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Building Resilience: The Conceptual Basis and Research Evidence for Resilience Training Programs

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The relationship between adverse experiences and later development has been explored by many researchers, leading to the conceptualization of resilience as a factor explaining the normal or optimal development of some individuals exposed to adversity. Today many different interventions exist aiming to improve the ability of individuals to respond to adversity. In this narrative literature review, we evaluate the literature surrounding resilience and resilience training, discussing the quality of the evidence supporting resilience training, theoretical and practical differences between types of training, and the impact of resilience and psychological training on outcome measures across a variety of settings. The results of our review show that the quality of the literature is mixed, resilience training is not well differentiated from other forms of training, and that the impact of psychological training on later functioning depends heavily on the type of outcome measured and the setting of the training. Further research must be conducted prior to the implementation of resilience training programs in order to assure their efficacy and effectiveness in proposed contexts.

Keywords: resilience, resilience training, psychological training, adverse experiences, psychological development

Since the mid-19th century, developmental and child psychologists have been attempting to uncover how childhood experiences impact adult development. A now well-known study published in 1998 found a direct, dose-dependent relationship between adverse childhood experiences and later risk factors for poor developmental outcomes in adulthood (Felitti et al., 1998). However, these outcomes were not universal, and researchers began to search for the reasons why some children underwent traumatic experiences, and grew up to be free of poor outcomes entirely (Howe, Smajdor, & Stöckl, 2012; Kalisch, Müller, & Tüscher, 2015). This construct began to be referred to as resilience, a term borrowed from the ecological literature (Holling, 1973). Originally referring to the ability of ecosystems to recover from natural disasters or other outside influences, it was then adapted by the psychology community to refer to the ability of humans to "bounce back" from traumatic events (Holling, 1973).

From the beginning, resilience has been a difficult term to define, ranging from a return to a normal developmental trajectory after adversity, to continued functioning during adversity, or even improvement above and beyond the normal trajectory after experiencing adversity (Fonagy & Target, 1994; Werner, 1995). However, at the core resilience encompasses the ability to adapt to a new or challenging situation (Luthar, 2006). Inherent in this definition is the existence of a stressor—resilience is not shown during normal development (Luthar, Cicchetti, & Becker, 2000). Rutter (1985) defined *resilience* as the factor separating those who adapt and evolve after experiencing stressors, thereby becoming less vulnerable to later stressors, from those who are unable to adapt, thereby becoming more vulnerable to later stressors. Further, Rutter cautioned against adopting strict definitions of resilience as a trait, as individuals can be resilient only in certain environments, toward certain situations, or at certain points in their lives. Rutter (2006) identified five key points from the resilience literature—namely, that resilience is not developed without exposure to some risk, that resilience may only become apparent in the face of some adversity, that resilience can come from physiological, psychological or environmental factors, and that resilience can be seen long after an adverse experience. Fletcher and Sarkar (2016) integrated these definitions and refer to resilience as "the role of mental processes and behavior in promoting personal assets and protecting an individual from the potential negative effect of stressors" (p. 16). Regardless of individual definitions, it is clear that the current discussions around resilience leave room for different interpretations of the concept.

Resilience as a Construct That Has Evolved Over Time

The earliest ideas of resilience conceptualized it as a collection of protective factors that outweighed the consequences of a negative event. Originally, many of these factors were considered to

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be internal traits, such as self-esteem, temperament and emotion regulation. Later, researchers recognized the impact of external factors as well, such as social environment and family history (Werner & Smith, 1982). Both of these types of protective factors were the target of some of the earliest interventions, including training programs for internal factors such as emotion regulation or community interventions for external factors such as social environments (Anderson et al., 2002). Later conceptualizations shifted to emphasize the dynamic nature of resilience, viewing it as a process that determines how people react to a variety of adverse situations (Grafton, Gillespie, & Henderson, 2010; Luthar et al., 2000). This view recognizes that underlying personal and environmental characteristics are components of resilience but sees resilience itself as a separate process impacting development. Fletcher and Sarkar (2016) referred to the view of athletes, who see resilience as a capacity that grows over time as they use different coping strategies to respond to challenging situations. This view is in line with the most recent conceptualizations of resilience, as the unique mechanism that allows an individual to appropriately recognize adversity and access existing protective factors (Richardson & Waite, 2002). In this view, resilience underlies the connections between protective and risk factors, adverse experiences, and later outcomes by motivating individuals to cope with adversity using all the tools they possess (Richardson & Waite, 2002). However, Fletcher and Sarkar (2016) suggested that coping and resilience are two separate processes. In their view, resilience changes the way adversity is appraised, while coping refers to the process of employing protective or compensatory strategies after an adverse event.

Research from Belsky and Pluess (2013) has added another layer to resilience theory with the addition of "differential susceptibility." This theory states that individuals benefit from positive or negative experiences to different degrees based on their innate responsiveness to environmental conditions (Belsky & Pluess, 2013). This means that some individuals may be less affected by adverse conditions, but will also gain less benefit from positive experiences. On the other hand, some individuals may be more susceptible to negative environmental conditions but may also benefit much more from positive environments, including resilience interventions (Belsky & Pluess, 2013). Recent research based on the differential susceptibility theory raises new questions of how we define resilience: as a trait in those not influenced much by their environment (whether positive or negative), a process that unfolds in response to positive interventions in those more influenced by their environment (Belsky & Pluess, 2013), or perhaps both. Belsky and Pluess's research suggested that though resilience may be trainable in some, it is not trainable in all and interventions might not show population-size effects. More vulnerable individuals might benefit disproportionately from interventions that aim to improve their resilience (Belsky & Pluess, 2013). To add further complexity to current discussions of resilience, Fletcher and Sarkar (2016) argued that a sufficiently supported but challenging environment is required for resilience to develop. This adds another layer to the criteria required for an appropriate resilience training program.

With the growing popularity of resilience training programs across many contexts, there are thus many questions that need to be addressed about definitions of resilience, evaluation methods in resilience interventions, and the overall efficacy of resilience training programs. Chmitorz et al. (2018) raised questions about the appropriateness of current methods used to measure resilience, suggesting that deficiencies in defining, studying and measuring resilience lead to difficulties showing that resilience training truly yields resilient outcomes. Citing similar concerns, the meta-analysis conducted by Leppin et al. (2014) found that resilience training may have a small to moderate effect on resilience and mental health, but the authors had low confidence in the evidence provided. However, a systematic review completed by Robertson, Cooper, Sarkar, and Curran (2014) concluded that resilience training in the workplace leads to benefits in mental health, well-being and psychosocial functioning, but cautions that drawbacks in the literature make it difficult to determine the exact mechanism behind these improvements. Further, Vanhove, Herian, Perez, Harms, and Lester (2016) suggested that factors such as targeting of at-risk individuals for training, increased one-on-one time, and in-person rather than computer-delivered training extends the impact of resilience training within corporate settings. Fletcher and Sarkar (2016) extended the results of Vanhove et al. (2016) and Robertson et al. (2014) by offering concrete suggestions for organizations considering resilience training for their employees.

By choosing to address the resilience training literature using a narrative review, this article goes beyond existing reviews summarized above by focusing on the trends in current resilience training programs and literature, and the differential effectiveness of these programs across contexts and populations. One of the defining features of resilience training is it's applicability to various fields within psychology. While resilience training arose from the clinical literature, the training of resilience is of great interest to sports psychology and exercise training, the military and police fields, schools and education systems, workplaces and other organizations as well as clinical populations. Given this, it is important to determine the optimal type of intervention for each context. Our review brings together studies from each context, which included participants from various populations, examined a vast number of clinical, personal and other outcome measures, and used a variety of methods. This allowed us to build on earlier reviews, which focused on specific aspects of resilience training, and examine instead the full picture of resilience training as it is used now.

In this narrative literature review, four primary questions were addressed, as follows:

1. What types of interventions exist to improve responses to stressful or traumatic experiences? How are these programs labeled, what type of content is included, and what theories are they derived from?

2. Are resilience programs different from other types of programs, including stress management or psychological training programs?

3. Do these programs affect outcomes indicated by the definition of resilience underlying the intervention?

4. If so, are the effects of the interventions evenly distributed across intervention type and setting?

Method

Selection Criteria

Selection criteria were determined by the authors and are included here: 1) research focus on an intervention that aimed to improve ability to deal with challenging situations, 2) contained enough information to evaluate the impact of the intervention on included outcome variables. The search terms "resilience training," "psychological skills training," "stress management training," and "mental health literacy intervention" were entered into PsycINFO and PubMed, resulting in 1305 citations. These search terms were determined by the results of an original literature search focusing on resilience training alone. Many studies were found to be cross-linked with psychological skills training or stress management training literature. After discussions with experts in the field, mental health literacy interventions were also included as many resilience interventions include a significant psychoeducation component.

Review of Articles

The abstracts of potentially relevant articles were reviewed by the first author, and studies that met the criteria were downloaded and read in full. An additional 25 studies were taken from a bibliography search of the articles downloaded. Of these, 114 were unique articles and 92 were found to fit the criteria of the study upon detailed review.

Data Collection

For each article, the methodology, setting, intervention type and length, participant's gender, age and health was recorded by the first author. Outcome variables were also recorded, as well as whether each intervention made a positive, negative or null impact, and whether effect sizes were reported by the authors. Impact, in this review, was determined by whether the study reported a statistically significant positive relationship between the intervention and an individual outcome variable. If effect sizes were reported, they were categorized into small, medium or large effects. Per Cohen, an effect size of 0.2 was considered small, an effect size of 0.5 considered medium and an effect size of 0.8 considered large. For studies that did not report an effect size, we did not calculate one. Due to the diversity of the methodologies, populations and structures of the included studies, as well as the relative lack of effect sizes reported by the authors, a meta-analysis was not completed and instead a narrative review of the results follows.

Results

The Content, Labeling, and Theoretical Background of the Interventions

The interventions examined in the selected 92 articles shared several common features. They often began with psychoeducation, teaching individuals about common stressors and symptoms of common mental health conditions such as anxiety or depression. Most interventions then focused on teaching coping skills or relaxation techniques. Some of these skills are summarized as follows; self-talk, or the practice of repeating encouraging thoughts to oneself (Hamilton, Scott, & MacDougall, 2007), cognitive restructuring, which involves identifying and challenging negative thoughts to enable more realistic thinking (Thomason & Pond, 1995), goal setting, which teaches individuals to set manageable goals and track their progress toward these goals (Lester et al., 2013), and arousal regulation, which is often taught through breathing exercises that teach individuals to maintain a stable breathing pattern to control their physiological state (Barwood, Thelwell, & Tipton, 2008). Each intervention taught these skills slightly differently and spent a different amount of time on teaching and practicing these skills. Some interventions—specifically stress inoculation interventions—focused on practicing these skills in the presence of images of stressful/traumatic situations that the participants might have to face in real life (Andersen et al., 2015; Arnetz, Nevedal, Lumley, Backman, & Lublin, 2008; Sarason, Johnson, Berberich, & Siegal, 1979). For example, Adler, Williams, McGurk, Moss, and Bliese (2015) conducted resilience training using military participants with a combination of classroom-based psychoeducation focused on realistic expectations for military life and the emotions often faced during training, practical techniques for managing emotions using a cognitive–behavioral model and practice of those techniques along with anxiety reduction techniques.

Three-quarters of studies used only healthy participants who were not currently facing adverse events. Citations for these studies appear in Appendix A. Researchers are still undecided on whether resilience can truly be trained or built during nontraumatic times (Luthar et al., 2000; Davydov, Stewart, Ritchie, & Chaudieu, 2010); targeting healthy populations in interventions is thus somewhat questionable in terms of potential benefits. Almost all (90%) of interventions took place over multiple sessions, with the total time invested in the training being highly variable, ranging from half an hour to 60 hr (the mean amount of intervention time was 12.7 hr, with a standard deviation of 11.16 hr). A quarter of interventions took less than 4 hr.

The majority (90%) of studies identified some theoretical background for their intervention, with 22.6% based on cognitive-behavioral theory (Bragard, Etienne, Merckaert, Libert, & Razavi, 2010; Castro, Adler, McGurk, & Bliese, 2012; De Vente et al., 2008; Elliot & Maples, 1991; Flaxman & Bond, 2010; Grime, 2004; Hains, Davies, Parton, Totka, & Amoroso-Camarata, 2000; Hirokawa, Yagi, & Miyata, 2002; Imamura et al., 2017; Jesus, Miguel-Tobal, Rus, Viseu, & Gamboa, 2014; Litz, Engel, Bryant, & Papa, 2007; Lloyd, Bond, & Flaxman, 2017; Mache, Danzer, Klapp, & Groneberg, 2015; Millear, Liossis, Shochet, Biggs, & Donald, 2008; Pahlevani et al., 2015; Sælid & Nordahl, 2017; Sarason et al., 1979; Songprakun & McCann, 2012; Steinhardt & Dolbier, 2008; Tak, Kleinjan, Lichtwarck-Aschoff, & Engels, 2014; Williams et al., 2007), 16.1% based on some form of resilience theory (Abbott, Klein, Hamilton, & Rosenthal, 2009; Adams, Camarillo, Lewis, & McNish, 2010; Adler et al., 2015; Bradshaw et al., 2007; Carr et al., 2013; Fraser & Pakenham, 2008; Griffith & West, 2013; Lester et al., 2012; Lester et al., 2013; Loprinzi, Prasad, Schroeder, & Sood, 2011; Peng et al., 2014; Rose et al., 2013; Sood, Sharma, Schroeder, & Gorman, 2014; Waite & Richardson, 2004), 16.1% based on stress management theory (Bodenmann, Perrez, Cina, & Widmer, 2002; Cigrang,

Todd, & Carbone, 2000; de Jong & Emmelkamp, 2000; Edimansyah, Rusli, & Naing, 2008; Jacobsen et al., 2002; Jacobsen et al., 2013; Krischer, Xu, Meade, & Jacobsen, 2007; Maysent & Spera, 1995; Öztürk & Ocakçı, 2017; Pipe et al., 2012; Soo & Lam, 2009; Thomason & Pond, 1995; Timmerman, Emmelkamp, & Sanderman, 1998; Umanodan et al., 2009; Villani et al., 2013) and 11.8% based on mindfulness theory (de Vibe et al., 2015; Fortney, Luchterhand, Zakletskaia, Zgierska, & Rakel, 2013; Goldhagen, Kingsolver, Stinnett, & Rosdahl, 2015; Jennings, Frank, Snowberg, Coccia, & Greenberg, 2013; Johnson et al., 2014; Johnson, Emmons, Rivard, Griffin, & Dusek, 2015; Pidgeon, Ford, & Klaassen, 2014; Ramey, Perkhounkova, Hein, Bohr, & Anderson, 2017; Stanley, Schaldach, Kiyonaga, & Jha, 2011; Stonnington et al., 2016). The remainder of the interventions included research supporting the intervention activities, but did not identify a central theoretical basis. However, 5.4 of studies included no theoretical background (Adam & Richardson, 2005; DeWiggins, Hite, & Alston, 2010; Didehvar et al., 2016; Ertekin Pinar, Duran Aksoy, Daglar, Yurtsal, & Cesur, 2017; Kanekar, Sharma, & Atri, 2009) and 2.2% cited only their own previous work to support their intervention (Luthans, Avey, & Patera, 2008; Luthans, Avey, Avolio, & Peterson, 2010).

The included articles also varied in their methodology, outcome measures and subject population. 62% of selected articles were randomized controlled trials, 19.6% quasi-experimental, 5.4% program evaluations or case studies, 4.3% correlational and 2.2% were either meta-analyses or literature reviews. Less than a third (29%) of articles reported effect sizes (Abbott et al., 2009; Arnetz et al., 2008; Bragard et al., 2010; Cacioppo et al., 2015; Grant, Green, & Rynsaardt, 2010; Heber, Lehr, Ebert, Berking, & Riper, 2016; Horn, Gilbert, Gilbert, & Lewis, 2011; Imamura et al., 2017; Jennings et al., 2013; Jesus et al., 2014; Johnson et al., 2014; Lester et al., 2012; Litz et al., 2007; Lloyd et al., 2017; Luthans, Avey, Avolio, & Peterson, 2010; Luthans, Avey, & Patera, 2008; McGonagle, Beatty, & Joffe, 2014; Millear et al., 2008; Pahlevani et al., 2015; Pidgeon et al., 2014; Sælid & Nordahl, 2017; Songprakun & McCann, 2012; Sood et al., 2014; Storch, Gaab, Küttel, Stüssi, & Fend, 2007; Umanodan et al., 2009; Villani et al., 2013). Articles of a variety of methodologies were included to give a complete picture of the research being done around resilience and psychological interventions. The majority (75%) of selected articles exclusively used self-report measures for data collection. Other methods included physiological data, performance data and work outcomes, with 18.3% of studies using a mixture of the above as opposed to one singular method. The gender make-up of the studies was mixed and the mean age of participants was 34.4, although only 48 studies provided age information and 73 studies provided gender information Due to excessive length, citations for these statistics are reported in Appendix B.

Differentiating Resilience Interventions From Other Interventions

For the purpose of this review, resilience interventions were separated from nonresilience interventions using their self-reported descriptions. An intervention was classified as a resilience-specific intervention if the authors identified it with a label such as a *resilience training* program or other similar wording, or if they explicitly predicted that the intervention would increase resilience. Resilience programs and nonresilience programs were compared on their participant selection, intervention characteristics, number of sessions, length of intervention and the types of outcome measures included (qualitative, quantitative or self-report). Participant selection did not differ between resilience and nonresilience interventions. The majority of participants for both types of interventions were healthy, specifically 83% for resilience interventions and 73% for nonresilience interventions. As mentioned earlier, the features of the interventions remained fairly consistent between resilience and nonresilience interventions, with both types including psychoeducation, skills training and practice. Resilience interventions did not differ systematically from other types of interventions on number of sessions, mean length of intervention, inclusion of longitudinal follow-up or reliance on self-report data. For this reason, we grouped these interventions together for further evaluation.

Almost half of studies included a single postintervention assessment, contrary to the idea underlying most conceptualizations of resilience that that it is a process that unfolds over time. Another common methodological limitation across studies was the overrepresentation of self-report data: 73% of studies contained exclusively self-report measures. The issues with this form of measurement are captured by Bonanno, Westphal, and Mancini in their 2011 examination of the construct of resilience, and was also addressed by Robertson et al. in their 2014 review of workplace resilience interventions. They caution against assuming that self-reports of resilience are accurately reflecting resilience itself. These self-report measures often measure personality traits linked to protective factors. Although resilience training programs may improve protective factors, it remains difficult to clearly show that this increase then translates into greater resilience.

The Impact of Resilience Interventions on Outcomes Across Settings

The outcome variables across the 92 studies were grouped into five categories: physical health, mental health, protective factors, performance factors and quality of life factors. Health included overall health, physiological measures of diabetes, physiological coherence (i.e., heart rate variance), and physiological reactivity to stress and was measured in 21 unique studies, which was 22% of the overall sample. Mental health included measures of anxiety, depression, perceived stress, overall mental health, distress, affect, posttraumatic stress disorder (PTSD), hopelessness, psychological capital and irrational beliefs, and was measured in 53 unique studies, which was 57% of the overall sample. Protective factors included self-reported resilience, coping strategies, self-esteem, self-efficacy, emotion regulation skills, leadership, social cognition, stress related growth, goal setting, social support, self-compassion, control over stress, problem solving and emotional reactivity. These outcomes were measured in 41 unique studies, which was 44% of the overall sample. Performance factors included task performance, work performance, completed exercise, absenteeism, attrition from a training program and sick leave time, and these factors were measured in 20 unique studies or 23% of the sample. Finally, quality of life factors included quality of life, life satisfaction, job satisfaction, happiness, morale, workplace well-being and burn out, and were studied in 17 unique studies or 18% of the sample.

As can be seen in Table 1, statistically significant positive effects from resilience training were reported by the authors on 61% of the measured outcome variables. Health improvements were significantly related to training 44% of the time, with 56% of studies finding no connection.

As can be seen below in Table 2, the impact of resilience training varied by setting—whereas training had an impact on outcomes in 72% of cases within the workplace and in law enforcement, only 55% of studies found differences in military or school settings and 56% found an impact of training in a health care setting. All of the sports interventions were found to improve outcomes, although the sample size of studies in this population was very small (at 3 studies) and the methodology limited to case studies and other noncontrolled experimental methods. The most success was seen in improvement of performance factors in police and sport settings, but again the sample size of these categories was quite small.

Generalized across all settings, 44% of physical health studies showed an impact on any measure although as seen in Table 2, the results are not consistent across settings or outcome categories. Resilience interventions were found to be most successful in sports, the workplace and for police, with 72% of studies reporting positive effects in workplaces and police training settings, and 100% of sports interventions. Interventions were found to be somewhat less successful in the military, health care and school settings, with 55–6% of studies reporting positive effects in these settings, and finally interventions were found to be primarily unsuccessful in community settings, which included open enrolment in a longitudinal training study(Bodenmann et al., 2002), brief online training (Lane et al., 2016) and stress management training for at risk adults (Timmerman et al., 1998), which was the only study to find an effect of their intervention. In terms of specific outcomes, most of the improvement in health variables can be accounted for by the 72.7% success rate for reducing physiological reactivity to stress. Similar to the results in health variables, quality of life variables were only improved 53% of the time, and these results varied greatly between specific outcome variables.

Interventions addressing mental health were found to have a positive impact in 65% of outcomes examined, although this ranged greatly across the different outcome measures and settings. Resilience interventions had the most impact on protective factors, with 69% of studies showing a positive impact. This is in line with the view of resilience as a process that improves the use of protective factors. However, the lack of a similar improvement in general quality of life or mental health outcomes raises doubts that resilience interventions are impacting protective factors in a way that improves ability to recover from adversity in the long-term (i.e., long-term resilience). Instead, these interventions may be improving protective factors such as self-compassion, emotional reactivity and problem-solving in the short-term but not teaching participants how and when to use these skills. Participants in these programs may self-rate themselves as better at the skills taught and yet not use their skills when faced with an unfamiliar situation, meaning that the benefit of resilience interventions may not be seen when examining overall well-being, mental health or general health. A potential example of this can be seen in the research of Millear et al. (2008), who piloted an adult resilience program in the workplace. While self-rated coping strategies, self-efficacy and social support improved, overall mental health and life satisfaction did not (Millear et al., 2008). Alternately, there may be no link between improvement on protective factors and improvement on resilience; in fact, to our knowledge, none of the studies included in our review attempted to establish the link between specific protective factors and resilience prior to designing the target intervention.

The effect of interventions on performance was mixed, with only 45% of studies showing a positive impact. This effect was concentrated in specific task performance and completion. On the other hand, less impact was found in more distal (and some would argue more concrete real-world) performance measures of absenteeism, training attrition or sick leave. Despite the promises of many existing programs (Leppin et al., 2014; Adler et al., 2015; Lester et al., 2013), only about half of studies included in this review found an impact of interventions on later work performance.

Overall, the percentage of studies that found positive results in each setting ranged between 33% and 66%. Only 32% of studies included effect size data, and the effect sizes found were primarily small (10 studies out of 92) or medium (13 studies out of 92), with only 4 out of 92 studies reporting large effects. There was no difference in positive results found in studies with healthy versus at-risk participants: the former found positive impact in 57% of studies while the latter found positive impact in 56% of studies. In terms of theoretical basis, mindfulness-based studies seemed to be the most effective with 80% (9 studies) finding an impact for the intervention. Research on CBT interventions found a positive impact 47.6% of the time (10 studies), psychoeducation 60% (3), resilience 47.6% (7) and stress management 60% (9).

Table 1
Overall Effectiveness by Outcome Category

Variable	*N*	Percentage of studies	Impact	No impact
Physical health	27	22	44% (12)	56% (15)
Mental health	106	57	65% (69)	35% (37)
Protective factors	61	44	69% (42)	31% (19)
Performance factors	22	23	45% (10)	55% (12)
Quality of life	28	28	53% (15)	47% (13)
Total	244 measures		61% (148/244)	39% (96/244)

Note. *N* represents the number of unique times each variable was measured, whereas the percentage of studies represents the percentage of unique studies that included at least one measure of each variable category.

Table 2
Overall Effectiveness by Outcome Category and Setting

Variable	*N*	Effective in workplace (%)	Effective in healthcare (%)	Effective in military (%)	Effective in school (%)	Effective in police (%)	Effective in sports (%)	Effective in community (%)
Physical health	27	80	0	57	75	66		0
Mental health	106	70	68	58	52	50		100
Protective factors	61	86	75	85	64			
Performance factors	22	42	0	16		100	100	0
Quality of life	28	61	50	66	33			
Total		72 (70/96)	56 (21/37)	55 (22/40)	55 (20/36)	72 (8/11)	100 (3/3)	33 (1/3)

Note. *N* represents the number of unique times each variable was measured.

Discussion

Resilience is a complex construct and has been difficult to define. As our narrative review reveals, the changing definitions and conceptualizations of resilience have important implications for resilience training programs. Programs designed at different times operated under different definitions of resilience, leading them to make choices that later became unsupported by research. Many training programs claim to train anyone to be more resilient, regardless of their innate vulnerability or current exposure to adverse situations (Coutu, 2002; Seligman & Fowler, 2011); this goes against most definitions of resilience which emphasize adversity, risk and vulnerability as important contributing factors to resilience. As well, the debate over whether resilience should be categorized as a trait or as a process carries over into evaluation of programs. When viewed as a trait, the outcome measure of resilience programs tends to be trait-level resilience measures. Alternately, when viewed as a process, resilience is measured more often through more distal outcomes including later psychological health, school or work performance; this approach essentially aims to capture the result of higher resilience as opposed its existence.

Robertson et al. (2014) noted the difficulty of designing or evaluating resilience training programs when many of the programs use different definitions, procedures and outcome measures. Similarly, Chmitorz et al. (2018) offer suggestions for future research that center around standardizing the definition of resilience as outcome-focused, and examining resilience as change in mental health in the context of changing environmental stressors. Here, we discuss the types of interventions offered, the extent to which resilience interventions differ from other types of mental health interventions, the theoretical backing for resilience interventions, as well as the impact of resilience interventions across contexts and populations.

What Types of Interventions Exist to Impact Resilience?

The resilience and nonresilience interventions included in this review often included psychoeducation on stressors and mental health, taught coping skills, and included time to practice these skills. Some of them urged participants to practice the skills further at home. The majority of interventions (75%) were targeted toward the general population including both healthy and at-risk individuals. This goes against recent conceptualizations of resilience advocated by Belsky and Pluess (2013) and Fletcher and Sarkar (2016) that those who are already doing well would be less likely to benefit from interventions, and therefore interventions should be targeted to individuals identified as vulnerable to adversity. As well, the setting of many interventions disregarded research showing that resilience is built only in the context of adversity by administering the intervention in a classroom-like setting, distant from stressors (Luthar et al., 2000). The majority of interventions (90%) included multiple sessions of instruction, which is in line with training research showing that new information is best integrated when learned and practiced at multiple times (Walton, 2014). The total time invested in the training varied greatly, which underscores a lack of research on the optimal time commitment for a successful intervention.

Are Current Resilience Interventions Different Than Other Types of Interventions?

The content of the interventions did not systematically differ between self-identified resilience interventions, psychological skills training, stress management training, or other types of interventions. This casts doubt on the idea that resilience training, as it exists now, is distinct from other already-existing interventions. Only a minority of studies (13%) measured 'resilience' as a specific outcome measure. This issue was highlighted by Robertson et al. (2014). The majority of intervention studies chose to measure success of an intervention through change in protective factors thought to lead to improved well-being (including self-esteem, social support, and others) or through self-reported change in well-being or health. These measures may reflect consequences of resilience in some way, but they do not directly measure the change in resilience due to the intervention. As well, the resilience measures used in these studies were self-reported, which has been criticized as reflecting primarily how confident the participant is in his or her resilience, not their actual resilience (Bonanno, Westphal, & Mancini, 2011). Resilience-specific training was no more effective at increasing self-reported resilience then other types of training.

Finally, many of these interventions (49%) included only one postintervention assessment. This approach does not allow for the measurement of gradual change over time. It is somewhat notable that in one study that did collect data directly after the intervention and then again at 1- and 4-month follow-ups, a group that completed mindfulness training did experience improvements in mindfulness and self-compassion at the later time points not seen directly after the intervention (Pidgeon et al., 2014). A similar result was found in a stress management study examining anxi-

ety—anxiety scores were reduced at a 6-month follow-up but not directly after the intervention (Timmerman et al., 1998).

Vanhove et al. (2016) found different effect patterns over time in healthy and at-risk populations in his review of workplace resilience interventions. In generalized interventions provided to all employees, the effect of the resilience training peaked directly after the training and decreased over time. In resilience-building programs targeted toward at-risk employees, the effects increased over time and were higher at the later follow-up point compared to immediately after the intervention (Vanhove et al., 2016). Given these results and now commonly accepted view of resilience as a process that unfolds over time, it is worrying that resilience interventions in the selected studies generally did not collect longitudinal data, and that many programs did not distinguish between at-risk and healthy participants.

Are Current Interventions Designed in Accordance With Theory?

Notably, there were fewer studies that cited resilience theories than there were interventions either labeled *resilience* training or predicting changes in resilience. This points to a lack of adherence to theories of resilience in designing interventions for it. Instead, many studies cited CBT or mindfulness in the design of their intervention. A few studies (Adams & Richardson, 2005; DeWiggins et al., 2010; Didehvar et al., 2016; Ertekin Pinar et al., 2017; Kanekar et al., 2009) did not cite any theoretical support at all for their interventions. Although CBT and mindfulness are practices that improve mental health, they have not been shown to improve resilience specifically. Fletcher and Sarkar (2016) suggested that the optimal resilience intervention would aim to maximize the personal qualities and resources of an individual in order to allow them to cope effectively with any stressor. Drawing from resilience literature, they suggested that resilience interventions take place in a challenging environment, where individuals are taught coping skills while facing real difficulties that they are supported through. This would be an example of a theoretically supported resilience intervention. Vanhove et al. (2016) also suggested that more direct and practical resilience interventions are more effective in improving psychosocial health.

Resilience interventions are theorized to affect at-risk populations more than healthy populations as resilience is thought to develop through adversity, with some researchers saying that resilience can only develop during traumatic situations (Luthar et al., 2000). Krischer et al. (2007) provided further evidence in support of this—in a study of stress management training for radiotherapy patients, only those identified as highly stressed prior to the intervention experienced improvement due to the intervention. Belsky (2016) argued that interventions should be targeted toward populations identified as highly vulnerable to both positive or negative experiences, saying that this population would be especially likely to suffer from adversity but also highly likely to respond positively to interventions. Further, he argues that providing resilience interventions to individuals who are not susceptible to adversity—to people who could be identified as already resilient—provides no benefit, because along with their resilience to adversity comes resistance to positive interventions. This goes beyond targeting at-risk populations, and requires identification of who would most benefit from the intervention.

These arguments from Fletcher and Sarkar (2016), Luthar et al. (2000), and Belsky (2016) seem to indicate that the most effective resilience interventions would be targeted only to people highly susceptible to their environment, and occur during a time of adversity. This is further supported by evidence from Peng et al. (2014), who found that resilience scores only improved for participants low in resilience prior to the intervention, while those already high in resilience did not experience improvement in resilience scores. This is not how most resilience interventions currently operate. Current interventions are presented to all members of a group (a workplace, a military unit, a school) at a common time determined by the needs of the organization rather than the participant's individual circumstances. The idea is that once trained, individuals will have the skills under their belt for times of adversity and will remember to use them. As discussed earlier, this is incredibly difficult to test in real-life: long-term follow-up is expensive, and introduces the possibility of large attrition rates; furthermore, retention of possibly at risk individuals in a Control (no intervention group) for an extended period of time may not be ethically defensible.

Walton (2014) argued that "wise interventions" are sensitive to the context and target specific identifiable psychological processes. Further, Walton conceptualizes wise interventions as changing the general approach an individual takes to new situations, which would then create a self-fulfilling cycle of change. Here, each time an individual approaches a similar situation they would practice the skills learned in an intervention, and would thus continue to improve over time. In a resilience intervention, that might look like daily or weekly short practice sessions where participants work through an ongoing project designed to be challenging and create stress. This would give participants the chance to build their coping skills and resilience to actual stressors in a safe and supportive environment where they are able to learn from their own responses. However, resilience interventions examined by this review tend to take place in a classroom setting under idealized conditions.

What Was the Impact of These Interventions?

Given that the similarity in the content of various interventions and overlap in the methods used to select participants and evaluate outcomes in the associated studies, the outcomes of all interventions were evaluated together. These outcomes can be viewed in Appendix B. Overall, interventions were found to have an impact on 62% of included outcome variables. Protective factors were impacted the most, with 69% of outcome variables classified as protective factors showing improvement. As most interventions aimed to train protective skills including coping strategies, social skills, self-efficacy and others, and most studies took posttest measurements directly after the study had ended, change in these variables can at best be seen as reflecting that the training did indeed take place (i.e., manipulation check). To proclaim that they have improved resilience, these interventions need to also show that they have impacted more distal outcomes such as mental health, quality of life or physical health. Chmitorz et al. (2018) suggested designing interventions in accordance with an outcome-focused definition of resilience, as well as an outcome-focused resilience measure—namely, the change in mental health alongside shifting stressor load. We suggest that physical

health, quality of life and performance measures such as work or sport outcomes could also be integrated into this outcome-focused measure.

Every intervention that focused on sports performance or police performance was found to be effective, compared with 25% of interventions that focused on work performance. Work performance was evaluated using statistics on overall work performance, sick leave use, absenteeism and training attrition. Improving work performance or decreasing sick leave use, absenteeism and attrition requires consistent application of resilience skills in order to meet new, unexpected challenges with flexibility. On the other hand, sports performance is typically measured using the results of one task, completed directly after the intervention, and police performance was similarly measured through concrete individual tasks. Participants were directly instructed to use the new coping skills when completing the task. Resilience interventions may have less impact on the spontaneous use of skills to meet new challenges in everyday life. This can be seen in Taylor et al.'s (2011) study of psychological skills training in a military trainee population. During a manipulation check, researchers found that the group of trainees that had previously received training on various psychological skills did not use those skills when faced with a stressful training situation. Their reported levels of skill usage were indistinguishable from the control group who had not received the training.

Conclusion

We used a narrative review approach to summarize the current resilience training literature. To sum up the key themes that emerges from our own review, while interventions have been found to be effective in some contexts on certain outcomes, the research is not clear on exactly what mechanisms are involved. This confusion can partially be attributed to the lack of longitudinal studies, lack of good resilience outcome measures that capture resilience as a process that unfolds over time, and other research design issues. However, it is clear that many currently in use interventions were not designed in accordance with the recursive nature of resilience, and necessary foundational research to determine the appropriate target population and targeted outcomes was not completed.

This review builds on the previously published literature in several ways. Chmitorz et al. (2018) commented mostly on the structure of the intervention studies, rather than on the interventions themselves. Our review focuses on the differential benefits of resilience interventions in different contexts, as well as the different definition of resilience and how that affects the design of interventions themselves. Although Chmitorz did touch on some of the same point, the use of a narrative review format allows us to present a more holistic view of the issues with resilience literature, and a more balanced discussion of the benefits and flaws of the resilience trainings themselves. Robertson (2014 and Vanhove et al. (2016) both focus on workplace interventions—while this review includes workplace interventions, primarily focuses on comparing resilience training across different populations and contexts—something that these earlier reviews do not include. Finally, in regards to Sarkar and Fletcher's work, their 2017 review primarily focuses on evaluating programs for their use at workplaces, and suggesting strategies for managers to use when selecting resilience training for their employees. They describe the features of some programs that have been shown to be somewhat effective, but do not compare these programs to each other or their effectiveness across multiple contexts. In our review, we include many of the studies mentioned in Sarkar and Fletcher (2017), but we compare the populations, study characteristics and effectiveness to other studies in other populations to gain an idea of the types of trends seen in resilience training, and the differential effectiveness of these programs across contexts and populations.

Limitations

Narrative reviews are often criticized for employing wide-ranging inclusion criteria and including less-than-ideal types of evidence, such as case studies, noncontrolled studies or other types of weak evidence. However, narrative reviews can offer an overview of the entire field of research, allowing readers new to the field to quickly understand the current state of research, and allowing experts in the field to understand the gaps in the research and where to go next (Byrne, 2016). For this reason, narrative reviews offer an invaluable accessible insight on current research, regardless of limitations.

There are some specific limitations to our narrative review method that should be noted. First, by collating the various types of interventions instead of isolating resilience studies by themselves, some of the effects of resilience studies may have been obscured. However, this was necessary in order to examine the psychological training research pool as a whole, and in order to determine whether there was any structural difference between resilience training and other types of psychological training. Another limitation of this study is the varying quality of the collected studies, as mentioned earlier. We included case studies, pilot studies and other nonrandomized studies in order to get a complete picture of the resilience literature. However, the results of some of these studies are not conclusive due to their methodological constraints. In addition, the categorization of each study into setting and outcome measure categories was somewhat arbitrary and determined by the best estimates of our researchers. However, other researchers may view the same studies and categorize them differently.

Future Research

When discussing future research directions, it is important to note that there are very real feasibility issues regarding conducting longitudinal randomized controlled trials on resilience training programs. First of all, these long-term studies are quite expensive and subject to increasing attrition problems over time, leading to selection bias in participants that complete the study. There are also ethical questions around depriving a control group of an intervention that may impact the development of quite serious psychological and physical health issues. However, since mass implementation of resilience interventions also present financial and logistical problems to organizations, foundational research establishing the causal links between the intervention targets and the outcomes of interest prior to administering the intervention might be a good investment. While many organizations such as schools, military establishments and workplaces feel great pressure from their stakeholders to protect mental health by administering resilience training programs, in some cases doing something is not better than doing nothing (Kuehn, 2017).

This can be exemplified by the phenomenon of medical reversal—when a treatment is taken off the market after re-

search determines it does not work or is in some cases harmful. While this is rare, examples can be found through medical history (Prasad & Cifu, 2011). To give a widely known example, antiarrhythmic therapy for heart failure was introduced in the 1980s and seen by doctors to be incredibly effective—so effective that doctors would not let their patients be randomized into the placebo arm of clinical trials. However, on completion of clinical trials after widespread use of the drug had already begun, it was found that these drugs actually increased the risk of death compared to placebo. When a crisis is seen as overwhelming and currently untreated, as was heart-related sudden death and as mental health is seen today, a treatment may be pushed past trial stages and widely implemented before the research is completed, simply to get it into the hands of patients that might need it. Even if there is no evidence that resilience training is dangerous, there is still the need for an accurate assessment of its effectiveness prior to implementing it on a large scale, minimally to ensure that a given ineffective program is not preventing a more effective intervention from taking its place. Van Dam et al. (2018) referred to this phenomenon in the field of mindfulness as the "opportunity cost" of using a popular treatment unsupported by research instead of searching for and using a treatment that could yield better results (Van Dam et al., 2018).

There is still a need for more research to determine whether the construct of resilience is truly a trait, a process or a multidimensional construct, and to determine a proper method of evaluating one's level of resilience. In order for the field of resilience to move forward, a clear construct definition and measure need to be determined prior to the design of new resilience interventions. Future resilience interventions should be carefully designed to reflect current research, modeled on successful psychosocial interventions, and aim to help participants learn to use resilience skills in appropriate contexts independently. They should be evaluated through longitudinal, controlled studies with multiple pre and post measurements, allowing for change in actual response to adversity to be measured. Finally, the construct of resilience needs to be defined in such a way that it allows for resilience interventions to be separated clearly from other types of stress management, psychological training or coping skills interventions. As resilience training spreads to schools, health care settings, and police and military organizations, it becomes even more important that these interventions are based on solid theory and research, designed effectively, and applied with appropriate consideration to the larger context.

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Appendix A

Methodology, Age, Gender, and Health Status by Study

Citation	Method	Participant	Percentage male	Self-report	Age
Abbott, Klein, et al., 2009	Experiment: randomized controlled trial	Sales managers	.87	self report and work statistics	43.00
Adams and Richardson, 2005	Program assessment	Program care assistant	Not reported	unsure	Not reported
Adams, Camarillo, et al., 2010	Correlational	Army medical staff	Not reported	Full self report	Not reported
Adler, Williams, et al., 2015	Experiment: randomized controlled trial	Active duty soldiers	.62	Full self report	17–35
Andersen, Papazoglou, et al., 2015	Experiment	SWAT team trainees	1.00	Physiological data	Not reported
Arnetz, Nevedal, et al., 2008	Experiment: randomized controlled trial	Rookie police officers	1.00	Self report and physiological data	Not reported
Arora, Aggarwal, et al., 2011	RCT	Novice surgeons	Not reported	Self report and physiological data	22.00
Barwood, Thelwell, et al., 2008	Experiment: RCT	Male civilian volunteers	1.00	Physiological data	Not reported
Bodenmann, Perrez, et al., 2002	Longitudinal (Quasi-experimental)	General population	.50	Full self report	Not reported
Bradshaw, Richardson, et al., 2007	Experiment: RCT	Diabetes patients	.28	Self report and physiological data	Not reported
Bragard, Etienne, et al., 2010	RCT (longitudinal)	Medical residents	.36	Full self report	28.00
Brouwers, Tiemens, et al., 2006	RCT	Mental health patients receiving care	Not reported	Self report and work outcomes	Not reported
Cacioppo, Adler, et al., 2015	RCT	Soldiers	.97	Full self report	24.00
Carr, Bradley, et al., 2013	Quasi-experimental	Military personnel	.83	Full self report	Not reported
Castro, Adler, et al., 2012	RCT	U.S Soldiers	.95	Full self report	Not reported
Cigrang, Todd, et al., 2000	RCT	Military trainees	.63	Attrition from training	29.00
de Jong and Emmelkamp, 2000	RCT	Employees	.47	Full self report	Not reported
De Vente, Kamphuis, et al., 2008	RCT	Employees	.28	Self report and absenteeism	41.00
de Vibe, Solhaug, et al., 2015	RCT	Medical students	.24	Full self report	24.00
DeWiggins, Hite, et al., 2010	Observation	Soldiers	Not reported	Full self report	Not reported
Didehvar, Zareban, et al., 2016	Quasi-experimental	Nurses/midwives	.00	Full self report	Not reported
Dolbier, Jaggars, et al., 2010	RCT	College students	.16	Full self report	21.00
Edimansyah, Rusli, et al., 2008	Quasi-experimental	Automotive workers	1.00	Full self report	30.00
Elliot and Maples, 1991	Program evaluation	Employees	.71	Full self report	45.00
Farchi and Gidron, 2010	RCT	Israeli citizens	.00	Full self report	Not reported
Flaxman and Bond, 2010	RCT	Government employees	Not reported	Full self report	Not reported
Fortney, Luchterhand, et al., 2013	Quasi-experimental	Primary care physicians	Not reported	Full self report	41.00
Fraser and Pakenham, 2008	Experiment	Children of parents with mental illness	.40	Full self report	40.50
Goldhagen, Kingsolver, et al., 2015	Correlational	Medical residents	.39	Full self report	13.00
Grant, Curtayne, et al., 2009	RCT	Executives in public health agency	.47	Full self report	20–39
Grant, Green, et al., 2010	RCT	High school teachers in Australia	.07	Full self report	49.84
Griffith and West, 2013	Program evaluation	Military	.30	Full self report	43.21
Grime, 2004	Randomized trial	Public sector employees	.75	Full self report	Not reported
Hains, Davies, et al., 2000	Experimental	Youth with diabetes	.42	Self report and physiological data	39.00
Hamilton, Scott, et al., 2007	RCT	University students	.47	Performance	12–15
Hampel, Meier, et al., 2007	Longitudinal experiment, non randomized	Schoolchildren	.67	Full self report	20.88
Harbalis, Hatzigeorgiadis, et al., 2008	RCT	Wheelchair basketball athletes	.50	Performance	10–13

(*Appendices continue*)

Appendix A (*continued*)

Citation	Method	Participant	Percentage male	Self-report	Age
Heber, Lehr, et al., 2016	RCT	Employees with elevated stress	1.00	Full self report	34.63
Hirokawa, Yagi, et al., 2002	Experiment	College students	.27	Full self report	43.30
Horn, Gilbert, et al., 2011	Case study	College athletes	.34	Full self report	20.00
Imamura, Kawakami, et al., 2017	RCT	Employees in Japan	.00	Full self report	Not reported
Jacobsen, Meade, et al., 2002	RCT	Cancer patients undergoing chemotherapy	.70	Full self report	39.00
Jacobsen, Phillips, et al., 2013	RCT	Cancer patients undergoing chemotherapy	.24	Full self report	26–88
Jennings, Frank, et al., 2013	RCT	High school teachers	.26	Full self report	57.22
Jesus, Miguel-Tobal et al., 2014	Meta-analysis of pre-post studies	Teachers or doctors	.11	Full self report	36.00
Johnson, Emmons, et al., 2015	Pilot study	Healthcare professional with DSM diagnosis of depression	Not reported	Full self report	Not reported
Johnson, Thom, et al., 2014	RCT	Marines	.13	Self report and physiological data	46.00
Johnson, Thom, et al., 2014	RCT	Marines		Physiological data	
Kanekar, Sharma, et al., 2009	RCT	Asian Indian immigrants in American Universities	Not reported	Full self report	Not reported
Krischer, Xu, et al., 2007	RCT	Cancer patients in radiotherapy	.87	Full self report	24.67
Lane, Totterdell, et al., 2016	RCT	General public	.28	Self report data and performance	60.96
Lester, Mogil, et al., 2011	Case study	Military families	.62	unsure	34.81
Lester, Saltzman, et al., 2012	Secondary analysis of program evaluation	Military families	Not reported	Full self report	Not reported
Lester, Stein, et al., 2013	Program evaluation	Military families	Not reported	Full self report	Not reported
Litz, Engel, et al., 2007	RCT	Military service members with PTSD	Not reported	Full self report	Not reported
Lloyd, Bond, et al., 2017	RCT	Government employees	1.00	Full self report	39.00
Loprinzi, Prasad, et al., 2011	RCT	Breast cancer survivors	.22	Full self report	46.20
Luthans, Avey, et al., 2008	Experiment:pre and post	Working adults	.00	Full self report	61.00
Luthans, Avey, et al., 2010	RCT	Management students and managers	Not reported	Self report data and work performance	32.20
Mache, Danzer, et al., 2015	RCT	Junior surgeons	.59	Full self report	21.10
Maysent and Spera, 1995	Quasi-experiment	unemployed clients of a temp agency	.29	Full self report	27.00
McCraty and Atkinson, 2012	Observational pre-post	Police officers	.09	Self report and physiological data	27–67
McGonagle, Beatty, et al., 2014	RCT	Workers with chronic illness	.85	Full self report	39.00
McKibben, Britt, et al., 2009	Correlational	Soldiers returned from deployment	.15	Full self report	38.70
Millear, Liossis, et al., 2008	Quasi-experimental	Employees of Australian company	.03	Full self report	18–40
Öztürk and Ocakçı, 2017	Quasi-experimental	Adolescents in prison in Turkey	Not reported	Full self report	36.00
Pahlevani, Ebrahimi, et al., 2015	Quasi-experimental	Nurses in Iran	Not reported	Full self report	Not reported
Peng, Li, et al., 2014	RCT	Chinese students	.00	Full self report	33.25
Pidgeon, Ford, et al., 2014	RCT	Human services professional	.70	Full self report	19.78
Ertekin Pinar, Duran Aksoy, et al., 2017	RCT	Pregnant women	.09	Full self report	40.70
Pipe, Buchda, et al., 2012	Pilot study	Nurses	Not reported	Full self report	Not reported

(*Appendices continue*)

Appendix A (*continued*)

Citation	Method	Participant	Percentage male	Self-report	Age
Ramey, Perkhounkova, et al., 2017	RCT	Police recruits	.82	Self report and physiological data	25.00
Rose, Buckey, et al., 2013	RCT	Graduate students	.50	Self report and social stress test	27.32
Sælid & Nordahl, 2017	RCT	School children	.00	Full self report	
Sahler, Dolgin, et al., 2013	RCT	Mothers of children with cancer	.56	Full self report	22–34
Sarason, Johnson, et al., 1978	RCT	Police recruits	Not reported	Self report and physiological data	Not reported
Sokol and Aiello, 1993	Case study	Team of employees	.30	Full self report	42.10
Songprakun and McCann, 2012	RCT	Thai population with depression	Not reported	Full self report	Not reported
Soo and Lam, 2009	Literature review	Adults and adolescents with diabetes	.68	Full self report	47.50
Sood, Sharma, et al., 2014	RCT	Radiology Physicians	1.00	Full self report	30.00
Stanley, Schaldach, et al., 2011	Case study	U.S Marines reservists	.18	Full self report	18–53
Steinhardt and Dolbier, 2008	RCT	College students	.41	Full self report	22–79
Stonnington, Darby, et al., 2016	Quasi-experiment	Transplant patients and caregivers	1.00	Full self report	Not reported
Storch, Gaab, et al., 2007	RCT	Students at swiss university	.53	Social stress test and physiological data	13.00
Tak, Kleinjan, et al., 2014	RCT	Adolescents in school	.25	Full self report	21.90
Taylor, Stanfill, et al., 2011	RCT	Navy personnel	1.00	Full self report	Not reported
Taylor-Rodgers and Batterham, 2014	RCT	College students	Not reported	Full self report	36–45
Thomason and Pond, 1995	RCT	Prison custody staff	.41	Self report and physiological data	39.00
Timmerman et al., 1998	Quasi-experiment	Community sample of adults with high risk profiles	1.00	Full self report	Not reported
Umanodan, Kobayashi, et al., 2009	Quasi-experiment	Japanese employees	.00	Full self report	Not reported
Villani, Grassi, et al., 2013	RCT	Oncology nurses	.16	Full self report	18–49
Waite & Richardson, 2004	RCT	Employees	.76	Full self report	19.00
Williams, Hagerty, et al., 2007	RCT	Navy recruits	.50	Self report, attrition and performance	16–19

Note. RCT = randomized controlled trial.

Appendix B

Detailed Impact of Intervention on Outcome Variables

Variable	*N*	Percentage of studies	Impact	No impact
Physical health				
Overall health (12, 13, 26, 29, 45, 54, 65, 89, 90, 92)	10.00	10.8%	40% (4)	60% (6)
Diabetes physiological measures (10, 35, 79)	3.00	3.2%	0 (0)	100% (3)
Psychological coherence (5, 72)	2.00	2.2%	0 (0)	100% (2)
Reactivity to stress (physiological) (5, 6, 7, 48, 49, 63, 72, 73, 84, 87, 88)	11.00	11.8%	72.7% (8)	27.3% (3)
Fatigue	1.00	1.1%	0 (0)	100% (1)
Total	27	22% (21/92)	44% (12)	56% (15)
Mental health				
Anxiety (1, 4, 12, 17, 18, 23, 26, 28, 31, 32, 34, 35, 39, 43, 44, 47, 51, 56, 58, 74, 76, 80, 83, 85, 86, 88, 89, 90, 91)	29.00	31.2%	62.1% (18)	37.9% (11)

(*Appendices continue*)

Appendix B (*continued*)

Variable	*N*	Percentage of studies	Impact	No impact
Depression (1, 12, 15, 18, 22, 23, 25, 28, 29, 31, 32, 34, 39, 43, 44, 51, 56, 66, 75, 82, 83, 85, 86, 92)	25.00	26.9%	60% (15)	40% (10)
Perceived stress (1, 7, 14, 21, 25, 28, 30, 32, 35, 37, 40, 47, 58, 61, 62, 66, 71, 72, 73, 81, 82, 83, 90, 91, 93)	25.00	26.9%	68% (17)	32% (8)
Overall mental health (4, 12, 27, 51, 54, 56, 66, 68, 83)	9.00	9.7%	55% (5)	45% (4)
Distress (6, 17, 19, 55, 89, 90)	6.00	6.5%	83.3% (5)	16.7% (1)
Affect (PANAS) (69, 75, 82, 83)	4.00	4.3%	75% (3)	25% (1)
PTSD symptoms (15, 56, 65)	3.00	3.2%	66.7% (2)	33.3 (1)
Hopelessness (26, 74)	2.00	2.2%	50% (1)	50% (1)
Psychological capital (59, 60)	2.00	2.2%	100% (2)	0 (0)
Irrational beliefs (46)	1.00	1.1%	100% (1)	0 (0)
Total	106	57% (53/92)	65% (69)	35% (37)
Protective factor				
Resiliency (10, 22, 31, 32, 58, 61, 64, 69, 70, 78, 82, 83)	12.00	12.9%	75% (9)	25% (3)
Coping strategies (2, 7, 14, 25, 29, 35, 40, 54, 62, 54, 66, 67, 85, 89, 91, 93)	16.00	17.2%	62.5% (10)	37.5% (6)
Social support (22, 29, 50, 66, 67)	5.00	5.4	20% (1)	80% (4)
Self-esteem (22, 74, 92)	3.00	3.2%	66.7% (2)	33.3% (1)
Self-efficacy (11, 37, 45, 61, 64, 85)	6.00	6.5%	66.7% (4)	33.3 (2)
Emotion regulation (34, 39, 45, 52, 69)	5.00	5.4%	80% (4)	20% (1)
Stigma against mental health (15, 86)	2.00	2.2%	50% (1)	50% (1)
Leadership (32, 65)	2.00	2.2%	100% (2)	0 (0)
Social cognition (13)	1.00	1.1%	100% (1)	0 (0)
Stress related growth (22)	1.00	1.1%	100% (1)	0 (0)
Goal setting (31)	1.00	1.1%	100% (1)	0 (0)
Self-compassion (70)	1.00	1.1%	100% (1)	0 (0)
Control over stress (73)	1.00	1.1%	100% (1)	0 (0)
Problem solving (75)	1.00	1.1%	100% (1)	0 (0)
Emotional reactivity (93)	1.00	1.1%	100% (1)	0 (0)
Hardiness (50)	1.00	1.1%	0 (0)	1 (100%)
Work engagement (42, 65)	2.00	2.2%	100% (2)	0 (0)
Total	61	44% (41/92)	69% (42)	31% (19)
Performance factor				
Task performance (6, 20, 38, 52, 63, 76, 87)	7.00	7.5%	71.4% (5)	28.6% (2)
Work performance (1, 14, 47, 63, 64, 90)	6.00	6.5%	50% (3)	50% (3)
Completed exercise (8, 36, 87)	3.00	3.2%	66.7 (2)	33.3 (1)
Absenteeism (17, 18, 39)	3.00	3.2%	0 (0)	100% (3)
Attrition from training (16, 93)	2.00	2.2%	0 (0)	100% (2)
Sick leave time (12)	1.00	1.1%	0 (0)	100% (1)
Total	22	23% (20/92)	45% (10)	55% (12)
Quality of life				
Quality of life (45, 54, 58, 80)	4.00	4.3%	100% (4)	0 (0)
Life satisfaction (19, 29, 66, 85)	4.00	4.3%	25% (1)	75% (3)
Job satisfaction (17, 46, 61, 64, 92)	5.00	5.4%	40% (2)	60% (3)
Happiness (1, 85)	2.00	2.2%	0 (0)	100% (2)
Morale (14, 65)	2.00	2.2%	50% (1)	50% (1)
Workplace well-being (31)	1.00	1.1%	100% (1)	0 (0)
Burn-out (11, 18, 28, 30, 39, 45, 46, 57, 64, 90)	9.00	9%	55% (5)	45% (4)
Purpose in life (92)	1.00	1.1%	100% (1)	0 (0)
Total	28	28% (26/92)	53% (15)	47% (13)

Note. Impact of interventions across unique outcome variables. *N* represents the number of unique times each variable was measured, whereas the percentage of studies represents the percentage of unique studies, which included at least one measure of each variable.

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