971340]

Zautra 2005
Zautra AJ, Johnson LM, Davis MC. Positive affect as a source of resilience for women in chronic pain. *Journal of Consulting and Clinical Psychology* 2005;**73**(2):212–20. [DOI: 10.1037/0022-006X.73.2.212; NIHMS71708; PMC2593933]

Zigmond 1983
Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica* 1983;**67**(6):361-70. [DOI: 10.1111/j.1600-0447.1983.tb09716.x]

* *Indicates the major publication for the study*

APPENDICES

Appendix 1. Evidence rating of modifiable resilience factors

Although an immense number of factors have been discussed in the literature, only a set of psychosocial factors has been scientifically validated as being appropriate determinants of resilience by cross-sectional and longitudinal (frequently observational) studies in different populations (e.g. patients affected by physical diseases like cancer, diabetes, spinal cord injury, coronary heart disease, etc.; different caregiver groups; individuals after trauma exposure). Upon closer examination, only some of the discussed resilience factors may be viewed as well-evidenced factors that have also been found to be protective factors in systematic reviews and meta-analyses (level 1). These factors are most likely to be related to adult resilience, as they were proven in different populations facing various adversities and stressors. However, it has to be kept in mind that the chosen factors represent the current state of knowledge on psychosocial resilience-promoting factors, and that other factors, which are not yet well researched, could also contribute to resilience.

Level of evidence and criteria	Resilience factors
Level 1: strong evidence (SRs and MAs) • Factor has been studied with regard to its association to resilience (i.e. mental health or well-being or psychological adaptation despite (acute or chronic) stressors, life events or traumas) in observational (cross-sectional or longitudinal) studies in adults • There is evidence from SRs AND MAs	
Level 1a: there is evidence for this factor from several SRs AND several MAs (both across different populations)	• **Active coping (e.g. problem-solving, planning)** ○ 2 MAs: Kvillemo 2014; Moskowitz 2009 ○ 4 SRs: Bjørkløf 2013; Kneebone 2003; Senra 2015; Van Kessel 2013 ○ Cross-sectional studies: e.g. Al-Yagon 2009; Dörfel 2008; Lechner 2007; Luo 2015; Marty 2010; Wang 2014 ○ Longitudinal studies: e.g. Butler 2009; Silver 2002 • **Self-efficacy** ○ 2 MAs: Jackson 2014; Lee 2013 ○ 9 SRs: Allart 2013; Dias 2015; Korpershoek 2011; Luszczynska 2009; Morris 2013; Peter 2012; Stewart 2011; Van Kessel 2013; Van Leeuwen 2012 ○ Cross-sectional studies: e.g. Barry 2003; Northouse 2002; Orengo 2001; Schwarzer 2008; Wright 2008 ○ Longitudinal studies: e.g. DeRoon-Cassini 2010; Guest 2015; Hartley 2008 • **Optimism or positive attributional style** ○ 4 MAs: Helgeson 2006; Lee 2013; Prati 2009; Shand 2015 ○ 5 SRs: Dias 2015; Duits 1997; Peter 2012; Stewart 2011; Van Kessel 2013 ○ Cross-sectional studies: e.g. Martin-Krumm 2003; Sumer 2005 ○ Longitudinal studies: e.g. Ahmad 2010; Carver 2010; Fresco 2006; Grote 2007; Kivimäki 2005; Myhren 2010; Segovia 2012 • **Social support** ○ 4 MAs: Lee 2013; Ozer 2003; Prati 2009; Shand 2015 ○ 11 SRs: Allart 2013; Casale 2013; Dias 2015; Duits 1997; McCann 2013; Morris 2013; Paterson 2013; Pragodpol 2013; Senra 2015; Stewart 2011; Van Kessel 2013 ○ Cross-sectional studies: e.g. Ahern 2004; Fuller-Iglesias 2008; Kaspersen 2003; Schumm 2006 ○ Longitudinal studies: e.g. Bartone 1989; Dyrbye 2010; Johnson 2009; Koenen 2003; Solomon 1988 • **Cognitive flexibility (e.g. positive reappraisal, acceptance of negative situations and emotions)**[1] ○ 6 MAs: Helgeson 2006; Kvillemo 2014; McIntosh 2012; Moskowitz 2009; Prati 2009; Shand 2015 ○ 11 SRs: Allart 2013; Bjørkløf 2013; Dias 2015; Guardino 2013; Kneebone 2003; Morris 2013; Nowlan 2015; Peter 2012; Senra 2015; Stewart 2011; Van Leeuwen 2012

(*Continued*)

	○ Cross-sectional studies: e.g. Bailey 2013; Farber 2003; Johnson 2015; Min 2013 ○ Longitudinal studies: e.g. Park 2008; Silver 2002; Wade 2001 • **Religiosity or spirituality or religious coping (e.g. frequent religious attendance)**[1] ○ 7 MAs: Ano 2005; Helgeson 2006; McIntosh 2012; Moskowitz 2009; Prati 2009; Salsman 2015; Shand 2015 ○ 7 SRs: Bjørkløf 2013; Guardino 2013; McCann 2013; Peter 2012; Senra 2015; Stewart 2011; Visser 2010 ○ Cross-sectional studies: e.g. Cruz 2016; Tsai 2015 ○ Longitudinal studies: e.g. Hebert 2007; Kasen 2014; Koenig 2007; Walsh 2002
Level 1b: there is evidence for this factor from several SRs AND a single MA (both across different populations)	• **Positive emotions or positive affect** ○ 1 MA: Lee 2013 ○ 2 SRs: Van Kessel 2013; Van Leeuwen 2012 ○ Cross-sectional studies: e.g. Cohen 2006; Gloria 2016; Ong 2006 ○ Longitudinal studies: e.g. Fredrickson 2003; Geschwind 2010; Quale 2010; Strand 2006; Zautra 2005 • **Hardiness** ○ 1 MA: Eschleman 2010 ○ 4 SRs: Brooks 2003; Dias 2015; McCann 2013; Stewart 2011 ○ Cross-sectional studies: e.g. Alexander 2001; Andrew 2008; Bernas 2000; Farber 2000; Hystad 2011; Judkins 2005; King 1998; Natvik 2011; Waysman 2001; Weiss 2002 ○ Longitudinal studies: e.g. Dolan 2006; Bartone 1989 • **Self-esteem** ○ 1 MA: Lee 2013 ○ 4 SRs: Allart 2013; Peter 2012; Stewart 2011; Van Leeuwen 2012 ○ Cross-sectional studies: e.g. Besser 2014; Fernández-Lansac 2012; Hayter 2014 ○ Longitudinal studies: e.g. Bookwala 2014
Level 1c: there is evidence for this factor from several SRs (across different populations) AND a single MA (in the same population)	• **Meaning in life or purpose in life** ○ 1 MA: Winger 2016 ○ 5 SRs: Allart 2013; Peter 2012; Van Kessel 2013; Van Leeuwen 2012; Visser 2010) ○ Cross-sectional studies: e.g. Alim 2008; Bauer-Wu 2005; Blackburn 2015; Feder 2013; Lyon 2001; Owens 2009; Pietrzak 2013; Schaefer 2013; Smith 2009; Tsai 2015 ○ Longitudinal studies: e.g. Krause 2007; Tsai 2016 • **Sense of coherence** ○ 1 MA: Winger 2016 ○ 7 SRs: Allart 2013; Bjørkløf 2013; Eriksson 2006; Peter 2012; Pragodpol 2013; Van Kessel 2013; Van Leeuwen

(*Continued*)

	2012) ○ Cross-sectional studies: e.g. Al-Yagon 2009; Cohen 2003; Forstmeier 2009 ○ Longitudinal studies: e.g. Frommberger 1999; Schnyder 2008
Level 2: moderate evidence (only SRs or single MA) • Factor has been studied with regard to its association to resilience (i.e. mental health or well-being or psychological adaptation despite (acute or chronic) stressors, life events or traumas) in observational (cross-sectional or longitudinal) studies in adults • There is evidence from SR OR a single MA	
Level 2a: there is evidence for this factor from several SRs (across different populations) OR there is no evidence from SRs, but from a MA (across different populations)	• **(Internal) Locus of control** ○ 6 SRs: Bjørkløf 2013; Dias 2015; Saksvik 2011; Senra 2015; Stewart 2011; Van Leeuwen 2012 ○ Cross-sectional studies: e.g. Kilic 2013; Sattler 2014; Solomon 1988 ○ Longitudinal studies: e.g. Karstoft 2015; Lawler 1992; Milte 2015; White 2012 • **Coping flexibility** ○ 1 MA: Cheng 2014 ○ Cross-sectional studies: e.g. Atal 2016; Bonanno 2011; Burton 2012; Park 2015 ○ Longitudinal studies: e.g. Bonanno 2004; Galatzer-Levy 2012
Level 2b: there is evidence for this factor from several SRs (in the same population)	• **Hope** ○ 2 SRs: Peter 2012; Van Leeuwen 2012 ○ Cross-sectional studies: e.g. Besser 2014; Hernandez 2013; Ong 2006; Truitt 2012 ○ Longitudinal studies: e.g. Ho 2010
Level 2c: there is evidence for this factor from a single SR (in the same population)	• **Humour** ○ 1 SR: McCann 2013 ○ Cross-sectional studies: e.g. Abel 2002a; Abel 2002b ○ Longitudinal studies: e.g. Kuiper 1992; Nezu 1988
Level 3: weak evidence (no SR or MA) • Expert opinion without explicit critical appraisal • Factor has not been studied sufficiently with regard to its association to resilience (i.e. mental health or well-being or psychological adaptation despite (acute or chronic) stressors, life events or traumas) in adults • Factor is only mentioned in unsystematic narrative reviews or discussion papers, or both	
	• **Altruism** ○ Narrative reviews or discussion papers: Haglund 2007; Southwick 2005; Wu 2013

Footnotes
MA: Meta-analysis; SR: Systematic review.

Results on systematic reviews and meta-analyses based on a literature search for potentially modifiable resilience factors in MEDLINE (search strategy: respective resilience factor.tw. AND (review or meta-analy$).tw.; search limited to "All adults (19 plus years)" and 1990-2016).

[1]Cognitive flexibility and religiosity or spirituality are multidimensional concepts resulting in highly ambiguous operationalisations. Cognitive flexibility comprises several concepts, such as positive reappraisal and acceptance (Southwick 2005). Religiosity or spirituality combines affective, behavioural and cognitive dimensions, each measured differently (Ano 2005; Pargament 2000; Salsman 2015).

Appendix 2. Examples of training methods to address resilience factors

Evidence-based resilience factor	Examples of training methods to address the resilience factor
Meaning in life or purpose in life	Introduce the benefits of purpose in life; support individuals in identifying important sources of meaning (e.g. social relationships, work) as well as in setting priorities and guiding values for their life (e.g. Sood 2011)
Sense of coherence (comprehensibility, meaningfulness, manageability)	Promote the understanding of external life challenges, personal beliefs and emotions; encourage participants to reflect on personal (internal or external) resources and to use them more frequently (e.g. Tan 2016)
Positive emotions or positive affect	Psychoeducation on emotions; mindfulness techniques; support individuals in identifying pleasant activities to enhance positive emotions (e.g. Jennings 2013)
Hardiness (challenge, commitment, control)	Situational reconstruction (i.e. imagination of stressful circumstances); focusing (i.e. reflection on bodily sensations of emotional upset) (e.g. Maddi 1998; Maddi 2009)
Self-esteem	Support participants in identifying personal strengths
Active coping (e.g. problem-solving, planning)	Introduce the problem-solving model and familiarise participants with the use of active coping strategies in stressful situations (e.g. making action plans) (e.g. Abbott 2009; Bekki 2013; Sahler 2013)
Self-efficacy	Support participants in identifying personal strengths and other sources of self-efficacy (e.g. social connections); support individuals in realising previous successes (e.g. coping of negative situations)
Optimism or positive attributional style	Teach participants to adapt a more positive attributional style for stressful (i.e. external, unstable, specific) and pleasant events (i.e. internal, stable, global); encourage individuals to gain a brighter outlook for the future by enhancing their attention for and the discovery of positive aspects in their lives (e.g. Carver 2010; Sadow 1993)

(*Continued*)

Social support	Encourage the individual's reflection on his or her current network (i.e. magnitude of social network, positive or negative aspects in social relationships); enhance the individual's support network by providing them with communication techniques (e.g. Kent 2011; Schachman 2004; Sood 2011; Steinhardt 2008)
Cognitive flexibility (e.g. positive reappraisal, acceptance of negative situations and emotions)	Positive reappraisal: introduction of ABC (Activating Event, Belief, Consequence) Technique of Irrational Beliefs (Ellis 1957) of cognitive therapy; train participants in identifying and challenging maladaptive thoughts and replacing them by more positive ones (e.g. Abbott 2009; Farchi 2010; Songprakun 2012; Steinhardt 2008) Acceptance: relaxation or mindfulness techniques
Religiosity or spirituality or religious coping (e.g. frequent religious attendance)	Spiritual exercises like meditation or yoga; psychoeducation on coping strategies like regular praying or participating in religious community activities (e.g. worship) (e.g. Sood 2011)

Appendix 3. Potential instruments for the measurement of psychological resilience based on previous reviews (Leppin 2014; Macedo 2014; Robertson 2015) and additional literature searches

N°	Measure	Theory and item selection	Internal consistency	Validity	Rating
1	Resilience Scale (RS-25) (Wagnild 1993)[4]	+	+++	+++	6+
2	Brief Resilience Scale (BRS) (Smith 2008)	+	+++	+++	6+
3	Ego Resiliency (Klohnen 1996)[4]	+	++	+++	5+
4	Connor - Davidson Resilience Scale (CD-RISC) (Connor 2003)	+	++	+++	5+
5	Resilience Scale for Adults (RSA_{33}) (Friborg 2005)	+	++	+++	5+

(*Continued*)

6	Trauma Resilience Scale (TRS_{37}) (Madsen 2010)	+	+++	++	5✦
7	Ego - Resiliency Scale (ER89) (Block 1996)[4]	-	++	+++	5✧
8	Resilience Scale (RS-14) (Wagnild 2010)[4]	+	+++	+	4✦
9	Resilience Scale for Adults (RSA_{37}) (Friborg 2003)	+	++	++	4✦
10	Resilience at Work Scale (Winwood 2013)	+	++	++	4✦
11	Workplace Resilience Inventory (WRI) (McLarnon 2013)	+	++	++	4✦
12	Multidimensional Trauma Recovery and Resiliency Scale (MTRR) (Harvey 2003)	+	+++	+	4✦
13	Resiliency Attitudes and Skills Profile (RASP) (Hurtes 2001)	+	+++	+	4✦
14	Resilience Appraisals Scale (RAS) (Johnson 2010)	-	+++	+	4✧
15	Revised Ego Resiliency 89 Scale (ER89-R) (Alessandri 2007)[4]	+	++	+	3✦
16	Ego Resiliency (Bromley 2006)[4]	+	++	+	3✦
17	Connor - Davidson Resilience Scale (CD-	+	++	+	3✦

(*Continued*)

	RISC-10) (Campbell-Sills 2007)				
18	Resilience Scale for Adults (RSA_{45}) (Hjemdal 2001)	+	+++	-	3✦
19	Brief Resilient Coping Scale (BRCS) (Sinclair 2004)	+	+	++	3✦
20	Trauma Resilience Scale (TRS_{48}) (Madsen 2010)	+	+++	-	3✦
21	Child and Youth Resilience Measure - 28 (CYRM-28) (Liebenberg 2012; Ungar 2008)	+	+++	-	3✦
22	Post-traumatic Growth Inventory (PTGI) (Tedeschi 1996)[5]	+	++	+	3✦
23	Adolescent Resilience Scale (Oshio 2002; Oshio 2003)	-	++	+	3✧
24	Resilience and Reintegration (20 items drawn from Spirit Core Scale) (Waite 2004)	-	+++	-	3✧
25	Psychological resilience (Windle 2008)	+	++	-	2✦
26	Child and Youth Resilience Measure - 12 (CYRM-12) (Liebenberg 2013)	+	++	-	2✦
27	Resilience scale (Bekki 2013)	+	++	-	2✦
28	Perceived resilience (Van der Kleij 2011)	-	++	-	2✧

(*Continued*)

29	Romanian Scale of Resilience to Occupational Stress (SROS) (Aniţei 2012)	-	-	-	0✧

Footnotes

The resilience scales are specified hierarchically according to psychometric quality criteria.

Theory & item selection: - (✧): no description of theory or item selection process available; and + (✦): description of theory or item selection process available.
Internal consistency (Cronbach's alpha): - (0): no information; + (1): $\alpha < 0.70$; ++ (2): $\alpha \geq 0.70$; and +++ (3): $\alpha > 0.90$.
Validity (convergent/divergent or criterion validity): - (0): no information; + (1): correlations (r) with construct-related measures or criterions available, all correlations < 0.50 or resilience measure only correlated with original instrument/long-form or no correlations but alternative results reported (e.g. odds ratio); ++ (2): correlations (r) with construct-related measures or criterions available, ≤ 50% of correlations ≥ 0.50; and +++ (3): correlations (r) with construct-related measures or criterions available, > 50% of correlations ≥ 0.50.
[4]Scales assessing resilience as personality characteristic.
[5]Scale assessing post-traumatic growth.

Appendix 4. Possible assessment instruments for the measurement of mental health and well-being based on intervention studies included in previous reviews and meta-analyses (Leppin 2014; Macedo 2014; Robertson 2015; Vanhove 2015)

- **Anxiety**
  - Depression Anxiety and Stress Scales (DASS-21) (Lovibond 1995)
  - Smith Anxiety Scale (SAS) (Smith 2007)
  - Beck Anxiety Inventory (BAI) (Beck 1993)
  - State-Trait Anxiety Inventory (STAI) (Spielberger 1970)
- **Depression**
  - Depression Anxiety and Stress Scales (DASS-21) (Lovibond 1995)
  - Center for Epidemiological Studies - Depression Scale (CES-D) (Radloff 1977)
  - Maslach Burnout Inventory (MBI) (Maslach 1997)
  - Oldenburg Burnout Inventory (Demerouti 2010)
  - Beck Depression Inventory (BDI) (Beck 1961)
  - Beck Depression Inventory - II (BDI-II) (Beck 1996)
  - Visual Analog Scale - Fatigue (VAS-Fatigue) (Wolfe 2004)
  - Patient Health Questionnaire for Depression (PHQ-D) (Spitzer 1999)
  - Hospital Anxiety and Depression Scale (HADS) (Zigmond 1983)
  - Time Urgency Scale (TUS) (Landy 1991)
- **Stress or stress perception**
  - Depression Anxiety and Stress Scales (DASS-21) (Lovibond 1995)
  - Perceived Stress Scale (PSS) (Cohen 1988)
  - Personal Stress Scale (PSS) (self-developed) (Petree 2012)
  - Subjective Units of Distress (SUDS) (Wolpe 1958)
  - Visual Analog Scale (VAS) (Arnetz 1985; Hasson 2005)
  - Stress and Perception of Control Scale (SPOCS) (unpublished instrument) (Rose 2013)
- **Well-being or life satisfaction or quality of life or vitality or vigour**

- Well-being
  - Ryff's Scales of Psychological Well-Being (Ryff 1989)
  - Workplace Well-being Index (WWBI) (Page 2005)
- Life satisfaction:
  - Satisfaction with Life Scale (Diener 1985)
- (Health-related) Quality of life (QOL):
  - Linear Analog Self-Assessment Scale (QOL-LASA) (Locke 2007)
  - Medical Outcomes Study (MOS) 36-item short-form health survey (SF-36) (Ware 1994)
  - World Health Organization Quality of Life - BREF (WHOQOL-BREF) (WHOQOL Group 1998)
- Vitality
  - Subscale of the MOS 36-item short-form health survey (SF-36) (Ware 1994)
- Vigour
  - Work Vigour subscale of the Utrecht Work Engagement scale (Schaufeli 2002)

Appendix 5. Possible assessment instruments for the measurement of resilience factors based on intervention studies included in previous reviews and meta-analyses (Leppin 2014; Macedo 2014; Robertson 2015; Vanhove 2015)

- **Social support**
  - Interpersonal Support Evaluation List - 12 (ISEL-12) (Cohen 1983)
  - Personal Resources Questionnaire (PRQ-85) (Brandt 1981)
  - Social Provisions Scale (Cutrona 1987)
  - Subscale Interpersonal relations of the Health-Promoting Lifestyle Profile II (Walker 1987)
  - Interpersonal Relationship Inventory (IPR) (Tilden 1990)
  - Support questionnaire (Cushway 1996)
  - MOS Social Support Survey (Sherbourne 1991)
  - Total of four scales devised by Moos (1979) for perceived social support (Maddi 1998)
- **Optimism**
  - Life Orientation Test - Revised (LOT-R) (Scheier 1994)
- **Self-efficacy**
  - Coping self-efficacy (CSE) (Chesney 2003)
  - Self-efficacy scale (Sherer 1982)
  - Teachers' Sense of Efficacy Questionnaire (TSES) (Tschannen-Moran 2001)
  - New General Self-Efficacy Scale (NGSE) (Chen 2004)
  - Coping Efficacy Scale (self-developed) (Bekki 2013)
- **Active coping**
  - Brief Coping Orientations to Problems Experienced scale (Brief COPE) (Carver 1997)
  - Ways of Coping Questionnaire (WOC) (Folkman 1988)
  - Coping Styles Questionnaire (CSQ) (Williams 1997)
  - Coping Styles (self-developed) (Bekki 2013)
- **Self-esteem**
  - Rosenberg Self-Esteem Scale (RSES) (Rosenberg 1965)
  - Self-Esteem Rating Scale (SERS) (Nugent 1993)
- **Hardiness**
  - HardiSurvey III - R (Maddi 2001)
  - Personal Views Survey (Maddi 1987)
  - Hardiness Scale or College Student Hardiness Measure (CSHM) (Atri 2007a; Atri 2007b; Kanekar 2009)
  - Cognitive Hardiness Scale (Nowack 1990)
- **Positive emotions or positive affect**
  - Positive and Negative Affect Schedule (PANAS) (Watson 1988)
  - Positive and Negative Affect Schedule Expanded Form (PANAS-X) (Watson 1994)
  - Authentic Happiness Inventory (AHI; unpublished measure) (Abbott 2009)

Appendix 6. MEDLINE search strategy (January 1990 to present)

In order to get a comprehensive understanding of the evidence in the field of psychological resilience interventions, and to identify training programmes that can really be assumed to enhance resilience in adults based on scientific findings, we will perform a literature search that combines and complements the search approaches from previous reviews and meta-analyses.

In contrast to the search strategy of Leppin 2014, Robertson 2015 and Vanhove 2015, who used very narrow search terms (e.g. 'resilience programme' or 'hardiness training'), we will also search for broader intervention terms. These broader search terms will be based on the search performed by Macedo 2014, but will also be supplemented by new terms (e.g. 'acceptance and commitment therapy', 'stress management', 'mindfulness').

1 Resilience, Psychological/
2 social adjustment/
3 Adaptation, Psychological/
4 (post-traumatic growth or posttraumatic growth or stress-related growth).tw,kf.
5 (positiv$ adj1 (adapt$ or adjust$)).tw,kf.
6 (psychol$ adj1 (adapt$ or adjust$)).tw,kf.
7 (resilien$ or hardiness$).tw,kf.
8 (cope or coping).tw,kf.
9 ((withstand$ or overcom$ or resist$ or recover$ or thriv$ or adapt$ or adjust$ or bounc$ back) adj5 (stress$ or trauma$ or adversit$)).tw,kf.
10 or/1-9
11 exp psychotherapy/
12 Stress, Psychological/th
13 (psychotherap$ or psycho-therap$).tw,kf.
14 (behav$ adj3 (intervention$ or program$ or therap$)).tw,kf.
15 ((cognit$ or cognitive behavior$ or CBT) adj3 (intervention$ or program$ or therap$)).tw,kf.
16 (psycho$ adj3 (intervention$ or program$ or therap$)).tw,kf.
17 relaxation.tw,kf.
18 mindful$.tw,kf.
19 (counsel?ing or coaching).tw,kf.
20 (third wave adj (psycho$ or therap$)).tw,kf.
21 cognit$ restructur$.tw,kf.
22 positive psychology.tw,kf.
23 (reframe$ or re-fram$ or reapprais$).tw,kf.
24 (stress adj1 (inoculation or manag$ or reduc$ or resist$)).tw,kf.
25 (anxiety adj3 manage$).tw,kf.
26 "acceptance and commitment ".tw,kf.
27 Combined Modality Therapy/
28 (multimodal or multi-modal or combined modal$).tw,kf.
29 exp Health promotion/
30 (health adj3 (educat$ or promot$)).tw,kf.
31 or/11-30
32 10 and 31
33 (resilien$ adj5 (train$ or program$ or intervention$ or promot$ or prevent$ or enhanc$ or learn$ or teach$ or educat$ or increas$ or develop$ or manag$ or therap$ or protocol$ or treat$)).tw,kf.
34 (hardiness$ adj5 (train$ or program$ or intervention$ or promot$ or prevent$ or enhanc$ or learn$ or teach$ or educat$ or increas$ or develop$ or manag$ or therap$ or protocol$ or treat$)).tw,kf.
35 or/32-34
36 randomized controlled trial.pt.
37 controlled clinical trial.pt.
38 randomi#ed.ab.
39 placebo$.ab.
40 drug therapy.fs.
41 randomly.ab.

42 trial.ab.
43 groups.ab.
44 or/36-43
45 exp animals/ not humans.sh.
46 44 not 45
47 35 and 46
48 limit 47 to yr="1990 -Current"

Appendix 7. Data collection/extraction sheet (items according to Higgins 2011c)

Source	• Study ID (created by review author) • Report ID (created by review author) • Review author ID (created by review author) • Citation and contact detail
Eligibility	• Confirm eligibility for review • Reason for exclusion
Methods	• Study design • Total study duration • Sequence generation* • Allocation sequence concealment* • Blinding* • Other concerns about bias:* ○ analyses to assure baseline comparability of groups for sociodemographic characteristics and outcomes of interest; and ○ selection of comparison group
Participants	• Total number • Setting • Diagnostic criteria • Age • Sex • Country • Comorbidity • Sociodemographics • Date of study
Interventions	• Total number of intervention groups • For each intervention and comparison group of interest: ○ specific intervention; and ○ intervention details (sufficient for replication, if feasible)
Outcomes	• Outcomes and time points (1) collected; (2) reported* • For each outcome of interest: ○ outcome definition (with diagnostic criteria, if relevant) ○ unit of measurement (if relevant) • For scales: upper and lower limits and whether high or low score is good

(*Continued*)

Results	• Number of participants allocated to each intervention group • For each outcome of interest: ○ sample size ○ missing participants* ○ summary data for each intervention group (e.g. means and SDs for continuous data at baseline and any time point after treatment; change); ○ estimate of effect with standard error, 95% CI and P value ○ subgroup analyses • Potential adverse effects
Miscellaneous aspects	• Funding source • Declaration of interests for the primary investigators • Key conclusions of the study authors • Miscellaneous comments from the study authors • References to other relevant studies • Correspondence required • Miscellaneous outcomes by the review authors

*Full description required for standard items in 'Risk of bias' tool.
CI: confidence interval; ID: identifier; SD: standard deviation.

Appendix 8. Criteria for 'Risk of bias' assessment in included RCTs (according to Higgins 2011d)

Item	Judgment	Description
1. Random sequence generation (selection bias). We will describe the method used to generate the allocation sequence in sufficient detail for each included trial to allow an assessment of whether it should produce comparable groups	Low risk	The investigators describe a random component in the sequence generation process such as: • random number table; • computer random number generator; • coin tossing; • shuffling cards or envelopes; • throwing dice; • drawing of lots; or • minimisation.* *Minimisation may be implemented without a random element (treatment sums are equal), and this is considered to be equivalent to being random
	High risk	The researchers describe a (systematic or non-systematic) non-random component in the sequence generation process such as: • systematic, non-random approach ○ generating the sequence by, for example: ◇ odd or even date of birth; ◇ date (or day) of admission; ◇ hospital or clinic record number; or ◇ alternation.

(*Continued*)

		• non-systematic, non-random approach ○ allocating the participant by, for example: ◇ judgement of the clinician; ◇ preference of the participant; ◇ results of a laboratory test or a series of tests; or ◇ availability of the intervention.
	Unclear risk	Insufficient information to permit a judgment of 'Low risk' or 'High risk'
2. Allocation concealment (selection bias). For each RCT we will describe the method used to conceal the allocation sequence in sufficient detail to determine whether intervention allocations could have been foreseen in advance of, or during, enrolment	Low risk	Participants and investigators enrolling participants could not foresee assignment because one of the following, or an equivalent method, was used to conceal allocation: • central allocation (including telephone, web-based and pharmacy-controlled randomisation); • sequentially numbered drug containers of identical appearance; or • sequentially numbered, opaque, sealed envelopes.
	High risk	Participants or investigators enrolling participants could possibly foresee assignment and thus introduce selection bias because one of the following methods was used: • open random allocation schedule (e.g. a list of random numbers); • assignment envelopes without appropriate safeguards (e.g. if envelopes were unsealed or non-opaque or not sequentially numbered); • alternation or rotation; • date of birth; • case record number; or • any other explicitly unconcealed procedure.
	Unclear risk	Insufficient information to permit judgement of 'Low risk' or 'High risk'. This is usually the case if the method of concealment is not described or not described in sufficient detail to allow a definite judgment (e.g. if the use of assignment envelopes is described, but it remains unclear whether envelopes were sequentially numbered, opaque and sealed)
3. Blinding of participants and personnel (performance bias): objective outcomes. For each included trial, we will describe all methods used to blind trial participants and personnel from knowledge of which intervention a participant received. We will provide any information relating to whether the intended blinding was effective. We will assess blinding separately for different classes of outcomes. Outcomes will be divided into objective (e.g. cortisol) and subjective (e.g. self-reported resilience and other psychological outcomes) . We will consider the same outcomes at different time points	Low risk	Any one of the following: • no blinding or incomplete blinding, but the review authors judge that the outcome is not likely to be influenced by lack of blinding; or • blinding of participants and key study personnel ensured, and unlikely that the blinding could have been broken.

(*Continued*)

4. Blinding of participants and personnel (performance bias): subjective outcomes. For each included trial we will describe all methods used to blind trial participants and personnel from knowledge of which intervention a participant received. We will provide any information relating to whether the intended blinding was effective. We will assess blinding separately for different classes of outcomes. Outcomes will be divided into objective (e.g. cortisol) and subjective (e.g. self-reported resilience and other psychological outcomes) . We will consider the same outcomes at different time points	Low risk	Blinding of participants and intervention providers, and unlikely that the blinding could have been broken
	High risk	Any one of the following: • no blinding or incomplete blinding, and the outcome is likely to be influenced by lack of blinding; or • blinding of key study participants and personnel attempted, but likely that the blinding could have been broken; and the outcome is likely to be influenced by the lack of blinding.
	Unclear risk	Insufficient information to permit a judgment of 'Low risk' or 'High risk'
5. Blinding of outcome assessors (detection bias): objective outcomes. For each included trial we will describe all methods used to blind outcome assessors from knowledge of which intervention a participant received. We will provide any information relating to whether the intended blinding was effective. We will assess blinding separately for different classes of outcomes. Outcomes will be divided into objective (e.g. cortisol) and subjective (e.g. self-reported resilience and other psychological outcomes). We will consider the same outcomes at different time points	Low risk	Any one of the following: • no blinding of outcome assessment, but the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding; or • blinding of outcome assessment ensured, and unlikely that the blinding could have been broken.
6. Blinding of outcome assessors (detection bias): subjective outcomes. For each included trial we will describe all methods used to blind outcome assessors from knowledge of which intervention a participant received. We will provide any information relating to whether the intended blinding was effective. We will assess blinding separately for different classes of outcomes. Outcomes will be divided into objective (e.g. cortisol) and subjective (e.g. self-reported resilience and other psychological outcomes). We will consider the same outcomes at different time points	Low risk	Any one of the following: • no blinding of outcome assessment, but the review authors judge that the outcome measurement is not likely to be influenced by lack of blinding; or • blinding of outcome assessment ensured, and unlikely that the blinding could have been broken.
	High risk	Any one of the following: • no blinding of outcome assessment, and the outcome measurement is likely to be influenced by lack of blinding; or

(*Continued*)

		• blinding of outcome assessment, but likely that the blinding could have been broken, and the outcome measurement is likely to be influenced by lack of blinding.
	Unclear risk	Insufficient information to permit a judgment of 'Low risk' or 'High risk'
7. Incomplete outcome data (attrition bias). For each RCT we will describe the completeness of outcome data for each main outcome, including attrition and exclusions from the analysis. We will state whether attrition and exclusions were reported, the numbers included at each stage (compared with the total number of participants randomised), reasons for attrition or exclusions (where reported), and whether missing data were balanced across groups or were related to outcomes. Where sufficient data are reported, or can be provided by the trial authors, we will re-include missing data in the analyses	Low risk	Any one of the following: • no missing outcome data; • reasons for missing outcome data unlikely to be related to true outcome (for survival data, censoring unlikely to be introducing bias); • missing outcome data balanced in numbers across intervention groups, with similar reasons for missing data across groups; • for dichotomous outcome data, the proportion of missing outcomes compared with observed event risk not enough to have a clinically relevant impact on the intervention effect estimate; • for continuous outcome data, plausible effect size (difference in means or standardised difference in means) among missing outcomes not enough to have a clinically relevant impact on observed effect size; • missing data have been imputed using appropriate methods; or • intention-to-treat; all randomised participants are analysed in the group to which they were allocated by randomisation, irrespective of noncompliance and co-interventions.
	High risk	Any one of the following: • reason for missing outcome data likely to be related to true outcome, with either imbalance in numbers or reasons for missing data across intervention groups; • for dichotomous outcome data, the proportion of missing outcomes compared with observed event risk is enough to induce clinically relevant bias in intervention effect estimate; • for continuous outcome data, plausible effect size (difference in means or standardised difference in means) among missing outcomes enough to induce clinically relevant bias in observed effect size; • potentially inappropriate application of simple imputation; or • 'as-treated' analysis done with substantial departure of the intervention received from that assigned at randomisation.
	Unclear risk	Insufficient reporting of attrition or exclusions to permit a judgement of 'Low risk' or 'High risk' (e.g. number randomised not stated, no reasons for missing data provided, number of dropouts not reported for each group)
8. Selective outcome reporting (reporting bias). For each included trial we will describe how the possibility of selective outcome reporting was examined and what was found	Low risk	Any of the following: • the study protocol is available and all of the study's pre-specified (primary and secondary) outcomes that are of interest in the review have been reported in the pre-specified way; or • the study protocol is not available, but it is clear that the published reports include all expected outcomes, including those that were pre-specified (convincing text of this nature may be uncommon).

(*Continued*)

	High risk	Any one of the following: • not all of the study's pre-specified primary outcomes have been reported; • one or more primary outcomes is reported using measurements, analysis methods or subsets of the data (e.g. subscales) that were not pre-specified; • one or more reported primary outcomes were not pre-specified (unless clear justification for their reporting is provided such as an unexpected adverse effect); • one or more outcomes of interest in the review are reported incompletely so that they cannot be entered in a meta-analysis; or • the study report fails to include results for a key outcome that would be expected to have been reported for such a study.
	Unclear risk	Insufficient information to permit a judgment of 'Low risk' or 'High risk'

Footnotes
RCT: randomised controlled trial.

CONTRIBUTIONS OF AUTHORS

All seven review authors contributed to the development of this protocol. The first authorship as well as the overall responsibility for the review is shared by IH and AK. IH, AK, AC and KL conceived the initial review design and developed the protocol. JK and HB provided expert statistical support for the planned data analysis. JK, HB, MW and KL critically commented on the protocol. All protocol authors agreed on this version before publication.

DECLARATIONS OF INTEREST

Isabella Helmreich - none known.

Angela Kunzler - none known.

Andrea Chmitorz - none known.

Jochem König - none known.

Harald Binder - none known.

Michèle Wessa - none known.

Klaus Lieb - is a board-certified cognitive-behaviour therapist with a special interest in schema therapy. Klaus Lieb is an Editor with the Cochrane Developmental, Psychosocial and Learning Problems Group.

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