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Literature Reviews

Trait Emotional Intelligence, Anxiety Sensitivity, and Experiential Avoidance in Stress Reactivity and Their Improvement Through Psychological Methods

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Abstract

Stress pervades daily society, often with deleterious consequences for those prone to react intensely to it. Intervention techniques to attenuate stress reactivity are thus paramount. With that goal in mind, researchers have sought to identify and alter malleable psychological dispositional variables that influence stress reactivity. Trait emotional intelligence (TEI), anxiety sensitivity (AS), and experiential avoidance (EA) are increasingly receiving attention in these research efforts. The self-reported emotional component of stress reactivity has been emphasized in investigations and is our focus. Specifically, this paper overviews the role of TEI, AS, and EA in self-reported stress responses. We also discuss empirically supported psychological methods to adjust suboptimal levels of these variables in normal populations. Both psycho-educational (information, skills) and mindfulness-based interventions (specific mindfulness therapies or components) are covered. Findings include that (1) TEI, AS, and EA are each correlated with the emotional component of stress reactivity to both naturalistic and lab-based stressors; (2) preliminary support currently exists for psycho-educational intervention of TEI and AS but is lacking for EA; (3) adequate evidence supports mindfulness-based interventions to target EA, with very limited but encouraging findings suggesting mindfulness methods improve TEI and AS; and (4) although more research is needed, stress management approaches based on mindfulness may well target all three of these psychological variables and thus appear particularly promising. Encouragingly, some methods to modify dispositional variables (e.g., a mindfulness-based format of guided self-help) are easily disseminated and potentially applicable to the general public.

Keywords: stress, emotional intelligence, experiential avoidance, anxiety sensitivity, mindfulness

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Many people experience moderate (or higher) stress each day. Indeed, nearly a quarter of people living in North America report high daily stress (American Psychological Association [APA], 2009; Statistics Canada, 2012). It is evident that extensive strain is placed on healthcare systems and economies due to stress (Rosch, 2001). Unfortunately, stress may also exacerbate risk for numerous mental illnesses (such as depression and anxiety) as well as hypertension and heart disease (Barker, 2007; Chu, Williams, Harris, Bryant, & Gatt, 2013; Dressler, 1984). Indeed, the possible deleterious consequences of stress clearly hinder human health; thus, the discovery of viable options to better prepare or protect individuals is essential.

Along those lines, psychologists have increasingly turned their attention to studying stress and its management. A variety of definitions for the term “stress” currently occur in this burgeoning literature. Some researchers con-

ceptualize stress as “a negative emotional experience accompanied by predictable biochemical, physiological, and behavioral changes” (Baum, 1990, p. 653), while others maintain that stress can be a positive experience as well that contributes to growth and development (e.g., Tedeschi & Kilmer, 2005). Still others propose that the term “stress” is too subjective to be useful to researchers (e.g., American Institute of Stress, n.d.) and advocate instead the use of the terms “stressor,” defined as a real or perceived demand on the body or mind, and “stress reactivity,” defined as the emotional and physical responses to the demand (e.g., Blonna, 2007). This terminology is used in this review.

Extensive research has revealed that stress reactivity to a given stressor evidently varies across individuals (e.g., Gelkopf, Berger, Bleich, & Silver, 2012; Lazarus, 1998; Telch, Rosenfield, Lee, & Pai, 2012; Vollrath, 2001). This variance in stress reactivity across individuals likely results from a multitude of interacting physiological, developmental, and psychological factors (for a review, see Wu et al., 2013), thereby offering numerous targets for improving stress reactivity. Complicating interpretation, the components of stress reactivity (e.g., subjective and physiological changes) may themselves diverge within an individual (e.g., Mikolajczak, Petrides, Coumans, & Luminet, 2009). We focus here on self-reported emotional responses to stress.

It is recognized that individual dispositional variables may influence one’s emotional responses to stress (e.g., Wu et al., 2013). For example, higher pessimism is associated with greater stress in parents of children with development disabilities (Wang, Michaels, & Day, 2011). Two methodologies have been heavily used in the research area of stress and dispositional variables. In one approach, researchers have examined how dispositional variables predict subjective reactions to naturalistic stressors (e.g., Schmidt, Lerew, & Jackson, 1997). To illustrate, during academic exam stress, university students with higher neuroticism develop more somatic symptoms (Zunhammer, Eberle, Eichhammer, & Busch, 2013). Another informative approach has used lab-based stressors (for reviews, see Allen, Kennedy, Cryan, Dinan, & Clarke, 2014; Kudielka, Hellhammer, & Kirschbaum, 2007). Although this method reduces ecological validity (e.g., Telman, Holmes, & Lau, 2013), its advantages include permitting a constant external stressor across individuals and also disentangling the possible stress generative effects of psychological variables from their role in stress reactivity (e.g., Vollrath, 2001). For example, using this method, researchers have found that those with high levels of negative affectivity have significantly greater negative mood after high demand laboratory stressors, relative to those with lower negative affectivity (O'Brien, Terry, & Jimmieson, 2008).

Taken together, the findings from this literature indicate that dispositional variables influence stress responses, thereby making stress “a highly personalized process” (Lecic-Tosevski, Vukovic, & Stepanovic, 2011, p. 291). Indeed, a number of potentially malleable dispositional variables influence reactivity to naturalistic and lab-based stressors and are included in two recent reviews (e.g., for a discussion of both negative affectivity and neuroticism, see Lecic-Tosevski et al., 2011; both optimism and coping style are covered in Wu et al., 2013). Three other modifiable dispositional variables – trait emotional intelligence (TEI), anxiety sensitivity (AS), and experiential avoidance (EA) – are increasingly receiving attention in stress research. We overview each below.

Broadly speaking, TEI is a personality trait reflecting individuals’ capacity to perceive, understand, use, and regulate emotions beneficially both within themselves and in others (Schutte, Malouff, & Thorsteinsson, 2013). AS is the fear of bodily symptoms of anxiety based on beliefs the symptoms are harmful or have aversive consequences (Reiss, Peterson, Gursky, & McNally, 1986). EA is the desire to avoid unwanted thoughts, feelings, memories, and physical sensations, plus associated behavioral avoidance (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996;

Jacob, Ower, & Buchholz, 2013; for a review, see Chawla & Ostafin, 2007). EA and AS are moderately correlated (r = .43, Bardeen, Fergus, & Orcutt, 2013), and lower EA (e.g., higher acceptance) is associated with higher TEI (r = .40, Donaldson-Feilder & Bond, 2004). To our knowledge, no investigation has examined how TEI correlates with AS.

All three of these dispositional variables are currently conceptualized as important influences on stress reactivity. More specifically, high TEI is posited to buffer individuals from the negative consequences of stress (Ugoji, 2012), while high AS and high EA are conceptualized as vulnerability factors for many forms of anxiety- and stress-related symptoms (Tanay, Lotan, & Bernstein, 2012). Indeed, based on findings that TEI, AS, and EA influence emotional stress reactivity in normal populations, researchers are advocating both psycho-educational intervention (e.g., for EA and AS; Bardeen et al., 2013; Keough & Schmidt, 2012; for TEI; Ugoji, 2012) and also mindfulness-based approaches (e.g., Tanay et al., 2012) as preventative strategies. For example, Ugoji (2012, p. 105) recommends that "stakeholders in education" include emotional intelligence training within the curriculum, and Schmidt, Eggleston, et al. (2007, p. 305) advocate reducing AS a "primary prevention intervention." Likewise, Bardeen and colleagues (2013, p. 468) suggest "directly target[ing]" high EA in at-risk individuals to reduce perceived stress.

The purpose of this paper is to overview the empirical evidence connecting TEI, EA, and AS to emotional stress reactivity, along with the positive mental health promotion strategies (e.g., Fledderus, Bohlmeijer, Smit, & Westerhof, 2010) that improve them. We omit discussion of the many successful therapeutic techniques that benefit patients in severe distress and instead focus on the two aforementioned broad types of psychological interventions: psycho-educational and mindfulness-based. We define psycho-educational approaches as those that help participants gain information, skills (e.g., through presentations, self-help, or self-reflection) and/or change their behavior (e.g., through adopting an exercise regime or by systematically encountering previously avoided stimuli). These interventions are often designed to improve a particular dispositional variable (e.g., emotional skills training is used for TEI; Slaski & Cartwright, 2003). Health promotion approaches based on mindfulness, in contrast, usually seek to improve quality of life, thus often including many dispositional variables as outcomes. A number of different mindfulness-based interventions are in use. All share extensive emphasis upon "present centered awareness" (Chiesa & Malinowski, 2011, p. 412) but otherwise diverge from one another in philosophical orientation, among other issues (for a review, see Chiesa & Malinowski, 2011). We focus here on practical implementation differences across mindfulness-based health promotion strategies (e.g., whether meditation is included) and describe below the two particular mindfulness-based methods – mindfulness-based stress reduction therapy (MBSR; Kabat-Zinn, 1982, 1990) and acceptance and commitment therapy (ACT; Hayes, Strosahl, & Wilson, 1999) –that are commonly adapted in health promotion research.

MBSR is a particularly well-established approach to lessen stress reactivity (for reviews, see Chiesa & Serretti, 2009, 2010). Influenced by Buddhist philosophy, MBSR focuses on intensive meditation to increase mental and physiological focus on self. Originally designed to help patients with chronic ailments and pain, MBSR has since shown its ability to reduce stress and promote health in normal populations (Chiesa & Serretti, 2009). MBSR is administered in a group setting and relies on four main methods to attenuate stress (Kabat-Zinn, 1990): yoga meditation, walking meditation, body scanning (non-judgemental focus on all bodily parts), and sitting practice (focus on breathing while comfortably seated). An adapted meditation component is sometimes used by itself in "mindfulness meditation" interventions (e.g., Chu, 2010). In MBSR and its adaptations, emphasis is consistently placed on acceptance of experiences in the moment, for their own "pure" (Chiesa & Malinowski, 2011, p. 412) sake.

Acceptance of present experience is also an essential component of ACT, but the purpose of this acceptance is to facilitate behavioral change (Baer & Krietemeyer, 2006; Chiesa & Malinowski, 2011). Indeed, ACT differs notably from other mindfulness-based methods in its inclusion of behavioral-change strategies to affect the content of experience and in fact originated as an individual therapy with specific behavioral strategies tailored to each client. Although ACT is now used in group and workshop format (e.g., Biglan, Layton, Jones, Hankins, & Rusby, 2013; Luoma, Kohlenberg, Hayes, Bunting, & Rye, 2008), its emphasis on personal values, goals, and actions consistent with these values and goals continues to distinguish it from other mindfulness-based methods (Baer & Krietemeyer, 2006). Additionally, ACT does not include formal meditation training and omits Buddhist influence (Chiesa & Malinowski, 2011). The mindfulness exercises included in ACT are thus shorter (Baer & Krietemeyer, 2006) and have far less emphasis on extensive bodily scanning than those of MBSR (Arch & Ayers, 2013).

These differences noted, the commonalities between ACT and MBSR are potentially more important (Baer & Krietemeyer, 2006). We adopt this perspective and discuss mindfulness-based methods as a type of health promotion strategy, along with psycho-educational approaches, in relation to TEI, EA, and AS, below. Our general aim is to provide an overview of the concrete, established ways to reduce emotional stress reactivity via modifying these dispositional variables.

Modifiable Dispositional Variables in Stress Reactivity

Trait Emotional Intelligence (TEI)

Overview — Emotional intelligence (EI) is a construct that has captivated researchers for decades. Although different models exist (for a review, see Muyia, 2009), most EI models include dimensions assessing one's capacity to perceive and understand emotions, as well as use and regulate emotions (Schutte et al., 2013). Most models contain both intra- and inter- personal aspects; for example, the EI model proposed by Salovey and Mayer (1989) includes abilities to regulate and appraise emotions in both oneself and in others. Less agreement exists concerning how to assess EI. Some researchers conceptualize EI as an objective cognitive proficiency assessed by performance accuracy; others advocate a subjective personality trait or mixed model (see Muyia, 2009) and use self- (or other-) reports of EI. Scores on measures from each EI type are only moderately correlated (Schutte et al., 2013). We focus here exclusively on subjective EI (referred to as "trait EI", or TEI, following others, e.g., Arora et al., 2011) because relative to objective EI, TEI is more strongly related to mental health (Martins, Ramalho, & Morin, 2010) and has garnered more attention in stress research (Schneider, Lyons, & Khazon, 2013), including in the mindfulness-based methods we discuss.

Higher TEI has incremental validity (Petrides, Pérez-González, & Furnham, 2007) in relation to many beneficial psychological outcomes (for reviews, see Martins et al., 2010; Zeidner, Matthews, & Roberts, 2012). For example, university students with high TEI are more likely to complete their degree (Keefer, Parker, & Wood, 2012), and adolescents with high TEI have significantly fewer depressive symptoms as well as less disruptive behavior compared to those with lower TEI (Davis & Humphrey, 2012). Complicating interpretation, different measures of TEI with distinct theoretical bases are in use (see Martins et al., 2010; Muyia, 2009). Additionally, cogent concerns have been raised about whether TEI is "pan-cultural" (Schutte et al., 2013, p. 66; for a review, see Matthews, Zeidner, & Roberts, 2012). Research is needed to address this issue (see Matthews et al., 2012). In the meantime, the overall pattern of findings from naturalistic stress studies suggests that higher total TEI beneficially impacts self-reported stress responses. Indeed, higher TEI is associated with less self-reported stress in many samples including nurses (Görgens-Ekermans & Brand, 2012), firefighters (Wagner & Martin, 2012), and human service

workers (e.g., physicians, teachers, and managers; Ogińska-Bulik, 2005) and is related to enhanced stress management skills in undergraduates (Ugoji, 2012). That noted, higher scores on the Attention to Feelings subscale of the Trait Meta-Mood Scale (Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) prospectively predicted increased stress in adolescents, suggesting that high scores may not be adaptive on all facets of all TEI measures (e.g., excessive focus on feelings; Salguero, Palomera, & Fernández-Berrocal, 2012).

Studies using lab-based stressors generally indicate that higher TEI (or an aspect thereof) reduces negative emotional stress responses. For example, less negative emotions and intrusive thoughts occurred after a stressful movie clip for those higher in TEI (on the Clarity [mood differentiation] and Repair [mood regulation] subscales of the Trait Meta-Mood Scale) compared to those with lower TEI (Ramos, Fernández-Berrocal, & Extremera, 2007). Likewise, those with higher TEI (on the Repair subscale of the Trait Meta-Mood Scale) characterized repeated lab stressors (adapted from the Trier Social Stress Test [TSST], Kirschbaum, Pirke, & Hellhammer, 1993) as less threatening (Salovey, Stroud, Woolery, & Epel, 2002) and had less worsening in mood after both the TSST (Mikolajczak, Roy, Luminet, Fillée, & de Timary, 2007) and a failure stressor (a difficult test misleadingly presented as easy; Mikolajczak et al., 2009; findings were significant for men and showed a trend for women). Contrastingly, several studies have linked higher TEI to augmented negative mood post-stressor (Arora et al., 2011; Petrides & Furnham, 2003; Sevdalis, Petrides, & Harvey, 2007) including more anxiety in medical students during a simulated surgery (Arora et al., 2011) and more tension, depression, and anger following a stressful movie clip (Petrides & Furnham, 2003). However, in these studies, those with higher TEI recovered faster from their negative moods post-stressor compared to low TEI participants (Arora et al., 2011; Petrides & Furnham, 2003; Sevdalis et al., 2007). Cumulatively, these findings suggest that interventions targeting TEI may benefit emotional stress reactivity over the long-term.

Psycho-educational intervention — Most commonly, TEI intervention has relied on training in emotional skills. The findings overall (for a review covering both ability EI and TEI, see Schutte et al., 2013) indicate that TEI does indeed increase after suitable training across samples including college students (e.g., Schutte & Malouff, 2002) and employees (e.g., Slaski & Cartwright, 2003). For example, both self-reported and informant-rated (spouse or close friend) TEI increased significantly one month after emotional intelligence training, compared to the control condition (Kotsou, Nelis, Grégoire, & Mikolajczak, 2011). Indeed, as shown in Table 1, the effect size estimate for increased self-reported TEI post-intervention was large, and the effect size estimate for informant-rated TEI was moderate. In contrast, both ratings of TEI failed to improve in the control group (and in fact informant-rated TEI decreased significantly; Kotsou et al., 2011). Table 1 summarizes the psycho-educational interventions for TEI that are discussed in this paper. Schutte and colleagues (2013, p. 62) provide a comprehensive review of all psycho-educational EI interventions to date, noting that the findings provide “preliminary evidence” that psycho-educational intervention is effective.

Despite these encouraging results, unanswered questions remain, including about the specific training approach needed for lasting change in TEI. For example, two psycho-educational interventions (Kirk, Schutte, & Hine, 2011; Wing, Schutte, & Byrne, 2006) used expressive writing (20 minutes daily for three days) instead of direct emotional skill instruction. Although TEI improved in both, data collected 2 weeks post intervention (available only in Wing et al., 2006) indicated that the effect was not maintained (although a trend towards significance was shown). In contrast, instructional skills training produced significantly increased TEI both 1-month and also 1-year post-intervention (Kotsou et al., 2011), suggesting that direct skills instruction produces a more durable increase in TEI.

Direct skills training programs, however, have varied in the number and length of sessions (Schutte et al., 2013); to illustrate, Nelis and colleagues (2011) utilized 18 hours of training plus email contact, while Schutte and Malouff (2002) asked students to complete a three-credit university course incorporating emotional skills. Less time-intensive TEI training approaches seem particularly worthy of further investigation. Surprisingly, the literature is largely absent of brief (e.g., one session) TEI interventions (see Carrick, 2010, pp. 50-51). One relevant dissertation used a half-day classroom workshop (plus individual coaching 6 weeks later), finding that several TEI competencies (Table 1) had significantly increased three months after the workshop (Carrick, 2010). Future research using brief TEI workshops is warranted, along with investigations establishing the precise content necessary to cover in TEI interventions (for a review, see Ciarrochi & Mayer, 2007), given different theoretical models (Mayer, Robers, & Barsade, 2008). Also worthy of further investigation is the possibility of briefer assessment measures of TEI. Currently, the most widely used brief measure of TEI contains 33 items (Assessing Emotions Scale; Schutte, Malouff, & Bhullar, 2009); shorter TEI measures, if valid and applicable across diverse settings, would be a welcome addition to this literature from a practical perspective (see Wong & Law, 2002, for a 16-item TEI measure for leadership and management research; for a review of TEI measures, see Pérez, Petrides, & Furnham, 2005).

Mindfulness-based intervention — Research using mindfulness-based methods to target TEI is in its infancy. The studies to date are summarized in Table 1. One pilot study used adapted MBSR to increase TEI in psychology graduate students (Cohen & Miller, 2009). The MBSR adaptation added increased attention to awareness of others (and was therefore called interpersonal mindfulness training [IMT]). Training otherwise closely followed a manualized MBSR (Kabat-Zinn, 1982) and consisted of six 90-minute sessions over six weeks administered in a group format, plus weekly homework on personal experience of mindfulness. The intervention significantly increased TEI, and also decreased perceived stress from baseline to post treatment; however, no control group was included. Experimental research testing whether adapted MBSR benefits TEI seems warranted.

Additional reasons exist to consider targeting TEI via mindfulness. Indeed, experimental evidence indicates that 20 minutes of mindfulness meditation over eight weekly sessions improves TEI in graduate students, compared to relaxation instructions without training (Chu, 2010). Other findings (not summarized in Table 1) are also consistent with meditation benefiting TEI, although the designs are either correlational (Schutte & Malouff, 2011) or impractical to apply to the general population (e.g., 10-day intensive Vipassana meditation retreat; Perelman et al., 2012). Furthermore, several prominent researchers emphasize the potential applicability of mindfulness-based methods to TEI improvement (e.g., see Schutte et al., 2013); along these lines, Ciarrochi and Blackledge (2006) advance a specific type of mindfulness-based method, mindfulness-based emotional intelligence training.

Summary — Many studies indicate that greater TEI is linked to decreased emotional stress reactivity, although additional research is needed given discrepant findings. Current preliminary evidence (Schutte et al., 2013) supports the use of psycho-educational emotional skills training to increase TEI. However, the precise nature of the ideal skills training (e.g., content of sessions) is unestablished. Mindfulness-based methods appear promising in TEI amelioration and warrant further consideration given their known benefits on a host of other psychological and physical variables (for a review, see Chiesa & Serretti, 2009).

Table 1

Summary of Psycho-Educational and Mindfulness-Based Interventions for TEI

Study	Intervention	Sample	Sex Distribution	Relevant Findings	Effect Size Estimate
Schutte & Malouff (2002)	Emotional skills training course	152 first year university students	74% female	Increased TEI improved retention rate for first year students vs. control group	d = .63[a] r = .23[b]
Slaski & Cartwright (2003)	4-week EI training program	120 retail chain managers	40% female	Increased TEI improvement in stress well-being vs. control group	n/a, p < .001 n/a, p < .001 n/a, p < .001
Kirk et al. (2011)	Emotional self-efficacy program via expressive writing	46 working adults (all residents of Australia)	67% female	Increased TEI positive affect vs. control group	partial η^2 = .31 partial η^2 = .12
Wing et al. (2006)	Positive expressive writing task with or without an emotional regulation cue (ERC)	175 Australian adults	64% female	Increased TEI at post-test for experimental groups vs. control but not significant at 2 week follow up	partial η^2 = .02 for positive writing; partial η^2 = .085 for writing with ERC; n/a, p = .08
Kotsou et al. (2011)	Instructional skills training aimed at improving five core emotional competencies	72 adults	68% female	At post-test improved TEI was noted along with decreased stress vs. control group; maintained at follow up	d = .90 self-rated TEI; d = .63 informant-rated TEI; d = 1.34; all p's Time 1 to Time 3 < .001
Nelis et al. (2011)	18 hours (4 sessions) of EI training	58 undergraduate university students	72% female	Improved TEI vs. control group maintained at follow up	d = 1.13 Time 1 to Time 2 d = .91 Time 1 to Time 3
Carrick (2010)	4 hour classroom based learning intervention on EI competencies	11 nurse managers from a university hospital with no previous EI training	100% female	Increased EI competencies of impulse control, flexibility, problem solving (no control group)	n/a; all p's < .05
Cohen & Miller (2009)	Adapted MBSR	21 graduate psychology students	95% female	Increased TEI decreased perceived stress pre-post (no control group)	d = .40 d = .55
Chu (2010)	Mindfulness meditation	19 graduate students	47% female	Increased TEI aspects of mood regulation emotion appraisal social skills decreased perceived stress vs. control group	 d = 1.86[a] d = 1.68[a] d = 1.81[a] d = 2.36[a]

Note. All psycho-educational training studies for TEI are reviewed in Schutte et al. (2013); above we summarize the studies discussed in this paper. TEI = trait emotional intelligence; EI = emotional intelligence; MBSR = mindfulness-based stress reduction; n/a = no effect size in article and not enough information given to calculate an effect size

[a]Effect size not given; we computed it using an effect size calculator (Becker, 2000).

[b]Effect size not given; we computed it using Ellis (2009).

Anxiety Sensitivity (AS)

Overview — Individuals who report heightened AS are prone to misinterpret somatic feelings and physiological responses to anxiety-related symptoms, often associating these feelings with danger and harm. Consequently, high AS individuals are susceptible to substance abuse, psychological disorders, and maladaptive stress reduction behaviors (Donnell & McNally, 1990; Mitchell, Riccardi, Keough, Timpano, & Schmidt, 2013; Stewart, Peterson, & Pihl, 1995; for a review, see Naragon-Gainey, 2010). For example, prospective research has established that

AS predicts the subsequent development of alcohol use disorders in adults two years later (Schmidt, Buckner, & Keough, 2007); similarly, in adolescents (age 9-13), AS predicts the development of anxiety symptoms one year later after controlling for baseline anxiety and depression (Schmidt et al., 2010). The role of AS in panic disorder in particular has received extensive attention (for a review, see McNally, 2002). Findings indicate that AS is a prospective predictor of panic; for example, AS predicts the development of spontaneous panic attacks two years later in those with no history of panic (Schmidt, Zvolensky, & Maner, 2006).

Theoretical conceptualizations of AS (Reiss, 1991) posit that higher AS amplifies emotional responses to stress (Isyanov & Calamari, 2004). Consistent with this idea, greater AS has been associated with heightened perceived stress in several samples including undergraduates (Bardeen et al., 2013; Tull & Gratz, 2008) and first-year medical school and health science graduate students (Isyanov & Calamari, 2004). Additionally, AS likely figures prominently in the appraisal of and reactivity to emotional events (Zvolensky et al., 2002).

In fact, AS has been linked with exacerbated distress and greater susceptibility to psychopathological disorders in volunteers responding to disastrous situations (Hagh-Shenas, Goodarzi, Dehbozorgi, & Farashbandi, 2005; Mitchell, Griffin, Stewart, & Loba, 2004). Likewise, emerging findings indicate that in adolescents, high AS predicts aggravated emotional responses to both natural disasters and also stressful life events (Hensley-Maloney & Varela, 2009; Kadak, Nasıroğlu, Boysan, & Aydın, 2013; McLaughlin & Hatzenbuehler, 2009).

Similar findings have resulted from lab-based stressor research. Indeed, empirical investigations have correlated elevated AS to heightened stress reactivity across experimental stressors, including mental arithmetic, cold pressor task, and the TSST (Gómez-Pérez, López-Martínez, & Asmundson, 2013; Lee, Watson, & Law, 2010; Messenger & Shean, 1998; Rosa Esteve & Camacho, 2008; Shostak & Peterson, 1990; Stewart, Buffett-Jerrott, & Kokaram, 2001; Thompson, Keogh, French, & Davis, 2008; Zvolensky et al., 2002). Furthermore, the link between AS and stress reactivity is of the upmost importance since stressful life events may trigger one's AS to increase, thereby aggravating vulnerability to numerous psychological disorders (Schmidt et al., 1997; Taylor, Koch, & McNally, 1992; Wheaton, Mahaffey, Timpano, Berman, & Abramowitz, 2012). Importantly, AS is malleable, as amply documented (e.g., Feldner, Zvolensky, Schmidt, & Smith, 2008; Keough & Schmidt, 2012; Korte & Schmidt, 2013).

Psycho-educational intervention — A number of different preventative interventions have targeted AS and are summarized in Table 2. Two interventions are adaptations of therapies, cognitive-behavioral therapy (CBT) and motivational enhancement therapy. The former is well established to reduce AS in clinical patients (for a meta-analysis, see Smits, Berry, Tart, & Powers, 2008). Modifying this approach for wider dissemination, Radhu, Daskalakis, Arpin-Cribbie, Irvine, and Ritvo (2012) used a 12-week web-based CBT intervention to successfully reduce both AS and negative thoughts in perfectionistic university students. With burgeoning Internet use, further research into web-based interventions to lessen AS would be welcome. Motivational enhancement therapy, commonly used to treat substance abuse and eating disorders, increases intrinsic motivation to improve poor lifestyle choices (Ager et al., 2011; Heather & McCambridge, 2013; Lothstein, 2012; Martin & Rehm, 2012). Important new research suggests its applicability to AS reduction as well. Specifically, Korte and Schmidt (2013) determined that a single session of motivational enhancement therapy led to a 26% decrease in AS. Given cost and time limitations, this type of brief intervention seems especially important. Further research examining the durability of the AS reduction obtained from one-session motivational enhancement therapy (Korte & Schmidt, 2013) and web-based CBT (Radhu et al., 2012) is warranted.

Most other AS interventions incorporate cognitive restructuring, which has been shown to improve AS in both adults (e.g., Steinman & Teachman, 2010) and adolescents (for a review, see Lau, 2013). For example, based on the success of anxiety reduction approaches using cognitive bias modification (for a review, see MacLeod & Mathews, 2012), researchers have used positive training, a specific type of interpretive bias modification method, to decrease AS. Positive training is accomplished by having participants add a positive outcome to incomplete anxiety-producing scenarios. For example, the vignette "You are jogging. Your heart starts to beat quickly. This is in_igorating" is completed with "invigorating," thereby enabling individuals to learn to associate anxiety-related symptoms with positive outcomes. In line with this hypothesis, the AS of nonclinical individuals diminished after positive training (Steinman & Teachman, 2010) compared to control conditions. Likewise, AS reduction (from pre-test to both post-test and to 48 hour follow-up) occurred after a different cognitive bias modification task, which trained participants to associate bodily sensations with neutral interpretations (MacDonald, Koerner, & Antony, 2013). Research investigating the long-term durability of AS reduction after cognitive bias modification would be welcome.

Brief informational interventions targeting AS have also garnered increasing attention. For example, Anxiety Sensitivity Amelioration Training (ASAT; Schmidt, Eggleston, et al., 2007) is comprised of informative presentations regarding stress reactivity, the goal of which is to educate individuals about biological responses to stress and assure them that these reactions are expected and normal. Schmidt, Eggleston, et al. (2007) administered ASAT to high-risk individuals, defined as those who had high AS scores (at least 1.5 standard deviations above the mean for nonclinical community members) but no current or recent (past year) psychological disorder. Promisingly, ASAT produced significant and rapid decreases in AS compared to the control condition (a health and nutrition video). This gain was partially maintained at 24-month follow-up, at which point there was also a significantly decreased incidence of Axis I disorders in participants who received ASAT, compared to those in the control condition. A further strength of ASAT is its ability to form part of a "stepped care" approach, implemented according to the degree of severity of existing issues and modified to suit individual needs (Schmidt, Eggleston, et al., 2007). Along these lines, ASAT has shown success in high AS participants who have experienced traumatic events. Specifically, Vujanovic, Bernstein, Berenz, and Zvolensky (2012) found that a two-hour session of ASAT (tailored for each individual) markedly reduced AS; importantly, the effect was largely maintained at three months post intervention. Due to the small number of participants in this study, a larger study of ASAT is warranted.

Another brief intervention, Keough and Schmidt's (2012) Anxiety Sensitivity Education and Reduction Training, combines stress information with interoceptive exposure, in which individuals repeatedly experience the bodily sensations they fear (Rapee & Barlow, 1988). Specifically, 50-minute PowerPoint presentations outlining the common physiological reactions to stress are used, along with practice of specific interoceptive exposure examples (tailored to the individual) (see also Carter, Marin, & Murrell, 1999). Recently, Anxiety Sensitivity Education and Reduction Training more rapidly lessened AS than did physical health education training (control group) emphasizing minimal alcohol consumption and adequate exercise and sleep. Importantly, the Anxiety Sensitivity Education and Reduction Training group still had substantially lower AS levels than the control group six months post-intervention (Keough & Schmidt, 2012).

One non-cognitive intervention, physical exercise, also successfully reduces AS (Broman-Fulks, Berman, Rabian, & Webster, 2004; Broman-Fulks & Storey, 2008; Smits, Berry, Rosenfield, et al., 2008), perhaps due partly to interoceptive exposure and also to neurochemical changes, including in the neurotransmission of serotonin, dopamine, and noradrenaline (for a review, see Lin & Kuo, 2013). Findings indicate that the greatest and most

rapid reductions in AS occur through repeated sessions of vigorous aerobic exercise (e.g., 20 minutes at 70% of the maximum heart rate, twice weekly for 2 weeks; Smits, Berry, Rosenfield, et al., 2008). Low intensity aerobic exercise seems less potent, although Broman-Fulks et al. (2004) did observe a reduction in AS in the low intensity exercise group (six 20-minute sessions at '220-age x .60' aerobic heart rate over 2 weeks). This finding is encouraging as low intensity exercise may be more feasible or attractive for many individuals than intense aerobic exercise. Indeed, individuals with a high body mass index – precisely those whose physical health would most benefit from exercise – are especially prone to fear feelings of biological arousal from vigorous exercise (Smits, Tart, Presnell, Rosenfield, & Otto, 2010). AS reduction post-exercise has been shown to persist for one (Broman-Fulks & Storey, 2008) to three weeks (Smits, Berry, Rosenfield, et al., 2008).

Mindfulness-based intervention — Although research on mindfulness-based methods to attenuate AS in normal populations is limited (see Table 2), preliminary evidence suggests that MBSR may be effective. Specifically, a recent investigation tested the effect of a brief mindfulness skills training program on both AS and EA (Tanay et al., 2012). Researchers asked university students and community members to attend four weekly 1-hour skills training sessions that focused on mindfulness meditation in the Mahasi tradition, "slightly different" (Tanay et al., 2012, p. 498) from MBSR. Participants also performed 15 minutes of mindfulness exercises four times per week. AS decreased significantly post-intervention in the experimental group, compared to the control group. Further research is warranted. In particular, researchers have questioned whether those with high baseline AS – who are thus especially fearful of bodily sensations – will benefit from mindfulness-based methods (see Rogojanski, Vettese, & Antony, 2011). Along those lines, clinical findings suggest that high AS patients do not benefit as much from MBSR compared to CBT, perhaps due to the extensive body scanning in MBSR that may be arduous for high AS participants (Arch & Ayers, 2013). Consistent with this idea, ACT, which does not include intensive bodily attention, was indeed effective in those with high AS (Wolitzky-Taylor, Arch, Rosenfield, & Craske, 2012). ACT interventions in normal populations to attenuate AS are lacking.

Summary — A variety of psycho-educational interventions reduce AS in the short-term. Options for AS improvement include exercise for those able to engage in physical activity, as well as varieties of brief forms of cognitive restructuring. Anxiety Sensitivity Education and Reduction Training and also ASAT have shown at least partial maintenance of AS improvement at 6- and 24-month follow-up, respectively; durability of gains from other methods is not yet established. Other important unanswered questions from the psycho-educational AS reduction research include the populations for whom each method is most effective (e.g., cultural or gender differences). Additional insight into adapted MBSR is needed to determine whether it helps those with high baseline AS. ACT may be a better option than MBSR in those with high AS. Further research will clarify matters.

Table 2

Summary of Psycho-Educational and Mindfulness-Based Interventions for AS

Study	Intervention	Sample	Sex Distribution	Relevant Findings	Effect Size Estimate
Radhu et al. (2012)	12-week web-based CBT intervention	47 students with high perfectionism scores	72% female	Decreased AS in intervention vs. control group	η^2 = .17
Korte & Schmidt (2013)	Motivational enhancement therapy	80 students with high AS	75% female	Decreased AS for intervention vs. control group controlling for baseline AS	β = .12
Steinman & Teachman (2010)	Cognitive bias modification (positive training)	75 students with high AS	69% female	Decreased AS for intervention vs. control group controlling for baseline AS	η_p^2 = .07
MacDonald et al. (2013)	Cognitive bias modification (interpretation training)	34 students with high AS	76% female	Decreased AS in training condition only from pre-test to post-test	*d* = .82
Schmidt, Eggleston, et al. (2007)	Anxiety sensitivity amelioration training	404 students and community members with high AS	61% female	Decreased AS post-intervention Partially maintained at 24-month follow-up	partial ε^2 = .047 n/a, *p* = .08
Vujanovic et al. (2012)	Anxiety sensitivity amelioration training	5 trauma-exposed adults	60% female	For 80% of participants, AS decreased to normal level	n/a
Keough & Schmidt (2012)	Anxiety sensitivity education and reduction training	104 individuals with high AS	84% female	Decreased AS for intervention vs. control group after 1 month and 6 months controlling for baseline AS	 β = -0.54 β = -0.51
Broman-Fulks et al. (2004)	Physical exercise (high-intensity or low-intensity)	54 students with high AS	76% female	Decreased AS for intervention vs. control for high-intensity exercise low intensity exercise	 η^2 = 0.60 η^2 = 0.36
Broman-Fulks & Storey (2008)	Aerobic exercise	24 participants with high AS	79% female	Decreased AS for exercise group after 1st session; maintained at follow-up	η_p^2 = .17
Smits, Berry, Rosenfield, et al. (2008)	Exercise with or without cognitive restructuring	60 participants with high AS	75% female	Decreased AS for both exercise groups compared to control	*d* = 2.15
Rogojanski et al. (2011)	Mindfulness or suppression for cravings	61 smokers	41% female	Baseline AS not associated with post-treatment self-efficacy in either group	n/a
Arch & Ayers (2013)	Adapted MBSR or group CBT	71 patients with an anxiety disorder	21% female	CBT outperformed MBSR in post-treatment symptom reduction for high AS patients	n/a
Wolitzky-Taylor et al. (2012)	ACT or CBT	87 patients with an anxiety disorder	47% female	Baseline AS did not affect symptom reduction results of ACT	n/a
Tanay et al. (2012)	Adapted MBSR	53 adults	65% female	Decreased AS in intervention vs. control group	*d* = .61

Note. AS = anxiety sensitivity; ACT = acceptance and commitment therapy; MBSR = mindfulness-based stress reduction; CBT = cognitive behavioral therapy; n/a = no effect size available.

Experiential Avoidance (EA)

Overview — Those who report high EA are largely unwilling to experience the physical and mental symptoms resulting from personal experiences, leading to ineffective and maladaptive coping behaviors (Hayes et al., 2004). Similarities exist between EA and the concept of avoidance coping (see Wu et al., 2013), but the two constructs are not identical. Instead, between the two, EA distinctly predicts quality of life (Karekla & Panayiotou, 2011). EA manifests itself across adolescents and adults through the continued suppression of emotions and emotional displays, causing greater re-occurrence in a vicious cycle of negativity and downward moods (e.g., Wegner, Schneider, Carter, & White, 1987).

High EA hinders psychological health and is related to increased pessimism and substance abuse (Fergus, Bardeen, & Orcutt, 2013; Levin et al., 2012), along with self-destruction, denial, self-blame, and behavioral disengagement (Karekla & Panayiotou, 2011). For example, high EA is associated with parental stress and dysphoria in mothers of preschool children in a Head Start program (Shea & Coyne, 2011); among parents of children with cerebral palsy, high EA significantly predicts chronic sorrow symptoms (Whittingham, Wee, Sanders, & Boyd, 2013). In contrast, those with lower EA accept and de-emphasize pain associated with stress (Costa & Pinto-Gouveia, 2011). Along those lines, studies using lab-based stressors report that high (relative to low) EA predicts more negative emotional responses after either unpleasant film clips (Shallcross, Troy, Boland, & Mauss, 2010; Sloan, 2004), inhalation of carbon dioxide-enriched air (which induces breathlessness and other physiological symptoms; Feldner, Zvolensky, Eifert, & Spira, 2003), or dysphoric mood induction (the Velten Mood Induction Procedure [Velten, 1968] accompanied by music; Gird & Zettle, 2009). That noted, studies that instructed participants to use acceptance versus other emotion regulation strategies (e.g., suppression) in the face of discomfort have found mixed results and overall no advantage for acceptance in minimizing negative affect (for a review, see Kohl, Rief, & Glombiewski, 2012); dispositional EA was not considered in the review. Kohl et al. (2012) point to substantial methodological differences among the studies and caution that no conclusion can be drawn yet about whether acceptance influences negative affect post-discomfort. Further research will clarify matters. As Kohl et al. (2012) note, this research line would benefit from identifying how trait levels of avoidance (e.g., EA) may influence effective use of state emotion regulation strategies (e.g., avoidance of provocation-induced emotion). Also important will be testing whether specifically training participants how to use a particular emotional regulation strategy (e.g., acceptance rather than avoidance) enhances the benefits of that strategy.

Research on how EA influences emotional responses to naturalistic stressors indicates that individuals with higher EA report greater distress and stress rumination (Goldstone, Farhall, & Ong, 2011; Morina, 2007). Indeed, a recent correlation between high EA and perceived stress has been reported, indicating that therapeutic methods to lower EA may, in turn, decrease stress reactivity (Bardeen et al., 2013), with a further link with emotional distress (Cristea, Montgomery, Szamoskozi, & David, 2013). An additional reason to target EA to reduce self-reported stress levels is that it moderates the relationship between AS and perceived stress, such that high EA individuals, regardless of AS level, report high perceived stress, whereas among low EA individuals, higher AS is associated with augmented perceived stress (Bardeen et al., 2013). EA thus seems a reasonable candidate for psychological intervention of stress reactivity (Costa & Pinto-Gouveia, 2011).

Psycho-educational intervention — To date, EA has received little effective psycho-educational intervention (please see Table 3 for a summary), unlike TEI and AS. Indeed, the narrative emotional disclosure task has failed to improve EA in several studies (Carpenter, 2000, reviewed in Chawla & Ostafin, 2007; Moore, Brody, & Dierberger, 2009; Wilson, 2012). For example, using this method to target EA, Moore et al. (2009) asked university students

to write about either traumatic or neutral events for 20 minutes on three consecutive days; one-month follow-up data revealed that EA did not improve in either group. Behavioral interventions have fared better, although much more research is needed. More specifically, in one investigation, systematic desensitization reduced EA (with results not significantly different from those of the mindfulness-based method ACT, described below; Zettle, 2003; see Chawla & Ostafin, 2007). Additionally, in adolescents with Tourette's syndrome, a behavioral treatment (habit reversal training) decreased EA to the same extent when administered alone or accompanied by ACT (Best, 2010). As such, the role that exposure techniques can play in reduction of EA is an important, but under-investigated, question (e.g., Gloster, Hummel, Lyudmirskaya, Hauke, & Sonntag, 2012).

Mindfulness-based intervention — ACT was designed explicitly to target EA (e.g., Burrows, 2013), and has thus figured prominently in EA intervention (Chawla & Ostafin, 2007).

Substantial evidence (summarized in Table 3) indicates that ACT decreases EA in both clinical and normal populations, with cost-effective group and self-help formats now available (e.g., Burrows, 2013; Fledderus, Bohlmeijer, Pieterse, & Schreurs, 2012; Luoma et al., 2008). For example, group ACT ("Living to the full" featuring eight 2-hour sessions over two months) significantly improved EA (plus emotional well-being and mental health) at 3-month follow-up, compared to the waitlist (Fledderus et al., 2010). Likewise, promising results were obtained from a guided self-help form of ACT, in which participants engaged in 10-15 minutes of mindfulness exercises daily and each week completed one of the nine self-help modules in an ACT self-help manual (Bohlmeijer & Hulsbergen, 2008); participants also received a weekly support email. Post-intervention results indicated that ACT self-help significantly improved both EA and anxiety, compared to wait-list; 3-month follow-up data from ACT participants indicated that these gains were maintained (Fledderus, Bohlmeijer, et al., 2012). These findings taken together suggest that ACT approaches that are easily disseminated (e.g., Fledderus et al., 2010; Fledderus, Bohlmeijer, et al., 2012) have substantial and durable benefits on both EA and mental health.

MBSR also may effectively reduce EA, although more research is needed. Two studies that did not include a control group (Kearney, McDermott, Malte, Martinez, & Simpson, 2012; Weinrib, 2011) found improved EA (relative to baseline) after manualized MBSR (Kabat-Zinn, 1982). Four months after the end of treatment (Kearney et al., 2012), EA improvement was maintained. Additionally, the aforementioned brief mindfulness skills training program, which did include a control group, also found improved EA after adapted MBSR (Tanay et al., 2012).

Summary — High EA is linked to stress reactivity, although no clear advantage has been shown for acceptance versus other strategies to temper negative affect post-discomfort. Substantial evidence indicates ACT significantly improves EA. Adapted MBSR may be effective as well although research is limited. The sparse research on psycho-educational intervention of EA suggests behavioral approaches hold more promise than the narrative emotional disclosure task. Indeed, elements of exposure arguably occur in ACT (Gloster et al., 2012), raising the possibility that exposure itself may ameliorate EA, as suggested by several studies.

Table 3

Summary of Psycho-Educational and Mindfulness-Based Interventions for EA

Study	Intervention	Sample	Sex Distribution	Relevant Findings	Effect Size Estimate
Tanay et al. (2012)	Adapted MBSR	53 adults	65% female	Decreased EA in intervention vs. control group	*d* = .60
Carpenter (2000)	Narrative emotional disclosure	50 adults	75% female	No difference in EA for intervention and control groups controlling for baseline EA	n/a
Moore et al. (2009)	Narrative emotional disclosure	233 adults	55% female	No difference in EA for intervention and control groups	n/a
Wilson (2012)	Narrative emotional disclosure	315 undergraduate students	49% female	No difference in EA for intervention and control groups	n/a
Best (2010)	Habit reversal training with and without ACT	13 adolescents with tic disorders	15% female	No difference in EA between habit reversal training with and without ACT	partial eta squared = .05
Zettle (2003)	ACT versus systematic desensitization	24 college students	83% female	No difference in EA between ACT and systematic desensitization	n/a
Burrows (2013)	ACT	1 assault survivor (case study)	1 female participant, no males	Decreased EA from 1st session to final session; maintained at 8-month follow-up	n/a
Fledderus, Bohlmeijer, et al. (2012)	ACT (with or without extensive email contact)	376 participants with moderate (not severe) depressive symptoms	70% female	Decreased EA in intervention groups vs. control ACT without extensive email For ACT with extensive email	 *d* = .70 *d* = .63
Luoma et al. (2008)	ACT	88 adults in treatment for substance abuse; 48 completers	53% female	Decreased EA pre- to post. AAQ and AAQ-II used for EA For EA (AAQ) For EA (AAQ-II)	 *d* = .56 *d* = .84
Fledderus et al. (2010)	ACT (group format)	93 participants with some (but not severe) psychological distress	82% female	Decreased EA in intervention vs. control group; gains maintained Post-treatment Follow-up	 *d* = .51 *d* = .74
Weinrib (2011)	MBSR	106 adults	85% female	Decreased EA pre- to post-treatment (no control group)	Wilks' Λ = .45
Kearney et al. (2012)	MBSR	92 veterans	24% female	Decreased EA (no control group) from baseline to 2 months from baseline to 6 months	 *d* = .65 *d* = .68

Note. EA = experiential avoidance; MBSR = mindfulness-based stress reduction; ACT = acceptance and commitment therapy; AAQ = Acceptance and Action Questionnaire; n/a = no effect size available.

Conclusions and Limitations

Collectively, this review focused on the role of TEI, AS, and EA in self-reported stress responses. Empirically supported psychological methods to adjust suboptimal levels of these variables in normal populations were overviewed as well. Since summaries of our findings for each variable were included above, we now draw attention to four major conclusions that emerge from examination of this general literature.

First, the current literature generally supports the conclusion that self-reported stress reactivity is influenced by each of these dispositional variables, with emotional stress reaction decreasing as TEI, AS, and EA improve. Unfortunately, unresolved issues, particularly for TEI, complicate interpretation. Studies that operationalize TEI as a single total score report that higher levels predict decreased emotional stress reactivity. However, investigation into the facets of TEI may importantly refine this finding. Indeed, greater attention to feelings was recently shown to prospectively predict intensified emotional stress (Salguero et al., 2012), perhaps by aggravating a tendency to ruminate, exacerbating risk for depression (Salguero, Extrema, & Fernández-Berrocal, 2013). Notably, although EA is unidimensional (Fledderus, Oude Voshaar, ten Klooster, & Bohlmeijer, 2012), AS is also a multifaceted construct (physiological, mental, and social concerns; Naragon-Gainey, 2010) but is largely viewed as a single entity in stress investigations to date (but see Broman-Fulks & Storey, 2008). Thus, further research that delves into the facets of TEI and AS and subjective stress reactivity would be welcome. Overall, the current findings support the objective of targeting each of these dispositional variables to reduce emotional stress reactivity, as a number of researchers have done.

The second conclusion this literature review permits is that preliminary support currently exists for psycho-educational intervention of both TEI and AS but is lacking for EA. Indeed, unsuccessful findings have consistently occurred after use of the narrative writing task to target EA, and other psycho-educational methods have been under-investigated. Limited findings suggest behavioral interventions such as exposure may in fact reduce EA, but the paucity of studies and the specialized populations studied (e.g., adolescents with Tourette's syndrome; Best, 2010) indicate the need for more research. In contrast to EA, effective psycho-educational interventions for both TEI and AS abound. Nevertheless, a number of questions remain. In particular, data establishing the necessary and sufficient parameters of effective psycho-educational approaches to target TEI and AS are largely absent. Also scarce in the literature are studies directly comparing which approach works best and for whom. Further research using psycho-educational interventions will undoubtedly clarify matters.

Third, adequate evidence supports a specific type of mindfulness-based method, ACT, to target EA, while mindfulness-based methods investigations are just beginning for TEI and AS, with encouraging preliminary findings. Nevertheless, caution is warranted in generalizing from these early mindfulness findings for TEI and AS. Indeed, the only MBSR study targeting TEI of which we are aware lacked a control group (Cohen & Miller, 2009). Furthermore, although the MBSR intervention of AS was a true experimental design with successful results (Tanay et al., 2012), concerns have been raised about whether individuals with extremely high baseline AS will be able to remain in an MBSR program that by definition requires extensive focus on bodily sensations, precisely that which is feared by high AS individuals (Arch & Ayers, 2013). ACT interventions for high AS have thus been posited as a better mindfulness-based method option than MBSR (Wolitzky-Taylor et al., 2012). Empirical investigation will shed light on this and other important unresolved issues.

Fourth, although the early state of the literature does not permit a conclusion concerning which intervention is "best," arguably reasons exist to consider using mindfulness-based methods in particular to target these dispositional variables. Mindfulness-based methods are known to have a vast array of psychological and physiological benefits (for a review, see Chiesa & Serretti, 2009, 2010), and exciting evidence continues to accrue along these lines. For example, MBSR was recently shown to successfully reduce physiological reactivity to stress through pro-inflammatory down regulation of the transcription factor NF-kB (Creswell et al., 2012), with subsequent increases in gray matter and improvement of neural circuits in the brain across both genders (Goldin, Ramel, & Gross, 2009; Kerr, Sacchet, Lazar, Moore, & Jones, 2013). Mindfulness-based methods may improve numerous dispositional variables implicated in stress reactivity, in addition to their other beneficial effects (e.g., Tanay et al., 2012). That noted, using a specific psycho-educational technique to target a particular dispositional variable makes sense to achieve the other beneficial outcomes associated with improved levels of the dispositional variable, in addition to reduced stress reactivity. For example, increased TEI may improve workplace civility (Kirk et al., 2011). Likewise, suboptimal levels of EA and AS are empirically documented risk factors for psychopathology (for reviews, see Chawla & Ostafin, 2007; Naragon-Gainey, 2010, respectively).

Mindfulness-based methods have been less studied with regard to these dispositional variables than have psycho-educational methods. Consequently, there are numerous unanswered questions concerning the aspects of mindfulness-based methods that are both necessary and sufficient to include; dismantling studies will undoubtedly illuminate which components (e.g., mediation, included in MBSR but not ACT) affect dispositional variables. Continued investigation into brief and easily disseminated forms of mindfulness-based methods also seems warranted. ACT self-help (Fledderus, Bohlmeijer, et al., 2012) is an important step in this direction. Likewise, exciting new work suggests that MBSR is beneficial when administered through telehealth (Niles, Vujanovic, Silberbogen, Seligowski, & Potter, 2013) and also when less time commitment is required (e.g., one hour instead of three hour weekly meetings; Klatt, Buckworth, & Malarkey, 2009). Ongoing investigations will undoubtedly advance the understanding of easily disseminated forms of mindfulness-based methods.

Future research directions include whether there are gender or cultural differences influencing response to these interventions. Overall, studies to date have tended to include more women than men; for example, the only MBSR intervention to date that examined changes in TEI included only one male participant (Cohen & Miller, 2009). Similarly, many intervention studies discussed in this work focused on North American samples. Along those lines, all the psycho-educational interventions for AS reviewed above used North American samples. The extent to which these findings will generalize to other cultures is an empirical question warranting scrutiny.

This paper has strengths. It adds to the existing literature on dispositional variables and stress (for reviews, see Lecic-Tosevski et al., 2011; Wu et al., 2013) by discussing three other modifiable psychological factors influencing stress reactivity, TEI, AS, and EA, each of which is increasingly receiving attention in stress research. We delineated the health promotion techniques that improve TEI, AS, and EA, covering both psycho-education and mindfulness methods. Particular emphasis was placed on interventions that are applicable to the general population and easily disseminated. Throughout, we drew heavily on current literature and sought to provide thorough coverage of the relevant scholarly works.

Despite these strengths, this review has limitations. The dispositional variables and intervention methods covered each comprise their own specialized area of study, and we did not focus on distinctions these literatures make, for example, in the different models of TEI or in the practical and theoretical differences among adapted MBSR

approaches. Numerous other dispositional variables (e.g., objective ability EI, Davis & Humphrey, 2012) importantly influence stress responses and were not included in this review. Likewise, we covered a limited number of intervention techniques and did not consider other well-established approaches that have proven efficacy. In particular, mindfulness-based cognitive therapy (Segal, Williams, & Teasdale, 2002) is a potent program that greatly reduces the risk of relapse in those with three or more depressive episodes (Galante, Iribarren, & Pearce, 2013). We were unable to cover physiological components of the stress response and likewise omitted both the rich literature on traumatic stressors and the burgeoning research on how these dispositional variables may be modified in those with psychopathology. Some studies yielding null results may have been inadvertently excluded (e.g., the file drawer problem, Rosenthal, 1979). Finally, in emphasizing reduced stress reactivity, we did not discuss how minimal stress reactivity might in fact be suboptimal (e.g., Lovallo, 2011). Future research will help to illuminate the precise level of stress reactivity that most promotes maximal health benefits over the long-term.

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