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A Meta-analysis of the Effects of Training Clinicians in Exposure Therapy on Knowledge, Attitudes, Intentions, and Behavior

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Abstract

Despite evidence that exposure therapy is an effective way to treat anxiety, many clinicians fail to implement it appropriately. The current review investigated whether training can improve practicing clinicians' beliefs about and implementation of exposure therapy. A systematic search of four databases (PsycINFO, Medline, Scopus, and ProQuest Dissertations and Theses) identified fifteen studies evaluating the impact of training in exposure therapy. A series of meta-analyses revealed that training had large-sized positive effects on clinicians' knowledge of exposure therapy ($d_+ = 1.18$), attitudes toward exposure therapy ($d_+ = 0.84$), and self-efficacy associated with delivering exposure therapy ($d_+ = 0.72$). There were, however, only medium-sized positive effects on clinicians' intentions to use exposure therapy ($d_+ = 0.41$) and behavior ($d_+ = 0.35$). These findings suggest that training can provide clinicians with the knowledge and confidence to use exposure therapy, but might not be sufficient to promote changes in practice. Future research should consider incorporating volitional interventions into training (e.g., if-then planning or implementation intentions), in order to bridge this gap.

Keywords: Exposure therapy, training, intention-behavior gap, meta-analysis

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A Meta-analysis of the Effects of Training Clinicians in Exposure Therapy on Knowledge, Attitudes, Intentions, and Behavior

Cognitive behavioral therapy (CBT) is recommended for the treatment of a range of anxiety-based disorders including Obsessive Compulsive Disorder (OCD; NICE, 2005), Social Anxiety Disorder (SAD; NICE, 2013), Generalized Anxiety Disorder and Panic Disorder (GAD; PD; NICE, 2011), and Post-Traumatic Stress Disorder (PTSD; NICE, 2018). Although the manualized content of CBT differs according to the specific anxiety disorder being treated, two elements are present in all recommendations – cognitive restructuring and behavioral change (Waller, 2009). Cognitive restructuring involves identifying and challenging irrational or maladaptive thoughts, while the behavioral aspect of CBT for anxiety-based disorders emphasizes the use of exposure therapy. Exposure therapy aims to reduce and resolve anxiety through repeated and prolonged confrontation with anxiety-provoking stimuli (Richard & Lauterbach, 2007). The efficacy of exposure therapy as an element of CBT has been demonstrated widely (Adams, Brady, Lohr, & Jacobs, 2015; Deacon & Abramowitz, 2004; Gunter & Whittal, 2010; Ougrin, 2011).

Barriers to Implementing Exposure Therapy

Despite clear evidence for the efficacy of exposure therapies, evidence suggests that many experienced clinicians do not use exposure when treating clients with anxiety (Becker, Zayfert, & Anderson, 2004; Hipol & Deacon, 2012; Meyer, Farrell, Kemp, Blakey, & Deacon, 2014; van Minnen, Hendricks, & Olff, 2010). Even when clinicians do use exposure, they often adapt the procedure or use it in an overly-cautious manner (Abramowitz, Deacon, & Whiteside, 2011; Deacon, Lickel, Farrell, Kemp, & Hipol, 2013; Stobie, Taylor, Quigley, Ewing, & Salkovskis, 2007). Such caution can reduce exposure's efficacy through prematurely terminating the exposure or choosing less distressing exposure tasks than recommended (Farrell, Deacon, Kemp, Dixon, & Sy, 2013). For example, Freiheit, Vye,

Swan, and Cady (2004) asked psychologists who regularly treated anxiety disorders which interventions they used for OCD, PD, and SAD. Even though 71% endorsed CBT as their theoretical orientation, far fewer (12-38%) used exposure for those disorders.

Waller (2009) used the term 'therapist drift' to describe clinicians' failure to deliver treatments adequately or at all. Such drift means that clients might not receive effective or competently-delivered therapy (Deacon et al., 2013; Farrell, Kemp, Blakey, Meyer, & Deacon, 2016; Waller & Turner, 2016). However, drift implies that clinicians have stopped using skills that they have developed, but it is also possible that many therapists do not use the skills in the first place, despite training. Whichever route the individual clinician has taken (drift from evidence-based therapies, or failure to take up those skills in the first place), evidence suggests that clients often do not obtain the potential benefits of the treatment (Gunter & Whittal, 2010). A number of factors contribute to therapist drift and to their initial failure to develop skills, including aspects of the client (e.g., Meyer et al., 2014). However, key factors that appear to limit the dissemination and implementation of exposure therapies include clinicians' lack of training, knowledge, and confidence in implementing exposure therapies; and their anxiety and negative beliefs about exposure therapies.

Becker et al. (2004) found that only 12 to 28% of clinicians had received training in exposure therapies for anxiety disorders and 60% of the clinicians reported that limited training was the most important factor preventing them from using exposure therapies. A qualitative study that explored barriers to delivering exposure-based CBT for anxiety also identified lack of training as an issue (Wolitzky-Taylor et al., 2018). Exposure therapies have also been described as having a 'public relations problem' (Richard & Gloster, 2007) and clinicians are often concerned that exposure therapies are potentially unethical (Olatunji, Deacon, & Abramowitz, 2009). Concerns about exposure therapies stem from the requirement that clinicians should purposefully evoke distress in their clients, rather than

soothe it. Some clinicians see this as conflicting with the ethical mandate that clinicians should not harm their clients (Gunter & Whittal, 2010) and many clinicians believe that exposure can exacerbate clients' symptoms, prompt drop-out and result in negative experiences for clinicians themselves, despite evidence that this is not the case (Olatunji et al., 2009; Rosqvist, 2005).

In addition to negative beliefs about exposure therapies, clinicians' own anxiety can present a barrier to implementing exposure therapies. Specifically, clinicians have reported feeling anxious when conducting exposure therapy (Pittig, Kotter, & Hoyer, 2019; Schare & Wyatt, 2013; Waller & Turner, 2016). Indeed, Schumacher et al. (2014; 2015) found high levels of physiological stress responses in clinicians during exposure. In turn, clinicians' distress has been linked to more cautious delivery of exposure therapy (Deacon et al., 2013; Scherr, Herbert, & Forman, 2015). Although clinicians often have such reservations about exposure therapies, exposure appears to be thought of positively by clients (Brown, Deacon, Abramowitz, Dammann, & Whiteside, 2007; Deacon & Abramowitz, 2004; Olatunji et al., 2009). Clients retain those positive perceptions overall even if they find the exposure unpleasant at the time (Cox, Fergus, & Swinson, 1994), suggesting that therapists' anxiety about delivering exposure therapy may be unwarranted.

Promoting the Use of Exposure Therapy

Targeting clinician factors has been suggested as an effective way to improve the implementation of exposure therapy. Proposed methods include education, training, and the promotion of positive beliefs about exposure therapy (Farrell, Deacon, Dixon, & Lickel, 2013; Waller & Turner, 2016). Several key principles for training practicing clinicians in exposure therapy have been outlined (e.g., Farrell et al., 2013). First, trainees should be provided with information regarding the underlying empirical and theoretical principles of exposure therapy. They should also be provided with examples from actual practice, where

intense and prolonged exposure does not lead to negative consequences. The combination of psychoeducation and case examples aims to balance empirical and emotional perspectives, thus reducing dissonance between clinicians' cognitions and affect. Second, training should challenge clinicians' expectations that exposure is unsafe, intolerable, or unethical. For example, clinicians can be encouraged to engage in exposure exercises to tackle their own anxiety. Finally, Farrell et al. (2013) suggest that training should include written and verbal exercises that encourage clinicians to defend the position that exposure is safe, tolerable, and ethical.

The Present Review

Poor adherence to evidence-based practice clearly has substantial implications for the care and treatment that clients receive, and hence for their subsequent clinical outcomes (Deacon et al., 2013; Farrell et al., 2016; Gunter & Whittal, 2010; Waller & Turner, 2016). Therefore, it is important to understand whether training can help clinicians to implement evidence-based practice. A narrative review of the impact of different training approaches on therapists' knowledge, attitudes and behavior with respect to evidence-based therapies found that training typically has a positive impact on knowledge and attitudes (Frank, Becker-Haimes, & Kendall, 2020). However, the review also suggested that more intensive methods (defined as 20+ hours of training, along with additional components such as homework, feedback on role plays etc.) might be needed to change therapists' behavior, though the evidence for this was limited by methodological issues such as a reliance on self-report measures of outcome. While Frank et al. (2020) demonstrate that training can enhance elements of clinical practice, no review has synthesized the empirical research assessing the efficacy of training in exposure therapy specifically, and none have quantified the impact of training on outcomes using meta-analysis. Consequently, it is difficult to know whether training in exposure therapy is effective, and to what extent.

The present review used meta-analytic methods to investigate the efficacy of training in exposure therapy. The Theory of Planned Behavior (TPB; Ajzen, 1991) was used as a framework to identify relevant outcomes and to assess the effects of training on the social-cognitive precursors to changes in clinicians' behavior as well as changes in actual or planned practice. The TPB proposes that intentions are the proximal determinant of behavior. Intentions are self-instructions to perform particular behaviors or to obtain certain outcomes (e.g., "I intend to use exposure therapy when working with someone with anxiety"). Intentions are a function of three beliefs: (i) attitudes, (ii) subjective norms, and (iii) perceived behavioral control. Attitudes are the individual's evaluation of performing the behavior (e.g., "Using exposure therapy would be effective"). Subjective norms are perceptions of others' views of the behavior (e.g., "Those who I work with think that I should use exposure therapy with my clients"). Finally, perceived behavioral control is the individual's confidence in their ability to perform the behavior (e.g., "Using exposure therapy with my clients would be easy"), and is similar to the construct of self-efficacy (Bandura, 1977).

The present review also aimed to investigate factors that might influence the impact of training in exposure therapy. A starting point was the nature of the measures and we compared the effects of training on, for example, different measures of attitudes toward exposure therapy (e.g., the Therapist Beliefs about Exposure Scale, TBES; Deacon et al., 2013, and the Attitudes Towards Exposure Therapy Scale, ATETS; Harned et al., 2011). We also considered how changes in behavior were assessed, as Godin, Bélanger-Gravel, Eccles, and Grimshaw (2008) found that the way that behavior is assessed (e.g., via self-reported vs. objective assessments) moderated the relationship between clinicians' intentions and behaviors. The nature of the comparison condition may also moderate the effect of training on outcomes. We hypothesized that studies would find smaller effects of training when

compared to active comparison conditions than when comparing with a passive comparison condition, with no training in exposure therapy. In particular, we hypothesized smaller effects when the participants received an alternative form of exposure therapy training (e.g., didactic teaching vs. roleplay), or when they received an intervention that included an element of training clinicians in exposure therapy but not the full program (e.g., Kaye's [2018] comparison of standard training in exposure therapy against the same workshop with acceptance-based techniques). Finally, we examined whether the methodological quality of the study and / or its design (e.g., repeated measures vs. independent groups) moderated the apparent effect of training on outcomes.

Method

Literature Search Strategy

Electronic searches of four databases (PsycINFO, Medline, Scopus, and ProQuest Dissertations and Theses) were conducted in January 2020. A combination of the following search terms was used to identify relevant records: (therapist* OR clinician* OR "mental health practitioner*" OR "CBT therapist*" OR "behavio* therapist*" OR psychotherapist*) AND (train* OR teach* OR dissemin* OR "overcom* barrier*") AND (exposure OR "exposure therapy" OR "graded exposure" OR "prolonged exposure") AND (CBT OR "behavio* therapy" OR "cognitive behavio* therapy"). To ensure a comprehensive search, the search terms included synonyms, which were mapped onto relevant subject headings and 'exploded' when possible to include related subject headings.

Inclusion and Exclusion Criteria

No restrictions were applied regarding the date of publication. To be eligible for inclusion in this review, studies were required to meet the following criteria:

1. Includes an intervention(s) intended to train clinicians specifically in exposure therapy.

2. Has an experimental research design (i.e., independent groups) or a pre-post intervention design.
3. Includes sufficient data to enable calculation of an effect size reflecting the impact of the training intervention on one or more of the outcomes of interest.
4. Data had not previously been used in previous publications.

The flow of studies through the review is presented in Figure 1. Electronic searches identified 3,848 records. Titles and abstracts were screened to establish potential relevance. Of the 3,848 records, 3,814 were removed (19 duplicates; 3,795 that did not meet inclusion criteria). The full texts of the remaining 34 records were read and checked against the inclusion criteria, and a further 22 were removed. Reference lists of relevant reviews and papers were then hand-searched, and an additional three records were identified for inclusion. Thus, a total of 15 records proved suitable for inclusion in the review.

Data Extraction

The following data were extracted from each study: (i) participant characteristics (age, gender, ethnicity, profession and/or current workplace, level of education, experience of exposure therapy); (ii) study characteristics (design, total sample size and sample size for each condition, where relevant); (iii) description of the training intervention and comparison condition (e.g., length of intervention, method of delivery, key training topics and activities); (iv) outcome variables (e.g., measures of knowledge, attitudes, subjective norms, intentions, and behavior); (v) means, standard deviations, or test statistics for each outcome variable. The characteristics of the primary studies are summarized in Supplemental Material A.

The methodological quality of the primary studies was assessed using Downs and Black's checklist (1998) for randomised and non-randomised studies in healthcare interventions. Due to the limited number of studies within the scope of this review, the quality appraisal was not used to exclude studies, but rather to identify potential biases and to

assess the impact of methodological quality on study outcomes (McDonagh, Peterson, Raina, Chang, & Shekelle, 2013). The first author coded all studies and then a trainee clinical psychologist, blind to the first author's rating repeated the quality assessment for a random subset (k = 10, 67%) of the included studies. Inter-rater reliability using a two-way random-effects intra-class correlation coefficient (ICC; Koo & Li, 2016), indicated good inter-rater reliability, ICC = .89, (95% CI [.86; .92]). Disagreements were resolved through discussion. The assessment of aspects of methodological quality for each of the primary studies is presented in Supplemental Material B. The highest possible score was 28. A total score was derived for each paper (with higher scores reflecting better quality) and score ratings were given the following qualitative labels (O'Connor et al., 2015): 'excellent' (24-28), 'good' (19-23), 'fair' (14-18), and 'poor' (<14). Quality scores ranged from 13 ('poor') to 23 ('good').

Computing Effect Sizes from the Primary Studies

Outcome variables were identified within each study and the TPB (Ajzen, 1991) was used as a framework for categorizing outcomes as either reflecting: Knowledge about exposure therapy; attitudes towards exposure therapy; subjective norms; self-efficacy regarding the use of exposure therapy; intentions to use exposure therapy; and/or the use of exposure therapy. The first and second author categorized the outcome variables, agreeing on 89% of variables. Disagreements were resolved jointly by discussion.

Effect sizes (Cohen's d) and associated standard errors were calculated for each outcome variable using the Meta-Essentials workbooks (Suurmond, van Rhee, & Hak, 2017). The completed workbooks can be accessed on the Open Science Framework (https://osf.io/4mejs/?view_only=20e262f9e0ad40ab85af44aeb4575e9e). Effect sizes were calculated using the means and standard deviations reported in the paper where possible, or summary statistics where the means and standard deviations were not available or could not

be computed from the available data (e.g., in Harned et al., 2014, the reported standard errors were converted to standard deviations to compute the effect size). For example, Chin et al. (2019) did not report the means and standard deviations for the measure of attitudes. Therefore, the chi-squared test statistic was converted into Cohen's *d* using the Psychometrica Effect Size Calculator (Lenhard & Lenhard, 2016). Due to the variability in follow-up time-points across studies, effect sizes were calculated using data from the first post-intervention time-point and intention-to-treat (ITT) analyses were used where reported.

Where multiple measures were used to assess the same outcome variable, effect sizes were calculated separately for each measure and then averaged to provide one effect size per outcome (Card, 2012). These effect sizes were disaggregated again where appropriate before conducting moderator analyses (e.g., if a study measured behavior using a combination of self-report and assessed measures, then a single effect size was computed for the main analysis, but separate effect sizes for the self-report and assessed measures were included in the respective moderator analysis). Where studies compared more than one intervention group with a control group (e.g., Harned et al., 2011; 2014), both comparisons were included as separate studies. In that case, the sample size of the comparison conditions (against which both intervention groups were compared) was halved to avoid violating the assumption of independence. Where studies with more than one intervention group did not also include a control group (e.g., Kaye, 2018, compared two intervention groups, both designed to train clinicians to use exposure therapy), the intervention with additional components (in the case of Kaye, 2018, the ST + ABT condition) was compared to the 'standard' intervention, with the latter being coded as an "active comparison condition".

Meta-analytic Strategy

Meta-Essentials workbooks were used to run the meta-analyses (Suurmond et al., 2017). The completed workbooks can be accessed on the Open Science Framework

(https://osf.io/4mejs/?view_only=20e262f9e0ad40ab85af44aeb4575e9e). Sample-weighted average effect sizes (d_+) were computed using a random effects model, as studies were likely to be "different from one another in ways too complex to capture by a few simple study characteristics" (Cooper, 1986, p. 526). Effect sizes were interpreted in line with Cohen's (1992) recommendations, where $d = 0.20$ represents a 'small' effect, $d = 0.50$ represents a 'medium' effect, and $d = 0.80$ represents a 'large' effect. Homogeneity Q and I^2 statistics were used to estimate the heterogeneity of effect sizes from the primary studies. A significant Q statistic indicates that the variability exceeds what would be expected based on sampling error (Higgins, Thompson, Deeks, & Altman, 2003). The I^2 statistic indicates the percentage of variation across the studies that is not explained by chance (Higgins, et al., 2003) and 0 to 40% was deened 'low'; 40 to 60% 'moderate'; 60 to 90% 'substantial'; and > 90% 'considerable' (Cochrane Consumers and Communication Review Group, 2016).

Moderator analyses were conducted to explore factors that might account for heterogeneity in the effect sizes for each primary meta-analysis (Borenstein, Hedges, Higgins, & Rothstein, 2009), provided that at least two studies represented each level of the moderator. When possible, studies were split into subgroups based on: elements of the study design (e.g., the nature of the comparison condition), the nature of outcome measures used, and / or methodological quality. An analogue to Analysis of Variance (ANOVA) was conducted using Meta-Essentials workbooks (Suurmond et al., 2017) analysis, to assess whether the subgroup variables could account for variability within the primary meta-analyses.

Publication bias was examined visually using funnel plots (Light & Pillemer, 1984; Field & Gillett, 2010), and statistically using Egger's regression (Egger, Davey, Smith, Schneider, & Minder, 1997). Orwin's (1983) formula was used to determine the fail-safe N,

as an additional measure of publication bias. This estimates the number of studies with a null finding that would be required to overturn the statistical significance of findings.

Results

Study Characteristics

Supplemental Material A details the characteristics of the primary studies. Sample sizes ranged from 23 to 943 participants. Studies were predominantly conducted in the USA, with one study conducted in the UK (Gega et al., 2007) and two studies conducted at international conferences (Waller et al., 2016; Wright & Waller, 2019). All of the studies had a majority female and Caucasian sample, which this is likely to be representative of mental health clinicians in the studied countries (e.g., Memon et al., 2016; Morison, Trigeorgis, & John, 2014). Studies included a range of professionals, such as psychologists, mental health nurses, medical students, and a range of community mental health clinicians.

Intervention conditions included didactic teaching sessions, face-to-face workshops, and online training. Most training sessions included information and activities aimed at tackling clinicians' negative beliefs about exposure therapy, and some used simulated scenarios to help clinicians to apply their learning. Most studies with a comparison condition used an active comparison, which also included an element of relevant training. However, three studies used a passive comparison condition, in which participants engaged in training about dialectical behavior therapy or CBT for eating disorders without any specific teaching about exposure therapy. The passive comparison conditions were comparable to the training interventions in quality, length, and design.

Studies used a variety of methods to evaluate the effect of training on outcomes, with six studies using a repeated-measures design and nine using independent groups designs (e.g., RCT quasi-experimental or a nonrandomized controlled designs). With respect to methodological quality (see Supplementary Materials B for paper-by-paper scores), the main

strengths of the studies included clearly reported aims, outcome measures, and interventions. Most studies used appropriate statistical analyses, reported their proposed analyses, and did not employ 'data dredging' (Smith, 2002). Nine studies (60%) reported power analyses, but it was not possible to determine whether six (40%) of the studies were adequately powered. Most did not report the population from which participants were recruited, nor the representativeness of the sample in relation to the intended population. However, studies with independent group designs usually reported that participants were recruited from the same population, which improves internal validity. Given the active nature of the interventions, it was not possible for any study to blind participants to the condition, and studies did not report whether participants were blind to the fact that other participants received a different intervention. Four studies (27%) attempted to blind the researchers measuring the main outcomes, but most studies used self-report measures, which limits the internal validity. Compliance with the intervention was only reported in three studies (20%), and so it is unclear how closely participants engaged with and adhered to the training. No studies provided a list of possible adverse events.

Outcome Measures

Most studies measuring the effect of training on attitudes towards exposure therapy used the Therapist Beliefs about Exposure Scale (TBES; Deacon et al., 2013) or the Attitudes Towards Exposure Therapy Scale (ATETS; Harned et al., 2011). However, one study created a questionnaire to assess the value that clinicians placed on treatment goals in exposure therapy (Ruzek et al., 2016). Another created a questionnaire that asked clinicians to indicate whether they believed that a series of statements relating to attitudes towards exposure therapy were true or false (Chin et al., 2019). Most studies used multiple-choice questionnaires to assess clinicians' knowledge of exposure therapy. The exception was Farrell et al. (2016), who asked clinicians to rate their knowledge of exposure therapy theory

and practice. Self-efficacy was typically measured using questionnaires designed by the authors of the studies, or using an adapted version of the self-efficacy subscale of the Behavioral Anticipation and Confidence questionnaire (Dimeff et al., 2009). The frequency or quality of the delivery of exposure therapy (i.e., behavior) was measured using self-report measures (The Exposure Therapy Case Vignette, Deacon et al., 2013; Exposure Therapy Delivery Scale, Reid et al., 2017; Exposure Therapy Clinical Use Survey, Harned et al., 2014), by asking clinicians how they would respond to a series of case scenarios or by assessing how clinicians behave in (real or role played) therapeutic sessions.

Impact of Training on Outcome Variables

Random effects meta-analyses were conducted to examine the effects of training on five outcome variables: Knowledge, attitudes, intentions, self-efficacy, and behavior (see Table 1). None of the studies identified as suitable for inclusion in the review examined the effect of training on subjective norms. Positive effect sizes indicate an improvement in the outcome. For example, a positive effect size indicates more positive attitudes towards exposure therapy, greater self-efficacy, or better delivery.

Knowledge

Nine studies evaluated the impact of training on knowledge about exposure therapy (see Figure 2). The effect sizes ranged from d = -0.14 to 3.69. The sample weighted average effect size was d_+ = 1.18, 95% CI [0.10, 2.25], p = .012, based on a total sample size of N = 607. This indicates that training had a large positive effect on clinicians' knowledge of exposure therapy. The homogeneity statistic was significant, $Q(8) = 149.05$, $p < .001$, indicating that the effect sizes from the primary studies varied. The I^2 statistic (94.63%) also indicated considerable heterogeneity. Visual inspection of the funnel plot (Supplemental material C.a) suggested some asymmetry and thus risk of publication bias. However, Egger's regression was not significant (p = .082). Orwin's (1983) fail-safe N analysis indicated that

203 studies with trivial effect sizes (d = 0.05) would be required to overturn the conclusion that training clinicians in exposure therapy has a positive impact on their knowledge of exposure therapy.

Attitudes

Thirteen studies evaluated the impact of training on attitudes toward exposure therapy (see Figure 3). Effect sizes ranged from d = 0.12 to 1.52. The sample weighted average effect size was d_+ = 0.84, 95% CI [0.56, 1.12], p < .001, based on a total sample size of N = 1,691. This indicates that training had a large positive effect on clinicians' attitudes towards exposure therapy. The homogeneity statistic was significant, $Q(11) = 193.35$, p < .001, indicating that the effect sizes from the primary studies varied. The I^2 statistic (93.79%) also indicated considerable heterogeneity. Visual inspection of the funnel plot (Supplemental material C.b) did not show asymmetry and Egger's regression was not significant (p = .199). Orwin's (1983) fail-safe N analysis indicated that 206 studies with trivial effect sizes (d = 0.05) would be required to overturn the conclusion that training clinicians in exposure therapy has a positive impact on their attitudes towards exposure therapy.

Self-efficacy

Six studies evaluated the impact of training on self-efficacy associated with using exposure therapy (see Figure 4). Effect sizes ranged from d = 0.19 to 2.06. The sample weighted average effect size was d_+ = 0.72, 95% CI [0.08, 1.35], p = .004, based on a total sample size of N = 1,179. This indicates that training had a medium-to-large positive effect on clinicians' belief in their ability to use exposure therapy. The homogeneity statistic was significant, $Q(5) = 19.77$, p < .001, indicating that the effect sizes from the primary studies were varied. The I^2 statistic (74.71%) also indicated substantial heterogeneity. Visual inspection of the funnel plot (Supplemental material C.c) suggested some asymmetry. However, Egger's regression was not significant (p = .092). Orwin's (1983) fail-safe N

analysis indicated that 80 studies with trivial effect sizes (d = 0.05) would be required to overturn the conclusion that training clinicians in exposure therapy has a positive impact on their self-efficacy when using exposure therapy.

Intentions

Four studies evaluated the impact of training on clinicians' intentions to use exposure therapy (see Figure 5). Effect sizes ranged from d = -0.15 to 0.74. The sample weighted average effect size was d_+ = 0.41, 95% CI [-0.29, 1.10], p = .062, based on a total sample size of N = 190. This indicates that training had a medium positive effect on clinicians' intentions to use exposure therapy; however, the confidence interval included zero, suggesting that the effect of training on intentions was not reliable. The homogeneity statistic was significant, $Q(3) = 11.08$, p = .011, indicating that the effect sizes from the primary studies varied. The I^2 statistic (72.92%) also indicated substantial heterogeneity. Visual inspection of the funnel plot (Supplemental material C.d) did not show asymmetry and Egger's regression was not significant (p = .614). Orwin's (1983) fail-safe N analysis indicated that 29 studies with trivial effect sizes (d = 0.05) would be required to overturn the conclusion that training clinicians in exposure therapy has a positive impact on their intentions to use exposure therapy.

Behavior

Nine studies evaluated the impact of training on clinicians' use of exposure therapy (see Figure 6). Effect sizes ranged from d = -0.23 to 1.52. The sample weighted average effect size was d_+ = 0.35, 95% CI [-0.08, 0.79], p = .060, based on a total sample size of N = 620. This indicates that training had a small-to-medium positive effect on clinicians' use of exposure therapy. However, the confidence interval included zero, suggesting that the effect of training on behavior was not reliable. The homogeneity statistic was significant, $Q(8) = 75.16$, $p < .001$, indicating that the effect sizes from the primary studies varied. The I^2

statistic (89.36%) also indicated moderate heterogeneity. Visual inspection of the funnel plot (Supplemental material C.e) did not show asymmetry and Egger's regression was not significant (p = .791). Orwin's (1983) fail-safe N analysis indicated that 55 studies with trivial effect sizes (d = 0.05) would be required to overturn the conclusion that training clinicians in exposure therapy has a positive impact on their use of exposure therapy.

Moderator analyses

Moderator analyses were conducted to identify variables that might explain the heterogeneity of effect sizes from the primary studies. An insufficient number of studies examined the effect of training on intentions to use exposure therapy to conduct any moderator analyses. However, a sufficient number of studies were available to consider whether the nature of the measures of attitudes and behavior moderated the effect of training on these outcomes, respectively, whether the design of the study moderated the effect of training on attitudes, self-efficacy, and behavior, whether the nature of the comparison condition moderated the effect of training on knowledge, attitudes, self-efficacy and behavior, and whether the methodological quality of the study moderated the effect of training on knowledge, attitudes, and behavior. Table 2 reports the findings of these analyses.

Nature of the outcome measures

Nature of the measure of attitudes. Four studies used the ATETS to measure clinicians' attitudes towards exposure therapy and six used the TBES. Studies using the ATETS showed a medium effect of training on attitudes, d_+ = 0.52 (95% CI [0.18; 0.87]), while studies using the TBES showed reported a large effect, d_+ = 1.17 (95% CI [0.79; 1.54]). The variance between subgroups was significant, Qb(1) = 8.51, p = .004, suggesting that the nature of the attitude measure moderated the effect of training on attitudes.

Nature of the measure of behavior. Seven studies asked participants to self-report their use of exposure therapy, and five studies had coders assess participants use of exposure

therapy in real or hypothetical scenarios. Studies using self-report and assessed measures both yielded small effects of training on behavior (d_+ = 0.24 and 0.27, respectively). The variance between subgroups was not significant, Qb(1) = 0.00, p = 950, suggesting that the way that behavior was measured did not significantly moderate the effect of training on behavior.

Study design

The design of the study did not significantly moderate the effect of training on attitudes, Qb(1) = 0.35, p = .552, or self-efficacy, Qb(1) = 0.24, p = .625, but did significantly moderate the effect of training on behavior, Qb(1) = 4.66, p = .031. Studies with a repeated-measures design typically reported a large-sized effect of training on behavior, d_+ = 1.07, whereas studies with an independent-groups design typically reported no effect, d_+ = 0.06.

Nature of the comparison condition

The nature of the comparison condition significantly moderated the effect of training on knowledge, Qb(1) = 11.01, p = .001, and self-efficacy, Qb(1) = 15.39, p < .001. Studies that compared the effect of the intervention against an active comparison condition that also included some training in exposure therapy typically reported a small effect of training on knowledge and self-efficacy (d_+ = 0.40 and 0.23, respectively), while studies that compared the effect of the intervention against a passive comparison condition that did not receive any training in exposure therapy typically reported a very large effect on knowledge and self-efficacy (d_+ = 2.57 and 1.81, respectively). The nature of the comparison condition did not significantly moderate the effect of training on attitudes, Qb(1) = 0.42, p = .517, or behavior, Qb(1) = 0.36, p = .547.

Methodological quality

The quality of seven studies was rated as ‘fair’ (47%), seven studies (47%) were rated as ‘good’, and one study (7%) was deemed to be ‘poor’. The methodological quality of the

studies did not significantly moderate the effect of training on knowledge, Qb(1) = 0.00, p = .956, attitudes, Qb(1) = 0.33, p = .556, or behavior, Qb(1) = 2.11, p = .146.

Discussion

This is the first review to examine the efficacy of training clinicians in exposure therapy for anxiety-based disorders. We identified 15 studies that examined the effects of training on clinicians' knowledge, attitudes, intentions, self-efficacy, and use of exposure therapy. A clear pattern emerged from the primary analyses. Training had large effects on clinicians' understanding of exposure therapy (d_+ = 1.18), attitudes towards exposure therapy (d_+ = 0.84), and self-efficacy associated with using exposure therapy (d_+ = 0.72). However, training had smaller effects on clinicians' intentions to use (d_+ = 0.41) and subsequent use of exposure therapy (d_+ = 0.35), and the confidence intervals for the latter two effects both included zero. The quality of the studies was generally fair to good and did not moderate the effect of training on outcomes, indicating that the synthesis was not biased by weak methods in the primary research. Taken together, these findings tell a clear story. Training reliably enhances clinicians' knowledge, attitudes, and confidence, but does not necessarily translate into increased motivation to use exposure therapy thereafter or actual practice.

Relatively few factors moderated the effect of training on outcomes. First, as might be expected, studies that compared training in exposure therapy against an active comparison condition that also received training in some aspect of exposure therapy showed smaller effects on knowledge and self-efficacy (but not on attitudes or behavior) than when the training was compared with more passive conditions (e.g., training that does not address exposure at all). Second, the measure used to assess attitudes to exposure therapy affected the outcomes, with training typically having a larger effect on the TBES (Deacon et al., 2013) than on the ATETS (Harned et al., 2011). These findings suggest that the TBES may be more sensitive measure of change (e.g., Farrell et al., 2013; Schumacher, Schopka, Heinrich &

Knaevelsrud, 2019; Whiteside, Deacon, Benito & Stewart, 2016), perhaps because the TBES specifically measures concerns about delivering exposure therapy (e.g., "Exposure therapy is inhumane"), while the ATETS measures attitudes toward exposure therapy more generally (e.g., "Exposure therapy is effective for real-world patients with complex problems").

The finding that training in exposure therapy reliably enhances clinicians' knowledge, attitudes, and confidence, but does not necessarily translate into increased motivation to use exposure therapy or actual practice is reminiscent of the gap between intentions and behavior, which is well-evidenced across many areas (e.g., health and educational goals, for a review, see Sheeran & Webb, 2016). Therefore, in addition to the previously identified barriers to implementing exposure therapy (e.g., a lack of training, knowledge and confidence, negative attitudes toward exposure therapy, Waller & Turner, 2016), training might also need to find ways to help clinicians to translate more positive beliefs about exposure therapy into changes in actual practice. Gollwitzer (1993; 1999) proposed that planning can increase the likelihood of goal attainment and developed the idea of 'implementation intentions' ('if-then' plans) that specify when, where, and how individuals will strive towards goals. Forming implementation intentions has been found to help people to achieve a range of goals (for reviews, see Gollwitzer & Sheeran, 2006; Toli, Webb, & Hardy, 2016), including taking action that provokes anxiety or feels uncomfortable (Schweiger Gallo, Keil, McCulloch, Rockstroh, & Gollwitzer, 2009; Sheeran, Aubrey, & Kellett, 2007) and increases the use of practices taught in classes (Casper, 2008). In light of the current findings, prompting clinicians to form implementation intentions might be a relatively easy and effective way to help them to translate the benefits of training into action. For example, as part of training, clinicians might be prompted to form 'if-then' plans to implement the exposure-based techniques that they have learned (e.g., "If I am working with someone with anxiety, then I will identify a form of exposure that may be helpful for them and commit myself to using it in the next session").

Alternatively (or in addition), they could be encouraged to form if-then plans in order to manage their own anxiety around exposure based therapy (e.g., "If I feel anxious about using exposure with a client, then I will tell myself that it will be good for them in the long run").

While therapist drift (Waller & Turner, 2016) might explain why training did not necessarily translate into changes in clinicians' behavior, it could also be argued that (often brief) training is unlikely to manifest as sustained change on the part of the therapist, or even that such training might result lead clinicians to conclude that therapy methods do not work, as they might not have learned the skills to apply those methods flexibly according to the individual patient's needs. However, training can be augmented and intensified to address these issues. In addition to the suggestions above, we note that Beidas and Kendall (2010) suggest that changes in therapists' behavior and patient outcomes is only likely when training actively addresses contextual variables, such the characteristics of the therapist and patient and the nature of the training and the host organization. They also recommend that training employ more active learning approaches, such as modelling and role plays, along with on-going consultation and support (Beidas, Edmunds, Cannuscio, Gallagher, Downey, & Kendall, 2013; Edmunds, Beidas, & Kendall, 2013). There are also calls for trainers to think about how technology can be used to augment and/or disseminate training more widely (Beidas, Koerner, Weingardt, & Kendall, 2011).

Strengths and Limitations

The strengths of the present review include a comprehensive and systematic search of four databases. Although we only identified and included one unpublished dissertation, there was no evidence of publication bias. Another key strength is the use of a theoretical framework (namely, the TPB; Ajzen, 1991) to structure the assessment of the impacts of training on outcomes. The finding that training tends to have a larger effect on attitudes and self-efficacy, than on intentions and actual behavior supports the premises of the TPB;

namely, that the effect of interventions on behavior occurs via distal predictors like knowledge and attitude that, in turn, impact more proximal predictors like intention. Finally, we would note that studies recruited a wide range of clinicians from a variety of clinically-relevant and ecologically valid settings, increasing the generalizability of the findings.

It is also important to recognize some potential limitations, however. First, the review is limited by the relatively small number of studies included in some meta-analyses meaning that some of the conclusions should be interpreted with caution (particularly the effects of training on intentions and self-efficacy, which were only examined by 4 and 6 of the primary studies, respectively, and the moderator analyses. It is also worth noting that most studies had a relatively small sample size, which limits their statistical power. Coyne, Thombs and Hagedoorn (2010) suggest that small, underpowered trials may overestimate the effect size and are potentially susceptible to methodological issues. Although the present review did not find that the methodological quality of studies moderated the effect of training on outcomes, this does not mean that future research should not be adequately powered.

Second, it is important to consider whether self-report measures of intended behavior reflected in actual clinical change, as that might not be a safe assumption. However, it should be noted that the effect sizes for impact on self-report and measured actual clinician behavior were similar, indicating that the self-report of behaviors is relatively accurate. Future research should monitor that potential difference routinely in studies of the impact of training.

Finally, it is also worth noting that none of the studies identified as suitable for inclusion in the meta-analyses examined the effect of training on subjective norms (clinicians' beliefs about whether important others would approve or disapprove of their using exposure therapy). Normative beliefs are often underestimated as determinants of behavior (Nolan, Schultz, Cialdini, Goldstein, & Griskevicius, 2008). Therefore, future research should include measures of subjective norms, in order to assess both the impact on

norms of training clinicians in exposure therapy and the impact of normative beliefs on behavior. With this in mind, it might also be valuable to expand the types of norms considered. Consideration of subjective (or injunctive) norms is specified by the TPB. However, it might be necessary to examine descriptive norms, which reflect people's beliefs about what others actually do (Cialdini, Reno & Kallgren, 1990; Sheeran & Orbell, 1999). For example, clinicians might believe that others would approve of their using exposure therapy. However, they might also see that relatively few of their colleagues use exposure, and thus become less likely to act on their good intentions.

Conclusion

Training in exposure therapy improves clinician's knowledge, attitudes, and self-efficacy with respect to using exposure when working with clients with anxuety. However, training has a smaller impact on clinicians' intentions to use exposure therapy and actual practice. These findings indicate the need to develop and improve training; for example, by including volitional interventions to help clinicians to translate positive beliefs into action, which might include the use of implementation intentions, as well as supervision to support clinicians following exposure therapy training. However, it should be stressed that the limited number of studies and the heterogeneity of effect sizes also suggests that further high quality studies are needed. In addition to developing existing methods of training, these studies will need relatively large samples and should consider measuring the impact of training on normative beliefs.

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Table 1

Sample-weighted Average Effect of Training on Outcomes

Outcome variable	*N*	*k*	d_+ (*SE*)	95% CI	*p*	*Q* (*p*)	I^2 (%)
Knowledge	607	9	1.18 (0.47)	0.10; 2.25	.012	149.05 (< .001)	94.63
Attitudes	1,691	13	0.84 (0.13)	0.56; 1.12	< .001	193.35 (< .001)	93.79
Self-efficacy	1,179	6	0.72 (0.25)	0.08; 1.35	.004	19.77 (< .001)	74.71
Intentions	190	4	0.41 (0.22)	-0.29; 1.10	.006	11.08 (.011)	72.92
Behavior	620	9	0.35 (0.19)	-0.08; 0.79	.060	75.16 (< .001)	89.36

Note: N = total number of participants; *k* = number of studies; d_+ = sample-weighted average effect size; *SE* = standard error; *CI* = confidence interval

Table 2

Moderators of the Effects of Training on Outcomes

Moderator	Outcome	Subgroups	*N*	*k*	d_+	95% CI	*Q*b (*p*)
Outcome measure	Attitudes	TBES	475	6	1.17	0.79; 1.54	
		ATETS	191	4	0.52	0.18; 0.87	
							8.51 (.004)
	Behavior	Self-reported	381	7	0.24	-0.07; 0.56	
		Assessed	475	5	0.27	-0.67; 1.21	
							0.00 (.950)
Study design	Attitudes	Repeated-measures	1226	5	0.97	0.38; 1.56	
		Independent groups	465	8	0.76	0.37; 1.15	
							0.35 (.552)
	Self-efficacy	Repeated-measures	988	2	0.69	-1.53; 2.90	
		Independent groups	191	4	0.90	-0.58; 2.38	
							0.24 (.625)
	Behavior	Repeated-measures	112	2	1.07	-4.65; 6.79	
		Independent groups	508	7	0.06	-0.24; 0.36	
							4.66 (.031)
Nature of the comparison condition	Knowledge	Passive	46	2	2.57	-4.96;10.09	
		Active	491	6	0.40	-0.15; 0.96	
							11.01 (.001)
	Attitudes	Passive	135	3	0.90	0.16; 1.65	
		Active	330	5	0.68	-0.01; 1.31	
							0.42 (.517)
	Self-efficacy	Passive	46	2	1.81	-1.17; 4.79	
		Active	145	2	0.23	-0.22; 0.67	
							15.39 (< .001)
	Behavior	Passive	46	2	0.25	-2.04; 2.54	
		Active	462	5	0.04	-0.39; 0.47	
							0.36 (.547)
Study quality	Knowledge	Good	290	5	1.19	-0.41; 2.79	
		Fair	317	4	1.14	-1.58; 3.86	
							0.00 (.956)
	Attitudes	Good	413	7	0.90	0.49; 1.31	
		Fair	1223	5	0.70	0.04; 1.36	
							0.33 (.566)
	Behavior	Good	290	5	0.02	-0.21; 0.26	
		Fair	330	4	0.65	-0.50; 1.80	
							2.11 (.146)

Note: N = total number of participants included in subgroup analysis; *k* = number of studies included in subgroup analysis; *CI* = confidence interval; *TBES* = Therapist Belief about Exposure Scale; *ATETS* = Attitudes Towards Exposure Therapy Scale; *Qb* = variance between subgroups

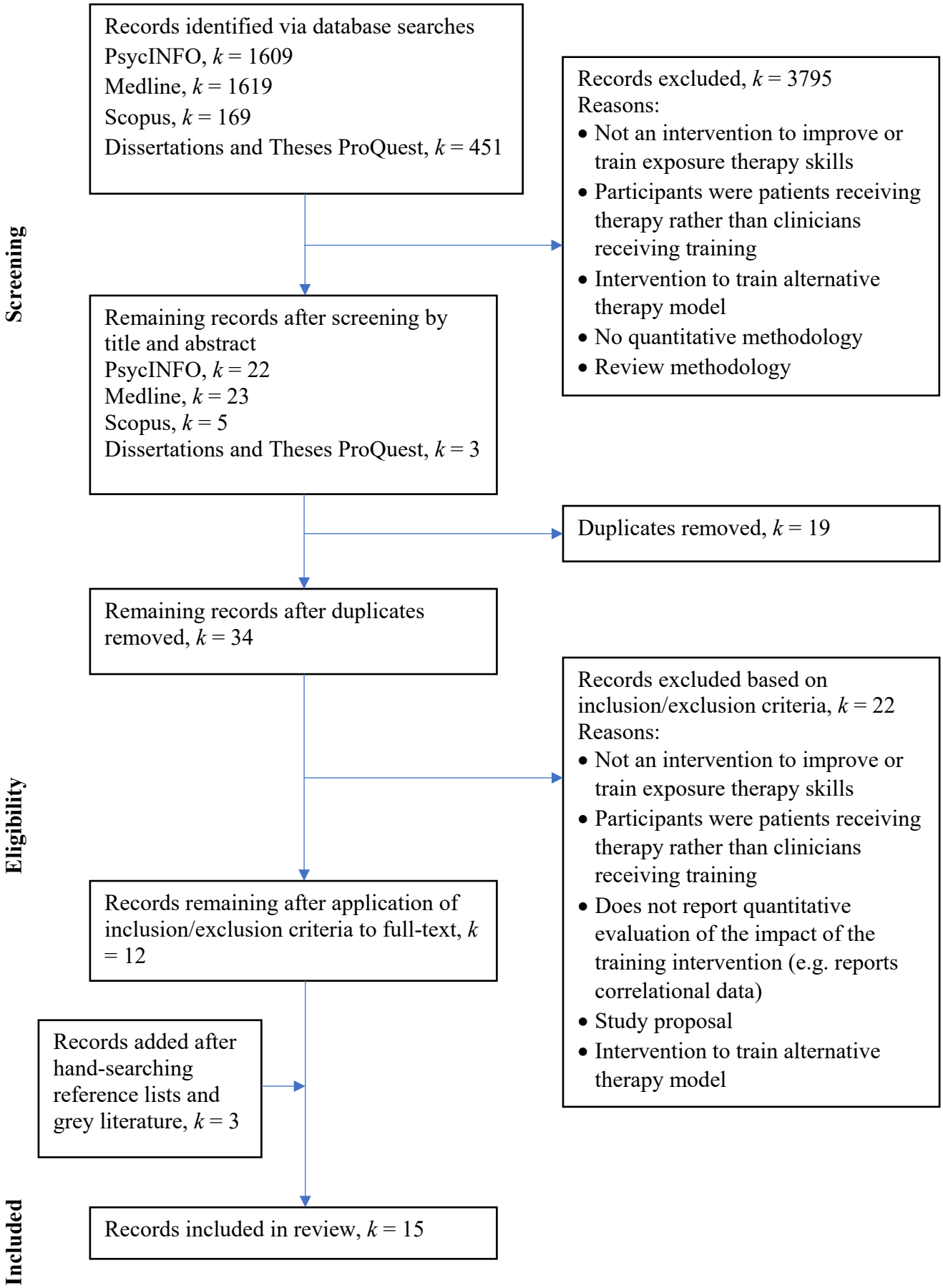


Figure 1

PRISMA diagram Showing the Flow of Studies Through the Review (adapted from Moher, Liberati, Tetzlaff, & Altman, 2009)

Figure 2

Forest Plot Showing the Effect of Training on Knowledge

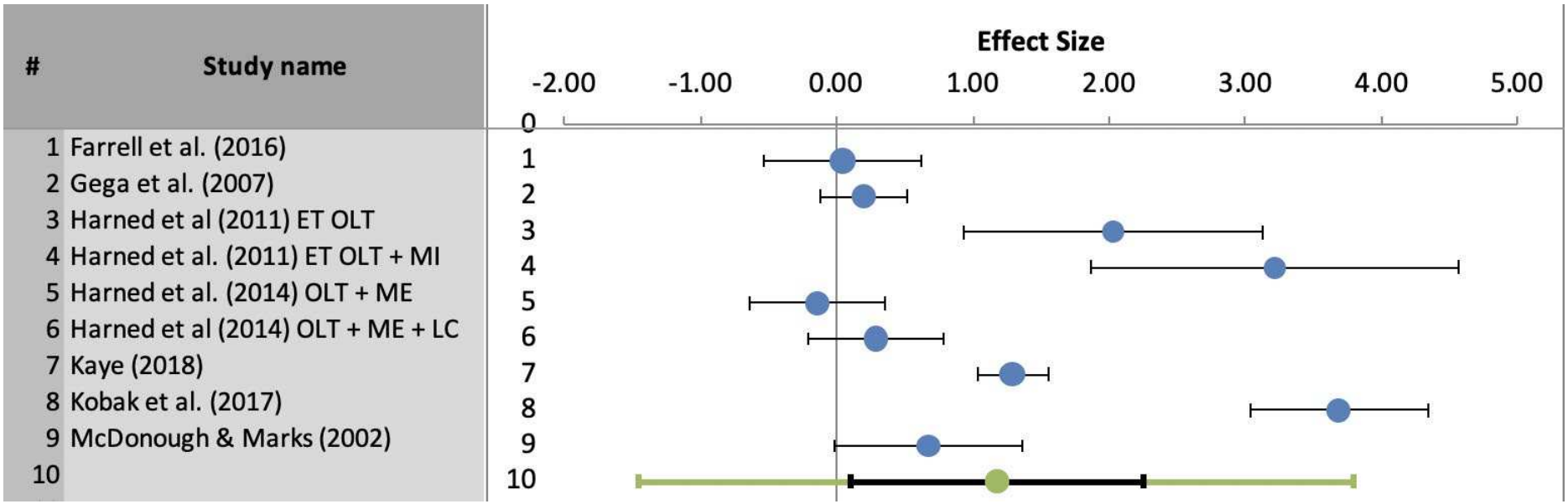


Figure 3

Forest Plot Showing the Effect of Training on Attitudes

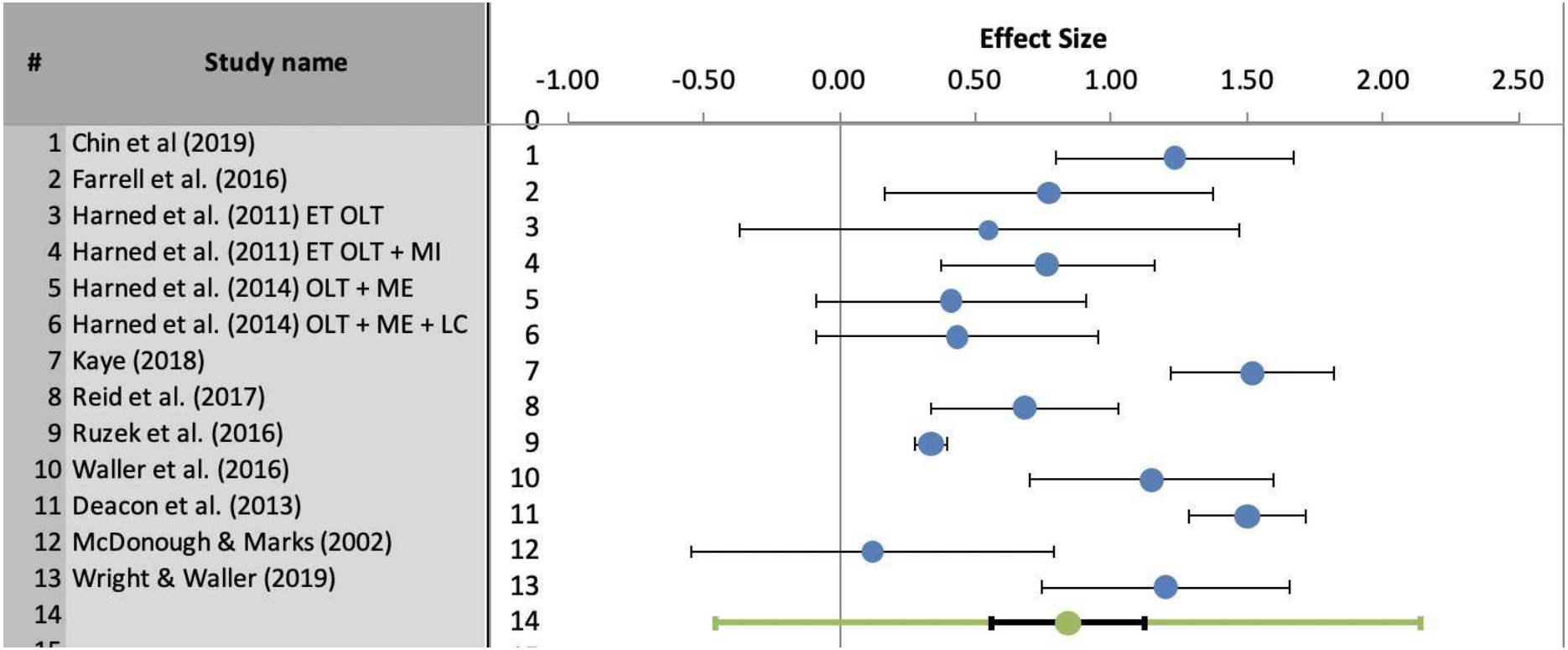


Figure 4

Forest Plot Showing the Effect of Training on Self-efficacy

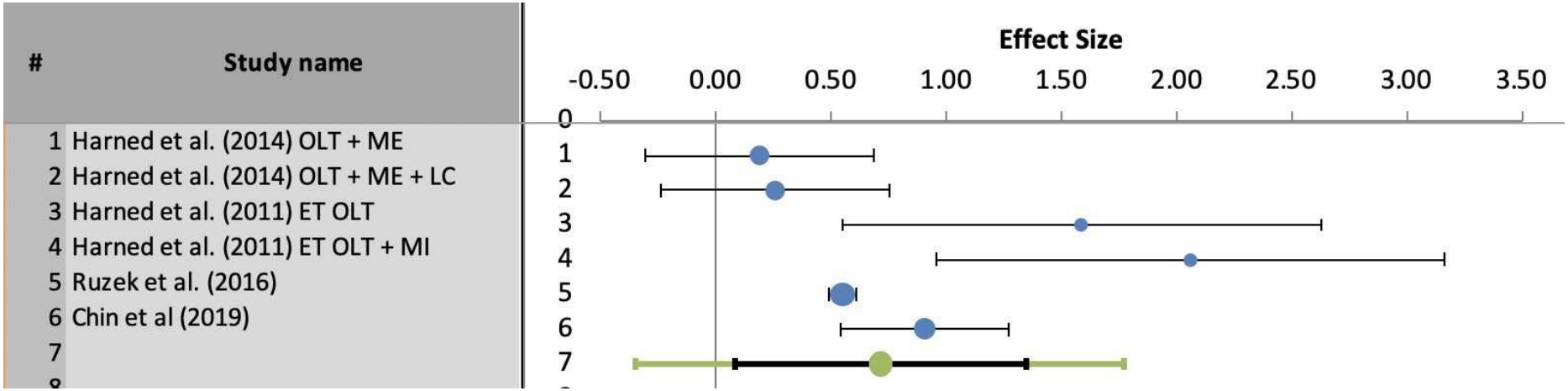


Figure 5

Forest Plot Showing the Effects of Training on Intentions

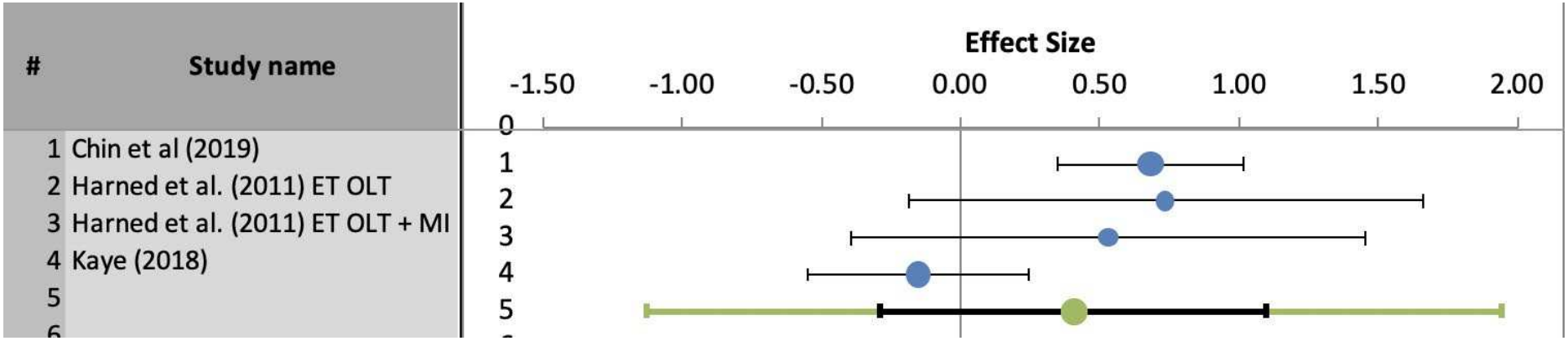
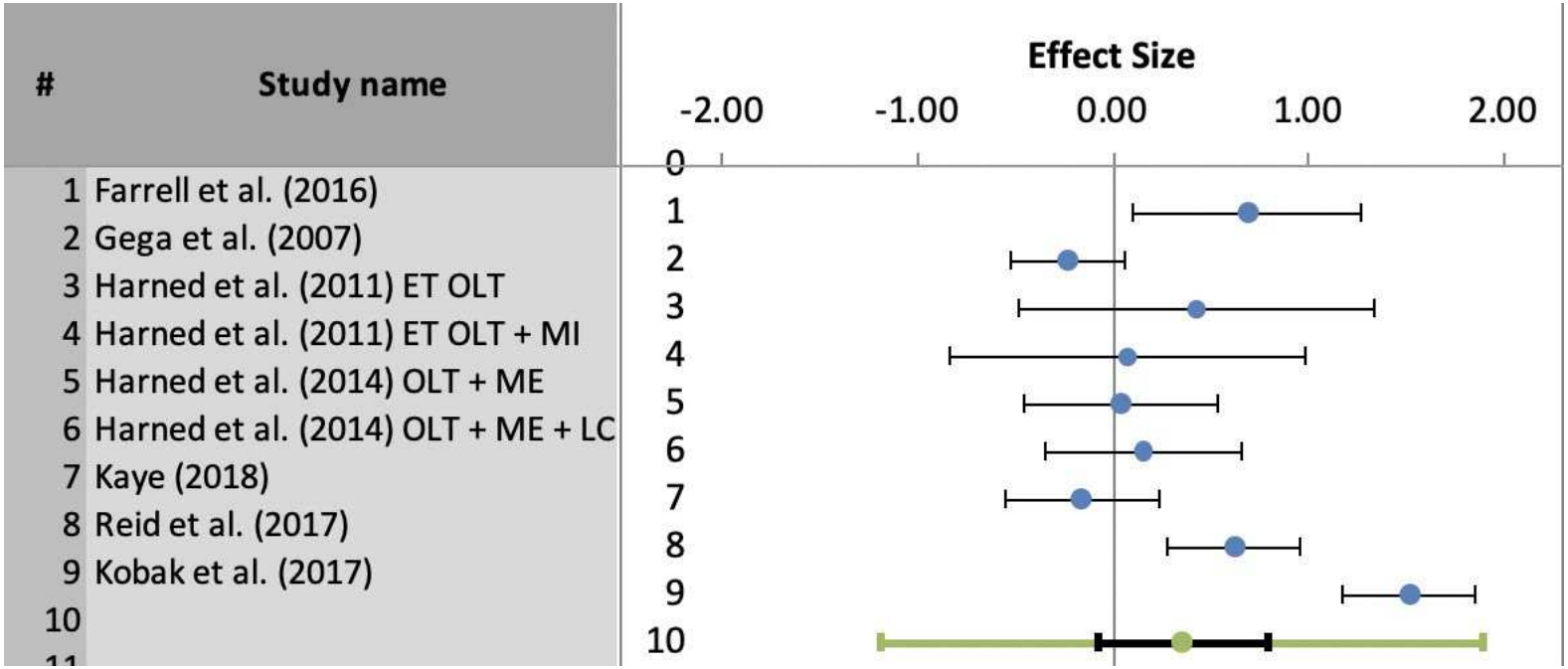


Figure 6

Forest Plot Showing the Effect of Training on Behavior



Supplemental Material A

Characteristics of the Primary Studies Included in the Meta-Analyses

Authors (year)	**Design**	***N***	**Participant characteristics**	**Comparison condition**	**Intervention**	**Outcome variable**	**Measure(s) of outcome variable**	**Effect size (*d*) for outcome variable**
Chin, Bernecker, Buchanan, Cunningham, Schumacher, and Coffey (2019)	Repeated-measures	53	• Community practitioners from substance abuse treatment facilities. • 57.1% master's degree level or educational specialist degree. • 42.9% current counsellor or psychosocial rehabilitation worker. • 74.5% female. • 40.4% 31-45years. • 75.5% Caucasian.	No comparison condition	An eight-hour Prolonged Exposure Therapy workshop. Included, didactic training, demonstration videos, and experiential activities such as role-plays.	Attitudes	Five items measuring attitudes towards prolonged exposure. Participants responded: 'true', 'false' or 'don't know'.	1.23
						Intentions	Two items measuring (i) commitment to and (ii) the importance of delivering prolonged exposure measured on 10-point Likert scale.	0.68
						Self-efficacy	Single item: I am confident that I can use exposure therapy with patients/clients I treat for PTSD.	0.91
Deacon, Farrell, Kemp, Dixon, Sy, Zhang, and McGrath (2013) Study 3	Repeated-measures	162	• Mental health professionals. • Majority master's level in social work or counselling. • Mean age = 51.2 (*SD* = 13.0) years. • 75.9% female. • 29.6% had provided exposure therapy in the last year. • Limited experience or	No comparison condition	Seven-hour didactic workshop on the nature and exposure-based treatment of anxiety disorders. Modifying negative beliefs about exposure therapy was briefly addressed but was not the main focus.	Attitudes	Therapist Beliefs about Exposure Scale (TBES).	1.50

			training in exposure therapy.					
Farrell, Kemp, Blakey, Meyer, and Deacon (2016)	Independent groups	49	• Endorsed theoretical orientations: 65.3% CBT, 14.3% family/systems, 10.2% humanistic/client-centered, 6.1% psychodynamic, 2.0% interpersonal, and 2.0% "other". • Mean age = 51.5 (*SD* = 10.5) years (31-73 years). • 65.3% female. • 93.6% Caucasian • 75.5% Master's degree, 18.4% Ph.D. • Mean 18.7 years of experience (*SD* = 9.6) in clinical practice.	Standard training workshop – eight-hour didactic instruction on the theory and practice of exposure therapy. (Active)	Enhanced training workshop – Standard training workshop plus: summaries of empirical findings that refute concerns about exposure therapy, case presentations and video-based client testimonials selected as emotion-based appeals, simulated interoceptive exposure exercise.	Knowledge Attitudes Behavior	Single item: How thorough is your understanding of the theory and practice of exposure therapy? (0 = not at all thorough, 100 = extremely thorough). Therapist Beliefs about Exposure Scale (TBES). Exposure Therapy Case Vignette (ETCV). (Self-report)	0.04 0.77 0.69
Gega, Norman, and Marks (2007)	Independent groups	92	• Mental health nursing students. • Mixed gender, age and ethnic origin. • No past training.	'Fearfighter' online individual training on exposure	Didactic lecture on exposure therapy, including how to do it, and coping techniques to use during exposure.	Knowledge	Two 10-item MCQs.	0.20

			Participants were in one of three pathways of study: 65% in a 3-year diploma, 11% in a 3-year degree, and 24% in an accelerated 2-year diploma. Participation and results were part of extra-curricular skills training and did not count towards examination results. • 75% English not first language.	therapy, including 'step-by-step' how to devise personalized exposure, and how to troubleshoot difficulties. (Active)		Behavior	Five questions on two case scenarios. Participants answered using short text and were scored for accuracy and completeness. (Assessed)	-0.23
Harned, Dimeff, Woodcock, and Skutch (2011) Exposure therapy online training (ET OLT)	Independent groups	23	• Minimal prior experience of exposure therapy. • Mean age = 41.4 (*SD* = 11.5) years. • 82.6% female. • 73.9% Caucasian, 6.5% African American, 8.7% Asian American, 8.7% Hispanic/Latino, 2.2% Other. • Range of professions with average 7.5 years worked as treatment provider. • Education: 8.7% BA/BS, 56.5% MA/MA, 28.3% Psy.D/Ph.D/M.D, 6.5% Ph.D dissertation. • 67.4% CBT theoretical orientation.	Control online training (OLT) – 'Dialectical Behavior Therapy validation principles and strategies'. Comparable in quality, length, and design, and containing no overlapping content. (Passive)	Exposure therapy online training (ET OLT) – Empirical and theoretical foundations of exposure therapy and how to conduct exposure therapy, activities for participants to construct exposure hierarchy and exposure task, and section highlighting the importance of minimizing avoidance during exposure and providing tips and practice exercises for recognizing and addressing avoidance.	Knowledge	27-item MCQ assessing knowledge of course content as well as ability to apply knowledge in hypothetical clinical scenarios.	2.03
						Attitudes	Attitudes Towards Exposure Therapy Scale (ATETS). 7 items assessing the perceived credibility of exposure therapy (e.g., "How scientific does exposure therapy seem to you?"). Items were rated on a 7-point scale from 1 = "Not at all" to 7 = "Extremely."	0.55
						Intentions	Adapted Readiness to Change Questionnaire 'action' subscale. 4-item measure of participants' motivation to learn and use exposure therapies (e.g., "I am	0.74

						motivated to use exposure procedures with my clients who have anxiety disorders." (5-point Likert scale with 1 = "Strongly disagree" and 5 = "Strongly agree.")	
					Self-efficacy	30-item self-efficacy questionnaire. All items began with, "I feel confident to" and were rated on 5-point Likert scale (1 = not confident, 5 = very confident).	1.59
					Behavior	4-item measure of the application of course content in clinical practice. (Self-report)	0.43
Harned, Dimeff, Woodcock, and Skutch (2011) Exposure therapy online training + motivational interviewing (ET OLT + MI)	Independent groups	23	• Minimal prior experience of exposure therapy. • Mean age = 41.4 (*SD* = 11.5) years. • 82.6% female. • 73.9% Caucasian, 6.5% African American, 8.7% Asian American, 8.7% Hispanic/Latino, 2.2% Other. • Range of professions with average 7.5 years worked as treatment provider. • Education: 8.7% BA/BS, 56.5% MA/MA, 28.3% Psy.D/Ph.D/M.D, 6.5% Ph.D dissertation. • 67.4% CBT theoretical orientation.	Control online training (OLT) – 'Dialectical Behavior Therapy validation principles and strategies'. Comparable in quality, length, and design, and containing no overlapping content. (Passive)	ET OLT plus motivational interviewing (ET OLT+MI) – In addition to ET OLT (see above, Harned et al., 2011 ET OLT), participants participated in 1–2 brief (up to 20- min) Motivational Interviewing-based phone calls to decrease ambivalence about adopting exposure therapies due to attitudinal barriers.	Knowledge	27-item MCQ assessing knowledge of course content as well as ability to apply knowledge in hypothetical clinical scenarios.	3.22
					Attitudes	Attitudes Towards Exposure Therapy Scale (ATETS) 7 items assessing the perceived credibility of exposure therapy (e.g., "How scientific does exposure therapy seem to you?"). Items were rated on a 7-point scale from 1 = "Not at all" to 7 = "Extremely."	0.77
					Intentions	Adapted Readiness to Change Questionnaire 'action' subscale.	0.53

							4-item measure of participants' motivation to learn and use exposure therapies (e.g., "I am motivated to use exposure procedures with my clients who have anxiety disorders." (5-point Likert scale with 1 = "Strongly disagree" and 5 = "Strongly agree.")	
						Self-efficacy	30-item self-efficacy questionnaire. All items began with, "I feel confident to" and were rated on 5-point Likert scale (1 = not confident, 5 = very confident).	2.06
						Behavior	4-item measure of the application of course content in clinical practice. (Self-report)	0.07
Harned, Dimeff, Woodcock, Kelly, Zavertnik, Contreras, and Danner (2014) Online training + Motivational enhancement (OLT + ME)	Independent groups	96	• Minimal prior experience of exposure therapy. • Mean age = 37.4 (*SD* = 10.3) years. • 71.3% female. • 72.1% Caucasian, 8.4% African American, 4.5% Asian American, 6.1% Hispanic/Latino, 8.9% multiracial. • Education: 11.8% BA/BS/RN, 67.1% MA/MS, 21.1% Psy.D/Ph.D/M.D/ABD.	Online 'Foundations of Exposure Therapies' training (OLT) – 10-hour online didactic training course with simulated clinical scenarios (Active).	OLT plus motivational enhancement (OLT+ME) – In addition to OLT, participants received two brief ME interventions to address attitudinal barriers to learning and using exposure therapy, including a five-minute video at the start of the OLT, and an online module at the end of the OLT with a virtual exposure therapy consultant.	Knowledge	49-item MCQ assessing knowledge of course content as well as ability to apply knowledge in hypothetical clinical scenarios.	-0.14
						Attitudes	Attitudes Towards Exposure Therapy Scale (ATETS).	0.41
						Self-efficacy	Adapted 27-item self-efficacy subscale of the Behavioral Anticipation and Confidence questionnaire. All items began with, "I feel confident to" and were rated on 5-point Likert	0.19

			• Range of professions with average 4.8 years worked since degree.				scale (1 = not confident, 5 = very confident).	
						Behavior	Exposure Therapy Clinical Use Survey (ETCS). (Self-report) Structured role plays coded by trained research assistant. (Assessed)	0.04
Harned, Dimeff, Woodcock, Kelly, Zavertnik, Contreras and Danner (2014) Online training + Motivational enhancement + Learning Community (OLT + ME + LC)	Independent groups	95	• Minimal prior experience of exposure therapy. • Mean age = 37.4 (*SD* = 10.3) years. • 71.3% female. • 72.1% Caucasian, 8.4% African American, 4.5% Asian American, 6.1% Hispanic/Latino, 8.9% multiracial. • Education: 11.8% BA/BS/RN, 67.1% MA/MS, 21.1% Psy.D/Ph.D/M.D/ABD. • Range of professions with average 4.8 years worked since degree.	Online 'Foundations of Exposure Therapies' training (OLT) – 10-hour online didactic training course with simulated clinical scenarios (Active).	OLT+ME, plus learning community (OLT+ME+LC). In addition to OLT+ME (see above, Harned et al., 2014), participants attended eight 1-hour LC meetings via an online conferencing platform facilitated by an experienced exposure therapy clinician. The first five meetings targeted knowledge acquisition and practice, and the next three meetings focused on increasing use of and clinical proficiency of exposure therapy. Homework assignments were given after each meeting.	Knowledge	49-item MCQ assessing knowledge of course content as well as ability to apply knowledge in hypothetical clinical scenarios.	0.29
						Attitudes	Attitudes Towards Exposure Therapy Scale (ATETS)	0.43
						Self-efficacy	Adapted 27-item self-efficacy subscale of the Behavioral Anticipation and Confidence questionnaire. All items began with, "I feel confident to" and were rated on 5-point Likert scale (1 = not confident, 5 = very confident).	0.26
						Behavior	Exposure Therapy Clinical Use Survey (ETCS). (Self-report). Structured role plays coded by trained research assistant. (Assessed)	0.16

Kaye (2018)	Independent groups	99	• 84% female. • 79% Caucasian. • 70% endorsed CBT orientation. • Average level of knowledge about exposure therapy was 44.9 (*SD* = 22.3) on scale 0-100	Standard exposure therapy training (ST) workshop, incorporating features to target clinicians' negative beliefs about exposure therapy (Active).	ST plus acceptance-based techniques (ST+ABT). ST workshop, plus role-play practice in developing fear hierarchies, and techniques intended to reduce clinicians' experiential avoidance of anxiety and discomfort during exposure.	Knowledge	Single item: How thorough is your understanding of the theory and practice of exposure therapy? (0 (not at all thorough) to 100 (extremely thorough).	1.29
						Attitudes	Therapist Beliefs about Exposure Scale (TBES).	1.52
						Intentions	Participants indicated the likelihood that they would regularly implement imaginal exposure, simulated exposure, therapist-directed in vivo exposure, client-directed in vivo exposure, and interoceptive exposure on a 5-point Likert scale from 0 (not at all likely) to 4 (very likely).	-0.15
						Behavior	Exposure Therapy Case Vignette (ETCV). (Self-report) Brief Experiential Avoidance Questionnaire (BEAQ). (Self-report) The Acceptance and Action Questionnaire-II (AAQ-II). (Self-report) Experiential Avoidance-Exposure (EA-E). (Self-report) Self-reported frequency of using each form of exposure	-0.16

						therapy since the workshop. Exposure sessions were videoed and coded by trained research assistants. Quality of exposure was determined in two ways: an objective composite score, comprised of therapist behaviors coded during the exposure. In addition, coders also provided a subjective overall assessment of the intensity of exposure delivery rated on a Likert scale. (Assessed)	
Kobak, Wolitzky-Taylor, Craske, and Rose (2017) Exposure module of CBT training intervention	Repeated-measures	70	• Community clinicians. • 83% female. • 85% Caucasian, 10% African American, and 5% other or mixed racial categories. • Mean age = 47.7 (*SD* = 13.7) years, (23-86 years). • Mean years of clinical experience = 12.2 (*SD* = 9.5). Range: 1–35 years. • 72% social workers, 24% psychologists, and 4% marriage and family therapists. • 40% received some type of prior formal training in CBT.	No comparison condition	Exposure module within web-based tutorial on CBT concepts and skills, including: differences between cognitive restructuring and exposure therapy, goals and critical factors in exposure therapy, therapist's role, designing exposure task, identifying and addressing avoidance of exposure therapy, and rationale for the frequency, timing and duration of exposure sessions.	Knowledge Behavior	46-item MCQ assessing trainees' knowledge of CBT concepts and techniques. Improvements in clinical skill were evaluated using the Yale Adherence and Competence Scale (YACS). (Assessed)	3.69 1.52
McDonough and Marks (2002)	Independent groups	37	• 3rd year medical students from King's College Hospital medical school.	'Fearfighter' online individual training on	Interactive face-to-face exposure therapy tutorial in small groups	Knowledge	75 true/false questions testing the student's ability to apply the principles of graded exposure to realistic clinical	0.67

			• 5 weeks into their 6-week clinical attachment in psychiatry. • 54% female.	exposure therapy, including 'step-by-step' how to devise personalized exposure, and how to troubleshoot difficulties (Active).			scenarios and their ability to recognise and avoid common pitfalls in treatment. Single -item: 'I find behavior therapy interesting' (0 = 'not true at all', 2 = 'slightly true', 4 = 'reasonably true', 6 = 'definitely true' and 8 = 'very true'.	0.12
Reid, Guzick, Balkhi, McBride, Geffken, and McNamara (2017)	Repeated-measures	42	• 60% doctoral students in a clinical, counselling, or school psychology, 19% pre-doctoral interns in clinical psychology, 12% postdoctoral associates, and 10% master's students in mental health counselling. • 81% female. • Mean age = 27.1 years (*SD* = 4.1). • 71% Caucasian, 14% Black, 7% Hispanic/Latino, 5% Indian/Middle Eastern, 2% Asian.	No comparison condition	Didactic presentation teaching basic principles of exposure therapy, challenges, and commonly held negative beliefs. Licensed supervisors systematically and regularly assess trainee competency. Supervisor-to-trainee and trainee-to-trainee feedback is provided by live modelling during treatment sessions and through individual and group supervision.	Attitudes Behavior	Therapist Beliefs about Exposure Scale (TBES) Exposure Therapist Delivery Scale (ETDS). (Self-report) Exposure Therapy Case Vignette (ETCV). (Self-report)	0.68 0.62

Ruzek, Eftekhari, Rosen, Crowley, Kuhn, Foa, Hembree, and Karlin (2016)	Repeated-measures	943	• 46.5% clinicians in specialized outpatient PTSD clinics, 26.6% clinicians in general mental health outpatient clinics, 6.9% clinicians in PTSD residential programs, and 16.6% clinicians in other clinic types. • 57.5% doctoral-level psychologists, 35.8% master's-level clinicians • 66.4% female. • 61.4% described theoretical orientation as CBT. • 74.4% never received formal training in prolonged exposure.	No comparison condition	Four-day interactive prolonged exposure therapy (PET) training workshop, including didactic teaching, supervised role-play, videos demonstrating core elements of PET, and discussion.	Attitudes	Questionnaire assessing (i) the degree to which clinicians valued specific exposure therapy treatment goals (e.g., helping patients to improve and not distressing patients), and (ii) various outcome expectancies associated with using prolonged exposure including for the patient and clinician.	0.34
						Self-efficacy	14-items assessed clinicians' self-efficacy to deliver prolonged exposure. For these items, clinicians were asked "How confident are you in your ability to effectively deliver the following aspects of prolonged exposure? on 7-point scale with 1 = "not at all confident", 4 = "somewhat confident", and 7 = "very confident".	0.55
Waller, D'Souza Walsh, and Wright (2016)	Repeated-measures	34	• 88% female. • 85.3% Caucasian. • Mean age = 39.0 (*SD* = 10.4) years. • Range of professions: 38% clinical psychology, 21% dietetics, 12% psychiatry, 6% nursing, 6% social work, 3% family therapy, 3% occupational therapy, 3% counselling, 3% psychotherapy, and 3% art therapy. One participant	No comparison condition	90-minute didactic teaching session covering the theory and evidence of exposure therapy for eating disorders.	Attitudes	Therapist Beliefs about Exposure Scale (TBES)	1.15

			did not state their profession.					
Wright and Waller (2019)	Independent groups	89	• Intervention group, 85.1% female; Comparison group, 76.2% female. • Intervention group, 85.1% Caucasian; Comparison group, 71.4% Caucasian. • Intervention group mean age = 38.3 (*SD* = 11.4) years; Comparison group mean age = 40.8 (*SD* = 10.8) years. • Qualified clinicians, delivering therapy to eating-disorders patients. • Intervention group mean time working with eating disorders = 9.3 (*SD* = 9.0) years; Comparison group mean time working with eating disorders = 4.3 (*SD* = 6.0) years.	90-minute teaching session on CBT for eating disorders (without specific teaching on exposure therapy as an element of CBT), including didactic presentation, role play, case presentations, and discussion of attendee case material and experiences (Passive).	90-minute teaching session on exposure therapy for eating disorders including didactic presentation, role play, case presentations, and discussion of attendee case material and experiences.	Attitudes	Therapist Beliefs about Exposure Scale (TBES)	1.20

Note: MCQ = Multiple-choice Questionnaire; CBT = Cognitive Behavioral Therapy

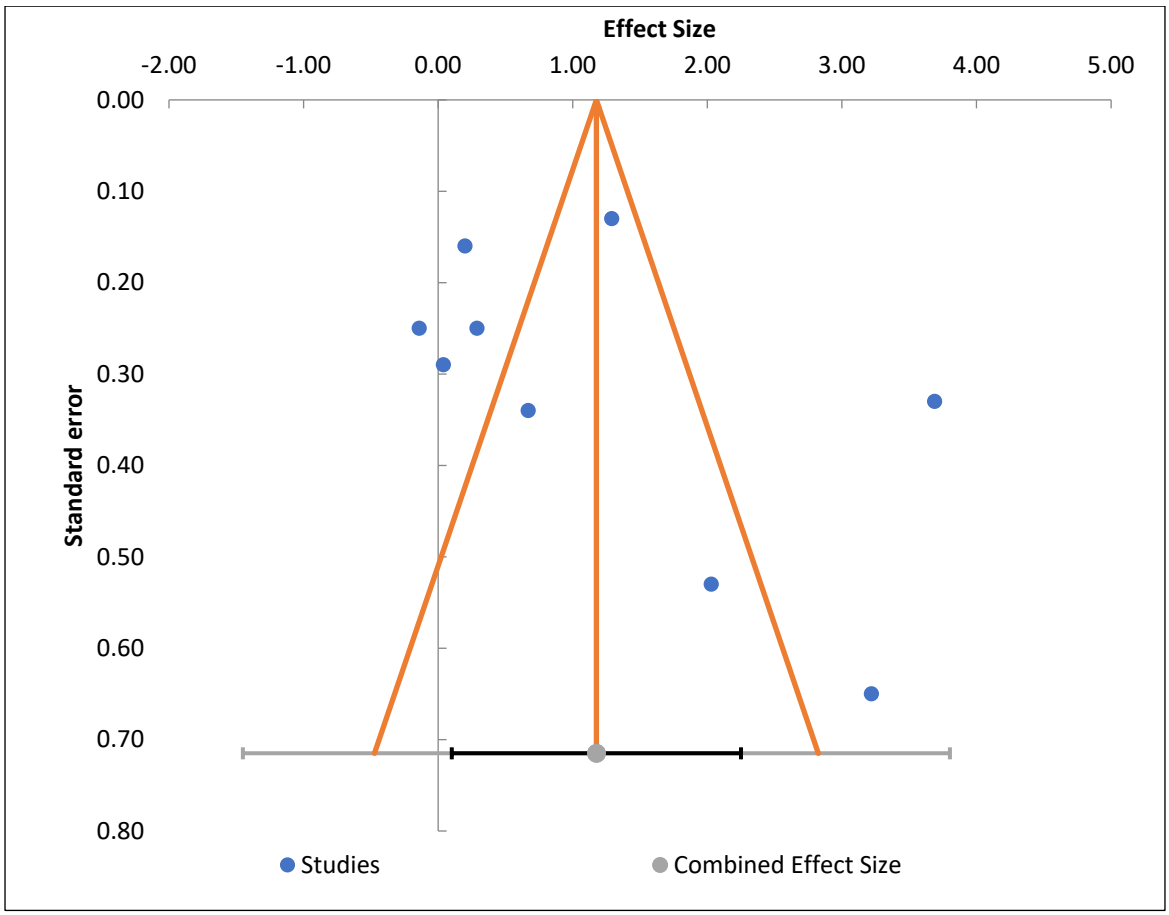
Supplemental Material B: Table Showing the Paper-by-Paper Assessment of Methodological Quality

	Item																												
Study	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**Total**	**Quality**
Chin (2019)	1	1	1	1	0	1	1	0	0	1	0	0	1	0	0	0	1	1	0	1	1	0	0	0	1	0	0	13/28	Poor
Deacon (2013)	1	1	1	1	0	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	0	1	0	15/28	Fair
Farrell (2016)	1	1	1	1	0	1	1	0	1	1	0	0	1	0	0	0	1	1	0	1	1	0	0	0	1	1	0	15/28	Fair
Gega (2007)	1	1	1	1	0	0	1	0	1	1	0	0	1	0	1	1	1	1	0	1	1	1	1	0	0	1	1	18/28	Fair
Harned (2011) ET OLT	1	1	1	1	2	1	1	0	1	0	1	1	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	23/28	Good
Harned (2011) ET OLT+MI	1	1	1	1	2	1	1	0	1	0	1	1	1	0	0	1	1	1	0	1	1	1	1	1	1	1	1	23/28	Good
Harned (2014) OLT+ME	1	1	1	1	2	0	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	23/28	Good
Harned (2014) OLT+ME+LC	1	1	1	1	2	0	1	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	1	1	23/28	Good
Kaye (2018)	1	1	1	1	2	1	1	0	1	1	1	1	0	0	0	1	1	1	0	1	1	1	0	0	1	1	1	20/28	Good
Kobak (2017)	1	1	1	1	1	1	1	0	0	1	1	0	1	0	1	1	1	1	0	1	1	1	0	0	0	0	1	18/28	Fair
McDonough (2002)	1	1	0	1	0	1	1	0	1	1	1	0	1	0	0	1	1	1	0	1	1	1	1	0	0	1	0	17/28	Fair
Reid (2017)	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	0	1	1	1	1	1	0	0	0	0	1	0	16/28	Fair
Ruzek (2016)	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	0	1	1	0	0	0	1	1	0	17/28	Fair
Waller (2016)	1	1	1	1	1	1	1	0	1	0	0	1	1	0	0	1	1	1	0	1	1	1	0	0	1	1	1	19/28	Good
Wright (2019)	1	1	1	1	1	1	1	0	1	1	0	0	1	0	0	1	1	1	1	1	1	1	0	0	1	1	1	20/28	Good

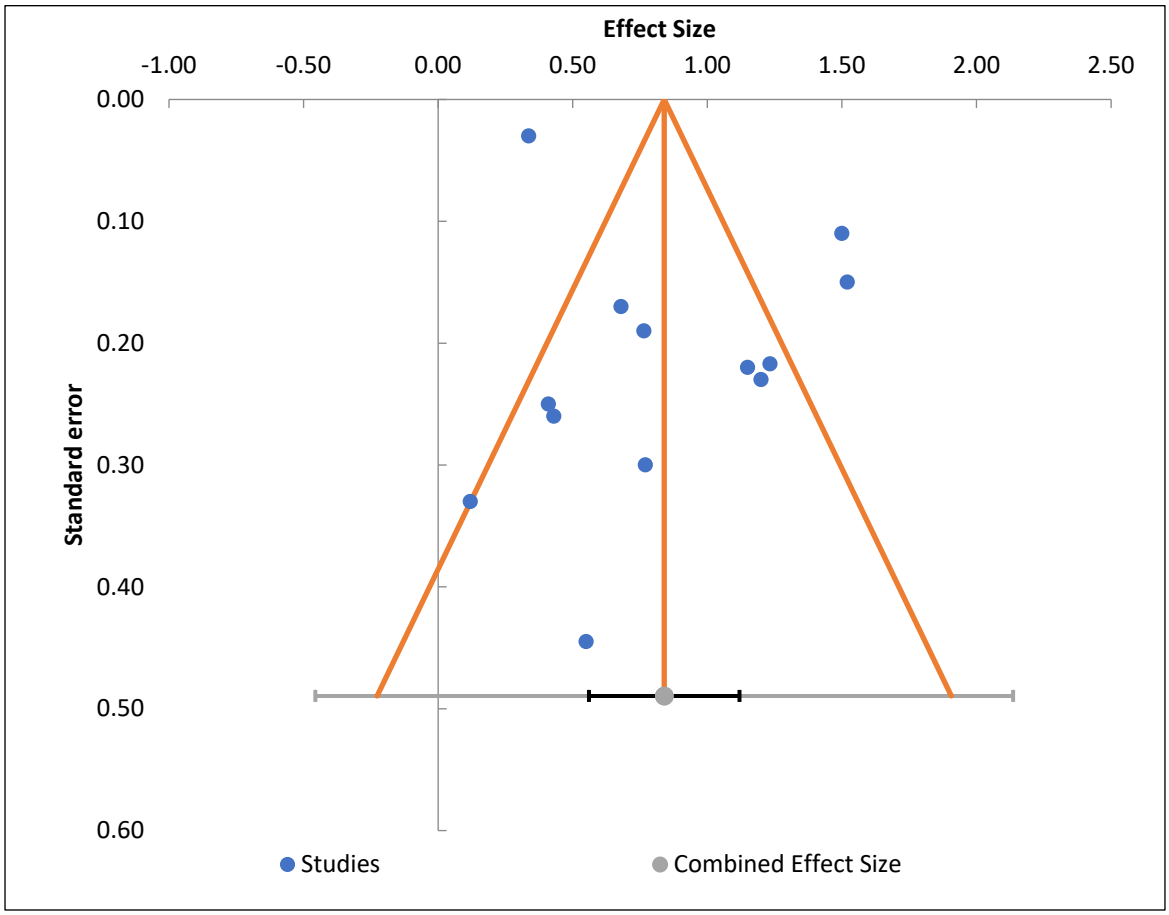
Note: Green = Yes; Orange = Unable to determine or partial (item 5); Red = No

Supplemental Material C: Funnel plots

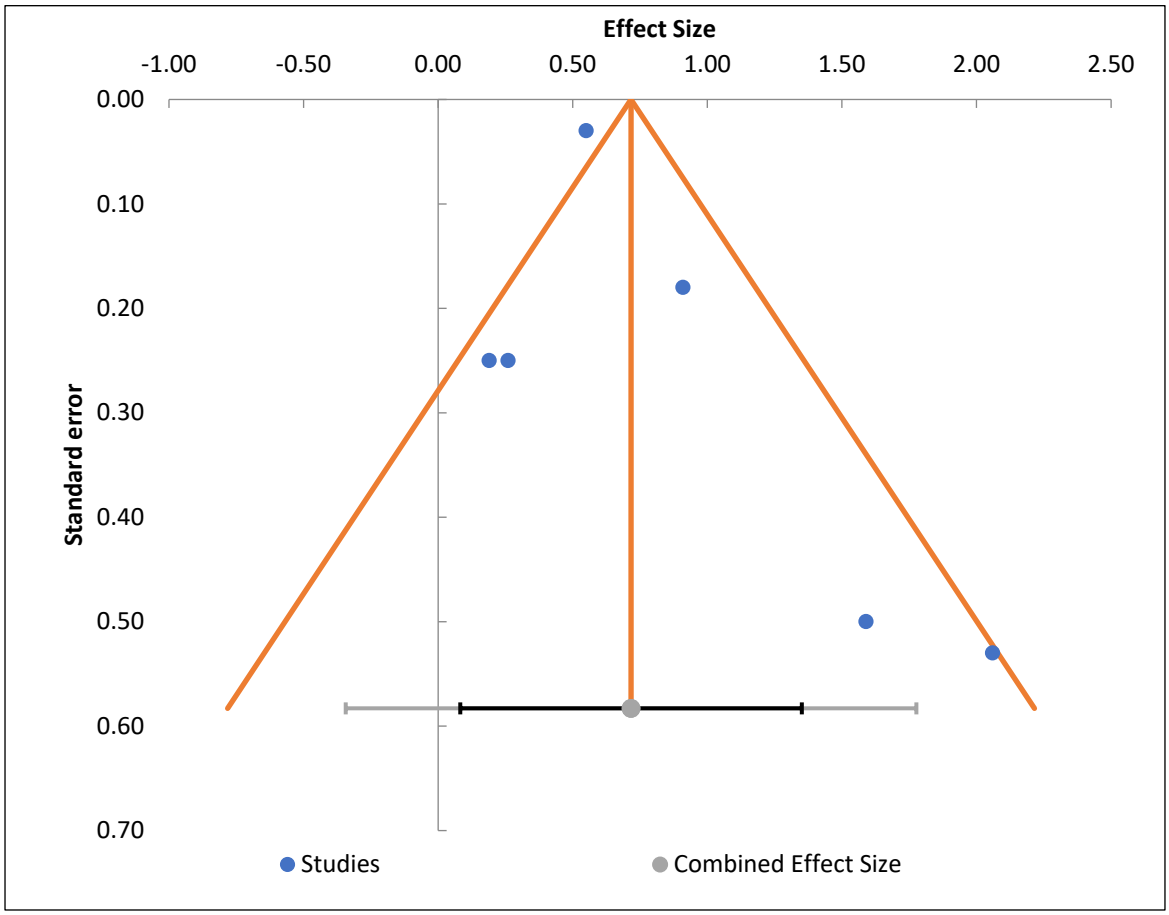
a) Funnel Plot Showing the Effect of Training on Knowledge



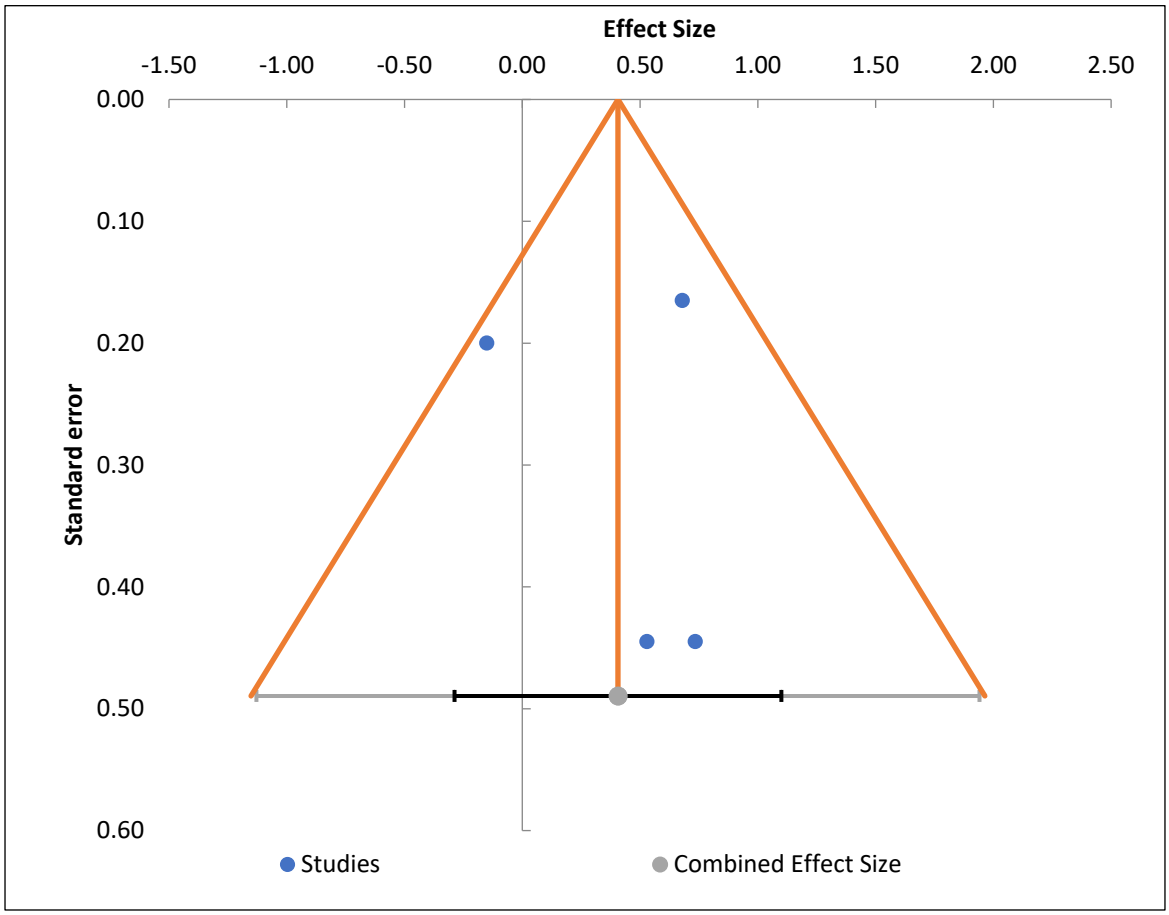
b) Funnel Plot Showing the Effect of Training on Attitudes



c) Funnel Plot Showing the Effect of Training on Self-efficacy



d) Funnel Plot Showing the Effect of Training on Intentions



e) Funnel Plot Showing the Effect of Training on Behavior