



Special issue paper

Resilience training in the workplace from 2003 to 2014: A systematic review

Ivan T. Robertson^{1,2*}, Cary L. Cooper³, Mustafa Sarkar⁴ and Thomas Curran⁵

¹Robertson Cooper, Manchester, UK

²Manchester Business School, University of Manchester, UK

³Lancaster University Management School, Lancaster University, UK

⁴School of Sport and Exercise, University of Gloucestershire, Gloucester, UK

⁵Department for Health, University of Bath, UK

Over a decade of research attests to the importance of resilience in the workplace for employee well-being and performance. Yet, surprisingly, there has been no attempt to synthesize the evidence for the efficacy of resilience training in this context. The purpose of this study, therefore is to provide a systematic review of work-based resilience training interventions. Our review identified 14 studies that investigated the impact of resilience training on personal resilience and four broad categories of dependent variables: (1) mental health and subjective well-being outcomes, (2) psychosocial outcomes, (3) physical/biological outcomes, and (4) performance outcomes. Findings indicated that resilience training can improve personal resilience and is a useful means of developing mental health and subjective well-being in employees. We also found that resilience training has a number of wider benefits that include enhanced psychosocial functioning and improved performance. Due to the lack of coherence in design and implementation, we cannot draw any firm conclusions about the most effective content and format of resilience training. Therefore, going forward, it is vital that future research uses comparative designs to assess the utility of different training regimes, explores whether some people might benefit more/less from resilience training, and demonstrates consistency in terms of how resilience is defined, conceptualized, developed, and assessed.

Practitioner points

- Despite conceptual and theoretical support for resilience training, the empirical evidence is tentative, with the exception of a large effect for mental health and subjective well-being outcomes.
- Most programmes utilize a cognitive-behavioural approach to developing resilience.
- At this stage, there is no definitive evidence for the most effective training content or format, but it would appear wise to include an element of one-to-one training and support based on individual needs.

An established body of research links the psychological well-being of a workforce to work-related outcomes, including individual and organizational productivity (Ford, Cerasoli,

*Correspondence should be addressed to Ivan T. Robertson, Robertson Cooper Ltd, Manchester Science Park, Manchester M15 6SE, UK (email: ivan.robertson@robertsoncooper.com).

Higgins, & Decesare, 2011; Taris & Schreurs, 2009). This research suggests that work-based interventions supporting resilience, designed to protect and sustain well-being and performance in the face of adversity, would be likely to deliver benefits for both employees and their organizations. Indeed, numerous studies indicate that training in the effective negotiation of workplace stressors leads to a healthier and more engaged workforce (e.g., Arnetz, Nevedal, Lumley, Backman, & Lublin, 2009; McCraty & Atkinson, 2012; Sood, Prasad, Schroeder, & Varkey, 2011). Yet, to date, no research has attempted to synthesize these resilience-based interventions. With this in mind, the purpose of the present study is to provide a systematic review of workplace resilience training and its efficacy in bringing about positive changes in personal resilience, mental health, physical/biological outcomes, psychosocial functioning, and job performance.

Interest in the concept of workplace resilience has grown during the period of global recession and subsequent austerity (see Robertson & Cooper, 2013). People in the workplace have heavier workloads now and are working under enormous pressure as we enter the 'getting more from less' era (Chartered Institute of Personnel & Development, 2009). This pressure, moreover, has extended to family life as median incomes have depreciated to balance an ailing economy (Office for National Statistics, 2013). Not surprisingly then, during the period of global recession, work-related stress soared by 40% and absentee rates increased by 25% (Houdmont, Kerr, & Addley, 2012). The need for personal resilience, especially in the workplace, has never been greater.

What is resilience?

The word resilience originates from the Latin verb *resilire*, or 'to leap back', and is defined in the Oxford Dictionary of English as 'being able to withstand or recover quickly from difficult conditions' (Soanes & Stevenson, 2006, p. 1498). The term's roots lie in science and mathematics; for example, in physics, resilience is considered to be the 'ability of a strained body, by virtue of high yield strength and low elastic modulus to recover its size and form following deformation' (Geller *et al.*, 2003, p. 458). Lazarus (1993) cited the example of elasticity in metals, with a resilient metal bending and bouncing back (instead of breaking) when stressed.

Turning to psychological resilience, numerous definitions have been proposed in the research literature (see Windle, 2011). In an attempt to provide definitional and conceptual clarity in this area, Fletcher and Sarkar (2013) recently reviewed and critiqued the variety of definitions, concepts, and theories of psychological resilience. Based on consistent themes emerging from the review, they defined psychological resilience as 'the role of mental processes and behavior in promoting personal assets and protecting an individual from the potential negative effect of stressors' (Fletcher & Sarkar, 2012, p. 675; 2013, p. 16). This definition encapsulates aspects of both trait and process conceptualizations of resilience (cf. Fletcher & Sarkar, 2012, 2013). The trait conceptualization suggests that resilience represents a constellation of characteristics that enable individuals to adapt to the circumstances they encounter (cf. Connor & Davidson, 2003). The process conceptualization of resilience recognizes that it is a capacity that develops over time in the context of person-environment interactions (Egeland, Carlson, & Sroufe, 1993). According to Howe, Smajdor, and Stokl (2012), 'it is the dynamic nature of [resilience] which sets this quality apart from related psychological traits such as "hardiness" and "mental toughness"' (p. 350). Similarly, Windle (2011) argued that 'the defining point which distinguishes hardiness from resilience is that it is a stable personality trait whereas resilience is viewed as something dynamic that will change across the lifespan' (p. 163).

Such a perspective is highly significant because it suggests that resilience is a largely malleable phenomenon, and as such it is suitable for intervention. Therefore, critically evaluating the efficacy of interventions committed to developing resilience is extremely important.

Interventions to enhance resilience in the workplace

Germane to the focus of the present study, research on resilience training in the workplace has provided evidence that resilience is amenable to change (e.g., Arnetz *et al.*, 2009; Grant, Curtayne, & Burton, 2009; Sood *et al.*, 2011). Indeed, resilience intervention protocols have yielded adaptive changes in various outcome variables (e.g., well-being, performance). To illustrate, resilience training has been found to have a positive impact on various mental health and subjective well-being outcomes (e.g., lower stress, depression, negative affect) in employees (e.g., Arnetz *et al.*, 2009; Grant *et al.*, 2009; Pipe *et al.*, 2012). In addition, some resilience intervention studies have revealed performance benefits including increases in goal attainment (Grant *et al.*, 2009), productivity (Pipe *et al.*, 2012), and observed behavioural performance (Arnetz *et al.*, 2009). Extant research therefore suggests that resilience training can be effective for employees.

Notwithstanding the efficacy of resilience interventions, it is important to note that training programmes in the workplace typically vary in content and delivery mode and have been applied to a variety of occupations (e.g., education, business, medicine, and police). Furthermore, there appears to be a lack of coherence and consistency in how resilience is defined, conceptualized, developed, and assessed in resilience training studies. For example, some interventions appear to be inconsistent with the respective resilience definition and measure adopted (see, e.g., Carr *et al.*, 2013; Grant *et al.*, 2009; Pidgeon, Ford, & Klassen, 2014).

The present study

With the variability inherent in resilience training studies to date, it is important that these interventions are synthesized with a view to bringing greater clarity on what does and does not work. Hence, this study sets out to provide a systematic review of resilience training in the workplace. Specifically, our goal is to locate workplace resilience interventions and to synthesize their effects on personal resilience and four broad categories of dependent variables: (1) mental health and subjective well-being outcomes, (2) physical/biological outcomes, (3) psychosocial outcomes, and (4) performance outcomes. With this information, we can provide recommendations for subsequent resilience training and intervention research.

Method

Search strategy

In April 2014, a computerized literature search of the Cochrane Central Register of Controlled Trials, MEDLINE, and PsycINFO was conducted using the search terms *resilien** (for resilience, resiliency, and resilient), training, intervention, and work between 1989 and 2014. To identify any additional published or unpublished trials, we also searched Google Scholar, Dissertation Abstracts International, and ETHOS online databases. The search included the grey literature, using reference lists and citation

searching from reviews and published trials, the Science Citation Index, and also involved consulting noted experts in the field. A digital dropbox was used to store and manage the yielded studies, and the flow diagram in Figure 1 depicts the literature retrieval process.

Selection criteria

Studies were selected for inclusion on the basis of criteria related to Study design, Participants, Interventions and Outcomes (SPIO). SPIO is a variation on PICO (Population, Interventions, Comparison, and Outcomes; Richardson, Wilson, Nishikawa, & Hayward, 1995). Data sets were included if they (1) were published in an English

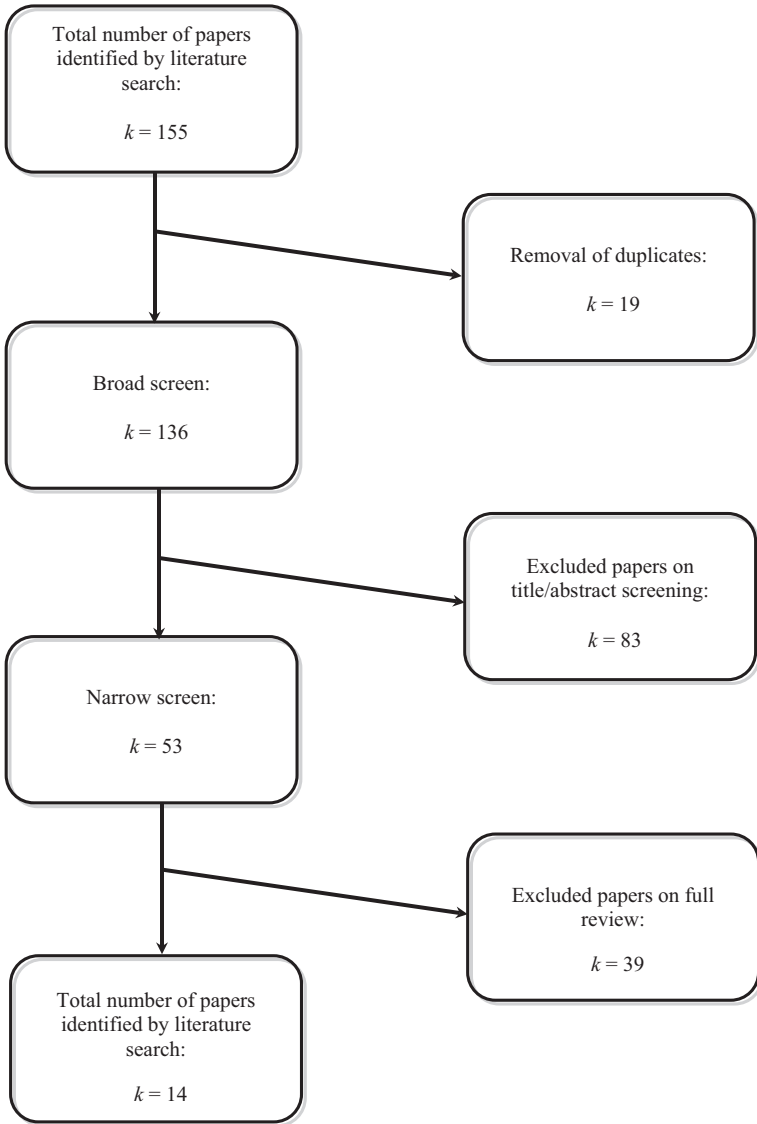


Figure 1. Search results flow diagram.

language journal, or were obtained using the procedures described for the identification of unpublished data; (2) were specifically resilience-based interventions; (3) employed a randomized controlled design, controlled design, or any other trial design that yielded quantitative values of all variables; and (4) were conducted in working populations (i.e., employees >18 years old). Personal resilience was the primary outcome sought as well as mental health and well-being outcomes, such as stress, anxiety, and depression. Secondary outcomes included physical health, psychosocial functioning, and job performance (see Table 1).

Selection of papers for inclusion

The titles and abstracts of the bibliographic records retrieved by the literature searches were screened for relevance using broad inclusion criteria (i.e., resilience and training/intervention). All relevant papers were then screened, using the narrow SPIO criteria, to identify eligible papers. As our narrow search yielded only small numbers, we decided not to further exclude studies on the basis of any methodological criteria. Instead, methodological issues are discussed below and outlined in the evidence table (Table 2). These screening criteria were based on guidelines provided by the Centre for Reviews and Dissemination (CRD; Akers, 2009).

Quality appraisal

Methodological rigour was assessed using the Cochrane Collaboration's assessment tool (Higgins *et al.*, 2011). This tool summarizes the risk of bias for major outcomes of an intervention trial. The evidence for each individual outcome was graded as low, unclear, or high risk. This process included screening for evidence of (1) concealment of blinding (both participants and assessors), (2) incomplete outcomes data, (3) selective reporting, and (4) any other sources of bias.

Data extraction

We developed a data extraction tool, which was adapted from a previous systematic review (*viz.* Simpson *et al.*, 2014). The data extracted included information on study design and methodology, the populations under review, the interventions being employed, and the outcomes reported in each trial. Four reviewers working indepen-

Table 1. SPIO narrow screen inclusion and exclusion criteria

	Inclusion criteria	Exclusion criteria
Study design	Randomized controlled trial, controlled trial, trial	Qualitative studies, single case studies, systematic review, literature review, methodological papers
Population	Adults (>18 years) and any working (employee) samples	<18 years and non-work samples
Intervention	Any specifically resilience-based intervention	Non-resilience interventions
Outcomes	Resilience and any mental health, well-being, physical, biological, psychosocial, and performance outcomes	

dently carried out the screening and data extraction. Broad screening was undertaken by MS. Narrow screening was conducted by IR, CC, MS, and TC by splitting up the identified papers (~25%), with each paper being reviewed fully to determine its applicability for inclusion. Any disagreement was adjudicated through group consensus.

Data synthesis

As the results of the search and review yielded only a small number of heterogeneous interventions ($k = 14$), a quantitative meta-analysis would not provide useful results. Instead, findings are presented in a narrative format.

Results

The search of the databases retrieved 155 records. Following broad and narrow screening (see Figure 1), fourteen papers were considered suitable for inclusion in the review: Abbott, Klein, Hamilton, and Rosenthal (2009), Arnetz *et al.* (2009), Burton, Pakenham, and Brown (2010), Carr *et al.* (2013), Grant *et al.* (2009), Jennings, Frank, Snowberg, Coccia, and Greenberg (2013), Liossis, Shochet, Milllear, and Biggs (2009), McCraty and Atkinson (2012), Milllear, Liossis, Shochet, Biggs, and Donald (2008), Pidgeon *et al.* (2014), Pipe *et al.* (2012), Sherlock-Storey, Moss, and Timson (2013), Sood *et al.* (2011), and Waite and Richardson (2003).

Study characteristics

Country of origin

The 14 studies originated from four countries. Six were from Australia (*viz.* Abbott *et al.*, 2009; Burton *et al.*, 2010; Grant *et al.*, 2009; Liossis *et al.*, 2009; Milllear *et al.*, 2008; Pidgeon *et al.*, 2014), one was from Sweden (*viz.* Arnetz *et al.*, 2009), one was from the United Kingdom (*viz.* Sherlock-Storey *et al.*, 2013), and six were from the United States (*viz.* Carr *et al.*, 2013; Jennings *et al.*, 2013; McCraty & Atkinson, 2012; Pipe *et al.*, 2012; Sood *et al.*, 2011; Waite & Richardson, 2003). All these countries are classified as individualist, and so can be considered broadly homogenous (Hofstede, 2001).

Study design

In terms of the design of the studies, eight studies conducted randomized controlled trials (*viz.* Abbott *et al.*, 2009; Arnetz *et al.*, 2009; Grant *et al.*, 2009; Jennings *et al.*, 2013; McCraty & Atkinson, 2012; Pidgeon *et al.*, 2014; Sood *et al.*, 2011; Waite & Richardson, 2003), two studies conducted (non-randomized) controlled trials (*viz.* Liossis *et al.*, 2009; Milllear *et al.*, 2008), and four studies reported trials with no control group (*viz.* Burton *et al.*, 2010; Carr *et al.*, 2013; Pipe *et al.*, 2012; Sherlock-Storey *et al.*, 2013).

Data collection

Regarding data collection, nine of the fourteen studies (*viz.* Arnetz *et al.*, 2009; Burton *et al.*, 2010; Carr *et al.*, 2013; Grant *et al.*, 2009; Jennings *et al.*, 2013; McCraty & Atkinson, 2012; Pipe *et al.*, 2012; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011) collected data at two time points (pre- and post-intervention). Four studies collected data

at three time points: Pre- and post-intervention and at 10-week follow-up (viz. Abbott *et al.*, 2009; Waite & Richardson, 2003) and pre- and post-intervention and at 6-month follow-up (viz. Lioussis *et al.*, 2009; Milllear *et al.*, 2008). Finally, one study collected data at four time points: Pre- and post-intervention, at 1-month follow-up, and at 4-month follow-up (Pidgeon *et al.*, 2014) (see Table 2).

Definition of resilience

Table 3 outlines the resilience definitions used by the 14 workplace resilience studies. Interestingly, six studies do not provide a guiding definition (viz. Arnetz *et al.*, 2009; Carr *et al.*, 2013; Grant *et al.*, 2009; Jennings *et al.*, 2013; Lioussis *et al.*, 2009; Milllear *et al.*, 2008). From the six studies that measure resilience (viz. Carr *et al.*, 2013; Grant *et al.*, 2009; Pidgeon *et al.*, 2014; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011; Waite & Richardson, 2003), two studies do not provide a guiding definition (viz. Carr *et al.*, 2013; Grant *et al.*, 2009), and one study uses a definition that is not consistent with the resilience measure used (viz. Pidgeon *et al.*, 2014). Thus, only three studies (viz. Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011; Waite & Richardson, 2003) use definitions in line with the respective resilience measure employed for evaluating the intervention. The implications of this will be discussed later.

Intervention characteristics

Intervention length

The resilience training interventions ranged from a single 90-min session (Sood *et al.*, 2011) to 13 weekly sessions (Burton *et al.*, 2010). Other programmes were delivered over a two-and-a-half-day retreat (Pidgeon *et al.*, 2014), 3 weeks (Pipe *et al.*, 2012), 4 weeks (Jennings *et al.*, 2013), 5 weeks (Waite & Richardson, 2003), 6 weeks (Sherlock-Storey *et al.*, 2013), 7 weeks (Lioussis *et al.*, 2009), 10 weeks (Abbott *et al.*, 2009; Arnetz *et al.*, 2009; Grant *et al.*, 2009), 11 weeks (McCarty & Atkinson, 2012; Milllear *et al.*, 2008), and 12 weeks (Carr *et al.*, 2013).

Intervention content

In terms of training content, two studies (viz. Abbott *et al.*, 2009; Carr *et al.*, 2013) were based on the Penn Resiliency Program (PRP; Gillham, Brunwasser, & Freres, 2008) which has provided the foundation for the US Army Master Resilience Training course (Reivich, Seligman, & McBride, 2011). The PRP was developed at the University of Pennsylvania and focuses on the enhancement of a subset of protective factors identified by Masten and Reed (2002). These include optimism, problem-solving, self-efficacy, self-regulation, emotional awareness, flexibility, empathy, and strong relationships.

Two studies were based on coaching-related principles (viz. Grant *et al.*, 2009; Sherlock-Storey *et al.*, 2013). Specifically, Sherlock-Storey *et al.* (2013) used a skills-based coaching approach and Grant *et al.* (2009) used a developmental or executive coaching approach. Skills-based coaching is typically characterized by a higher level of structure and/or more directive style of coaching, a fairly narrow skill or behavioural focus, and a shorter timescale than development coaching which is typically more complex and emergent in focus, less directive in style, and more about creating the right conditions and 'psychological space' for reflective learning.

Table 2. Study characteristics

Author/Year	Design	Sample	Intervention	Data collection
Abbott et al. (2009)	RCT	Fifty-three sales managers randomly allocated to intervention ($n = 26$; female % = 15; $M_{\text{age}} = 40.50$) or waiting list control ($n = 27$; female = 11; $M_{\text{age}} = 46.00$)	Ten-week online resilience training. Seven core skills based on cognitive therapy: Emotion regulation, impulse control, optimism, casual analysis, empathy, self-efficacy, and reaching out	Pre, post, follow-up
Arnetz et al. (2009)	RCT	Eighteen male police officers randomly allocated to intervention ($n = 9$) and normal practice control ($n = 9$)	Ten-week group-based resilience training. Participants received weekly workshops on relaxation methods, imagery and mental rehearsal	Pre, post
Burton et al. (2010)	T	Sixteen administrative staff recruited to an intervention group. Overall $M_{\text{age}} = 36.5$, female % = 17%	Thirteen-week group resilience training. Participants received eleven 2-hr sessions that developed: acceptance, cognitive diffusion, mindfulness, self-as-context, values and committed action as well as cognitive-behavioural therapy and physical activity promotion	Pre, post
Carr et al. (2013)	T	One hundred and sixty US Armed Forces personnel recruited to an intervention group	Twelve-week Master Resilience Training programme. Participants received weekly group training sessions that developed: optimism, problem-solving, self-efficacy, self-regulation, emotional awareness, flexibility, empathy and strong relationships	Pre, post
Grant et al. (2009)	RCT	Forty-one senior managers randomly assigned to intervention and waiting list control groups. Overall $M_{\text{age}} = 49.84$, female % = 93%	Ten-week group-based and one-to-one resilience training. Provided 360 degrees feedback, half day leadership workshop and four individualized coaching sessions. Coaching used a cognitive-behaviour solution focused approach	Pre, post
Jennings et al. (2013)	RCT	Fifty school teachers matched and randomized to intervention ($n = 25$) and waiting list control ($n = 25$) groups. Overall $M_{\text{age}} = 36.00$, female % = 89	Four-week group-based and one-to-one resilience training. Five full day workshops with 1 one-to-one coaching phone call. Intervention focused on building emotional skills, mindfulness/stress reduction and compassion practices	Pre, post

Continued

Table 2. (Continued)

Author/Year	Design	Sample	Intervention	Data collection
Lioissis et al. (2009)	CT	Volunteering civil servants were the intervention group ($n = 19$, $M_{\text{age}} = 39.4$, female % = 84%) and matched university alumni were used as the comparison group ($n = 65$, $M_{\text{age}} = 39.29$, female % = 76%)	Seven-week Promoting Adult Resilience (PAR) training programme. Participants received seven 90-min group sessions on: understanding and developing personal strengths and resilience, managing stress, changing negative self-talk, promoting positive relationships, problem-solving, and conflict resolution	Pre, post, follow-up
McCarty and Atkinson (2012)	RCT	Sixty-five police officers randomized to intervention ($n = 29$) and waiting list control ($n = 36$) groups. Overall $M_{\text{age}} = 39.00$, female % = 10	Eleven-week group-based resilience training. Focused on self-regulation techniques and scenario-based simulation training	Pre, post
Milllear et al. (2008)	CT	Volunteering employees of a resource sector company were part of intervention group ($n = 9$; $M_{\text{age}} = 35.40$) and matched university alumni were used as a comparison group ($n = 41$; $M_{\text{age}} = 37.11$)	Eleven-week group-based resilience training. PAR: strengths-based programme; integrates interpersonal and cognitive-behaviour therapy perspectives. Weekly 1-hr session at employees' workplace (delivered in groups of 8–14 people) over 11 consecutive weeks	Pre, post, follow-up
Pidgeon et al. (2014)	RCT	Thirty-five human service professionals randomized to an intervention ($n = 21$) and nil-intervention control ($n = 14$) group. Overall $M_{\text{age}} = 40.70$, female % = 91	Two-and-a-half-day group-based retreat resilience training. Followed by booster sessions at 1- and 4-month follow-up. Retreat focus on mindfulness, cognitive therapy strategies, and self-compassion	Pre, post, follow-up
Pipe et al. (2012)	T	Twenty-nine nurses volunteered for the intervention. Overall $M_{\text{age}} = \sim 40$, female % = $\sim 90\%$	Two positive coping and resilience group sessions conducted over a 3-week period. Session 1 was 5 hr and focused on learning how to regulate stress. Session 2 was a reinforcement session of 2 hr	Pre, post

Continued

Table 2. (Continued)

Author/Year	Design	Sample	Intervention	Data collection
Sherlock-Storey et al. (2013)	T	Twelve public sector middle-managers volunteered for the intervention. Age range = 35–64, female % = 75%	Six-week resilience coaching intervention. Three one-to-one 90-min sessions were accompanied by a workbook. Coaching focused on: goal setting, explanatory style, using strengths, social support, self-care, self-efficacy and attaining perspective	Pre, post
Sood et al. (2011)	RCT	Thirty-two physicians randomly allocated to intervention ($n = 20$; female % = 45; $M_{\text{age}} = 46.80$) or waiting list control ($n = 12$; female = 50; $M_{\text{age}} = 50.20$)	Single 90-min session. Stress Management and Resiliency Training (SMART). Adapted from Attention and Interpretation Therapy (AIT). AIT addresses two aspects of human experience, attention and interpretation. Participants were also provided training in a brief structured relaxation intervention. Participants were offered an optional 30- to 60-min follow-up session depending on individual needs	Pre, post
Waite and Richardson (2003)	RCT	One hundred and fifty civil servants randomly allocated to intervention ($n = 73$, $M_{\text{age}} = \sim 30$, female % = 84%) and nil-intervention control ($n = 77$, $M_{\text{age}} = \sim 30$, female % = 84) groups	Five-week resiliency training programme. Participants had a 7 hr group training programme each week, reflecting a total of 35-hr contact. The training focused on understanding resilience, using resilience techniques and developing positive interpersonal relationships	Pre, post, follow-up

Table 3. Definitions of resilience

Author/Year	Definition of resilience
Abbott <i>et al.</i> (2009)	'A person's ability to persevere in the face of challenges, setbacks and conflicts (Reivich & Shatte, 2002)' (p. 89)
Arnetz <i>et al.</i> (2009)	No guiding definition provided
Burton <i>et al.</i> (2010)	'The capacity of people to effectively cope with, adjust, or recover from stress and adversity' (p. 266)
Carr <i>et al.</i> (2013)	No guiding definition provided
Grant <i>et al.</i> (2009)	No guiding definition provided
Jennings <i>et al.</i> (2013)	No guiding definition provided
Liossis <i>et al.</i> (2009)	No guiding definition provided
McCraty and Atkinson (2012)	'The capacity to prepare for, recover from, and adapt to stress, adversity, trauma, or tragedy' (p. 49)
Millar <i>et al.</i> (2008)	No guiding definition provided
Pidgeon <i>et al.</i> (2014)	'Competence to cope and adapt in the face of adversity and to bounce back when stressors become overwhelming' (p. 355)
Pipe <i>et al.</i> (2012)	'The ability to adapt to life's ever-changing landscape and recover quickly from stressors and potential stressors' (p. 11)
Sherlock-Storey <i>et al.</i> (2013)	'When beset by problems and adversity sustaining and bouncing back and even beyond to attain success (Luthans <i>et al.</i> , 2007)' (p. 22)
Sood <i>et al.</i> (2011)	'The ability of an individual to withstand adversity (Connor & Davidson, 2003)' (p. 858)
Waite and Richardson (2003)	'A force within everyone that drives them to seek self-actualization, altruism, and be in harmony with a spiritual source of strength (Richardson, 2002)' (p. 179)

Three interventions used mindfulness- and compassion-based practices (*viz.* Burton *et al.*, 2010; Jennings *et al.*, 2013; Pidgeon *et al.*, 2014). Burton *et al.*'s (2010) intervention was based on Acceptance and Commitment Therapy (ACT), which uses acceptance and mindfulness strategies to develop psychological resilience through six core processes: Acceptance, cognitive defusion (changing one's relationship with thoughts), being present (mindfulness), self-as-context, values, and committed action. Jennings *et al.*'s (2013) intervention introduced a series of mindful awareness practices, beginning with the basic practice of body and breath awareness and extending to activities that promote a mindful approach to daily activities (e.g., standing, walking, being present in front of the classroom). To promote compassion, the intervention introduced 'caring practice' and 'mindful listening'. Caring practice involved a guided reflection of 'loving kindness' focused on generating feelings of care for self and others, and mindful listening exercises were designed to promote the ability to listen to others without judgment. Pidgeon *et al.*'s (2014) intervention was based on metta, or loving-kindness meditation, described as a mind-training practice utilized to increase feelings of warmth and caring for the self and others. The programme consisted of periods of silence and training in mindfulness and metta skills to increase mindfulness and self-compassion.

Two studies (*viz.* McCraty & Atkinson, 2012; Pipe *et al.*, 2012) were primarily based on self-regulation of stress responses via technology to achieve a more coherent physiological state. Police officers from McCraty and Atkinson's (2012) study learnt a set of skills that enabled them to self-regulate their mental, emotional, and physical systems. The programme utilized a set of proven techniques and technology (emWave) for achieving

coherence. Pipe *et al.*'s (2012) intervention included a 'Transforming Stress' workshop that focused on the impact of stress on the body–mind–spirit and several techniques for learning how to self-regulate stress responses by shifting into a more coherent physiological state. Participants were also given use of an emWave heart rate variability technology, which helped them learn how the techniques were impacting on their stress responses.

Five interventions (*viz.* Arnetz *et al.*, 2009; Liossis *et al.*, 2009; Milllear *et al.*, 2008; Sood *et al.*, 2011; Waite & Richardson, 2003) consisted of multimodal cognitive-behavioural techniques (e.g., attentional training, energy management, relaxation training, imagery, and self-talk). Arnetz *et al.*'s (2009) programme consisted of relaxation and imagery training with mental skill rehearsal. The Promoting Adult Resilience (PAR) programme (*viz.* Liossis *et al.*, 2009; Milllear *et al.*, 2008) consisted of seven main topics: (1) understanding personal strengths and resilience, (2) understanding and managing stress, (3) challenging and changing negative self-talk, (4) practising changing negative self-talk, (5) promoting positive relationships, (6) problem-solving and managing conflict, and (7) bringing it together. Sood *et al.*'s (2011) programme addressed two aspects of human experience, namely attention and interpretation. Participants were also provided with training in a brief structured relaxation intervention (*viz.* paced breathing meditation). Lastly, Waite and Richardson's (2003) intervention was a biopsychospiritual enrichment programme designed to improve mental and spiritual health. Drawing from multidisciplinary perspectives (e.g., Chi, quanta, collective unconscious), participants learnt skills in using resilience to increase energy and focus energy in performing job functions, and to develop interpersonal skills.

Intervention delivery

There were four main modes of delivery: Online training (Abbott *et al.*, 2009), group-based sessions (Arnetz *et al.*, 2009; Burton *et al.*, 2010; Liossis *et al.*, 2009; McCraty & Atkinson, 2012; Milllear *et al.*, 2008; Pidgeon *et al.*, 2014; Pipe *et al.*, 2012; Waite & Richardson, 2003), one-to-one training (Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011), and a combination of group-based sessions with one-to-one training (Carr *et al.*, 2013; Grant *et al.*, 2009; Jennings *et al.*, 2013). Five of the 14 studies provided opportunities for additional training in the form of group-based booster sessions (Jennings *et al.*, 2013; Liossis *et al.*, 2009; Pidgeon *et al.*, 2014), a follow-up review session to provide an opportunity for participants to report back informally on how things were going (Waite & Richardson, 2003), and a follow-up session based on individual needs (Sood *et al.*, 2011) (see Table 2).

Participant characteristics

Demographics

Across the 14 studies, there was a total of 800 participants. The mean age of the participants ranged from 30 to 50, based on the 12 studies that provided this information (excluding Arnetz *et al.*, 2009; Carr *et al.*, 2013). For the 12 studies that provided information about gender split (excluding Carr *et al.*, 2013; Milllear *et al.*, 2008), there appeared to be a bias to either predominantly male (see, e.g., Abbott *et al.*, 2009; Arnetz *et al.*, 2009; McCraty & Atkinson, 2012) or predominantly female (see, e.g., Grant *et al.*, 2009; Jennings *et al.*, 2013; Pidgeon *et al.*, 2014) participants. The only exception was

the study by Sood *et al.* which had an approximately balanced split between both genders (53% male and 47% female).

Occupations

The participants were comprised of sales managers from an industrial organization (Abbott *et al.*, 2009), police officers (Arnetz *et al.*, 2009; McCraty & Atkinson, 2012), administrative staff from a university (Burton *et al.*, 2010), US Armed Forces personnel (Carr *et al.*, 2013), executives and senior managers from a public health service agency (Grant *et al.*, 2009), public school teachers (Jennings *et al.*, 2013), civil servants (Liossis *et al.*, 2009; Waite & Richardson, 2003), employees of a resource sector company (Millar *et al.*, 2008), human service professionals from a not-for-profit community organization (Pidgeon *et al.*, 2014), nurses in an oncology inpatient hospital unit (Pipe *et al.*, 2012), public sector middle-managers (Sherlock-Storey *et al.*, 2013), and Department of Medicine physicians at a tertiary care medical centre (Sood *et al.*, 2011) (see Table 2).

Outcomes

The primary aim of this review was to examine the effect of resilience training on personal resilience (see Table 4) and four broad categories of dependent variables relating to mental health and subjective well-being outcomes (see Table 5), physical/biological outcomes (see Table 6), psychosocial outcomes (see Table 7), and performance outcomes (see Table 8). Statistically significant results and (non-significant) medium-large effect sizes for the dependent variables in each study are noted below.

Resilience

Significant increases in resilience were demonstrated post-intervention by police officers from Sood *et al.* ($d = 1.16$, $p = .0003$), executives and senior managers from Grant *et al.* ($p < .05$), and middle-managers from Sherlock-Storey *et al.* ($d = 0.71$, $p = .01$). Interestingly, while all of the aforementioned studies revealed positive

Table 4. Resilience outcomes

Author/Year	Outcome (measure)	Intervention effect size (p)	Follow-up effect size
Carr <i>et al.</i> (2013) ^a	Resilience (CD-RISC)	-0.20 (.03)	
Grant <i>et al.</i> (2009)	Resilience (CHS)	+ve, $p < .05^b$	n/a
Pidgeon <i>et al.</i> (2014)	Resilience (RS-14)	+ve, $p > .05^b$	NR
Sherlock-Storey <i>et al.</i> (2013) ^a	Resilience (PCQ)	0.71 (.01)	n/a
Sood <i>et al.</i> (2011)	Resilience (CD-RISC)	1.16 (.0003)	n/a
Waite and Richardson (2003)	Resilience (RES)	0.14 (.41)	0.09 (.60)

Note. -ve = lower intervention mean; +ve = higher intervention mean; NR = results not reported. Intervention effect size reported as Cohen's d unless otherwise stated.

^aIntervention effect size based on repeated (pre, post), within-group, measures only.

^bUnable to calculate effect size.

Table 5. Mental health and subjective well-being outcomes

Author/Year	Outcome (measure)	Intervention effect size (p)	Follow-up effect size
Abbott et al. (2009)	Depression, anxiety and stress (DASS)	0.02 (.81)	NR
	Quality of life (WHOQOL-BREF)	0.01 (.97)	
	Happiness (AHI)	0.01 (.61)	
Arnetz et al. (2009)	Negative mood (POMS)	-1.11 (.03)	n/a
	Stress (VAS)	-0.80 (.13)	
Burton et al. (2010) ^a	Autonomy (SPWB)	+ve, $p < .05^b$	n/a
	Mastery (SPWB)	+ve, $p < .01^b$	
	Growth (SPWB)	+ve, $p < .01^b$	
	Positive relations (SPWB)	+ve, $p > .05^b$	
	Purpose (SPWB)	+ve, $p > .05^b$	
	Self-acceptance (SPWB)	+ve, $p < .05^b$	
	Positive affect (PANAS)	+ve, $p < .01^b$	
	Depression (DASS)	-ve, $p > .05^b$	
	Anxiety (DASS)	+ve, $p > .05^b$	
Carr et al. (2013) ^a	Stress (DASS)	-ve, $p < .05^b$	
	Stress load	-0.08 (>.05)	n/a
Grant et al. (2009)	Depression (DASS)	-ve, $p < .05^b$	n/a
	Anxiety (DASS)	-ve, $p > .05^b$	
	Stress (DASS)	-ve, $p > .05^b$	
Jennings et al. (2013)	Subjective well-being (WWBI)	+ve, $p < .05^b$	
	Depression (CED-S)	-0.45 (.15)	n/a
	Negative affect (PANAS)	-0.16 (.13)	
	Positive affect (PANAS)	0.24 (.36)	
Liossis et al. (2009)	Depression (DASS)	-ve, $p > .05^b$	-ve, $p > .05^b$
	Anxiety (DASS)	-ve, $p > .05^b$	-ve, $p > .05^b$
	Stress (DASS)	-ve, $p > .05^b$	-ve, $p > .05^b$
	Vigour (WVS)	$\eta^2 = .01$ ($p > .05$)	0.81 (.05)
	Psychological well-being (SPWB)	$\eta^2 = .01$ ($p > .05$)	0.76 (.07)
McCarty and Atkinson (2012)	Anxiety (POQS)	-0.01 (.89)	n/a
	Depression (POQS)	-0.75 (.01)	
	Distress (POQS)	-0.62 (.03)	
	Anger (POQS)	-0.23 (.37)	
	Sadness (POQS)	-0.42 (.11)	
	Negative emotion (POQS)	-0.65 (.02)	
	Vitality (POQS)	0.53 (.06)	
	Positive emotion (POQS)	0.22 (.38)	
	Stress (DASS)	-0.46 (.003)	-0.96 (.001)
Milliar et al. (2008)	Psychological well-being (SPWB)	$\eta^2 = .02$ (.29)	$\eta^2 = .02$ (.36)
	Life satisfaction (SWLS)	$\eta^2 = .02$ (.25)	$\eta^2 = .02$ (.40)
Pipe et al. (2012) ^a	Anxiety (POQA)	-1.38 ($p < .01$)	n/a
	Depression (POQA)	-1.54 ($p < .01$)	
	Stress (POQA)	-1.28 ($p < .01$)	

Continued

Table 5. (Continued)

Author/Year	Outcome (measure)	Intervention effect size (<i>p</i>)	Follow-up effect size
Sood <i>et al.</i> (2011)	Stress (PSS)	−1.01 (.01)	n/a
	Anxiety (SAS)	−1.32 (.001)	
	Quality of life (LASA)	0.83 (.03)	
Waite and Richardson (2003)	Purpose (PIL)	0.26 (.13)	−0.02 (.91)

Note. −ve = lower intervention mean; +ve = higher intervention mean; NR = results not reported; η^2 = eta squared.

Intervention effect size reported as Cohen's *d* unless otherwise stated.

^aIntervention effect size based on repeated (pre, post), within-group, measures only.

^bUnable to calculate effect size.

Table 6. Physical/biological outcomes

Author/Year	Outcome (measure)	Intervention effect size (<i>p</i>)	Follow-up effect size
Arnetz <i>et al.</i> (2009)	Antithrombin	1.03 (.04)	n/a
	Cortisol	−0.89 (.43)	
	Heart rate (BPM)	−0.08 (.90)	
Burton <i>et al.</i> (2010) ^a	Fasting blood glucose	−ve, $p > .05^b$	n/a
	Total Cholesterol	−ve, $p < .05^b$	
	C-Reactive protein	−ve, $p > .05^b$	
	Cortisol	+ve, $p > .05^b$	
	BMI	+ve, $p > .05^b$	
	Systolic blood pressure	−ve, $p > .05^b$	
	Diastolic blood pressure	−ve, $p > .05^b$	
Jennings <i>et al.</i> (2013)	Minutes/week physical activity	+ve, $p > .05^b$	
	Physical ill-being (DPS)	−0.45 (.15)	n/a
	Exhaustion (MBI)	0.04 (.87)	
Liossis <i>et al.</i> (2009)	Exhaustion (LOT-R)	$\eta^2 = -.01$ ($p < .05$)	−0.77 (.01)
McCarty and Atkinson (2012)	Fatigue (POQS)	−0.31 (.27)	n/a
	Sleeplessness (POQS)	−0.29 (.27)	
	Body aches (POQS)	0.01 (.99)	
	Indigestion (POQS)	−0.40 (.13)	
	Rapid heart rate (POQS)	−0.64 (.01)	
Pipe <i>et al.</i> (2012) ^a	Fatigue (POQA)	−1.44 ($p < .01$)	n/a
Sood <i>et al.</i> (2011)	Fatigue (VAS)	−0.23 (.42)	n/a

Note. −ve = lower intervention mean; +ve = higher intervention mean; η^2 = eta squared.

Intervention effect size reported as Cohen's *d* unless otherwise stated.

^aIntervention effect size based on repeated (pre, post), within-group, measures only.

^bUnable to calculate effect size.

changes in resilience post-intervention, US Army personnel from Carr *et al.* exhibited significant decreases in resilience ($d = -0.20$, $p = .03$) post-intervention. This finding will be discussed later.

Table 7. Psychosocial outcomes

Author/Year	Outcome (measure)	Intervention effect size (p)	Follow-up effect size
Burton et al. (2010) ^a	Mindfulness (MAAS)	+ve, $p < .05^b$	n/a
	Acceptance (AAQII)	+ve, $p < .05^b$	
	Social support (MOS)	+ve, $p > .05^b$	
Carr et al. (2013) ^a	Morale	−0.17 (.01)	n/a
Liossis et al. (2009)	Optimism (LOT-R)	$\eta^2 = .01$ ($p > .05$)	0.74 (.02)
	Coping self-efficacy (CSE)	1.17 (.001)	0.70 ($p > .05$)
	Work satisfaction	$\eta^2 = .01$ ($p > .05$)	0.85 (.01)
	Work–life fit	0.74 (.001)	0.44 ($p < .05$)
	Work–life balance	0.43 (.04)	1.19 (.001)
	McCraty and Atkinson (2012)	Peacefulness (POQS)	0.51 (.06)
	Social support (POQS)	0.33 (.22)	
	Mental clarity (POQS)	0.39 (.14)	
	Goal clarity (POQS)	−0.10 (.69)	
	Communication effectiveness (POQS)	−0.18 (.49)	
	Work Satisfaction (POQS)	−0.29 (.27)	
Millear et al. (2008)	Coping self-efficacy (CSE)	1.12 (.004)	1.14 (.002)
	Social skills (SSS)	$\eta^2 = .02$ (.25)	$\eta^2 = .02$ (.39)
	Work–life fit	$\eta^2 = .01$ (.50)	0.28 (.05)
	Work–life balance	$\eta^2 = .03$ (.16)	$\eta^2 = .06$ (.09)
	Work Satisfaction	$\eta^2 = .001$ (.75)	$\eta^2 = .002$ (.32)
Pidgeon et al. (2014)	Mindfulness (FFMQ)	+ve, $p > .05^b$	
	Self-compassion (SCS)	+ve, $p > .05^b$	
Pipe et al. (2012) ^a	Positive outlook (POQA)	1.09 ($p < .01$)	n/a
	Motivation (POQA)	1.05 ($p < .01$)	
	Calmness (POQA)	1.46 ($p < .01$)	
	Resentfulness (POQA)	−1.04 ($p < .01$)	
	Anger management (POQA)	−0.95 ($p < .01$)	
Sherlock-Storey et al. (2013) ^a	Hope (PCQ)	0.83 (.002)	n/a
	Optimism (PCQ)	0.81 (.002)	
	Self-efficacy (PCQ)	0.97 (.01)	
Waite and Richardson (2003)	Self-esteem (RSES)	0.00 (.99)	−0.05 (.77)
	Locus of control (ILOCC)	0.23 (.20)	0.00 (.99)
	Job satisfaction (IRS)	0.40 (.02)	0.17 (.31)
	Interpersonal relations (HPLP)	0.35 (.04)	0.03 (.85)

Note. −ve = lower intervention mean; +ve = higher intervention mean; η^2 = eta squared. Intervention effect size reported as Cohen's d unless otherwise stated.

^aIntervention effect size based on repeated (pre, post), within-group, measures only.

^bUnable to calculate effect size.

Mental health and subjective well-being outcomes

Physicians from Sood et al. demonstrated significant decreases in stress ($d = -1.01$, $p = .01$) and anxiety ($d = -1.32$, $p = .001$) and significant increases in quality of life ($d = 0.83$, $p = .03$) post-intervention. Nurses from Pipe et al. demonstrated significant reductions in stress ($d = -1.28$, $p < .01$), anxiety ($d = -1.38$, $p < .01$), and depression

Table 8. Performance outcomes

Author/Year	Outcome (measure)	Intervention effect size (<i>p</i>)	Follow-up effect size
Abbott <i>et al.</i> (2009)	Gross margin	0.05 (.16)	NR
	Product sold	0.00 (.76)	
Arnetz <i>et al.</i> (2009)	Observed performance	1.26 (.02)	n/a
Carr <i>et al.</i> (2013) ^a	Self-rated performance	0.13 (<i>p</i> > .05)	n/a
Grant <i>et al.</i> (2009)	Goal attainment (GAS)	+ve, <i>p</i> < .05 ^b	n/a
McCraty and Atkinson (2012)	Productivity (POQS)	-0.26 (.33)	n/a
Pipe <i>et al.</i> (2012) ^a	Productivity (POQA)	0.97 (<i>p</i> < .01)	n/a

Note. -ve = lower intervention mean; +ve = higher intervention mean; NR = results not reported. Intervention effect size reported as Cohen's *d* unless otherwise stated.

^aIntervention effect size based on repeated (pre, post), within-group, measures only.

^bUnable to calculate effect size.

($d = -1.54$, $p < .01$) post-intervention. Employees from Millear *et al.* displayed significant reductions in stress post-intervention ($d = -0.46$, $p = .003$) and at 6-month follow-up ($d = -0.96$, $p = .001$). Police officers from Arnetz *et al.* reported significant decreases in negative mood ($d = -1.11$, $p = .03$) and non-significant but large reductions in stress ($d = -0.80$, $p = .13$) post-intervention. Public school teachers from Jennings *et al.* displayed non-significant but moderate decreases in depression ($d = -0.45$, $p = .15$) post-intervention. Police officers from McCraty and Atkinson demonstrated significant reductions in depression ($d = -0.75$, $p = .01$), distress ($d = -0.62$, $p = .03$), and negative emotion ($d = -0.65$, $p = .02$) and non-significant but moderate increases in vitality ($d = 0.53$, $p = .06$) post-intervention. Civil servants from Liossis *et al.* displayed significant increases in vigour ($d = 0.81$, $p = .05$) and non-significant but large increases in psychological well-being ($d = 0.76$, $p = .07$) at 6-month follow-up. Administrative staff from Burton *et al.* demonstrated significant decreases in stress ($p < .05$) and significant increases in positive affect ($p < .01$), autonomy ($p < .05$), mastery ($p < .01$), growth ($p < .01$), and self-acceptance ($p < .05$) post-intervention. Lastly, executives and senior managers from Grant *et al.* exhibited significant decreases in depression ($p < .05$) and significant increases in subjective well-being ($p < .05$) post-intervention.

Physical/biological outcomes

Police officers from Arnetz *et al.* demonstrated non-significant but large reductions in cortisol ($d = -0.89$, $p = .43$) and significant increases in antithrombin ($d = 1.03$, $p = .04$) post-intervention. Nurses from Pipe *et al.* exhibited significant decreases in fatigue ($d = -1.44$, $p < .01$) and public school teachers from Jennings *et al.* revealed non-significant but moderate decreases in physical ill-being ($d = -0.45$, $p = .15$) post-intervention. Civil servants from Liossis *et al.* demonstrated significant decreases in exhaustion post-intervention ($p < .05$) and at 6-month follow-up ($d = -0.77$, $p = .01$). Police officers from McCraty and Atkinson displayed significant decreases in rapid heart rate ($d = -0.64$, $p = .01$) and administrative staff from Burton *et al.* exhibited significant decreases in total cholesterol ($p < .05$) post-intervention.

Psychosocial outcomes

Middle-managers from Sherlock-Storey *et al.* displayed significant increases in hope ($d = 0.83, p = .002$), optimism ($d = 0.81, p = .002$), and self-efficacy ($d = 0.97, p = .01$) post-intervention. Nurses from Pipe *et al.* reported significant increases in positive outlook ($d = 1.09, p < .01$), motivation ($d = 1.05, p < .01$), and calmness ($d = 1.46, p < .01$) and significant decreases in resentment ($d = -1.04, p < .01$) and anger management ($d = -0.95, p < .01$) post-intervention. Civil servants from Liossis *et al.* exhibited significant increases in coping self-efficacy post-intervention ($d = 1.17, p = .001$) and non-significant but large increases at 6-month follow-up ($d = 0.70, p > .05$), significant increases in work–life fit post-intervention ($d = 0.74, p = .001$) and at 6-month follow-up ($d = 0.44, p < .05$), significant increases in work–life balance post-intervention ($d = 0.43, p = .04$) and at 6-month follow-up ($d = 1.19, p = .001$), and significant increases in optimism ($d = 0.74, p = .02$) and work satisfaction ($d = 0.85, p = .01$) at 6-month follow-up. Employees from Millier *et al.* displayed significant increases in coping self-efficacy post-intervention ($d = 1.12, p = .004$) and at 6-month follow-up ($d = 1.14, p = .002$). In addition, significant increases in work–life fit were found by Millier *et al.* at 6-month follow-up ($d = 0.28, p = .05$). Public school teachers from Jennings *et al.* exhibited significant increases in self-efficacy ($d = 0.60, p = .002$) and perceived accomplishment ($d = 0.40, p = .05$) post-intervention. Civil servants from Waite and Richardson demonstrated significant increases in job satisfaction ($d = 0.40, p = .02$) and interpersonal relations ($d = 0.35, p = .04$) post-intervention. Police officers from McCraty and Atkinson demonstrated non-significant but large increases in peacefulness ($d = 0.51, p = .06$) post-intervention, and administrative staff from Burton *et al.* demonstrated significant increases in mindfulness ($p < .05$) and acceptance ($p < .05$) post-intervention.

Performance outcomes

Executives and senior managers from Grant *et al.* demonstrated significant increases in goal attainment post-intervention ($p < .05$), nurses from Pipe *et al.* exhibited significant increases in productivity post-intervention ($d = 0.97, p < .01$), and police officers from Arnetz *et al.* displayed significant increases in observed behavioural performance post-intervention ($d = 1.26, p = .02$).

Methodological quality of included papers

For the randomized and non-randomized controlled trials (10 studies viz. Abbott *et al.*, 2009; Arnetz *et al.*, 2009; Grant *et al.*, 2009; Jennings *et al.*, 2013; Liossis *et al.*, 2009; McCraty & Atkinson, 2012; Millier *et al.*, 2008; Pidgeon *et al.*, 2014; Sood *et al.*, 2011; Waite & Richardson, 2003), quality was assessed using the Cochrane Collaboration tool for risk of bias (Higgins *et al.*, 2011). None of the studies adequately described evidence of sequencing at the randomization stage, and Millier *et al.* (2008) and Liossis *et al.* (2009) did not use random assignment but had independently selected experimental and control groups. Likewise, across the studies, allocation to experimental and control groups was either not well concealed or had insufficient information to make an inference. Blinding of the assessors and outcome assessment were not reported in any of the reviewed studies. However, five of the 10 studies (viz. Jennings *et al.*, 2013; Liossis *et al.*, 2009; McCraty & Atkinson, 2012; Pidgeon *et al.*, 2014; Sood *et al.*, 2011) did describe incomplete outcome data, including attrition rates, and there was only evidence of outcome reporting bias (i.e.,

the selective reporting of some outcomes but not others, depending on the nature and direction of the results) in two trials (viz. Abbott *et al.*, 2009; Pidgeon *et al.*, 2014). Finally, baseline measures were statistically controlled for in four of the 10 studies (viz. Jennings *et al.*, 2013; Liossis *et al.*, 2009; Millier *et al.*, 2008; Sood *et al.*, 2011) but were either omitted or unclear in the others. Overall, the risk of bias in the reviewed studies was typically high (see Table 9).

Discussion

The purpose of this study was to synthesize research on resilience training in the workplace and to specifically evaluate the effect of training on personal resilience and four broad categories of dependent variables: (1) mental health and subjective well-being outcomes, (2) physical/biological outcomes, (3) psychosocial outcomes, and (4) performance outcomes. In general, the studies offer support for the positive impact of resilience training. In 13 of the 14 reviewed studies, there was a statistically significant change in at least one of the dependent variables. Furthermore, in 12 of the 14 studies, the direction of the results is in favour of a beneficial effect for the training. On the other hand, there is no single dependent variable that shows a statistically significant effect across all of the studies in which it was investigated.

Is resilience training effective?

Does resilience training enhance resilience?

Six studies (viz. Carr *et al.*, 2013; Grant *et al.*, 2009; Pidgeon *et al.*, 2014; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011; Waite & Richardson, 2003) measured resilience, with three of the six showing a significant positive effect (viz. Grant *et al.*, 2009; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011). Interestingly, despite the training, Carr *et al.* found that resilience (and morale) declined in US Army personnel across the deployment period. A possible explanation for this finding is that the lower morale may have reflected less perceived helplessness of behaviour by commanders and yielded an impression that such programmes do not provide benefit. In that circumstance, resilience programmes may be implemented with low priority of commitment, compromising whatever benefit may be present. Consequently, Carr *et al.* proposed that ‘appropriately cast expectations for the effects of such programs are essential for their implementation’ (p. 153).

Mental health and subjective well-being outcomes

The most frequently studied category of dependent variables was mental health and subjective well-being. Within this category, the most frequently studied outcomes were depression, stress, negative mood/affect/emotion, and anxiety. A sample-size-weighted mean effect size based on the 13 effect sizes available for this cluster of variables gives a value of $d = 0.78$ (a large effect). This is a bigger effect than those observed by Brunwasser, Gillham, and Kim (2009) in their evaluation of the PRP for youths. Overall, the Brunwasser *et al.* effect sizes ranged from 0.11 to 0.21, although they did find larger effects for some of the subgroups in their sample (up to 0.31). They also found that effects were more stable for longer follow-up periods. It was not possible to examine the impact of follow-up period in our study, but it is something that should be a point of focus for future research.

Table 9. Risk of bias summary for RCT and CT

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of assessors (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data addressed (attrition bias)	Selective outcome reporting (reporting bias)	Other sources of bias (i.e., baseline bias)
Abbott <i>et al.</i> (2009)	Unclear	Unclear	High	High	High	High	High
Arnetz <i>et al.</i> (2009)	Unclear	High	High	High	Unclear	Low	Unclear
Grant <i>et al.</i> (2009)	Unclear	High	High	High	Unclear	Low	High
Jennings <i>et al.</i> (2013)	Unclear	Unclear	High	High	Low	Low	Low
Lioassis <i>et al.</i> (2009)	High	High	High	High	Low	Low	Low
McCarty and Atkinson (2012)	Unclear	High	High	High	Low	Low	High
Millar <i>et al.</i> (2008)	High	High	High	High	High	Low	Low
Pidgeon <i>et al.</i> (2014)	Unclear	High	High	High	Low	High	High
Sood <i>et al.</i> (2011)	Unclear	High	High	High	Low	Low	Low
Waite and Richardson (2003)	Unclear	Unclear	High	High	High	Low	High

Note. Low = low risk of bias; Unclear = unclear risk of bias; High = high risk of bias.

Psychosocial outcomes

The majority of the studies (excluding Abbott *et al.*, 2009; Arnetz *et al.*, 2009) also investigated psychosocial outcomes as dependent variables. Three such studies (*viz.* Jennings *et al.*, 2013; Pidgeon *et al.*, 2014; Sherlock-Storey *et al.*, 2013) measured self-efficacy, with all showing a positive effect. In addition, results for other psychosocial outcomes (e.g., work satisfaction, social skills) were generally in the direction of a beneficial effect, but most of the effect sizes were too small to reach statistical significance, given the sample sizes used in the studies.

Physical/biological outcomes

Seven studies examined physical/biological outcomes. The results, however, provide very few statistically significant effects. Similarly, most of the effect sizes observed, regardless of statistical significance, were small-to-moderate in magnitude. There were, though, two exceptions to this. First, the results of the study by Pipe *et al.* (2012) showed that resilience training resulted in significantly large reductions in fatigue ($d = -1.44, p < .01$). Second, the results of the study by Arnetz *et al.* (2009) showed that resilience training resulted in a significantly large increase in antithrombin ($d = 1.03, p = .04$), an anticoagulant helpful in preventing thrombosis. The trend in their results for cortisol (a large but not statistically significant effect) also suggests further benefits for resilience training.

Performance outcomes

Six studies examined performance outcomes, but there was no common dependent variable across these studies. Two studies that assessed observed performance and goal attainment showed positive trends, with a large effect for both of these variables (*viz.* Arnetz *et al.*, 2009; Grant *et al.*, 2009). Interestingly, there were contrasting results with regard to productivity. Pipe *et al.* found that resilience training resulted in significantly higher levels of productivity, whereas McCraty and Atkinson (2012) found that resilience training resulted in (non-significant) moderately lower levels of productivity. Results for more distal outcomes (*viz.* gross margin and product sold) showed no indication of any effect.

Summary

The findings of this review provide some indication that resilience training for workers may have beneficial consequences. This is especially the case for mental health and subjective well-being outcomes, such as stress, depression, anxiety, and negative mood/affect/emotion, which appear particularly sensitive to resilience intervention. There is also an indication, across the studies, that self-efficacy and personal resilience may be improved following training – as would be expected. However, it is noteworthy that only a few studies measured these outcomes and the results available must thus be interpreted cautiously. This is similarly the case for physical/biological and performance outcomes of which indications of efficacy permit only tentative conclusions (as they rely on single studies for most of the outcomes investigated).

The impact of resilience training

As well as considering the impact of resilience training on personal resilience, the potential mechanism by which resilience training may influence other outcomes (*viz.*

mental health and subjective well-being, psychosocial, physical/biological, and performance outcomes) is also of interest. At this stage, it is worth considering a theoretical model for the impact of resilience training on these outcomes. Our preferred definition of resilience (Fletcher & Sarkar, 2012, 2013) suggests that resilience represents a constellation of characteristics that protect individuals from the potential negative effect of stressors. In turn, resilience would act as a mediating variable, such that an increase in resilience would lead to improvements in other outcomes. The results from this systematic review provide tentative support for such a model. Specifically, of the studies that found an improvement in resilience after training (*viz.* Grant *et al.*, 2009; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011), two of these studies also measured mental health and subjective well-being outcomes with both studies finding increases in these outcomes. The study that found a decrease in resilience after training (*viz.* Carr *et al.*, 2013) correspondingly did not show any improvements in mental health and subjective well-being outcomes. Moreover, two studies did not show any significant changes in resilience after training (*viz.* Pidgeon *et al.*, 2014; Waite & Richardson, 2003), and one of these (*viz.* Waite & Richardson, 2003) measured mental health and subjective well-being outcomes with no change in these either. Although limited in the number of studies, these results are consistent with the interpretation that resilience may mediate the impact of resilience training on certain desirable outcomes.

It is reasonable to expect that a primary outcome of interest of resilience training is an improvement in resilience. With this in mind, it is somewhat surprising that only six of the 14 studies that we identified measured resilience as an outcome (*viz.* Carr *et al.*, 2013; Grant *et al.*, 2009; Pidgeon *et al.*, 2014; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011; Waite & Richardson, 2003). This limits the evidence about the direct impact of resilience training on personal resilience. Five of the six studies produced positive results for resilience (*viz.* Grant *et al.*, 2009; Pidgeon *et al.*, 2014; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011; Waite & Richardson, 2003), but only three reached statistical significance (*viz.* Grant *et al.*, 2009; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011). These findings suggest that resilience training may be effective in improving personal resilience but that this is not always the case, suggesting that the effectiveness of the training may be moderated by the nature of training. Next, we consider various factors that may affect the impact of resilience training.

The nature of resilience training

The work-based resilience training studies reviewed here used a number of different, yet interrelated, approaches to developing mental processes and behaviours with the ultimate aim of protection from negative consequences.

Guiding definition, validity of measures, and intervention content

As mentioned in the Results section, from the six studies that measured resilience (*viz.* Carr *et al.*, 2013; Grant *et al.*, 2009; Pidgeon *et al.*, 2014; Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011; Waite & Richardson, 2003), two studies did not provide a guiding definition (*viz.* Carr *et al.*, 2013; Grant *et al.*, 2009). In addition, Carr *et al.* and Grant *et al.*'s interventions appeared to be inconsistent with the measures they employed. For example, Carr *et al.*'s programme predominantly focused on resilient thinking yet the measure employed, the Connor–Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003), assesses resilient qualities. Furthermore, Grant *et al.* used a psycho-

metric tool that measures hardiness, namely the Cognitive Hardiness Scale (Nowack, 1990), but indicated that their training targeted resilience. Importantly, Windle, Bennett, and Noyes (2011) noted that hardiness measures ‘do not fit well with the notion of resilience as a dynamic process’ (p. 8).

From the four studies that measured resilience and provided resilience definitions, one study (*viz.* Pidgeon *et al.*, 2014) used a definition that was not consistent with the resilience measure and intervention employed. Specifically, Pidgeon *et al.* defined resilience as ‘competence to cope and adapt in the face of adversity and to bounce back when stressors become overwhelming’ (p. 355). Notwithstanding the conceptual distinction between resilience and coping (see, for a review, Fletcher & Sarkar, 2013), the Resilience Scale (RS; Wagnild & Young, 1993) used by the authors is based on five characteristics (*viz.* perseverance, equanimity, meaningfulness, self-reliance, and existential aloneness) that do not appear to be covered directly in the intervention. Only three studies (*viz.* Sherlock-Storey *et al.*, 2013; Sood *et al.*, 2011; Waite & Richardson, 2003) used definitions in line with the respective resilience measure employed. For example, Sherlock-Storey *et al.* defined resilience as ‘when beset with problems and adversity sustaining and bouncing back and even beyond to attain success’ (p. 22), which is consistent with the resilience coaching programme delivered in the face of organizational change and also in line with Luthans, Youssef, and Avolio’s (2007) conceptualization and operationalization of resilience within their measure of psychological capital (see also Youssef & Luthans, 2007). As a further example, Waite and Richardson defined resilience as ‘the force within everyone that drives them to seek self-actualization, altruism, wisdom, and be in harmony with a spiritual source of strength (Richardson, 2002) (p. 179)’. This definition is consistent with their biopsychospiritual enrichment programme designed to improve mental and spiritual health, and their corresponding assessment of Resilience and Reintegration (RES) measured ‘to reflect the . . . concept of reintegration as detailed by Richardson (2002)’ (p. 179). However, it is worth noting that, despite the content validity of Waite and Richardson’s programme, it has been argued that ‘the suggestion by Richardson that resilience may be the driving force that controls the universe may be a little overstated’ (Windle, 2011, p. 165).

Intervention length and delivery

The structure, duration, and delivery method for the interventions varied considerably. The most common format involved group-based training over a 10- to 11-week period. The limited evidence base currently available does not suggest that longer programmes produce better results. For example, a 30-hr intensive training programme provided for school teachers (Jennings *et al.*, 2013) produced several positive results but so did a 90-min programme for physicians (Sood *et al.*, 2011). Some programmes offered individual support for trainees. The most extensive individualized programme was that of Grant *et al.* (2009). This programme did produce several beneficial effects and so did other programmes offering individual support (Jennings *et al.*, 2013; Sood *et al.*, 2011). The evidence is too limited to support a conclusion that individualized training is critical in overall effectiveness, as some programmes without this element also delivered beneficial results. Yet, the results do suggest that, until conclusive evidence is available, it may be wise to include individual support in any resilience training programme.

One of the programmes (*viz.* Abbott *et al.*, 2009) was delivered online. It is interesting to note that this intervention was one of the only two studies in the review to produce no positive results (see also Carr *et al.*, 2013). Previous research has shown that online

interventions can be effective in changing health-related behaviour (Portnoy, Scott-Sheldon, Johnson, & Carey, 2008). However, many interventions fail to work due to the lack of take-up (Bennett & Glasgow, 2009). Indeed, Abbott *et al.* (2009) note that a high proportion of their sample did not complete the training and this may go some way to explain the lack of effects for their intervention.

Building adversity into resilience training

Two studies (*viz.* Arnetz *et al.*, 2009; McCraty & Atkinson, 2012) built adversity into their resilience training programmes by systematic exposure to realistic critical incident simulations. To illustrate, police officers in Arnetz *et al.*'s study participated in a live, life-like critical incident simulation involving the reenactment of a post office robbery. Similarly, a total of three different scenarios (*viz.* a building search, high speed car pursuit, domestic violence episode) were conducted over the course of McCraty and Atkinson's study. Drawing from theories of stress inoculation (Meichenbaum, 1985), it has been suggested that exposure to adversity in moderation can help individuals to develop resilience in the face of future pressure situations (*cf.* Sarkar & Fletcher, 2014; Seery, 2011; Seery, Holman, & Silver, 2010). For example, in the context of elite sport, researchers have found that adversity-related experiences are vital in the development of superior Olympic performance (Howells & Fletcher, 2015; Sarkar, Fletcher, & Brown, 2014). Practically, this suggests that psychologists should seek to create an environment with regular appropriate challenges that help individuals to develop resilience; however, there may be a point when these practices contribute to or become inappropriate adversities that have a negative impact on performance and/or well-being. Practitioners therefore need to maintain a reflective outlook that constantly reviews the consequences of their practices (*cf.* Ashby, Ryan, Gray, & James, 2013) because, if they do become an active agent in an (inappropriate) adversity, it is likely to compromise their ability to facilitate resilience.

Limitations and future research

The major limitation of the research reported in this study is the shortage of studies evaluating work-based resilience training, indicating a need for further systematic research in this area. As Table 9 indicates, the research that is available is not methodologically strong, limiting the possibility of drawing clear conclusions about the efficacy of resilience training and further supporting the need for researchers to execute well-designed studies that minimize threats to external validity. Interestingly, the (two) studies employing randomized controlled designs and possessing the least risk of bias (*viz.* Jennings *et al.*, 2013; Sood *et al.*, 2011) provided generally positive results in favour of the resilience training. Furthermore, statistical power is an issue in many of the studies reported. Sample sizes are generally small (mean $N = 57$) indicating that the average statistical power in the studies is <70% (for a medium effect at 0.05, two tailed, Cohen, 1988). Although we appreciate the difficulties in recruiting and retaining participants for the studies that are needed, it will be helpful if researchers in the future aim to conduct studies that provide higher levels of statistical power whenever possible.

As mentioned previously, the resilience training typically used content derived from a common base of research and theory (*i.e.*, cognitive-behavioural techniques). Yet, the training delivery modes nevertheless varied in content and formats (*e.g.*, the PRP, coaching-related principles, mindfulness and compassion-based practices, and self-

regulation of stress responses). The studies available, thus, do not enable concrete conclusions about the most effective design and delivery of resilience training. Further comparative research with work samples, designed to isolate and compare different design and delivery features (e.g., length, number of sessions, degree of individualized support, specific content) and target groups, would be particularly helpful. Moreover, pursuing an array of research strategies (e.g., case studies) would accelerate the growth in understanding the key features that influence the success of resilience training. As part of this recommendation, it would be interesting to explore whether some people might benefit more/less from resilience training particularly with regard to personality variables (cf. Lu, Wang, Liu, & Zhang, 2014), which currently do not appear to be used or measured in existing training programmes. This comparison may then be extended to other populations where resilience training has been carried out (see, for a review, Brunwasser *et al.*, 2009; Leppin *et al.*, 2014).

Before addressing these questions, a more fundamental issue for researchers to consider is the content and construct validity for their resilience training programmes. Specifically, it is essential that future interventions demonstrate consistency in terms of how resilience is defined, conceptualized, developed, and assessed. Based on the findings of this review, there is a particular need for conceptual clarity. This requirement is supported by Fletcher and Sarkar (2012) who argued the following when discussing the content of resilience training:

From a research perspective, although resilience intervention studies are required . . . , it is important that such work is grounded in systematic resilience research programs rather than piecemeal and incomplete strategies based on, for example, the mental toughness, hardiness or coping literatures. Such research programs, which should be underpinned by the conceptual and theoretical advances already made in this area in general psychology (cf. Fletcher & Sarkar, 2013), will provide the most rigorous and robust platform from which to develop resilience training. (p. 676)

In addition to demonstrating conceptual clarity and consistency, researchers need to be clearer and more coherent in terms of how resilience interventions are assessed and evaluated. With regard to measuring resilience, as a number of existing questionnaires measure phenomena that are related to resilience but are conceptually distinct from the construct (e.g., hardiness, recovery, coping), evaluators of resilience training need to employ measures that do not divert researchers' attention from examining the true nature of resilience (cf. Sarkar & Fletcher, 2013). In this regard, future researchers should consider assessing and evaluating resilience through the lens of interactionism (see, for a review, Pangallo, Zibarras, Lewis, & Flaxman, 2015) in line with the definition presented in the Introduction section (cf. Fletcher & Sarkar, 2012, 2013) and the process conceptualization of resilience, which recognizes that it is a capacity that develops over time in the context of person–environment interactions (cf. Egeland *et al.*, 1993). Furthermore, as most of the resilience inventories to date have been developed for use in clinical settings (cf. Pangallo *et al.*, 2015; Sarkar & Fletcher, 2013), researchers should consider using more contextually relevant measures including the Resilience at Work Scale (Winwood, Colon, & McEwen, 2013), and the Workplace Resilience Inventory (McLarnon & Rothstein, 2013). In Table 10, we provide specific guidelines on how future researchers can advance knowledge about resilience training to improve work-related resilience intervention research.

Table 10. Guidelines on how future researchers can advance knowledge about resilience training**Definition of resilience**

Researchers should use a consistent definition of resilience as it will provide scholars with conceptual boundaries that will help determine the nature, direction, and veracity of resilience research enquiry. We recommend using Fletcher and Sarkar's (2012, 2013) definition of psychological resilience when designing and delivering resilience training as it encapsulates aspects of both trait and process conceptualizations of resilience.

Intervention design and methodological quality

Researchers should ideally use randomized controlled designs (i.e., pre–post measures with a control group) when conducting resilience training studies.

Studies need to adequately describe evidence of sequencing at the randomization stage.

Studies need to better conceal participants' allocation to experimental or control groups.

Studies need to report data better. Specifically, they need to describe incomplete outcome data (e.g., attrition rates) and avoid selective outcome reporting.

Several studies did not report an effect size, making quantitative meta-analysis impossible. Studies need to report effect sizes, rather than only statistical significance levels.

Studies need to control for baseline measures.

Measurement of resilience

Only six of 14 studies directly measured resilience. Future work should measure resilience so that researchers can better judge the effectiveness of resilience training programmes.

As a number of existing questionnaires measure phenomena that are related to resilience but are conceptually distinct from the construct (e.g., hardiness, coping), resilience training studies need to employ measures that do not divert researchers' attention from examining the true nature of resilience (cf. Sarkar & Fletcher, 2013).

Researchers should consider using more contextually relevant measures including the Resilience at Work Scale (Winwood et al., 2013), and the Workplace Resilience Inventory (McLarnon & Rothstein, 2013).

Future researchers should assess resilience through the lens of interactionism (see, for a review, Pangallo et al., 2015) in line with the recommended definition (Fletcher & Sarkar, 2012, 2013) and the process conceptualization of resilience, which recognizes that it is a capacity that develops over time in the context of person–environment interactions.

Mechanisms of change

Future research should identify the processes through which resilience interventions impact resilience and other outcome variables (i.e., mental health and subjective well-being, psychosocial, physical/biological, and performance outcomes).

Researchers should explore a mediated model of resilience to unpack mechanisms of change (i.e., resilience training → increased resilience → secondary outcomes [i.e., mental health and subjective well-being, psychosocial, physical/biological, and performance outcomes]).

Isolation of effects

As resilience training programmes combine multiple elements, future research needs to isolate the effects to determine which elements are affecting which outcome measures.

Experimental research designs that target specific aspects of resilience may be useful in this regard (e.g., measuring an individual's reaction to an experimental stress paradigm).

Homogeneity

It is vital that future research demonstrates consistency in terms of how resilience is defined, conceptualized, developed, and assessed.

This will enable the results of resilience training studies to be accumulated and compared via meta-analysis.

Concluding remarks

As Cooper, Flint-Taylor, and Pearn (2013) suggest with respect to resilience training and its importance in the future,

... resilience-building has shifted from a narrow focus as a remedial or preventative measure designed to cover stress and anxiety ... to a broader focus as capacity or strength-builder to enable people, teams and organizations to sustain high levels of performance in challenging and difficult circumstances.(p. 204)

Concerns about individual and organizational resilience are now centre stage in human resource management and occupational psychology not only to enhance productivity but also to foster workplace well-being and engagement. This systematic review is the first step in identifying the impact of resilience training in the workplace and provides initial evidence of the impact of resilience training on personal resilience, mental health and subjective well-being outcomes, and performance. More work-based studies in this area are required to better enable us to determine which aspects of resilience training are effective and to identify potential mediators. By further exploring and understanding these issues, researchers will not only be able to contribute to the overall success of organizations, but also boost the well-being and engagement of organization members.

References

References preceded by an asterisk were included in the systematic review.

- *Abbott, J.-A., Klein, B., Hamilton, C., & Rosenthal, A. (2009). The impact of online resilience training for sales managers on wellbeing and work performance. *Electronic Journal of Applied Psychology, 5*, 89–95. doi:10.7790/ejap.v5i1.145
- Akers, J. (2009). *Systematic reviews: CRD's guidance for undertaking reviews in health care*. York, UK: Centre for Reviews and Dissemination, University of York.
- *Arnetz, B. B., Nevedal, D. C., Lumley, M. A., Backman, L., & Lublin, A. (2009). Trauma resilience training for police: Psychophysiological and performance effects. *Journal of Police and Criminal Psychology, 24*, 1–9. doi:10.1007/s11896-008-9030-y
- Ashby, S. E., Ryan, S., Gray, M., & James, C. (2013). Factors that influence the professional resilience of occupational therapists in mental health practice. *Australian Occupational Therapy Journal, 60*, 110–119. doi:10.1111/1440-1630.12012
- Bennett, G. G., & Glasgow, R. E. (2009). The delivery of public health interventions via the Internet: Actualizing their potential. *Annual Review of Public Health, 30*, 273–292. doi:10.1146/annurev.publhealth.031308.100235
- Brunwasser, S. M., Gillham, J. E., & Kim, E. S. (2009). A meta-analytic review of the Penn Resiliency Program's effect on depressive symptoms. *Journal of Consulting and Clinical Psychology, 77*, 1042–1054. doi:10.1037/a0017671
- *Burton, N. W., Pakenham, K. I., & Brown, W. J. (2010). Feasibility and effectiveness of psychosocial resilience training: A pilot study of the READY program. *Psychology, Health & Medicine, 15*, 266–277. doi:10.1080/13548501003758710
- *Carr, W., Bradley, D., Ogle, A. D., Eonta, S. E., Pyle, B. L., & Santiago, P. (2013). Resilience training in a population of deployed personnel. *Military Psychology, 25*, 148–155. doi:10.1037/h0094956
- Chartered Institute of Personnel and Development (2009). Employee outlook. Working life in a recession. *Quarterly Survey Report*, Spring, 1–29.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.
- Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson resilience scale (CD-RISC). *Depression and Anxiety, 18*, 76–82. doi:10.1002/da.10113

- Cooper, C. L., Flint-Taylor, J., & Pearn, M. (2013). *Building resilience for success*. Basingstoke, UK: Palgrave Macmillan.
- Egeland, B., Carlson, E., & Sroufe, L. A. (1993). Resilience as process. *Development and Psychopathology*, *5*, 517–528. doi:10.1017/S0954579400006131
- Fletcher, D., & Sarkar, M. (2012). A grounded theory of psychological resilience in Olympic champions. *Psychology of Sport and Exercise*, *13*, 669–678. doi:10.1016/j.psychsport.2012.04.007
- Fletcher, D., & Sarkar, M. (2013). Psychological resilience: A review and critique of definitions, concepts, and theory. *European Psychologist*, *18*, 12–23. doi:10.1027/1016-9040/a000124
- Ford, M. T., Cerasoli, C. P., Higgins, J. A., & Decesare, A. L. (2011). Relationships between psychological, physical, and behavioural health and work performance: A review and meta-analysis. *Work and Stress*, *25*, 185–204. doi:10.1080/02678373.2011.609035
- Geller, E., Weil, J., Blumel, D., Rappaport, A., Wagner, C., & Taylor, R. (2003). *McGraw-Hill dictionary of engineering*. (2nd ed.), London, UK: McGraw-Hill.
- Gillham, J. E., Brunwasser, S. M., & Freres, D. R. (2008). Preventing depression in early adolescence: The Penn Resiliency Program. In J. R. Z. Abela & B. L. Hankin (Eds.), *Handbook of depression in children and adolescents* (pp. 309–322). New York, NY: Guilford Press.
- *Grant, A. M., Curtayne, L., & Burton, G. (2009). Executive coaching enhances goal attainment, resilience and workplace well-being: A randomized controlled study. *The Journal of Positive Psychology*, *4*, 396–407. doi:10.1080/17439760902992456
- Higgins, J. P., Altman, D. G., Gøtzsche, P. C., Jüni, P., Moher, D., Oxman, A. D., et al. (2011). The Cochrane Collaboration's tool for assessing risk of bias in randomized trials. *British Medical Journal*, *343*, d5928. doi:10.1136/bmj.d5928
- Hofstede, G. (2001). *Culture's consequences: Comparing values, behaviors, institutions and organizations across nations*. Thousand Oaks, CA: Sage.
- Houdmont, J., Kerr, R., & Addley, K. (2012). Psychosocial factors and economic recession: The Stormont Study. *Occupational Medicine*, *62*, 98–104. doi:10.1093/occmed/kqr216
- Howe, A., Smajdor, A., & Stokl, A. (2012). Towards an understanding of resilience and its relevance to medical training. *Medical Education*, *46*, 349–356. doi:10.1111/j.1365-2923.2011.04188.x
- Howells, K., & Fletcher, D. (2015). Sink or swim: Adversity- and growth-related experiences in Olympic swimming champions. *Psychology of Sport and Exercise*, *16*, 37–48. doi:10.1016/j.psychsport.2014.08.004
- *Jennings, P. A., Frank, J. L., Snowberg, K. E., Coccia, M. A., & Greenberg, M. T. (2013). Improving classroom learning environments by cultivating awareness and resilience in education (CARE): Results of a randomized controlled trial. *School Psychology Quarterly*, *28*, 374–390. doi:10.1037/spq0000035
- Lazarus, R. S. (1993). From psychological stress to emotions: A history of changing outlooks. *Annual Review of Psychology*, *44*, 1–21. doi:10.1146/annurev.ps.44
- Leppin, A. L., Giofriddo, M. R., Sood, A., Montori, V. M., Erwin, P. J., Zeballos-Palacios, C., et al. (2014). The efficacy of resilience training programs: A systematic review protocol. *Systematic Reviews*, *3*, 20–25. doi:10.1186/2046-4053-3-20
- *Lioussis, P. L., Shochet, I. M., Milliar, P. M., & Biggs, H. (2009). The Promoting Adult Resilience (PAR) program: The effectiveness of the second, shorter pilot of a workplace prevention program. *Behaviour Change*, *26*, 97–112. doi:10.1375/behc.26.2.97
- Lu, W., Wang, Z., Liu, Y., & Zhang, H. (2014). Resilience as a mediator between extraversion, neuroticism and happiness, PA and NA. *Personality and Individual Differences*, *63*, 128–133. doi:10.1016/j.paid.2014.01.015
- Luthans, F., Youssef, C. M., & Avolio, B. J. (2007). *Psychological capital*. New York, NY: Oxford University Press.
- Masten, A. S., & Reed, M. G. J. (2002). Resilience in development. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 74–88). New York, NY: Oxford University Press.
- *McCraty, R., & Atkinson, M. (2012). Resilience training programme reduces physiological and psychological stress in police officers. *Global Advances in Health and Medicine*, *1*, 44–66.

- McLarnon, M. J. W., & Rothstein, M. G. (2013). Development and initial validation of the Workplace Resilience Inventory. *Journal of Personnel Psychology, 12*, 63–73. doi:10.1027/1866-5888/a000084
- Meichenbaum, D. (1985). *Stress inoculation training*. New York, NY: Pergamon.
- *Milliar, P., Liassis, P., Shochet, I. M., Biggs, H., & Donald, M. (2008). Being on PAR: Outcomes of a pilot trial to improve mental health and wellbeing in the workplace with the promoting adult resilience (PAR) programme. *Behaviour Change, 25*, 215–228. doi:10.1375/behc.25.4.215
- Nowack, K. (1990). Initial development of an inventory to assess stress and health. *American Journal of Health Promotion, 4*, 173–180. doi:10.4278/0890-1171-4.3.173
- Office for National Statistics (2013). *Changes in real earnings in the UK and London, 2002 to 2012*. London, UK: Author. Retrieved from http://www.ons.gov.uk/ons/dcp171766_29_9377.pdf
- Pangallo, A., Zibarras, L., Lewis, R., & Flaxman, P. (2015). Resilience through the lens of interactionism: A systematic review. *Psychological Assessment, 27*, 1–20. doi:10.1037/pas0000024
- *Pidgeon, A. M., Ford, L., & Klassen, F. (2014). Evaluating the effectiveness of enhancing resilience in human service professionals using a retreat-based mindfulness with metta training programme: A randomized controlled trial. *Psychology, Health, & Medicine, 19*, 355–364. doi:10.1080/13548506.2013.806815
- *Pipe, T. B., Buchda, V. L., Launder, S., Hudak, B., Hulvey, L., Karns, K. E., & Pendergast, D. (2012). Building personal and professional resources of resilience and agility in the healthcare workplace. *Stress and Health, 28*, 11–22. doi:10.1002/smi.1396
- Portnoy, D. B., Scott-Sheldon, L. A. J., Johnson, B. T., & Carey, M. P. (2008). Computer-delivered interventions for health promotion and behavioral risk reduction: A meta-analysis of 75 randomized controlled trials (1988–2007). *Preventive Medicine, 47*, 3–16. doi:10.1016/j.ypmed.2008.02.014
- Reivich, K. J., Seligman, M. E. P., & McBride, S. (2011). Master resilience training in the U.S. army. *American Psychologist, 66*, 25–34. doi:10.1037/a0021897
- Reivich, K., & Shatte, A. (2002). *The resilience factor: Seven essential skills for overcoming life's inevitable obstacles*. New York, NY: Broadway Books.
- Richardson, G. E. (2002). The metatheory of resilience and resiliency. *Journal of Clinical Psychology, 58*, 307–321. doi:10.1002/jclp.10020
- Richardson, W. S., Wilson, M. C., Nishikawa, J., & Hayward, R. S. (1995). The well-built clinical question: A key to evidence-based decisions. *ACP Journal Club, 123*, A12–A13.
- Robertson, I., & Cooper, C. L. (2013). Resilience. *Stress and Health, 29*, 175–176. doi:10.1002/smi.2512
- Sarkar, M., & Fletcher, D. (2013). How should we measure psychological resilience in sport performers? *Measurement in Physical Education and Exercise Science, 17*, 264–280. doi:10.1080/1091367X.2013.805141
- Sarkar, M., & Fletcher, D. (2014). Ordinary magic, extraordinary performance: Psychological resilience and thriving in high achievers. *Sport, Exercise, and Performance Psychology, 3*, 46–60. doi:10.1037/spy0000003
- Sarkar, M., Fletcher, D., & Brown, D. J. (2014). What doesn't kill me ...: Adversity-related experiences are vital in the development of superior Olympic performance. *Journal of Science and Medicine in Sport, 18*(4), 475–479. doi:10.1016/j.jsams.2014.06.010
- Seery, M. D. (2011). Resilience: A silver lining to experiencing adverse life events. *Current Directions in Psychological Science, 20*, 390–394. doi:10.1177/0963721411424740
- Seery, M. D., Holman, E. A., & Silver, R. S. (2010). Whatever does not kill us: Cumulative lifetime adversity, vulnerability and resilience. *Journal of Personality and Social Psychology, 99*, 1025–1141. doi:10.1037/a0021344
- *Sherlock-Storey, M., Moss, M., & Timson, S. (2013). Brief coaching for resilience during organisational change – an exploratory study. *The Coaching Psychologist, 9*, 19–26.

- Simpson, R., Booth, J., Lawrence, M., Byrne, S., Mair, F., & Mercer, S. (2014). Mindfulness based interventions in multiple sclerosis: A systematic review. *BMC Neurology*, *14*, 15. doi:10.1186/1471-2377-14-15
- Soanes, C., & Stevenson, A. (2006). *Oxford dictionary of English*. (2nd ed.), Oxford, UK: Oxford University Press.
- *Sood, A., Prasad, K., Schroeder, D., & Varkey, P. (2011). Stress management and resilience training among Department of Medicine faculty: A pilot randomized clinical trial. *Journal of General Internal Medicine*, *26*, 858–861. doi:10.1007/s11606-011-1640-x
- Taris, T. W., & Schreurs, P. J. G. (2009). Well-being and organizational performance: An organizational-level test of the happy-productive worker hypothesis. *Work and Stress*, *23*, 120–136. doi:10.1080/02678370903072555
- Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the Resilience Scale. *Journal of Nursing Management*, *1*, 165–178.
- *Waite, P. J., & Richardson, G. E. (2003). Determining the efficacy of resiliency training in the work site. *Journal of Allied Health*, *33*, 178–183.
- Windle, G. (2011). What is resilience? A review and concept analysis. *Reviews in Clinical Gerontology*, *21*, 152–169. doi:10.1017/S0959259810000420
- Windle, G., Bennett, K. M., & Noyes, J. (2011). A methodological review of resilience measurement scales. *Health and Quality of Life Outcomes*, *9*, 1–18. doi:10.1186/1477-7525-9-8
- Winwood, P. C., Colon, R., & McEwen, K. (2013). A practical measure of workplace resilience: Developing the Resilience at Work Scale. *Journal of Occupational and Environmental Medicine*, *35*, 1205–1212. doi:10.1097/JOM.0b013e3182a2a60a
- Youssef, C., & Luthans, F. (2007). Positive organizational behavior in the workplace: The impact of hope, optimism, and resilience. *Journal of Management*, *33*, 774–800. doi:10.1177/0149206307305562

Received 27 May 2014; revised version received 13 March 2015