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Review

The relationship between trait mindfulness and affective symptoms: A meta-analysis of the Five Facet Mindfulness Questionnaire (FFMQ)

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HIGHLIGHTS

- Higher trait mindfulness is associated with fewer negative affective symptoms.
- Relationships with symptoms vary across different mindfulness facets.
- Nonjudging and Acting with Awareness show the strongest correlations.
- Observing is not meaningfully correlated with symptoms in non-meditators.
- Relationships were mostly consistent across symptom type (e.g. anxiety, depression).

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ABSTRACT

Trait mindfulness appears to be related to lower levels of negative affective symptoms, but it remains uncertain which facets of mindfulness are most important in this relationship. Accordingly, the present meta-analysis examined studies reporting correlations between affective symptoms and trait mindfulness as assessed by the Five Facet Mindfulness Questionnaire. A comprehensive search yielded 148 eligible studies, comprising 157 distinct samples and 44,075 participants. The weighted mean correlation for affective symptoms and overall trait mindfulness was $r = -0.53$. Among mindfulness facets, *Nonjudge* ($r = -0.48$) and *Act with Awareness* ($r = -0.47$) demonstrated the largest correlations, followed by *Nonreact* ($r = -0.33$) and *Describe* ($r = -0.29$). *Observe* was not significantly correlated with affective symptoms. No significant differences in the strength of correlations were found between anxiety, depression and posttraumatic stress disorder (PTSD) symptoms, though symptoms of generalized anxiety disorder exhibited a weaker negative relationship with the *Describe* facet compared to PTSD symptoms. *Describe* also showed a stronger relationship with affective symptoms in Eastern samples compared to Western samples, whereas Western samples had a stronger relationship with *Nonjudge*. These results provide insight into the nature of the association between trait mindfulness and negative affect.

1. Introduction

A wealth of evidence now exists demonstrating that mindfulness-based interventions can improve mental health (Eberth & Sedlmeier, 2012; Hofmann, Sawyer, Witt, & Oh, 2010; Khoury et al., 2013). Relatedly, the link between dispositional or trait mindfulness and psychological health has received a growing amount of attention in the recent literature (Pallozzi, Wertheim, Paxton, & Ong, 2017; Rau & Williams, 2016; Tomlinson, Yousaf, Vittersø, & Jones, 2017). Trait mindfulness refers to an individual's characteristic tendency to maintain awareness of the present moment in a nonreactive and nonjudgmental manner. Trait mindfulness is distinct from state mindfulness, which describes the nonjudgmental present-focused awareness experienced in any given moment (Medvedev, Krägeloh, Narayanan, & Siegert, 2017), and from mindfulness practice, which involves deliberately engaging in mindful exercises to foster a state of mindfulness.

Numerous studies have shown that mindfulness practice is associated with increased trait mindfulness (Goldberg et al., 2016; Quaglia, Braun, Freeman, McDaniel, & Brown, 2016), which in turn is associated with reduced psychological distress (Alsubaie et al., 2017; Gu, Strauss, Bond, & Cavanagh, 2015). Accordingly, trait mindfulness represents an important construct in understanding the effects of mindfulness-based interventions on psychological health. Moreover, trait mindfulness can

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be conceptualized as both a psychological resilience factor (i.e. having it prevents the onset of psychopathology) and a risk factor (i.e. lacking it may increase susceptibility to psychopathology) (Thompson, Arnkoff, & Glass, 2011). Thus its relationship with mental health can also help inform our understanding of the components underlying the etiology and maintenance of psychological disorders.

Researchers theorize that trait mindfulness reduces psychological distress by helping individuals observe their negative thoughts and emotions in a decentered and less judgmental manner, thereby reducing emotional reactivity, experiential avoidance, and over-engagement with negative emotions (Hayes & Feldman, 2004). A substantial body of research has demonstrated positive associations between trait mindfulness and various indices of psychological health (Keng, Smoski, & Robins, 2011), including improved self-esteem (Randal, Pratt, & Bucci, 2015), lower levels of neuroticism (Hanley & Garland, 2017), reduced negative affect (Giluk, 2009), decreased substance abuse behaviors (Karyadi, VanderVeen, & Cyders, 2014), and differential activity in brain regions associated with emotion regulation (Wheeler, Arnkoff, & Glass, 2017). In fact, a recent systematic review by Tomlinson et al. (2017) identified over 100 studies, most of which were correlational, that found higher levels of trait mindfulness to be associated with fewer symptoms of psychopathology, maladaptive cognitive processes (e.g., rumination), and other factors related to negative emotionality (e.g., stress reactivity). However, no quantitative analysis across studies has been conducted on the relationship between trait mindfulness and psychological distress, leaving an important gap in the literature.

Another notable aspect of this research is that it commonly operationalizes trait mindfulness as a unitary construct, despite substantial theoretical and empirical support for the idea that mindfulness is multidimensional in nature (Baer, Smith, & Allen, 2004; Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006; Dimidjian & Linehan, 2003). For instance, most definitions of mindfulness describe it as both the extent to which one directs attention toward the present, as well as the manner in which one orients toward the present (Bishop et al., 2004; Shapiro, Carlson, Astin, & Freedman, 2006). Importantly, recent research suggests that different facets of mindfulness may have differential relationships with various psychological variables (e.g., Hanley & Garland, 2017). For example, although most aspects of mindfulness are associated with reduced psychological distress, the tendency to observe one's experience is often uncorrelated, or even positively correlated, with psychopathology (Brown, Bravo, Roos, & Pearson, 2015; Curtiss & Klemanski, 2014a; Rudkin, Medvedev, & Siegert, 2018). Consequently, it is important to examine relationships with psychological symptoms at the facet level to provide a more fine-grained perspective on the contribution trait mindfulness to mental health.

1.1. Study aims

The aims of the present study were threefold. First, we sought to conduct a meta-analysis on the association between trait mindfulness and negative affective symptoms, including anxiety, depression, and symptoms of related affective disorders (social anxiety disorder (SAD), posttraumatic stress disorder (PTSD), panic disorder, generalized anxiety disorder (GAD), and obsessive compulsive disorder (OCD)). Although a wide array of mental health difficulties have demonstrated associations with trait mindfulness, the present study focused on negative affective symptoms given that the disorders defined by such symptoms (e.g. depression and anxiety-related disorders) represent the most common forms of affective psychopathology (Kessler, Chiu, Demler, & Walters, 2005). Thus, such symptoms represent an important area for quantifying the relationship between trait mindfulness and psychological distress. Furthermore, a focus on negative affective symptoms across a wide array of disorders is justified by research that consistently shows a high degree of overlap across diagnostic categories, with negative affect being a core shared feature of depressive and anxiety-related disorders (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014; Brown, Chorpita, & Barlow, 1998; Rosellini, Boettcher, Brown, & Barlow, 2015; Watson, Clark, & Carey, 1988).

Our second aim was to quantify the relationship of affective symptoms with distinct facets of mindfulness, specifically those captured by the FFMQ. We focused on the FFMQ given that it is the most comprehensive and widely used assessment of mindfulness facets (Bergomi et al., 2013; Quaglia et al., 2016; Van Dam et al., 2018), and is also recommended based on validation of its psychometric properties in a wide array of sample types (Sauer et al., 2013). Furthermore, the FFMQ was derived through a factor analysis of items from five different mindfulness questionnaires, and thus represents an empirically based amalgamation of various overlapping conceptualizations of trait mindfulness. Facets of the FFMQ include the propensity to observe internal and external experiences (*Observe*), describe internal experiences with words (*Describe*), act with awareness of the present (*Act with Awareness*), take a nonjudgmental stance toward one's inner experiences (*Nonjudge*), and let one's thoughts and feelings go without focusing or elaborating on them (*Nonreactivity*; see Table 1 for sample items from each facet). Factor analyses of the FFMQ have consistently supported the instrument's hierarchical structure (Baer et al., 2006; Baer et al., 2008; Christopher et al., 2012; Gu et al., 2016; Williams et al., 2014), justifying the present investigation in to correlations with both individual mindfulness facets as well as an overall trait mindfulness factor.

The final aim of this study was to examine various sample and measurement characteristics as potential moderators of the relationship

Table 1
FFMQ facets and sample items.

Facet	Description of facet	Sample items
Observe	Noticing internal and external experiences	I pay attention to sensations, such as the wind in my hair or sun on my face. I pay attention to how my emotions affect my thoughts and behavior.
Describe	Labeling internal and external experiences with words	I'm good at finding the words to describe my feelings. I can easily put my beliefs, opinions, and expectations into words.
Act with awareness	Attending to one's activities in the moment as opposed to operating on “autopilot”	I rush through activities without being really attentive to them. (reverse scored) I find it difficult to stay focused on what's happening in the present. (reverse scored)
Nonjudge	Accepting and not evaluating one's thoughts and feelings	I think some of my emotions are bad or inappropriate and I shouldn't feel them. I make judgments about whether my thoughts are good or bad.
Nonreact	Allowing one's thoughts and feelings to come and go without becoming involved or carried away with them	I perceive my feelings and emotions without having to react to them. Usually when I have distressing thoughts or images, I just notice them and let them go.

between trait mindfulness and negative affective symptoms. For instance, relationships among affective symptoms and trait mindfulness have been shown to vary across symptom type, with some mindfulness facets exhibiting differential associations with depression as compared to anxiety (Cash & Whittingham, 2010; Curtiss & Klemanski, 2014b), and within different types of anxiety (Desrosiers, Klemanski, & Nolen-Hoeksema, 2013). Specifically, Curtiss and Klemanski (2014b) found that among anxious and depressed patients, lower *Nonreactivity* predicted greater symptoms of generalized anxiety disorder (GAD), whereas lower *Act with Awareness* predicted greater symptoms of depression. Accordingly, we explored the potential moderating effects of symptom type on the relationship between trait mindfulness and affective symptoms, as such an analysis could provide information about specific facets of mindfulness that are especially relevant for particular clinical presentations. Additionally, due to potential variation in correlations resulting from different symptom measures, we also examined measure used as a moderator within each type of symptom (e.g., within measures of depression).

This study also investigated a number of potential moderators related to sample characteristics. Given evidence that the structure and correlates of mindfulness facets can vary across different types of samples (Baer et al., 2006; Bravo, Pearson, & Kelley, 2018; Tran, Glück, & Nader, 2013), we examined the potential moderating effects of sample type, specifically comparing clinical, medical, unselected community, and unselected student samples. In addition, we compared samples with and without meditation experience, as the relationship between trait mindfulness and psychological health may be stronger in meditating samples compared to those with no meditation experience, particularly for the *Observe* facet (Baer et al., 2008). We also examined mean age of sample, percent of sample that was female, and mean FFMQ score (of facet or total score) as exploratory moderators related to sample characteristics.

Lastly, we considered the cultural background and language of the samples. The extant mindfulness literature is derived from a wide range of countries, and cultural and language differences may influence relationships of mindfulness and its facets with affective symptoms. The cultural background of the samples might be relevant because mindfulness has its roots in Eastern (Buddhist) philosophy, and the Western conceptualization of mindfulness that is captured by the FFMQ may be understood and experienced differently for individuals from Eastern cultures (Schmidt, 2011). Furthermore, well-established differences in self-concept across individualistic (Western) vs. collectivistic (Eastern) societies could influence the relationship between mindfulness and affective symptoms (Kitayama, Markus, Matsumoto, & Norasakkunkit, 1997). For example, some evidence suggests that nonjudgment is more strongly linked to positive psychological outcomes in Western samples, possibly because of the strong emphasis on the self within individualistic cultures (Raphiphatthana, Jose, & Chobthamkit, 2018). Closely related to differences in culture is the question of whether the language of the assessments influences mindfulness-symptom relationships. Given the number of languages represented among the studies in the meta-analysis and difficulties with interpretability of the large number of comparisons, we report results of language as a moderator in supplemental materials.

2. Methods

The protocol for this meta-analysis was registered with the International Prospective Register of Systematic Reviews (PROSPERO) (registration number CRD42017072413).

2.1. Selection of studies

To identify potentially eligible articles, we searched PsycINFO, PubMed, and Web of Science for studies that cited either of the initial studies validating the FFMQ (Baer et al., 2006; Baer et al., 2008). We also used the Tests and Measures (TM) field on PsycINFO to search for relevant FFMQ studies, entering the following search terms: (TM: five facet mindfulness questionnaire) AND (anx* OR depress* OR obsessive compulsive disorder OR posttraumatic stress disorder OR trauma OR ocd OR obsessi* OR compulsi*). The initial search was conducted on July 5, 2017, and was updated on April 13, 2018 and again on June 17, 2019.

Eligibility was assessed by the first through fourth authors and a team of independent trained assessors. Articles were initially scanned for preliminary eligibility based on sample type and the administration of relevant questionnaires. This was followed by a second more thorough review that examined whether the appropriate statistics necessary for correlational meta-analysis were reported. Studies were eligible for inclusion if they: 1) concurrently administered the FFMQ and a validated measure of affective symptoms (i.e. published evidence of reliability and validity), including anxiety, depression, and any anxiety-related disorders. This included measures of PTSD, and OCD, as the etiology and maintenance of PTSD and OCD symptoms share a high degree of overlap with DSM-5 anxiety disorders despite no longer being classified as such (Stein et al., 2010; Zoellner, Rothbaum, & Feeny, 2011); 2) reported a Pearson's correlation coefficient (r) for the relationship of symptom scores with total and/or subscale FFMQ scores, 3) consisted of a sample $\geq$ 18 years of age (though several studies with university students that included 17 year olds were deemed eligible if the mean age of the sample was at least 18).

Articles were excluded if they reported only partial correlations, as covariates would not be consistent across studies. In addition, articles reporting Spearman's correlations were excluded, as the metric for such a correlation is not comparable to a Pearson's correlation. If studies had overlapping samples, we chose the study with the largest sample size for inclusion. We allowed for alternate versions of the FFMQ (e.g., the 24-item short form; Bohlmeijer, ten Klooster, Fledderus, Veehof, & Baer, 2011) provided they demonstrated adequate psychometric properties (e.g., internal consistency, convergent validity with the standard 39-item FFMQ). However, a number of studies eliminated one of the five facets when calculating Total FFMQ scores, in which case we did not include the full scale correlation in our analysis. With regard to symptom measures, we excluded measures that assessed anxiety- and depression-related processes such as rumination, stress, or state affect, but were not explicit measures of affective symptoms.

2.2. Data extraction

Data for each study were extracted on two separate occasions by independent raters (JKC, KC, AFG, and LCC) and compared to ensure accuracy, with discrepancies jointly resolved by the raters, and in consultation with the first author (JKC) when necessary. Data extracted for effect size calculations included correlations of affective symptom measures with total and/or subscale FFMQ scores, sample size, and internal consistency of included measures (Cronbach's α). If internal consistency was not reported, we identified a study that reported internal consistency for the same measure in a sample that was as closely matched as possible to the sample being used (see supplementary material for additional information about criteria used to find a matching sample, as well as the specific matching samples used). Additional information extracted included mean raw FFMQ score (total and/or subscale), percent female, language of measures, and the country where the study was conducted. For studies that did not use the 39-item version of the FFMQ, we did not extract mean FFMQ, as total scores would not be comparable across measures.

We categorized symptom type for each effect size based on whether the measure used assessed depression, general symptoms of anxiety (i.e., not assessing a specific anxiety disorder), or symptoms of a specific a clinical disorder. We also categorized sample types according to the following categories: unselected student, unselected community, clinical, medical, meditator, and other. Because of the limited number of

studies that administered diagnostic interviews to assess the presence of clinical disorders, we used broad criteria for designation of a clinical sample, which included studies that used cutoff scores on self-reported symptom measures indicating clinical severity, disorders in remission (e.g., depression, anorexia), and clinically relevant behavior (e.g., recent suicide attempt). If studies included participants from multiple categories of sample type and did not report statistics for each group separately, we contacted the researchers to obtain this data. If we were not able to get access to the data, samples were designated as 'other'.

2.3. Statistical analysis

Analyses were conducted using Comprehensive Meta-Analysis version 3.0 (Borenstein, Hedges, Higgins, & Rothstein, 2014). Because of the skewed distribution of the correlation coefficient, Fisher's Z transformation (Hedges & Olkin, 1985) was applied to all correlations prior to calculating weighted mean effect sizes. Results were then transformed back to Pearson's *r* for reporting purposes. Study weights were based on sample size, or more precisely the inverse variance weight, equal to the sample size minus 3 (Borenstein et al., 2014).

Also prior to calculating weighted mean effect sizes, we corrected for measurement error of the scales used for each correlation, as such error systematically reduces the size of the correlation (Hunter & Schmidt, 2004). To make this correction, we used the following formula: $r' = \frac{r}{\sqrt{(\alpha_{symptom\ measure})(\alpha_{FFMQ})}}$, in which *r'* is the corrected correlation coefficient, *r* is the reported correlation, and $\alpha_{\text{symptom measure}}$ and α_{FFMQ} correspond to Cronbach's α (i.e. internal consistency) for the respective measures (Hunter & Schmidt, 2004). Because such a correction also increases the corresponding sampling error of the estimate, the following correction of study weights (i.e. the inverse variance weight) was also applied: $w' = w(\alpha_{symptom\ \ measure})(\alpha_{FFMQ})$, in which *w'* is the corrected inverse variance weight and *w* is the initially calculated inverse variance weight.

Weighted mean correlations were calculated for the relationship between affective symptoms (i.e. all eligible measures) and Total FFMQ scores, as well as the five FFMQ subscales (facets). We used the convention proposed by Cohen (1988) to describe small ($r = 0.10$), medium ($r = 0.30$) and large ($r = 0.50$) effect sizes. For studies that included multiple symptom measures, an average within-sample effect size was created so as to not violate assumptions of meta-analysis about the independence of effect sizes. If a study divided participants from a single sample in to multiple subsamples for reporting purposes (e.g., individuals with and without meditation experience; Feliu-Soler et al., 2016), a single weighted mean effect size was created for the study. If data were collected on two clearly distinct samples using different recruitment methods (e.g., undergraduates receiving course credit and patrons of a meditation center recruited via listserv; de Bruin, Topper, Muskens, Bögels, & Kamphuis, 2012), or multiple studies were reported in a single manuscript, separate effect sizes were used from each sample.

We examined the potential influence of publication bias by inspecting asymmetry in the funnel plot, which shows effect size estimates as a function of their precision. Egger's regression intercept was used as a formal test of funnel plot asymmetry (Egger, Smith, Schneider, & Minder, 1997). In addition, we used the Trim and Fill method (Duval & Tweedie, 2000), which estimates the number of studies that would have to be removed from the funnel plot to make it symmetrical, and then imputes an estimated effect size that accounts for funnel plot asymmetry.

Heterogeneity in weighted mean effect sizes was examined using the I^2 statistic, which represents the portion of observed variation that can be attributed to the actual difference between studies, rather than to random error. Guidelines for I^2 suggest that 25, 50, and 75% values represent low, moderate, and high heterogeneity, respectively (Higgins, Thompson, Deeks, & Altman, 2003). A random effects model was used for all analyses regardless of statistical heterogeneity given the variability within sample characteristics and symptom measures used.

Moderator analyses were conducted using the between-group heterogeneity statistic (Q_B) recommended by Hedges and Olkin (1985) for categorical moderators. Moderators investigated included sample type, culture (Eastern vs. Western), meditation experience, symptom measure type, and symptom measure used (within each symptom type). For the analysis of symptom type, we relaxed assumptions of independence and allowed a single study to contribute effect sizes to multiple subgroups in order to maintain power. Although this can inflate the standard error of combined effect sizes, it leads to a more conservative test of significance, thereby providing additional protection against Type 1 error (Borenstein et al., 2014). Following prior meta-analytic research (Broomhall, Phillips, Hine, & Loi, 2017), the test of each categorical moderator variable included only those subgroups with at least 3 effects sizes. Meta-regression analyses were used for the evaluation of continuous moderators (mean FFMQ, mean age, percent female), with predictors entered in to the regression model simultaneously. For facets with multiple significant moderators (categorical or continuous) related to sample characteristics, we also used meta regression to test a model with all significant moderators entered, which served as a more stringent test of moderation.

To correct for susceptibility to Type 1 error resulting from the large numbers of tests of moderation performed, we controlled for the false discovery rate (FDR), which is the portion of significant tests estimated to be false positives (Benjamini & Hochberg, 1995). Controlling for the FDR adjusts the statistical significance threshold by incorporating the distribution of all *p*-values produced by a family of tests, thereby providing more power and specificity to the actual data being analyzed than methods such as the Bonferroni procedure (Glickman, Rao, & Schultz, 2014). An FDR of 5% was used for moderator analyses in the present study.

3. Results

3.1. Study flow and characteristics

The number of studies identified by our search and the reasons for exclusion can be seen in Fig. 1. We identified 148 eligible studies, which consisted of 157 distinct samples comprising 44,075 participants. This included 46 unselected student samples, 27 unselected community samples, 22 clinical samples, 18 medical samples, and 44 samples designated as 'other'. Only five studies reported data on samples in which all participants had meditation experience. The mean sample age across studies was 34.11 years ($SD = 12.43$), and the mean percent female was 62.69 ($SD = 22.34$). One hundred thirty-three samples were from Western cultures, with the United States being the most represented country ($k = 67$), and 15 samples were from Eastern cultures (China: $k = 10$; Japan: $k = 4$; India: $k = 1$). One-hundred three of the 157 samples completed study instruments in English, with the most common other languages being Chinese ($k = 10$), Dutch ($k = 8$), Spanish ($k = 8$), and Norwegian ($k = 6$). See Appendix A for a table of characteristics of each sample included in the analyses.

3.2. Correlations between affective symptoms and trait mindfulness

The main aim of this meta-analysis was to estimate the magnitude of the relationship between affective symptoms and overall trait mindfulness as well as the five facets of mindfulness measured by the FFMQ. Table 2 displays the meta-analytic findings. Across 91 distinct samples, the correlation of negative affective symptoms with Total FFMQ score was $r = -0.53$ ($p < 0.001$, 95% CI = −0.50 to −0.56), indicating that greater levels of trait mindfulness were associated with lower levels of affective symptomatology.

Four of the five FFMQ subscales were significantly negatively correlated with affective symptoms: *Act with Awareness* ($r = -0.47$, 95%

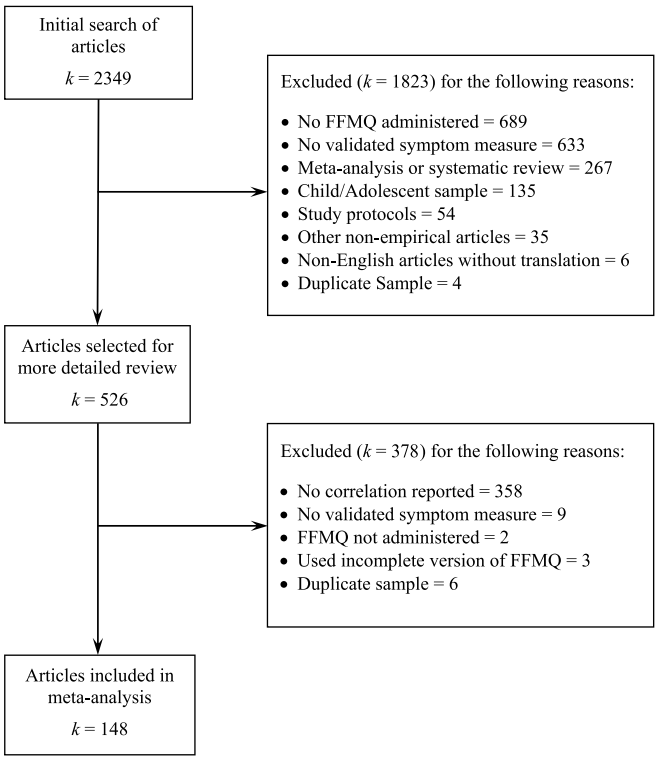

Fig. 1. Flowchart of study inclusion and exclusion.

CI = −0.44 to −0.49, $p < 0.001$) and *Nonjudge* ($r = -0.48$, 95% CI = −0.45 to −0.51, $p < 0.001$) demonstrated correlations in the large range, while *Nonreact* ($r = -0.33$, 95% CI = −0.30 to −0.37, $p < 0.001$) and *Describe* ($r = -0.29$, 95% CI = −0.27 to −0.32, $p < .001$) demonstrated correlations in the medium range. The *Observe* facet was not significantly correlated with affective symptoms ($r = 0.01$, 95% CI = −0.02 to 0.05, $p = 0.46$).

3.3. Publication bias

Egger's regression intercepts were non-significant ($p > 0.05$) for correlations with Total FFMQ scores and all facets except for *Nonreact* and *Observe*, indicating symmetry in the funnel plot (see Table 2). For the *Nonreact* (Intercept = −1.52, $p = 0.023$) and *Observe* (Intercept = −1.14, $p = 0.040$) facets, Egger's regression intercepts were significant, indicating possible publication bias, but the Trim and Fill method did not determine that any studies would need to be trimmed in order to make their funnel plots symmetrical. Despite a non-significant Egger's regression intercept value, the Trim and Fill method suggested that 18 studies would have to be trimmed from the left side of the mean (i.e., stronger negative effect size) for the *Describe* scale to make the plot symmetrical. Number of studies trimmed, adjusted effect sizes and confidence intervals are listed in Table 2.

3.4. Moderator analyses

Large amounts of heterogeneity between studies were found for correlations with the FFMQ total scale and the various facets (see Table 2). The following moderator analyses were conducted in order to determine potential sources of this heterogeneity. Given the large number of comparisons, an FDR of 5% was used to control employed to reduce family-wise error. The adjusted threshold for significance was determined to be $p < 0.02$. We describe significant moderation effects in the sections below, and complete results of each moderation test can be seen in Tables 3–5.

3.4.1. Symptom type

Symptom type was analyzed as a moderator to examine differential relationships between trait mindfulness and symptoms of depression and anxiety, as well as GAD, PTSD and SAD symptoms, which were the only three disorders with sufficient studies to examine as a separate subgroup. Correlations across symptom types and mindfulness facets, along with tests of moderation are shown in Table 3. A significant difference across symptom type was found for the *Observe* facet ($Q(4) = 13.77$, $p = 0.008$), with follow-up analyses indicating that *Observe* had a significantly more positive correlation with SAD symptoms ($r = 0.14$, 95% CI = 0.06 to 0.22) compared to depression symptoms ($r = -0.02$, 95% CI = −0.06 to 0.02; $Q(1) = 12.25$, $p < 0.001$). There was also a significant difference across symptom type for the *Describe* facet ($Q(4) = 21.11$, $p < 0.001$). Follow-up analyses showed that correlations between the *Describe* facet and GAD symptoms ($r = -0.21$, 95% CI = −0.18 to −0.24) were significantly weaker compared to *Describe* and depression symptoms ($r = -0.32$, 95% CI = −0.28 to −0.35; $Q(1) = 18.98$, $p < 0.001$). Finally, the relationship between the *Nonreact* facet and affective symptoms was also significantly moderated by symptom type. Specifically, *Nonreact* showed a significantly weaker relationship with SAD symptoms ($r = -0.14$, 95% CI = −0.01 to −0.26) compared to depression symptoms ($r = -0.33$, 95% CI = −0.29 to −0.37; $Q(1) = 9.85$, $p = 0.002$), GAD symptoms ($r = -0.42$, 95% CI = −0.31 to −0.51; $Q(1) = 11.92$, $p < 0.001$), and anxiety symptoms ($r = -0.31$, 95% CI = −0.25 to −0.36; $Q(1) = 6.56$, $p = 0.01$).

3.4.2. Symptom measure

Within each symptom type, we examined whether correlations varied as a result of the specific symptom measure used (see Table 4). Only anxiety, depression and GAD measures had a sufficient number of correlations across different measures to test moderation. Neither depression measure type or GAD measure type significantly moderated the association between FFMQ scores and symptoms. Anxiety symptom measure, however, significantly moderated correlations between anxiety symptoms and the Total FFMQ ($Q(4) = 23.30$, $p < 0.001$), the

Table 2
Correlations of FFMQ scales with affective symptoms, and tests of publication bias.

FFMQ scale	*k*	*r*	95% CI	I^2	Egger's regression		Trim and fill analysis		
					Intercept	95% CI	Studies trimmed	Adjusted r	Adjusted 95% CI
Total FFMQ	91	−0.53***	−0.50 to −0.56	83.43	−0.80	−1.95 to 0.34	0	NA	NA
Observe	100	0.01	−0.02 to 0.05	84.81	−1.15	−2.24 to −0.05*	0	NA	NA
Describe	100	−0.29***	−0.27 to −0.32	78.66	−0.36	−1.34 to 0.61	18	−0.25	−0.22 to −0.28
Act w/awareness	104	−0.47***	−0.45 to −0.49	82.52	−0.10	−1.13 to 0.93	0	NA	NA
Nonjudge	105	−0.48***	−0.45 to −0.51	87.84	−0.39	−1.61 to 0.83	0	NA	NA
Nonreact	105	−0.33***	−0.30 to −0.37	89.79	−1.51	−2.81 to −0.21*	0	NA	NA

* $p < 0.05$.
*** $p < 0.001$.

Table 3
Correlations between FFMQ scales and symptom types, as well as tests of moderation.

Symptom type	Total FFMQ		Observe		Describe		Act w/awareness		Nonjudge		Nonreact	
	r	*k*	*r*	*k*	*r*	*k*	*r*	*k*	*r*	*k*	*r*	*k*
Depression	−0.54**	77	−0.02	79	−0.32**	79	−0.48**	82	−0.48**	83	−0.33**	82
Anxiety	−0.53**	45	0.05*	46	−0.26**	44	−0.48**	46	−0.49**	47	−0.31**	46
GAD	−0.48**	12	0.05	14	−0.21**	14	−0.40**	15	−0.48**	15	−0.42**	17
PTSD	−0.42**	12	0.02	13	−0.30**	13	−0.51**	13	−0.48**	13	−0.25**	14
SAD	–	–	0.14**	4	−0.32**	4	−0.41**	4	−0.47**	4	−0.14*	4
Q_B ($df = 4$[a])	8.39*, [b]		13.77**		20.70**		8.36		0.13		14.56*	

GAD = generalized anxiety disorder; PTSD = post-traumatic stress disorder; SAD = social anxiety disorder; Symptoms of obsessive compulsive disorder and panic disorder not included as there were not sufficient studies to conduct meta-analysis.

* $p < 0.05$.

** $p < 0.01$.

[a] *df* for Total FFMQ is 3.

[b] Did not fall below threshold for significance determined by use of the False Discovery Rate.

Table 4
Correlations of FFMQ scales with anxiety, depression and GAD measures, as well as tests of moderation.

Moderator	Total FFMQ		Observe		Describe		Act w/awareness		Nonjudge		Nonreact	
	r	*k*	*r*	*k*	*r*	*k*	*r*	*k*	*r*	*k*	*r*	*k*
Anxiety measure												
BAI	−0.35**	4	–	–	–	–	–	–	–	–	–	–
BSI-A	–	–	0.07	5	−0.10	4	−0.41**	4	−0.46**	4	−0.39**	4
DASS-A	−0.46**	18	0.11	15	−0.30**	15	−0.46**	15	−0.51**	15	−0.25**	15
HADS-A	−0.63**	4	−0.06	8	−0.26**	8	−0.56**	8	−0.51**	8	−0.37**	8
SCL-90-A	−0.46**	3	0.21**	3	−0.25	3	−0.45**	3	−0.42**	3	−0.19*	3
STAI-T	−0.71**	9	−0.07	7	−0.35**	6	−0.54**	7	−0.55**	8	−0.55**	8
Q_B ($df = 4$)	23.30**		18.69**		4.36		6.24		2.49		13.93**	
Depression measure												
BDI	−0.49**	19	−0.01	20	−0.26**	20	−0.49**	22	−0.48**	22	−0.35**	21
BSI-D	–	–	−0.02	5	−0.33**	4	−0.47**	4	−0.55**	4	−0.42**	4
CES-D	−0.55**	16	−0.02	18	−0.33**	19	−0.46**	19	−0.44**	20	−0.30**	19
DASS-D	−0.50**	17	−0.01	15	−0.34**	16	−0.50**	16	−0.51**	15	−0.33**	16
HADS-D	−0.63**	4	−0.16	6	−0.38**	6	−0.52**	6	−0.40**	6	−0.37**	6
PHQ-9	−0.61**	6	0.01	4	−0.32**	5	−0.54**	5	−0.45**	5	−0.38**	6
SCL-90-D	−0.50**	5	0.15**	4	−0.27**	4	−0.47**	4	−0.49**	4	−0.25**	4
Q_B ($df = 6$[a])	9.10		12.25		9.31		2.92		5.49		5.12	
GAD measure												
GAD-7	−0.39**	3	0.17	3	−0.22**	4	−0.50**	4	−0.51**	4	−0.39**	5
PSWQ	−0.51**	9	0.02	11	−0.21**	10	−0.37**	11	−0.47**	11	−0.43**	12
Q_B ($df = 1$)	4.73*, [b]		1.05		0.09		4.77*, [b]		0.13		0.10	

BAI = Beck Anxiety Inventory; BSI-A = Brief Symptom Inventory – Anxiety subscale; DASS-A = Depression Anxiety and Stress Scale – Anxiety subscale; HADS-A = Hospital Anxiety and Depression Scale – Anxiety subscale; SCL-90-A = Symptom Checklist 90 – Anxiety subscale; STAI-T = Stait-Trait Anxiety Inventory – Trait subscale; BDI = Beck Depression Inventory; BSI-D = Brief Symptom Inventory – Depression subscale; CES-D = Center for Epidemiological Studies – Depression measure; DASS-D = Depression Anxiety and Stress Scale – Depression subscale; HADS-D = Hospital Anxiety and Depression Scale – Depression subscale; PHQ-9 = Patient Health Questionnaire-9; SCL-90-D = Symptom Checklist 90 – Depression subscale; GAD-7 = Generalized Anxiety Disorder – 7 item scale; PSWQ = Penn State Worry Questionnaire.

* $p < 0.05$.

** $p < 0.01$; categories with no data reported had fewer than 3 studies, so were not included in moderator analyses.

[a] *df* for Depression Measure Type as a moderator of Total FFMQ-Depression correlations is 5.

[b] Did not fall below threshold for significance determined by use of the False Discovery Rate.

Nonreact facet ($Q(4) = 13{,}93$, $p = 0.002$), and the *Observe* facet ($Q(4) = 18.69$, $p < 0.001$).

Specifically, Total FFMQ scores demonstrated stronger correlations with anxiety symptoms among studies utilizing the State-Trait Anxiety Inventory-Trait scale (STAI-T; $r = -0.71$, 95% CI = −0.55 to −0.82) compared to those using the anxiety scale of the Depression Anxiety Stress Scales (DASS-A; $r = -0.46$, 95% CI = −0.40 to −0.51; $Q(1) = 6.16$, $p = 0.01$), the Beck Anxiety Inventory (BAI; $r = -0.34$, 95% CI = −0.26 to −0.43, $Q(1) = 8.10$, $p = 0.004$), and the Symptom Checklist-90, anxiety subscale (SCL-90-A; $r = -0.46$, 95% CI = −0.36 to −0.54, $Q(1) = 7.32$, $p = 0.007$). The anxiety subscale of the Hospital Anxiety Depression Scale (HADS-A) also showed a significantly stronger relationship with Total FFMQ scores ($r = 0.63$, 95% CI = −0.51 to −0.72) when compared to the BAI ($Q(1) = 13.14$, $p < 0.001$) and the DASS-A ($Q(1) = 6.16$, $p = 0.01$).

Studies using the STAI-T also showed a significantly stronger negative correlation with *Nonreact* ($r = -0.54$, 95% CI = −0.35 to −0.69) than those using the DASS-A ($r = -0.25$, 95% CI = −0.15 to −0.34; $Q(1) = 6.90$, $p = 0.009$) and the SCL-90-A ($r = -0.19$, 95% CI = −0.01 to −0.35; $Q(1) = 7.41$, $p = 0.007$). Finally, on the *Observe* facet correlations with anxiety symptoms among studies using the STAI-T ($r = -0.07$, 95% CI = −0.21 to 0.06; $Q(1) = 9.90$, $p = 0.002$) and the HADS-A ($r = -0.06$, 95% CI = −0.15 to −0.06; $Q(1) = 13.61$, $p < 0.001$) were significantly differently compared to the SCL-90-A

Table 5
Correlations of FFMQ scales with affective symptoms across sample type, language and culture, as well as tests of moderation.

Moderator	Total FFMQ		Observe		Describe		Act w/awareness		Nonjudge		Nonreact	
	r	*k*	*r*	*k*	*r*	*k*	*r*	*k*	*r*	*k*	*r*	*k*
Sample type												
Clinical	−0.51**	10	−0.06*	16	−0.26**	17	−0.43**	17	−0.39**	17	−0.34**	18
Community	−0.52**	16	0.02	21	−0.30**	19	−0.49**	21	−0.48**	20	−0.34**	21
Medical	−0.62**	10	−0.06	11	−0.41**	12	−0.55**	11	−0.55**	11	−0.30*	11
Student	−0.51**	27	0.10**	30	−0.26**	31	−0.44**	33	−0.49**	34	−0.31**	32
Q_B (*df* = 3)	3.73		23.52**		12.62**		6.54		24.73**		0.71	
Culture												
Western	−0.53**	78	0.01	89	−0.28**	89	−0.47**	93	−0.49**	94	−0.34**	94
Eastern	−0.55**	13	0.01	11	−0.40**	11	−0.51**	11	−0.32**	11	−0.26**	11
Q_B (*df* = 1)	0.14		0.01		14.58**		3.52		16.01**		1.22	
Meditation experience												
Yes	−0.67**	4	−0.25**	4	−0.32**	4	−0.46**	4	−0.55**	4	−0.56**	4
No[a]	−0.51**	41	0.07**	50	−0.27**	49	−0.51**	53	−0.49**	53	−0.32**	52
Q_B (*df* = 1)	3.58		10.60**		0.27		2.88		4.35*, [b]		4.75*, [b]	

* $p < 0.05$.
** $p < .01$; categories with no data reported had fewer than 3 studies, so were not included in moderator analyses.
[a] Only unselected community and student samples were included in group with no meditation experience, as those were the populations that samples with meditation experience were drawn from.
[b] Did not fall below threshold for significance determined by use of the False Discovery Rate.

($r = 0.21$, 95% CI = 0.01 to 0.32). Correlations with *Observe* among HADS-A and DASS-A ($r = 0.11$, 95% CI = 0.02 to 0.20) were also significantly different from one another ($Q(1) = 6.99$, $p = 0.008$).

3.4.3. Sample type

Aggregated correlations for student, community, clinical and medical samples, as well as tests of moderation are presented in Table 5. Sample type was a significant moderator of the relationship between affective symptoms and the *Observe* ($Q(3) = 23.52$, $p < 0.001$), Describe ($Q(3) = 12.62$, $p = 0.006$) and *Nonjudge* facets, ($Q(3) = 24.73$, $p < 0.001$). Specifically, *Observe* showed a significantly different relationship with affective symptoms in student samples ($r = 0.10$, 95% CI = 0.06 to 0.15) compared to clinical samples ($r = -0.06$, 95% CI = −0.12 to 0.00; $Q(1) = 20.28$, $p < 0.001$) and medical samples ($r = -0.06$, 95% CI = −0.16 to 0.05; $Q(1) = 7.68$, $p = 0.006$). *Describe* showed a significantly stronger inverse relationship among medical samples ($r = -0.41$, 95% CI = −0.33 to −0.48) compared to student samples ($r = -0.26$, 95% CI = −0.21 to −0.30; $Q(1) = 11.68$, $p < 0.001$) as well as clinical samples ($r = -0.26$, 95% CI = −0.21 to −0.31; $Q(1) = 9.67$, $p = 0.002$). Finally, *Nonjudge* showed a weaker relationship with affective symptoms for clinical samples ($r = -0.38$, 95% CI = −0.34 to −0.43) compared to medical samples ($r = -0.55$, 95% CI = −0.48 to −0.61; $Q(1) = 16.32$, $p < 0.001$), community samples ($r = 0.48$, 95% CI = −0.43 to −0.53; $Q(1) = 7.86$, $p = 0.005$), and student samples ($r = -0.49$, 95% CI = −0.46 to −0.52; $Q(1) = 16.29$, $p < 0.001$).

3.4.4. Culture and language

Aggregated correlations for Western and Eastern samples, along with tests of moderation, are presented in Table 5. Correlations for both the *Describe* ($Q(1) = 14.58$, $p \leq 0.001$, and the *Nonjudge* facets ($Q(1) = 16.01$, $p < 0.001$) were significantly moderated by culture. *Describe* showed a stronger relationship with affective symptoms in Eastern samples ($r = -0.40$, 95% CI = −0.35 to −0.45) than Western samples ($r = -0.28$, 95% CI = −0.25 to −0.31). *Nonjudge*, on the other hand, showed a stronger relationship with Western samples ($r = -0.49$, 95% CI = −0.46 to −0.52) compared to Eastern samples ($r = -0.32$, 95% CI = −0.24 to −0.40). Language of the measures also significantly moderated the relationship of affective symptoms with the *Describe* and *Nonjudge* facets, as well as *Act with Awareness*. Results can be seen in the supplementary materials.

3.4.5. Meditation experience

Because all samples with meditation experience consisted of either students or community members (as opposed to clinical or medical patients), meditation experience was examined as a moderator only among student and community samples. Results showed that samples with meditation experience exhibited a negative correlation between affective symptoms and the *Observe* facet ($r = -0.25$, 95% CI = −0.07 to −0.42), which was significantly different from the positive correlation seen in samples without meditation experience ($r = 0.07$, 95% CI = 0.03 to 0.11; $Q(1) = 10.60$, $p < 0.001$). Meditation experience did not significantly moderate relationships with any other facet or FFMQ total scores, though nearly all correlations were numerically larger among samples with meditation experience relative to those without (see Table 5).

3.4.6. Age, sex, and mean FFMQ

When simultaneously testing the three continuous moderators (sample age, percent female, and mean FFMQ), age significantly impacted the relationship of affective symptoms with *Observe* ($B = -0.005$, $p = 0.016$). The direction of this effect indicates that increasing sample age was associated with a weaker positive relationship with *Observe*. Age was not a significant moderator for *Act with Awareness* ($B = -0.004$, $p = 0.09$), *Describe* ($B = -0.004$, $p = 0.032$), *Nonjudge* ($B = 0.0001$, $p = 0.97$), *Nonreact* ($B = -0.0005$, $p = 0.84$) or Total FFMQ ($B = 0.001$, $p = 0.57$). Sex approached but not did not reach significance as a moderator of the *Describe* facet ($B = 0.02$, $p = 0.059$), with the direction of the effect indicating a trend toward weaker negative correlations between *Describe* scores and affective symptoms among more female samples. Sex distribution did not significantly moderate total mindfulness scores or any other FFMQ facets (p's > 0.32), nor did mean FFMQ (p's > 0.15).

3.4.7. Follow-up analyses

For the facets demonstrating multiple significant moderators (*Nonjudge, Describe* and *Observe*), we conducted a meta-regression to examine whether moderators for each facet remained significant when tested simultaneously. For categorical moderators, we created a dichotomous variable for each group that demonstrated significant differences from other groups in order to more precisely test whether such a difference would hold while controlling for other moderators.

For the *Nonjudge* facet, sample type (driven by lower correlations among clinical samples) and culture were significant moderators of the correlation with affective symptoms when tested independently. When tested together, clinical status ($B = 0.14$, $p = 0.003$) and culture ($B = 0.23$, $p < 0.001$) both remained significant moderators. For the *Observe* facet, age, meditation experience, and sample type (driven by larger correlations with student samples) were significant moderators. When tested simultaneously, meditation experience approached significance ($B = -0.19$, $p = 0.045$), whereas age ($B = 0.003$, $p = 0.22$) and student status ($B = 0.076$, $p = 0.24$) were not significant. When tested independently, however, both student status ($B = 0.13$, $p < 0.001$) and age ($B = -0.006$, $p < 0.001$) were significant predictors beyond the effect of meditation experience, reflecting that the non-significant results for age and student status in the initial model were likely a result of the high correlation between the two variables ($r_{pb} = 0.69$, $p < 0.001$). Lastly, for the *Describe* facet, sample type (driven by medical samples), and culture were significant moderators of the correlation with affective symptoms. When tested together, culture ($B = 0.17$, $p < 0.001$) and medical status ($B = -0.16$, $p > 0.001$) both remained significant.

4. Discussion

The present study is the first meta-analysis to examine the relationship between trait mindfulness and negative affective symptoms. Results showed a large negative relationship between affective symptoms and overall trait mindfulness as measured by the FFMQ, providing strong evidence that the propensity toward being mindful is associated with lower symptoms of anxiety, depression, and related psychological disorders. Similarly, these results also indicate that the propensity toward mindlessness (e.g. reacting judgmentally, running on 'autopilot') is associated with higher levels of negative affective symptoms. As such, the results of this study are important in understanding both the risk and resilience factors that contribute to the etiology, maintenance and treatment of affective psychopathology.

Importantly, the size of this relationship between trait mindfulness and affective symptoms varied substantially across mindfulness facets, demonstrating the importance of assessing trait mindfulness multi-dimensionally. Specifically, the *Nonjudge* and *Act with Awareness* facets exhibited large negative correlations with affective symptoms, the *Describe* and *Nonreact* facets exhibited medium-sized correlations, and the *Observe* facet was not correlated with affective symptoms. Although some significant moderators emerged, the overall pattern of results largely held across different symptom types, symptom measures, sample types, cultures, and languages.

The finding that nonjudgment and acting with awareness are the components of a mindful disposition most strongly correlated with lower affective symptoms is consistent with a number of findings in the literature. For one, several studies have shown that *Nonjudge*, and to a lesser extent *Act with Awareness*, have the strongest impact on symptoms of anxiety and depression when controlling for other mindfulness facets (Baer et al., 2006; Barcaccia et al., 2019; Petrocchi & Ottaviani, 2016; Soysa & Wilcomb, 2015). In addition, meta-analyses on the relationship between trait mindfulness and other variables related to psychological health, specifically substance use behaviors (Karyadi et al., 2014) and neuroticism (Hanley & Garland, 2017), similarly found that *Nonjudge* and *Act with Awareness* (as well as *Nonreact*) demonstrated the strongest correlations with the outcomes being investigated. Finally, nonjudgment in particular demonstrates substantial overlap with the concept of self-compassion (Neff & Dahm, 2015), which has been shown to be strongly associated with lower levels of psychopathology (Macbeth & Gumley, 2012). In conjunction with such findings, the results of the present study suggest that nonjudgment and acting with awareness may be particularly important in understanding the relationship between trait mindfulness and negative affectivity. Future research should consider these constructs as beneficial targets for treatment of affective symptoms, and for evaluating the mechanisms of mindfulness-based interventions.

4.1. Moderators of trait mindfulness and symptom relationships

In contrast to the other facets of trait mindfulness, the *Observe* facet was not associated with affective symptoms when analyzing across all samples included in this study, and even showed a small positive correlation among student samples. This relationship was moderated by meditation experience, however, such that there was an inverse relationship between *Observe* and affective symptoms among samples who had been exposed to meditation practice. This finding is consistent with prior research (Baer et al., 2006; de Bruin et al., 2012), and provides further evidence that the *Observe* facet of the FFMQ does not assess aspects of observant attention that are beneficial among non-meditators. In fact, research on mindfulness facets and suicidality indicates that high levels of the *Observe* facet of the FFMQ may even increase the risk of suicidal ideation and behavior (Cheng, Banks, Bartlett, San Miguel, & Vujanovic, 2018; Stanley et al., 2019). Such findings may result from the fact that many of the items in the *Observe* facet focus on observation of external stimuli and bodily sensations without any qualifications of the manner in which those observations are made. As such, attending to these phenomena may not foster reduced psychological distress without additional skills or capacities such as those developed through meditation (Desrosiers et al., 2013; Lindsay & Creswell, 2017). Indeed, recent research indicates that observing in a way that leads to greater emotional awareness appears to be predictive of lower psychological symptoms in both meditators and non-meditators (Rudkin et al., 2018).

Notably, all FFMQ facets and the total score exhibited larger correlations with affective symptoms in samples with meditation experience, even though this difference only reached significance for *Observe*, possibly because of the small number of samples with meditation experience. It may be that the propensity for mindfulness is associated with more psychological benefits among those with experience in mindfulness practice. Alternatively, certain characteristics of those drawn to meditation practice may lead to a stronger relationship between trait mindfulness and affective symptoms. More research investigating the mechanisms by which meditation experience impacts the relationship between trait mindfulness and psychological distress is needed.

For the *Observe* facet, age and sample type also emerged as significant moderators over and above the effects of meditation experience. The direction of this effect suggests greater *Observe* scores to be associated with more affective symptoms among younger samples and student samples, whereas there is no such association among older and non-student samples. Similar to the relationship with *Observe* seen in non-meditators, observing among younger student samples may not be as adaptive if paired with lower levels of nonjudgment and non-reactivity to inner experiences (Curtiss, Klemanski, Andrews, Ito, & Hofmann, 2017; Eisenlohr-Moul, Walsh, Charnigo Jr, Lynam, & Baer, 2012; Lindsay & Creswell, 2017). Older adults typically report higher levels of trait mindfulness, inclusive of the *Nonjudge* and *Nonreact* facets (Frank, Nara, Zavagnin, Touron, & Kane, 2015; Prakash, Hussain, & Schirda, 2015), and appear more driven to regulate emotions (Kryla-Lighthall & Mather, 2009). Accordingly, they may be less likely to respond maladaptively to observed experiences, reflected by a lack of positive association with affective symptoms. It should be noted, however, that it is unclear based on the data in this study whether it is in fact age or differences in student samples that are driving differential relationships with the *Observe* facet, particularly given the high degree of overlap between such characteristics. Future research in to age-related differences in the relationship between mindfulness facets and mental health is warranted, including in adolescent samples, which the present meta-analysis did not include.

The size of aggregated correlations with trait mindfulness in this

study was largely consistent across symptom domains. One exception to this was in the *Describe* facet which had a weaker inverse relationship with symptoms of GAD compared to symptoms of depression. This may be related to the fact that a core symptom of GAD is worry, which is a verbal-linguistic process characterized by repetitive negative thoughts about future events (Borkovec & Inz, 1990). The propensity to describe external and internal experiences, then, may be less helpful if it also is related to articulating concerns about possible negative outcomes for the future. Consistent with the notion, prior research has shown that the *Describe* facet does not significantly predict worry over and above other mindfulness facets, and that high and low worriers show no difference in their scores on the *Describe* facet (Fisak & Von Lehe, 2012).

Social anxiety symptoms also showed some differences in relationship to mindfulness facets compared to other affective symptoms, specifically exhibiting a weaker negative association with the *Nonreact* facet and a stronger positive association with *Observe.* With regard to the latter finding, it may be that a propensity toward observing is particularly related to the heightened self-focused attention that characterizes social anxiety (Hofmann, 2007), which in is related to greater social anxiety symptoms. Given the small number of studies assessing SAD symptoms in this meta-analysis ($k = 4$), however, findings should be viewed as only preliminary.

For the *Nonjudge* facet, weaker relationships with affective symptoms were seen in clinical samples and samples from Eastern cultures. The smaller correlations in clinical samples relative to medical, community and students samples could be due to a more restricted range of symptom severity. Alternatively, among individuals with more psychological distress, nonjudgment may be less protective against affective symptoms due to the presence of a wider variety of other vulnerability factors or emotion regulation deficits influencing symptom severity. With regard to differences in Eastern samples, findings may be related to the relative importance of nonjudgment in collectivistic Eastern societies compared to individualistic Western societies. Self-criticism has been shown to be more prevalent, but less harmful, within collectivistic cultures due to the emphasis on improving oneself in order to better serve the collective whole (Kitayama et al., 1997). Judgment of one's thoughts and feelings, then, may be less strongly associated with anxiety and depression in Eastern cultures because it is a more normative behavior that can help one fit in with and contribute to a larger group. Individuals from Western societies, on the other hand, may experience more negative affect in response to critical self-judgments given the importance of an independent sense of self-worth for overall well-being.

In contrast to *Nonjudge*, the *Describe* facet exhibited a stronger relationship with affective symptoms in Eastern samples, which is notable given evidence that mean levels of *Describe* are lower in Eastern relative to Western samples (Raphiphatthana et al., 2018; Sugiura, Sato, Ito, & Murakami, 2012). This finding is consistent with research in Eastern samples demonstrating *Describe* to be a relatively strong predictor of negative affect even when controlling for other mindfulness facets (Hou, Wong, Lo, Mak, & Ma, 2014; Mandal, Arya, & Pandey, 2012), a pattern not typically seen in Western samples (Baer et al., 2006; Barcaccia et al., 2019; Cash & Whittingham, 2010). *Describe* was also more strongly associated with affective symptoms in medical samples. It may be that describing and labeling one's emotions in the context of physical illness may be particularly helpful for distinguishing between physical and mental health symptoms, thereby promoting more adaptive acknowledgment and regulation of negative affect.

A final moderator that emerged in this study was the symptom measure used to assess anxiety. Although no differences were seen across measures of depression and GAD symptoms, among anxiety questionnaires, the STAI-T and in some cases the HADS-A exhibited a more strongly negative relationship with Total FFMQ, *Nonreact* and the *Describe* facets compared to other anxiety measures, whereas the SCL-90-A showed differences in the opposite direction. Future researchers should be aware of such differences when selecting questionnaires to examine relationships between trait mindfulness and symptoms of anxiety.

4.2. Clinical implications

A number of clinical implications can be taken from the results of this meta-analysis. For one, assessing trait mindfulness both multi-dimensionally and as an overarching construct may be a fruitful element of case conceptualization and treatment planning. Overall levels of trait mindfulness can serve as a meaningful indicator of the severity of affective symptomology, and particular attention should be directed toward the tendency to judge one's thoughts and feelings (i.e. low *Nonjudge* scores) and to run on 'autopilot' instead of deliberately attending to the present moment (i.e. low *Act with Awareness* scores). In addition, high levels of trait mindfulness may also represent a strength or resilience factor that could be leveraged in treatment. For instance, preliminary evidence suggests that prioritizing interventions that match patients' individual strengths such as dispositional mindfulness can be advantageous (Sauer-Zavala, Cassiello-Robbins, Ametaj, Wilner, & Pagan, 2018). Low levels of trait mindfulness, on the other hand, may be important to identify among non-clinical populations as a risk factor for the development of affective disorders, and for individuals completing treatment could be an indicator of vulnerability to relapse (Michalak, Heidenreich, Meibert, & Schulte, 2008a).

Another implication related to case conceptualization and treatment planning is that the relevance of trait mindfulness and its facets to a patient's affective symptoms can be influenced by a number of individual characteristics. For instance, the propensity to describe internal and external experiences may function differently among individuals who experience significant symptoms of generalized anxiety disorder (e.g. worry), whereas the impact of observing such experiences may be influenced by exposure to meditation practice. In addition, nonjudgment may be a less important component of affective symptoms for individuals from Eastern backgrounds relative to their Western counterparts, whereas the tendency to describe internal and external experiences may be of greater significance. Although the influence of these factors is by no means definitive, it important for clinicians to consider such characteristics when attending to trait mindfulness as a component of an individual's psychopathology.

4.3. Limitations

The findings of this meta-analysis should be considered in light of several limitations. First, the correlational nature of the data analyzed in this study precludes any conclusions about a causal relationship between high trait mindfulness and reduced affective symptoms. Additionally, this meta-analysis cannot rule out the possibility that the correlations seen in this research are specific to trait mindfulness rather than a host of possible third variables (e.g., factors related to emotion regulation capacity or personality). However, a number of longitudinal and treatment studies have shown that trait mindfulness predicts lower future levels of affective symptoms (Call, Pitcock, & Pyne, 2015; Ford, Lam, John, & Mauss, 2017; Gu et al., 2016; Michalak, Heidenreich, Meibert, & Schulte, 2008b; Petrocchi & Ottaviani, 2016), and cross-sectional and longitudinal research has demonstrated that trait mindfulness remains a significant predictor of symptoms when controlling for related variables such as self-compassion (Soysa & Wilcomb, 2015), rumination (Ford et al., 2017; Petrocchi & Ottaviani, 2016), worry (Barcaccia et al., 2019) and reappraisal (Ford et al., 2017).

A second limitation of the present research is that there was some evidence for publication bias within results for the *Observe, Describe,* and *Nonreact* facets. This indicates that effect sizes could be inflated due to under-reporting of non-significant results. However, the adjusted effect sizes using the Trim and Fill method for *Describe* was minimally smaller than unadjusted effects, and the lack of consistency between the two assessments of publication bias further suggests that any bias was

not particularly strong. Furthermore, most studies reported the data used in this meta-analysis as part of a large table of significant and non-significant correlations, and the significance of correlations was rarely a primary outcome for the study. Consequently, the non-publication of significant results (i.e. the "file drawer problem") is less likely to be an issue than for meta-analyses examining the efficacy of an intervention.

Another important consideration for the results of this study is that they were based exclusively on trait mindfulness and its facets as measured by the FFMQ. Numerous other assessments of trait mindfulness exist (see Sauer et al., 2013 for a review), and although a strength of the FFMQ is that its items were empirically derived from numerous other mindfulness measures, it is not necessarily reflective of all conceptualizations of mindfulness. For example, recent factor analytic research on the FFMQ in conjunction with several other mindfulness measures has suggested that, in addition to poor fit of the *Observe* facet, a distinct *Acceptance* facet significantly loads onto the underlying mindfulness construct (Siegling & Petrides, 2016). A final limitation is that the moderator analyses in this study were exploratory in nature, and many were based on a limited number of samples. Accordingly, moderator findings should be considered preliminary, and future research should conduct more controlled examinations of the moderator effects found in this study. Future research would also benefit from further investigation of the relationship between trait mindfulness and symptoms of OCD and panic disorder, as only two studies examining OCD one study examining panic disorder symptoms were eligible for the present meta-analysis.

4.4. Conclusion

In spite of these limitations, the results of this meta-analysis provide strong evidence of a robust relationship between trait mindfulness and lower levels of affective symptoms. Importantly, this relationship varies substantially across mindfulness facets, with nonjudgment of internal experiences and acting with awareness of the present moment exhibiting particularly strong correlations. The propensity to describe and not react to thoughts and feelings appears moderately associated with lower affective symptoms, whereas observing internal and external experiences does not show a meaningful relationship, at least among non-meditating samples. These results highlight the importance of assessing mindfulness as a multi-faceted construct, and suggest that nonjudgement and acting with awareness might be particularly fruitful targets for reducing symptoms of psychological distress. However, more longitudinal and mechanistic research is needed in order to isolate the specific effect of trait mindfulness on affective psychopathology and confirm the hypothesized direction of these effects.

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Contributors

Author JKC, KCC and AFG conceptualized the idea for this research and developed the methodological approach. Authors JKC, KC, AFG and LCC conducted the literature search and completed data extraction. Author JKC ran the analyses and wrote the first draft of the manuscript, with contributions and editing from KC, AFG and LCC. Author SGH provided guidance on major methodological and conceptual decisions and provided critical revision of the manuscript. All authors have contributed to and approved the final manuscript.

Declaration of Competing Interest

All other authors declare they have no conflicts of interest.

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Appendix A

Table A.1
Study characteristics.

Study (1st author, yr)	Sample type	N	% Female	Mean age	Country	Language	FFMQ version	General anxiety	Depression	GAD	SAD	PTSD
An, 2018	Other (male prisoners)	40	0	41.2	China	Chinese	39-item	SCL-90-anx	SCL-90-dep	–	–	–
Baker, 2019a	Medical	115	68	48.3	USA	English	39-item	–	SOSI-D	–	–	–
Baker, 2019b	Clinical	140	73	33.4	USA	English	39-item	–	BDI	PSWQ	–	–
Barcaccia, 2019	Community	274	71	34.5	Italy	Italian	39-item	STAI-T	BDI	–	–	–
Barnes, 2010	Student	144	69	19.0	USA	English	39-item	–	BDI-II	–	–	–
Barnhofer, 2011	Community	144	60	43.0	UK	English	39-item	–	BDI-II	–	–	–
Baroni, 2016	Community	119	19	29.0	Italy	Italian	39-item	HADS-T[5]	–	–	–	–
Bogusch, 2016	Student	283	87	20.4	USA	English	24-item	STICSA	–	–	–	–
Bohlmeijer, 2011	Clinical	364	70	42.5	Netherlands	Dutch	39-item	HADS-A	CES-D	–	–	–
Bonamo, 2015	Student	136	100	19.5	USA	English	39-item	STAI-T	CES-D	–	–	–
Boughner, 2016	Other (trauma-exposed community)	1031	55	35.4	North America	English	24-item	–	–	–	–	PCL-5
Bowen, 2017	Clinical	286	28	38.5	USA	English	39-item	–	–	–	–	PCL
Bowlin, 2012	Student	280	68	19.1	USA	English	39-item	DASS-A	DASS-D	–	–	–
Boyle, 2017	Medical	71	100	47.0	USA	English	39-item	–	CES-D	–	–	–
Bravo, 2016	Student (meditators)	200	69	22.8	USA	English	39-item	–	CES-D	PSWQ	–	–
	Student (non-meditators)	481	66	22.3	USA	English	39-item	–	CES-D	PSWQ	–	–

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Table A.1 (*continued*)

Study (1st author, yr)	Sample type	N	% Female	Mean age	Country	Language	FFMQ version	General anxiety	Depression	GAD	SAD	PTSD
Bravo, 2018	Student	310	41	24.5	USA	English	39-item	KAS	CES-D 10-item	–	–	–
	Military	407	45	32.7	USA	English	39-item	KAS	CES-D 10-item	–	–	–
Brown, 2015	Student	944	64	–	USA	English	39-item	–	CES-D	PSWQ	–	–
Brown-Iannuzzi, 2014	Community	605	60	40.9	USA	English	39-item	–	BDI	–	–	–
Buitron, 2017	Student	218	78	20.8	USA	English	39-item	–	CES-D	–	–	–
Burzler, 2019	Community	1133	54	37.7	Austria	German	other[a]	BSI-A	BSI-D	–	–	–
Caluyong, 2015	Medical	74	39	63.4	Canada	English	39-item	–	BDI-II	–	–	–
Cashwell, 2010	Student	339	71	22.5	USA	English	39-item	TAQ	CES-D	–	–	–
Cebolla, 2012	Combined (students, community, clinical)	462	50	27.4	Spain	Spanish	39-item	BSI-A	BSI – Dep	–	–	–
Chen, 2018	Student	443	54	20.7	China	Chinese	39-item	DASS-A	DASS-D	–	–	–
Cheng, 2018	Clinical	119	43	33.3	USA	English	39-item	–	–	–	–	PCL-5
Cheung, 2018	Other (emerging adults)	333	72	20.0	China	Chinese	39-item	–	CES-D	–	–	–
Christopher, 2012	Community	349	75	32.4	USA	English	39-item	–	CES-D	–	–	–
Clerkin, 2017	Clinical	105	43	43.1	USA	English	39-item	–	–	–	LSAS	–
Cohen, 2017	Meditators	195	68	47.6	USA	English	39-item	STAI-T	BDI-II	–	–	–
Consedine, 2014	Community	121	67	47.0	Australia	English	39-item	HADS-A	HADS-D	–	–	–
Corman, 2019	Community	156	62	42.8	France	French	39-item	HADS-A	HADS-D	–	–	–
Corthorn, 2016	Other (mothers of preschoolers)	62	100	36.0	Chile	Spanish	39-item	DASS-A	DASS-D	–	–	–
Cosme, 2015	Community	51	49	25.0	Sweden	English	39-item	STAI-T	BDI	–	–	–
Costa, 2016	Medical	55	80	55.3	Portugal	Portuegese	39-item	–	DASS-D	–	–	–
Cowdrey, 2012	Community	228	83	24.0	UK	English	39-item	–	PHQ-9	GAD-7	–	–
	Clinical	42	0	24.0	UK	English	39-item	–	PHQ-9	GAD-7	–	–
Crane, 2010	Clinical	31	68	42.3	UK	English	39-item	–	BDI-II	–	–	–
Curtiss, 2017	Community	1667	55	42.4	Japan	Japanese	39-item	–	PHQ-9	GAD-7	–	–
Day, 2015	Student	214	89	18.7	USA	English	39-item	–	–	PSWQ	–	–
de Bruin, 2012	Student (meditators)	288	55	53.1	Netherlands	Dutch	39-item	–	–	PSWQ	–	–
	Student (non-meditators)	451	74	20.7	Netherlands	Dutch	39-item	–	–	PSWQ	–	–
Deng, 2011	Student	244	75	20.6	China	Chinese	39-item	STAI-T	BDI	–	–	–
Desrosiers, 2013	Clinical	184	65	38.0	USA	English	39-item	MASQ	MASQ; BDI-II	PSWQ	–	–
Didonna, 2012	Student	305	60	20.9	Italy	Italian	39-item	SCL-90-anx	SCL-90-dep	PSWQ	–	–
Drake, 2016	Student	73	77	20.3	USA	English	39-item	STAI-T	–	–	–	–
Dundas, 2013a	Student	264	75	21.5	Norway	Norwegian	39-item	–	BDI-II	–	–	–
Dundas, 2013b	Student	264	75	21.5	Norway	Norwegian	39-item	–	SCL-90 dep	–	–	–
Dundas, 2017	Student	158	85	25.0	Norway	Norwegian	39-item	STAI-T	MDI	–	–	–
English, 2018	Other (range of emotional maltreatment)	126	100	19.0	Canada	English	39-item	DASS-A	–	–	–	–
Erisman, 2012	Student	410	60	23.6	USA	English	39-item	DASS-A	DASS-D	–	–	–
Feliu-Soler, 2016	Community (meditators)	355	57	44.0	Spain	Spanish	39-item	DASS-A	DASS-D	–	–	–
	Community (non-meditators)	270	72	37.9	Spain	Spanish	39-item	DASS-A	DASS-D	–	–	–
Fisak, 2012	Student	400	69	21.7	USA	English	39-item	–	–	PSWQ	–	–
Fisak, 2019	Student	1324	63	20.1	USA	English	24-item	YBOCS-SR*	–	–	–	–
Fledderus, 2012	Clinical	372	70	42.5	Netherlands	Dutch	39-item	HADS-A	CES-D	–	–	–
Freudenthaler, 2017	Community	853	53	34.6	Austria	German	other[a]	BSI-A	BSI-D	–	–	–
Frostadottir, 2019	Other (residential rehab patients)	57	88	51.0	Iceland	Icelandic	39-item	DASS-A	DASS-D	–	–	–
Garland, 2013	Clinical	125	8	38.7	USA	English	39-item	–	–	–	–	PCL-C
Gilbert, 2012	Student	185	83	28.0	UK	English	39-item	DASS-A	DASS-D	–	–	–
Gonzalez, 2016	Medical	137	15	48.9	USA	English	39-item	–	–	–	–	PDS
Graham, 2013	Student	57	74	28.9	USA	English	39-item	DASS-A	–	–	–	–
Gu, 2016	Clinical	238	71	49.2	UK	English	39-item	–	BDI-II	–	–	–
Gustavson, 2018	Student	233	58	19.2	USA	English	39-item	BAI	BDI	PSWQ	–	–
Hagen, 2016	Other (tsunami survivors)	25	64	48.0	Norway	Norwegian	39-item	–	–	–	–	IES
Hamill, 2015	Student	467	77	21.0	USA	English	39-item	DASS-A	DASS-D	–	–	–
Hawley, 2017	Clinical	170	57	33.6	Canada	English	39-item	YBOCS*	PDSS	PSWQ	SPS	–
Heeren, 2011	Community	214	61	35.4	Belgium	French	39-item	STAI-T	BDI-II	–	–	–
Hicks, 2018	Other (expectant parents)	102	50	27.7	USA	English	39-item	–	EPDS	–	–	–
Hoge, 2013	Clinical	87	51	39.4	USA	English	39-item	STAI-T	–	PSWQ	–	–
	Other (high stress adults)	49	65	38.7	USA	English	39-item	STAI-T	–	PSWQ	–	–
Hoppener, 2018	Community	414	67	39.0	Netherlands	Dutch	39-item	–	CES-D	–	–	–
Hou, 2014	Community	230	77	49.1	China	Chinese	39-item	STAI-T	CES-D	–	–	–
Jain, 2019	Other (dementia caregivers)	23	91	60.0	USA	English	39-item	–	QIDS-SR	–	–	–
Jensen, 2018	Medical	165	57	53.2	USA	English	15-item	–	CES-D	–	–	–
Jones, 2015	Other (caregivers of cancer patients)	68	67	65.3	Australia	English	39-item	DASS-A	DASS-D	–	–	–
Jury, 2019	Community	552	58	36.0	New Zealand	English	39-item	–	BDI	–	–	–

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Table A.1 (*continued*)

Study (1st author, yr)	Sample type	N	% Female	Mean age	Country	Language	FFMQ version	General anxiety	Depression	GAD	SAD	PTSD
Kalill, 2014	Other (trauma-exposed students)	157	77	26.0	USA	English	39-item	–	–	–	–	PCL
Kantrowitz-Gordon, 2018	Other (pregnant women)	857	100	–	USA	English	39-item	PPA*	EPDS	–	–	–
Kearney, 2013	Clinical	42	58	53.6	USA	English	39-item	–	PROMIS	–	–	PSS-I
Khan, 2018	Other (mothers of infants)	89	100	27.0	USA	English	39-item	BAI	CES-D	–	–	–
Ko, 2018	Student	41	66	19.8	USA	English	39-item	STAI-T	CES-D	–	–	–
Kögler, 2015	Other (caregivers of palliative care pts)	130	71	54.3	Germany	German	other[b]	BSI-A	BSI-D	–	–	–
Kraemer, 2015	Student	56	70	19.5	USA	English	39-item	IDAS-Panic*	–	–	–	–
Kraemer, 2018	Medical	61	62	34.7	USA	English	39-item	DASS-A	CES-D	–	–	–
Kuhl, 2017	Other (trauma-exposed students)	536	54	–	USA	English	24-item	–	–	–	–	PCL
Lau, 2018	Community	364	59	37.8	China	Chinese	39-item	DASS-A	DASS-D	–	–	–
Laurent, 2013	Student	200	50	21.2	USA	English	39-item	BAI	CES-D	–	–	–
Lavender, 2011	Student	276	100	20.3	USA	English	39-item	DASS-A	DASS-D	–	–	–
LeBeau, 2018	Medical	30	10	54.9	USA	English	39-item	–	PHQ-9	–	–	–
Lee, 2017	Medical	80	76	60.3	USA	English	39-item	–	BDI-II	–	–	–
Lee, 2019	Community	186	61	38.3	Hong Kong	Chinese	39-item	DASS-A	DASS-D	–	–	–
Levin, 2014	Clinical	844	56	39.3	USA	English	39-item	SADS	CGI-S dep	–	–	–
Linares, 2016	Community	505	76	26.7	Spain	Spanish	39-item	–	CES-D	–	–	–
Lu, 2019	Other (nurses)	500	92	27.7	China	Chinese	39-item	ZSAS	CES-D	–	–	–
MacKenzie, 2017	Clinical	137	54	34.4	Canada	English	39-item	–	–	–	SIAS, SPIN	–
Maisel, 2016	Combined (autism and community)	151	23	33.3	U.K. & U.S.A.	English	39-item[c]	STAI-T	–	PSWQ	–	–
Mandal, 2012	Student	100	48	23.5	India	Hindi	39-item	SCL-90 anx	SCL-90 dep	–	–	–
Martin, 2018	Clinical	152	42	33.9	USA	English	39-item	–	–	–	–	PCL-5
Medvedev, 2018	Community	200	75	38.1	New Zealand	English	39-item	DASS-A	DASS-D	–	–	–
Medvedev, 2018	Student	200	75	38.1	New Zealand	English	39-item	DASS-A	DASS-D	–	–	–
Mioduszewski, 2018	Medical	52	75	47.0	Canada	English	other[d]	–	PHQ-9	GAD-7	–	–
Miyata, 2015	Community	100	76	44.4	Japan	Japanese	39-item	–	BDI	–	–	–
	Meditators	66	76	44.4	Japan	Japanese	39-item	–	BDI	–	–	–
Montgomery, 2016	Medical	120	70	45.9	UK	English	39-item	HADS-A	HADS-D	–	–	–
Moskowitz, 2015	Medical	175	3	40.8	USA	English	39-item[c]	–	BDI	–	–	–
Murphy, 2013	Community	43	72	38.4	U.K.	English	39-item[c]	–	BDI-II	–	–	–
Nakajima, 2018	Student	348	31	19.2	Japan	Japenese	39-item	CES-D	CES-D	–	–	–
Nassif, 2018	Other (post-deployment military)	627	0	0	USA	English	39-item	–	PHQ-9	–	–	PCL
Nigol, 2019	Medical	190	83	49.5	Australia	English	39-item	–	DASS-D	–	–	–
Onate, 2018	Other (caregiver of relative)	264	85	48.1	Spain	Spanish	24-item	HADS-A	HADS-D	–	–	–
Pagnini, 2018	Medical	150	64	42.8	Italy	Italian	39-item	HADS-A	HADS-D	–	–	–
Parsons, 2017	Student	235	71	18.8	USA	English	39-item	–	–	–	SIAS, SPS	–
Pickard, 2016	Student	148	74	21.3	Australia	English	39-item	–	DASS-D	–	–	–
Pleman, 2019	Medical	177	93	52.0	USA	English	39-item	HADS-A	HADS-D	–	–	–
Poulin, 2016	Medical	76	76	56.5	Canada	English	39-item	–	PHQ-9	–	–	–
Pow, 2017	Other (mental health counselors)	235	67	58.0	USA	English	39-item	–	–	–	–	IES-R
Pratscher, 2018	Student	520	60	19.3	USA	English	39-item	DASS-A	DASS-D	–	–	–
Querstret, 2018	Community	127	80	40.7	UK	English	24-item	–	PHQ-9	GAD-7	–	–
Ramadas, 2018	Clinical	63	44	32.8	Portugal	Portugese	39-item	BDI	BDI	–	–	–
Raphiphatthana, 2016	Student	228	75	–	New Zealand	English	32-item	BAI[e]	CES-D[f]	–	–	–
Riley, 2018	Other (mothers)	723	100	35.1	Australia	English	24-item	CES-D	CES-D	–	–	–
Rudkin, 2018	Community	219	70	41.9	New Zealand	English	39-item[c]	BAI, STAI-T	–	PSWQ	–	–
Sairanen, 2018	Other (parents of ill children)	75	81	42.6	Sweden	Swedish	39-item	DASS-A	DASS-D	–	–	–
Sanders, 2010	Clinical	60	80	36.5	UK	English	39-item	–	BDI	–	–	–
Schirda, 2015	Medical	95	83	44.0	USA	English	39-item	–	BDI-II	–	–	–
Schmidt, 2015	Student	399	41	19.9	Chile	Spanish	39-item	DASS-A	DASS-D	–	–	–
Schoorl, 2015	Clinical	101	85	41.3	Netherlands	Dutch	39-item[c]	–	BDI-II	–	–	SRIP
Scott-Hamilton, 2016	Other (athletes)	12	17	33.6	Australia	English	39-item	SAS-2*	–	–	–	–
Shearer, 2016	Student	43	57	–	USA	English	39-item	–	BDI-II	–	–	–
Shepherd, 2016	Other (university employees, students)	94	66	20.8	USA	English	39-item[c]	–	QIDS-SR	–	–	–
Shipherd, 2018	Other (military)	1524	9	28.5	USA	English	39-item	–	–	–	–	PCL
Short, 2013	Student	213	83	25.0	Canada	English	39-item	DASS-A	–	PSWQ	–	–
Short, 2016	Student	77	71	21.2	Canada	English	39-item	DASS-A	DASS-D	–	–	–
Slonim, 2015	Student	207	67	21.8	Australia	English	39-item	DASS-A	DASS-D	–	–	–
Solem, 2015	Community	224	67	31.8	Norway	Norwegian	39-item	–	PHQ-9	GAD-7	–	–
Spears, 2015	Other (smokers)	199	37	38.7	USA	Spanish	39-item	–	CES-D	–	–	

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Table A.1 (*continued*)

Study (1st author, yr)	Sample type	N	% Female	Mean age	Country	Language	FFMQ version	General anxiety	Depression	GAD	SAD	PTSD
Stanley, 2019	Other (firefighters)	831	6	38.4	USA	English	39-item	–	–	–	–	PCL-5
Stephenson, 2017	Clinical	113	20	52.4	USA	English	39-item	–	PHQ-9	–	–	PCL
Struk, 2017	Student	2592	73	20.2	Canada	English	39-item[c]	DASS-A	DASS-D	–	–	–
Sugiura, 2012	Student	110	58	19.3	Japan	Japanese	39-item	–	BDI-II	–	–	–
Svendsen, 2017	Student	277	56	22.9	Norway	Norwegian	39-item	–	SCL-90 dep	–	–	–
Tellez, 2015	Other (dental patients)	120	54	39.1	USA	English	24-item	MDAS*	–	–	–	–
Tomfohr, 2015	Community	130	56	21.7	USA	English	39-item	–	CES-D	–	–	–
Tran, 2013	Community	506	54	36.1	Austria	German	39-item	BSI-A	BSI-D	–	–	–
	Student	164	54	22.9	Austria	German	39-item	BSI-A	BSI-D	–	–	–
Truijens, 2016	Other (pregnant women)	905	100	30.2	Netherlands	Dutch	15-item	–	EDS	–	–	–
Veehof, 2011	Medical	141	93	43.1	Netherlands	Dutch	39-item	HADS-A	HADS-D	–	–	–
Watson-Singleton, 2018	Clinical	283	52	37.2	USA	English	20-item	–	BDI-II	–	–	–
Webb, 2019	Clinical	134	48	34.0	USA	English	24-item	–	PHQ-9	GAD-7	–	–
Weiner, 2016	Other (hospital staff and students)	117	59	0.0	France	French	39-item	–	BDI-SF	–	–	–
Weisman de Mamani, 2018	Other (dementia caregivers)	106	81	50.7	USA	English	39-item	BAI	BDI	–	–	–
Woodrruff, 2014	Student	147	71	–	USA	English	39-item	BAI	BDI-SF	–	–	–
Xu, 2016	Other (long-term male prisoners)	40	0	41.3	China	Chinese	39-item	ZSAS	SDS	–	–	–
Zapolski, 2018	Student	388	62	20.6	USA	English	39-item	DASS-A	DASS-D	–	–	–
Zhuang, 2017	Student	158	64	19.7	China	Chinese	39-item	–	BDI	–	–	–

General Anxiety Measures: BAI = Beck Anxiety Inventory; BSI-A = Brief Symptom Inventory-Anxiety; DASS-A = Depression Anxiety Stress Scale-Anxiety; HADS-A = Hospital Anxiety and Depression Scale-Anxiety; HADS-T = Hospital Anxiety and Depression Scale-Total; KAS = Kremen Anxiety Scale; MASQ = Mood and Anxiety Symptom Questionnaire; SADS = Social Avoidance and Distress Scale; SCL-90-Anx = Symptom Checklist-90-Anxiety; STAI-T = State-Trait Anxiety Inventory-Trait scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; TAQ = Trimodal Anxiety Questionnaire; ZSAS = Zung Self-Rating Anxiety Scale.

Depression Measures: BDI = Beck Depression Inventory; BDI-SF = Beck Depression Inventory-Short Form; BDI-II = Beck Depression Inventory II; BSI-D = Brief Symptom Inventory-Depression; CES-D = Center for Epidemiologic Studies- Depression; CES-D 10-item = Center for Epidemiologic Studies- Depression-10-item; CGI-S dep = clinical Global Impression-Severity for depression; DASS-D = Depression Anxiety Stress Scale-Depression; EDS = Edinburgh Depression Scale; EPDS = Edinburgh Postpartum Depression Scale; HADS-D = Hospital Anxiety and Depression Scale-Depression; MASQ = Mood and Anxiety Symptom Questionnaire; MDI = Major Depression Inventory; PHQ-9 = Patient Health Questionnaire-9; QIDS-SR = Quick Inventory of Depressive Symptomatology-Self-Report; SCL-90-dep = Symptom Checklist-90-Depression; SDS = Zung Self-Rating Depression Scale; SOSI-D = Symptoms of Stress Inventory-Depression.

GAD Measures: GAD-7 = Generalized Anxiety Disorder-7; PSWQ = Penn State Worry Questionnaire.

SAD Measures: LSAS = Liebowitz Social Anxiety Scale; SIAS = Social Interaction Anxiety Scale; SPIN = Social Phobia Inventory; SPS = Social Phobia Scale.

PTSD Measures: IES-R = Impact of Event Scale-Revised; PCL = Post-Traumatic Stress Disorder Checklist; PCL-C = Post-Traumatic Stress Disorder Checklist-Clinician Version; PDS = Post-Traumatic Stress Diagnostic Scale; PROMIS = NIH-sponsored Patient Reported Outcomes Measurement Information System; PSS-I = PTSD Symptom Scale Interview; SRIP = Self-Rating Inventory for Post-Traumatic Stress Disorder.

* Other Anxiety Measures (not analyzed as a 'General Anxiety' measure): IDAS-Panic = Inventory of Depression and Anxiety Symptom-Panic; MDAS = Modified Dental Anxiety Scale; PPA = Prenatal Pregnancy Anxiety Scale; SAS-2 = Sport Anxiety Scale; YBOCS-SR = Yale-Brown Obsessive Compulsive Scale-Self Report.

[a] Used the 4 items with the best psychometric properties for each facet, but all 7 nonreact items.

[b] Used 3 items with highest factor loadings on facet.

[c] Used only select subscales from the 39-item FFMQ.

[d] FFMQ type is unspecified; 5 HADS-Total was classified as a "general anxiety" measure.

[e] Used 5 items from BAI assessing physiological aspects of anxiety.

[f] Used 9 items from CES-D assessing negative affect and anhedonia.

Appendix B

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Appendix A. Supplementary data

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