

# A Meta-Analysis of Indicated Mental Health Prevention Programs for At-Risk Higher Education Students

Colleen S. Conley, Jenna B. Shapiro, Alexandra C. Kirsch, and Joseph A. Durlak  
Loyola University Chicago

This meta-analysis found empirical support for the effectiveness of indicated prevention programs for higher education students at risk for subsequent mental health difficulties based on their current subclinical levels of various presenting problems, such as depression, anxiety, or interpersonal difficulties. A systematic literature search identified 79 controlled published and unpublished interventions involving 4,470 college, graduate, or professional students. Programs were effective at post-intervention overall ( $ES = 0.49$ ,  $CI [0.43, 0.55]$ ), and for both targeted outcomes ( $ES = 0.58$ ,  $CI [0.51, 0.64]$ ) as well as additional nontargeted outcomes assessed in the studies ( $ES = 0.32$ ,  $CI [0.25, 0.39]$ ). Interventions compared with a no-intervention or a wait-list control ( $ES = 0.64$ ,  $CI [0.57, 0.71]$ ,  $k = 68$ ) demonstrated significantly larger effects overall than did interventions compared with an attention-placebo control ( $ES = 0.27$ ,  $CI [0.11, 0.43]$ ,  $k = 11$ ), although both were significant. Among the former group, modality and presenting problem emerged as significant moderators of intervention effectiveness, and among the 43 of these that assessed effectiveness at an average follow-up period of 35 weeks, the positive effects from intervention remained strong ( $ES = 0.59$ ,  $CI [0.50, 0.68]$ ). Overall, programs were fairly brief, attracted and retained students, were positively rated by students, and effective when administered by paraprofessionals as well as professionals. Current findings are promising and stimulate recommendations for improving future research, such as expanding the range of outcomes assessed, and clarifying moderators and mediators of intervention impact.

## Public Significance Statement

This meta-analysis found empirical support for the effectiveness of indicated prevention programs for higher education students at risk for subsequent mental health difficulties based on their current subclinical levels of various presenting problems, such as depression, anxiety, or interpersonal difficulties. Several features of these interventions, such as their brevity and positive ratings offered by students, indicate the feasibility of helping students who are having difficulties before they become more serious.

*Keywords:* mental health, meta-analysis, indicated prevention, higher education, students

Mental health problems are common among higher education students. For example, epidemiological evidence suggests that up to 40% of higher education students have a diagnosable mental disorder (Blanco et al., 2008), and many college students struggle with various subclinical-level psychological symptoms (Bewick, Gill, Mulhern, Barkham, & Hill, 2008). One large national survey of over 95,761 respondents found that over the past year, 36.7% of students reported experiencing levels of depression so severe that

it was difficult for them to function, 58.4% had overwhelming anxiety, and 39.6% had experienced overwhelming anger (American College Health Association [ACHA], 2016). A significant portion of students also reported recent interpersonal stresses such as loneliness (59.3%), family difficulties (28.8%), problems in intimate relationships (30.1%), and other interpersonal concerns (26.1%). Mental health problems in college students deserve attention, not only because of their psychological and social impact on students and the broader campus community, but also because adjustment difficulties have an impact on academic functioning and enrollment. Students with mental health problems are at risk for lower academic performance and for dropping out of school (Eisenberg, Golberstein, & Hunt, 2009; National Alliance on Mental Illness, 2012), which presents a loss to students and to institutions.

Additional data suggest that the typical ways to offer mental health services on campuses—through appointments with counseling or health centers—have significant limitations. Counseling center usage data suggests that only 35.6% of students who need mental health services for clinical or subclinical problems seek assistance through traditional campus resources (Eisenberg, Hunt,

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Colleen S. Conley, Jenna B. Shapiro, Alexandra C. Kirsch, and Joseph A. Durlak, Department of Psychology, Loyola University Chicago.

This research was supported by the American College Health Foundation Stephen D. Weiss Award. An early version of these results was presented at the American College Health Association annual meeting in 2015. Special thanks go to Evan Zahniser and the many research assistants who provided valuable contributions to this project.

Correspondence concerning this article should be addressed to Colleen S. Conley, Department of Psychology, Loyola University Chicago, 1032 West Sheridan Road, Chicago, IL 60660. E-mail: cconley@luc.edu

Speer, & Zivin, 2011), and 50% of students who stop attending college because of mental health reasons report not having accessed mental health services (National Alliance on Mental Illness, 2012). Additionally, with an average staff-to-student ratio of 1:2081, and larger campuses tending to report an even greater burden, it is not surprising that counseling center staff frequently report a strain on their available resources, which contributes to longer waiting lists and shorter session limits (Gallagher, 2014). Recognizing the importance of moving beyond traditional treatment models into more preventive ones, the American Psychological Association [APA], with supportive legislation from Congress, has advocated for prevention programs on college campuses to address the increasing mental health needs of students; however, thus far, these efforts have been focused predominantly on suicide prevention, and the APA acknowledges the need to expand this initiative more broadly (Eiser, 2011).

Because the usual mental health services available on campuses are not meeting students' needs, it is important to investigate the impact of preventive approaches such as universal interventions offered to all students, selective prevention targeted for subpopulations that are at elevated risk because of various demographic or socioeconomic circumstances, and indicated prevention delivered to those at risk for mental illness due to experiencing early signs of mental health problems that have not yet developed into diagnosable clinical conditions.

### Prevention in Higher Education

Many different types of prevention programs have been offered in higher educational settings. Reviews of research focused on alcohol or tobacco use (e.g., Scott-Sheldon, Carey, Elliott, Garey, & Carey, 2014; Rodgers, 2012), sexual assault (e.g., Vladutiu, Martin, & Macy, 2011), body image and eating concerns (Yager & O'Dea, 2008), test anxiety (Ergene, 2003), and low academic achievement (Kulik, Kulik, & Shwalb, 1983) have indicated the potential for preventive interventions to lessen problems in these areas, although the quality of the research varies with the subject area, and more work is needed to understand the particular outcomes that are most amenable to change, the longer term effects of interventions, and the study features that moderate different types of outcomes.

Other reviews have focused on prevention programs for depression, anxiety, stress and other mental health symptoms. However, some have combined universal, selective, and indicated prevention studies in their analyses so the relative effectiveness of each approach cannot be determined (Buchanan, 2012; Davies, Morriss, & Glazebrook, 2014; Reavley & Jorm, 2010; Regehr, Glancy, & Pitts, 2013). Some have included a limited number of studies or restricted their attention only to published reports (Buchanan, 2012; Davies et al., 2014; Regehr et al., 2013; Shiralkar, Harris, Eddins-Folensbee, & Coverdale, 2013). In a meta-analysis of 103 *universal* face-to-face (FTF) published and unpublished prevention programs for higher education students, the reviewed interventions successfully impacted several types of outcomes including depression, anxiety, stress, social emotional skills, self-perceptions, and academic behaviors and performance (Conley, Durlak, & Kirsch, 2015). In another meta-analysis involving higher education samples but focused on technology-based interventions, both indicated and universal preventive approaches were

successful, although mean effects were significantly higher overall for indicated interventions (Conley, Durlak, Shapiro, Kirsch, & Zahniser, 2016). Both indicated and universal programs were associated with significant changes in participants' levels of depression, anxiety, stress, and interpersonal relationships.

There were only 26 *indicated* technology-delivered interventions in the Conley and colleagues (2016) review, but many more FTF indicated interventions have been conducted in higher education settings. These studies merit attention, but have not been systematically evaluated yet. These indicated programs typically involve brief small-group interventions for students who have been identified using various screening procedures to detect subclinical levels of mental health symptoms. For example, one study screened female college students to identify those experiencing mild to moderately high depression symptoms but who had never been diagnosed with clinical depression (Peden, Hall, Rayens, & Beebe, 2000). Ninety-two participants meeting eligibility criteria were randomized either to a no-intervention control group or to a six-week cognitive-behavioral intervention condition aimed at reducing negative thinking. Participants in the intervention group showed significant declines in depressive symptoms and negative thinking and increases in self-esteem compared with the control group, with gains maintained at one- and six-month follow-ups. Another study identified students at risk for panic and anxiety disorders by screening them on a measure of anxiety sensitivity (Abplanalp, 2001). In this study, 405 participants were randomized either to an attention-placebo control group that participated in a nonspecific discussion or to a three-session intervention condition that met in groups and participated in psychoeducation, exposure exercises, and relaxation exercises. Participants in the intervention significantly improved on anxiety sensitivity and mood compared with those in the control group.

### The Current Meta-Analysis

The purpose of the current meta-analysis is to evaluate the impact of published and unpublished FTF indicated prevention programs for various types of early identified mental health problems, such as subthreshold depression and anxiety symptoms, which are common signs of adjustment difficulties for higher education students. We examined the impact of programs overall, as well as separately for each major primary presenting problem targeted in the interventions. We predicted that indicated interventions would be associated with significant mean effects for each identified presenting problem.

In their review of universal programs discussed above, in which many interventions sought to promote student skills, Conley and colleagues (2015) found that programs including supervised practice were more effective than interventions that did not incorporate this feature. In skill-training programs, supervised practice is an important component because those beginning to learn new behaviors need support and individualized feedback to attain skill mastery (see Conley et al., 2015). Therefore, we hypothesized that supervised practice would moderate the outcomes of the indicated prevention studies in the current review, as well.

We separately examined outcomes specifically related to the presenting problems (e.g., targeted outcomes such as depressive symptomatology) and additional outcomes assessed by the interventions (e.g., outcomes not directly targeted, such as school adjust-

ment or interpersonal relationships). Further, as reviews have indicated that outcomes can vary depending on the type of control condition (Lipsey & Wilson, 1993; Wampold, Minami, Tierney, Baskin, & Bhati, 2005) we examined the results separately for interventions that used no-intervention or wait-list controls, and those that employed attention-placebo controls. Although we did not have specific predictions, we were interested in investigating the relative effectiveness of different intervention strategies (e.g., cognitive-behavioral, relaxation, social skills training) across presenting problems and for specific targeted problem areas (e.g., depression, anxiety, interpersonal problems). Finally, we also examined the potential influence of various other variables relating to methodology (e.g., publication status, experimental design), participant characteristics (e.g., gender, ethnicity, primary presenting problem), and intervention features (e.g., individual or group modality, facilitator expertise, intervention duration) on intervention effectiveness in an exploratory fashion.

## Method

As this research did not involve any direct data collection from human subjects, research ethics committee approval was not applicable.

### Search Strategy and Study Selection

A multifaceted systematic search strategy was conducted to assemble a representative sample of unpublished and published literature. Literature searches were performed through the end of December 2014 in seven online databases, including Pubmed, ERIC, Medline, Proquest Digital Dissertations, PsycINFO, Web of Science, and Cochrane Libraries. Searches were conducted using a combination of search terms to identify studies evaluating indicated mental health (e.g., depression, anxiety, distress, at-risk) prevention programs (e.g., prevention, intervention, program, workshop) with a higher education sample (e.g., college, university, graduate, undergraduate). In addition, 46 relevant journals were hand-searched, covering a period of 10 years from 2005–2014. Reference lists of relevant reviews and included reports were searched for additional studies. Finally, publication lists of the authors of included reports were searched to capture additional relevant articles.<sup>1</sup>

The five inclusion criteria were (a) the study evaluated an indicated prevention program that targeted those with early signs of mental health symptoms, but who had not reached a point where they met diagnostic criteria for a clinical disorder; (b) the sample was comprised of undergraduate, graduate, and/or professional students; (c) the report contained a nonintervention control group (i.e., either a no-intervention, wait-list, or attention-placebo group); (d) there was at least one quantitative mental health outcome measure (see below) with data in a usable format for calculating effect sizes; (e) there were at least  $n \geq 10$  participants assigned to each condition; and (f) the study appeared in English by December 31, 2014. Excluded studies were those that primarily focused on academics, physical health, substance use, sexual assault, body image, or test anxiety (see, e.g., Ergene, 2003; Rodgers, 2012; Yager & O'Dea, 2008, for reviews and meta-analyses in these areas). We also excluded reports in which two alternative treatments were compared without

any control group, and intervention formats that have previously been the focus of meta-analyses, including technology-delivered, expressive writing, and bibliotherapy programs (Conley et al., 2016; Frattaroli, 2006; Marrs, 1995). If variations of the same intervention were presented in the same report, the more comprehensive intervention with more elements was included. Data were included only once from multiple reports of the same sample, such as a dissertation and published report on the same study.

Figure 1 indicates the flow of studies into the meta-analysis. Initially, 13,603 studies were identified, and 13,526 were excluded based on our various inclusion and exclusion criteria, leaving 77 eligible reports. Eight of these did not provide data in a usable format for calculating effect sizes and nine contained overlapping samples, leaving a final sample of 60 reports evaluating 79 different interventions.

### Study Coding

Included studies were coded on general aspects of the study (e.g., year of report, publication status, country in which the intervention took place, type of experimental design and control group), participant characteristics (e.g., sample size, sample and differential attrition, gender and ethnic breakdown, primary presenting problem), intervention features (e.g., primary intervention strategy, group or individual modality, facilitator expertise, treatment duration) and outcomes assessed. Codes that require further explanation are described below.

**Type of control.** Studies were coded as having (a) a *no-intervention or wait-list control condition* in which the comparison group only completed assessment procedures or (b) an *attention-placebo control condition* in which the comparison group participated in some activity that did not contain the therapeutic elements of the evaluated intervention (e.g., participating in general discussion groups designed not to contain any structure or specific guidance about the presenting problem, Meichenbaum, Gilmore, & Fedoravicius, 1971; lying quietly instead of receiving systematic progressive relaxation exercises to combat anxiety, Dolbier & Rush, 2012). *Attention-placebo control* groups thus offered some activity to participants in an attempt to control for some nonspecific factors such as nontherapeutic information, attention, and social interaction.

**Primary presenting problem.** Presenting problems included: (a) *Depression*; (b) *Anxiety*; (c) *Both Depression and Anxiety*; (d) *Anger*; (e) *General Psychological Distress*, including significant stress, negative emotionality, or difficulty coping; (f) *Cognitive Vulnerability*, including two studies with primary presenting problems of negative self-referential thoughts and one with perfectionism as the primary concern; and (g) *Interpersonal Problems*, which included shyness, loneliness, or low social support.

**Outcomes assessed.** Each outcome variable was first classified into one of 11 categories: (a) *Depression*; (b) *Anxiety*; (c) *Anger*; (d) *General Psychological Distress*, assessing stress or general affect/mood; (e) *Social-Emotional Skills*, including assessments of coping strategies, affective regulation and cognitive modification techniques, social skills, and emotional self-awareness; (f) *Self-Perceptions*, including measures of self-esteem and other

<sup>1</sup> A copy of the search terms, the journals and reviews that were hand searched, and the coding manual are available from the authors on request.

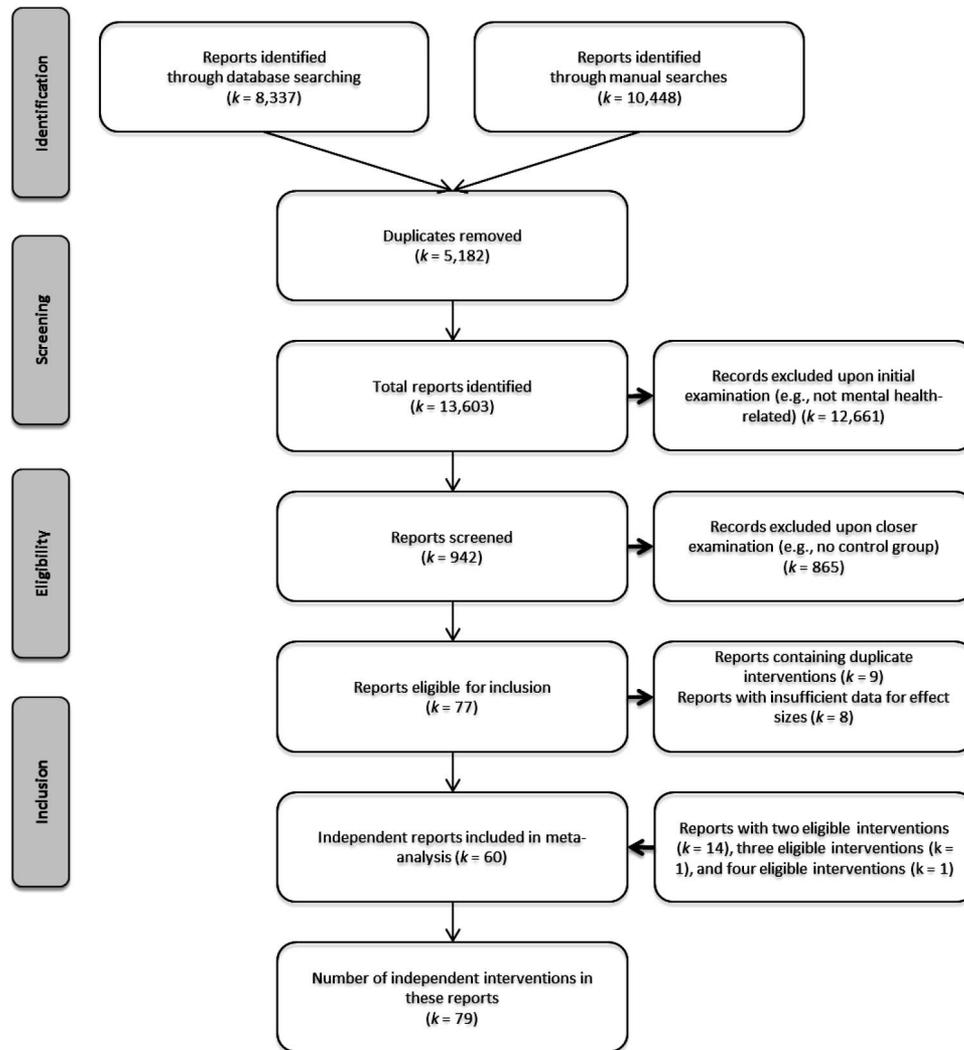


Figure 1. Flow of information through the different phases of the review.

self-evaluation; (g) *Interpersonal Relationships*, including assessments of relationship quality, interpersonal satisfaction, social support, communication or conflict; (h) *Academics*, including reports of grades, GPA, and university retention; (i) *Physical Health*; (j) *Spirituality*; and (k) *Substance Use* outcomes. Due to small sample sizes, academics, physical health, spirituality, and substance use outcomes were combined into an (l) *Other* category for data analysis.

Outcomes were further categorized as reflecting a *Targeted* outcome of the intervention, which was either explicitly stated by study authors or determined based on the subclinical problems that participants were screened on for study inclusion, or as reflecting an additional *Nontargeted* outcome of the intervention. For example, if an intervention focused on lowering depressive symptoms and depressogenic thinking, these outcomes were coded as targeted, and additional outcomes assessing anxiety, self-perceptions, or interpersonal relationships were coded as nontargeted.

The source of the outcome data was categorized as: (a) *Self-Report*, rating scales completed by intervention participants; (b)

*Behavioral Observations*, observer ratings of specific responses in experimental situations; (c) *Physiological Measures*, including heart rate and blood pressure; (d) *Academic Performance Measures*, including grades and absences; (e) *Behavioral Performance Measures*, such as anxiety performance tests; (f) *Diagnostic Interviews* conducted by qualified professionals; (g) *Other Expert Judgments*, including therapist or group leader ratings, and (h) *Reports from Peers*, such as ratings of social skills.

**Severity exclusion.** Studies were coded on whether participants who had diagnoses, were currently seeking treatment, or showed severe symptoms were excluded from intervention participation or from data analyses. This code identified which studies retained a clear indicated prevention focus by excluding participants who should be receiving treatment for serious (i.e., clinical-level) problems. It also identified any studies that had ensured participants were not also seeking intervention elsewhere during the study.

**Primary intervention strategy.** Each program was coded for its main prevention strategy: (a) *Cognitive-Behavioral* interven-

tions that focused on monitoring and modifying maladaptive thoughts with or without additional behavioral elements; (b) *Relaxation* interventions that exclusively used methods such as deep breathing, progressive muscle relaxation, and systematic desensitization exercises; (c) *Social Skills Training* interventions that focused on developing interpersonal skills through assertiveness training, role playing, or interpersonal skill-building exercises; (d) *General Behavioral* interventions that used exposure, behavioral activation, and/or skill-building techniques; (e) *Social Support* interventions that focused on nondirective peer-based discussion and support; (f) *Mindfulness* interventions, which rely on training the mind to adopt a nonjudgmental present-focused awareness; (g) *Meditation* interventions that focused on mindfully controlling breathing with the eyes closed; (h) *Psychoeducational* interventions that offered reading literature and information relevant to the participants' presenting problems and ways of coping; (i) *Acceptance and Commitment Therapy (ACT)* interventions that have a values-based approach toward acceptance of emotional responses and life circumstances; (j) *Interpersonal Psychotherapy (IPT)* programs that evaluate how changes in social relationships impact psychological functioning, and (k) *Other* interventions, including one resilience training intervention that focused on goal-setting and self-efficacy building, and one forgiveness training intervention.

**Facilitator expertise.** The intervention facilitator was coded as: (a) *Professional*, which included mental health professionals such as psychologists or psychiatric nurses, or (b) *Paraprofessional*, which included university staff, graduate students, or student peers.

**Intervention content.** Specific intervention components were coded to determine the most effective features that might predict program success. Interventions were coded for whether they had *Supervised Skills Practice*, in which there were opportunities for participants to practice specific skills in session with a facilitator who could monitor and provide feedback about skill development.

**Establishing reliability.** Two undergraduate and one graduate-level research assistant completed 20 hours of training including group review of nine reports (15%) with the study authors. Coders then independently coded 15 reports (25%) and demonstrated good levels of reliability; level of agreement across codes based on Fleiss' kappa averaged 0.87 (ranged from 0.49 to 1.0); the intraclass correlation among the raters averaged 0.87 (range = 0.62, 1.0). The remaining 36 (60%) reports were coded independently by one coder, and then checked by one or more of the study authors. Disagreements in coding were resolved through discussion among the study authors.

## Data Analysis Strategy

Effect sizes were calculated and analyzed with Comprehensive Meta-Analysis Version 3 (CMA-V3; Borenstein, Hedges, Higgins, & Rothstein, 2014), which permits ES adjustments for small sample size, and weights studies according to the inverse of their variance before analyses are conducted. Effect sizes (ES), represented by Hedges'  $g$ , were calculated at post-test for 521 outcomes and at follow-up for 260 outcomes. Means, standard deviations, and  $N$ s were used to calculate effect sizes whenever available; other methods were used to estimate effects (e.g., based on  $t$  test or chi-square values) following recommended procedures (Boren-

stein, Hedges, Higgins, & Rothstein, 2009; Lipsey & Wilson, 2001). Authors were contacted via email to obtain any missing data that were needed for calculating effect sizes. If the report indicated that an ES was nonsignificant and no other data were available, it was conservatively estimated as zero. A total of 17 outcomes (3.3%) were estimated as zero. ESs of measures from the same study that were coded in the same outcome category were averaged, resulting in each intervention only having one ES per outcome category. Positive effect sizes indicate that participants in the intervention fared better than controls.

The value of two ESs were considered outliers given that their values were greater than three standard deviations from the mean of their distributions. As suggested by Lipsey and Wilson (2001), these ESs were Winsorized by setting the value equal to three standard deviations from the mean. ESs at post-test and follow-up were adjusted for pre-intervention outcome scores if pre-intervention data were available, by subtracting the pre-test from the post-test ES. Random effects modeling was used to increase the generalizability of the findings, and 95% confidence intervals (CIs) were calculated for each ES.

**Significance and heterogeneity.** We interpreted mean ESs as statistically significant at the  $p < .05$  level, but only when there were more than five interventions in a category. Differences between mean effect sizes, when there were more than five interventions in each category, were determined by assessing the significance of between-groups  $Q$ . Sample heterogeneity was assessed with  $I^2$  values using guidelines of  $\leq 25\%$  for low heterogeneity, 50% for moderate heterogeneity, and  $> 75\%$  for high heterogeneity (Higgins, Thompson, Deeks, & Altman, 2003). We also present within-group  $Q$ -values and associated  $p$  values as a metric for heterogeneity.

## Results

### Descriptive Information on Review Sample

Table 1 provides descriptive information on the 79 reviewed interventions. A few features are worthy of note here. Overall, interventions were fairly well designed in terms of randomization (86%) and had low levels of overall attrition (7%) and differential attrition (attrition from the intervention group minus control group averaged 0.5%). The majority of interventions targeted either anxiety (29%) or anger (27%) as the primary presenting problem. Over a fourth of the interventions explicitly stated that participants who had a current diagnosis or who were in treatment were excluded. About half of the interventions were cognitive-behavioral, and over a third (37%) were behavioral (relaxation, social skills training, or general behavioral interventions); most (86%) were delivered in a group format. Notably, nearly all (96%) interventions included skills practice. On average the interventions lasted approximately eight hours. Researchers provided quantitative data on the mean percentage of sessions attended for 29 interventions, which averaged 89%.

Table 1 lists sources of outcome data by intervention. Across all interventions, 84% of the outcomes were self-report measures, 6% were behavioral observations, 6% were physiological measures, and less than 1% each were academic performance measures, behavioral performance measures, diagnostic interviews, other expert judgments, or reports from peers.

Table 1  
*Descriptive Characteristics for the 79 Included Interventions (77 at Post-Intervention, and 2 at Follow-Up Only)*

Study characteristics	All interventions ( $k = 79$ )	
	$k$	%
General study features		
Year of report		
1970–1979	15	19.0%
1980–1989	19	24.1%
1990–1999	11	13.9%
2000–2009	20	25.3%
2010–2014	14	17.7%
Publication status		
Published	71	89.9%
Unpublished <sup>a</sup>	8	10.1%
Country		
Inside the United States	71	89.9%
Outside the United States <sup>b</sup>	8	10.1%
Design features		
Experimental design		
Randomized	68	86.1%
Quasi-experimental	11	13.9%
Type of control		
No-intervention/wait-list	68	86.1%
Attention-placebo	11	14.0%
Participant characteristics		
Initial sample size (intervention + control)		
$M$ ( $SD$ )	28.58	(30.95)
Median (range)	18.00	(10–244)
0–50	47	59.5%
51–100	26	32.9%
101+	6	7.6%
Overall sample attrition		
$M$ ( $SD$ )	7.32%	(10.93%)
Median (range)	.00%	(0–33%)
Differential attrition ( $k = 45$ reported)		
$M$ ( $SD$ ) of absolute value	5.28%	(9.79%)
Median (range) of absolute value	.00%	(0–45%)
Gender (% female; $k = 76$ reported)		
$M$ ( $SD$ )	60.15%	(25.34%)
Median (range)	59.39%	(0–100%)
Ethnicity (% non-Caucasian; $k = 25$ reported)		
$M$ ( $SD$ )	35.02%	(33.26%)
Median (range)	20.00%	(0–100%)
Type of student		
Undergraduates	67	84.8%
Mixed undergraduates/graduates	9	11.4%
Graduate/professional students	3	3.8%
Type of school		
Four-year college/university	76	96.2%
Graduate/professional school	3	3.8%
Primary presenting problem		
Depression	11	13.9%
Anxiety	23	29.1%
Both depression and anxiety	2	2.5%
Anger	21	26.6%
General psychological distress	12	15.2%
Cognitive vulnerability (negative thoughts, perfectionism)	3	3.8%
Interpersonal problems (shyness, loneliness, low support)	7	8.9%
Severity exclusion		
Yes	22	27.8%
No	57	72.2%

(table continues)

Table 1 (continued)

	All interventions ( <i>k</i> = 79)	
	<i>k</i>	%
Intervention features		
Primary intervention strategy		
Cognitive-behavioral	40	50.6%
Relaxation	15	19.0%
Social skills training	9	11.4%
General behavioral	5	6.3%
Social support	2	2.5%
Mindfulness	1	1.3%
Meditation	1	1.3%
Psychoeducational	1	1.3%
Acceptance and commitment therapy	2	2.5%
Interpersonal psychotherapy	1	1.3%
Other (resilience training, forgiveness program)	2	2.6%
Modality		
Individual	9	11.4%
Group	68	86.1%
Combination	2	2.5%
Facilitator expertise ( <i>k</i> = 75 reported)		
Professional	27	36.0%
Paraprofessional (nonmental health staff, trainee, peer)	48	64.0%
Duration—Total hours ( <i>k</i> = 70 reported)		
<i>M</i> ( <i>SD</i> )	7.69	(4.15)
Median (range)	7.75	(.08–24)
Intervention content		
Supervised skills practice		
Yes	76	96.2%
No	3	3.8%
Attendance—% sessions attended ( <i>k</i> = 29 reported)		
<i>M</i> ( <i>SD</i> )	88.76%	(9.12%)
Median (range)	89.13%	(65–100%)
Sources of outcome data (multiple sources possible)		
Self-report	78	98.7%
Behavioral observations	11	13.9%
Physiological measures	13	16.5%
Academic performance measures	1	1.3%
Behavioral performance measures	2	2.5%
Diagnostic interviews	4	5.1%
Other expert judgments	3	3.8%
Reports from peers	1	1.3%

<sup>a</sup> Seven unpublished interventions were dissertations or theses, one was a conference paper. <sup>b</sup> Countries include Canada, Iceland, Iran, Jordan, Scotland, and Taiwan.

**Overall Effectiveness of Indicated Prevention Programs**

Table 2 provides general information about the 77 interventions that provided ES data at post-intervention and the two interventions that only provided follow-up data, including each study’s mean post-intervention and follow-up ESs for targeted and nontargeted outcomes. Programs were effective overall at post-intervention (ES = 0.49, CI [0.43, 0.55], *k* = 77, *p* < .001). As displayed in Table 2, the average post-intervention study-level ESs ranged from 0.00 to 2.45 for targeted outcomes and from –0.50 to 1.53 for nontargeted outcomes. There were no statistically significant iatrogenic effects for either targeted or nontargeted outcomes. Overall, interventions yielded significantly larger effects for targeted outcomes (ES = 0.58, CI [0.51, 0.64], *k* = 77, *p* < .001) than nontargeted outcomes, ES = 0.32, CI [0.25, 0.39], *k* = 47, *p* < .001, *Q*(1) = 13.76, *p* < .001, although both types of effects were significant.

Interventions with a no-intervention or a wait-list control group (ES = 0.64, CI [0.57, 0.71], *k* = 66, *p* < .001) were associated with significantly larger effects overall, *Q*(1) = 18.05, *p* < .001, than were

interventions that were compared with an attention-placebo control (ES = 0.27, CI [0.11, 0.43], *k* = 11, *p* = .001), although both were associated with significant effects. Given this finding and the fact that there were only 11 interventions involving attention-placebo controls, the following three main sections only include interventions using no-intervention or wait-list controls. Interventions using attention-placebo controls are presented in the fourth main section below.

The *I*<sup>2</sup> within values for indicated interventions revealed moderate heterogeneity, *I*<sup>2</sup> = 35.81%, *Q*(65) = 101.26, *p* = .003, suggesting the potential for moderators. Application of Duval and Tweedie’s (2000) trim and fill method, which can be considered a sensitivity analysis in that it adjusts for possible publication bias and missing studies, yielded a lower, but still significant, intervention effect (ES = 0.39, CI [0.31, 0.44]). There was moderate heterogeneity for targeted outcomes, *I*<sup>2</sup> = 52.06%, *Q*(65) = 127.94, *p* < .001, and nontargeted outcomes, *I*<sup>2</sup> = 50.06%, *Q*(40) = 65.64, *p* = .006.

Table 2  
*Selected Characteristics of 79 Indicated Mental Health Prevention Programs for At-Risk Higher Education Students*

Study	Initial <i>N</i> (intervention + control) and participants	Primary intervention strategy	Primary presenting problem	Duration (all information reported)	Study-level ES ( <i>SE</i> ) for targeted outcomes	Study-level ES ( <i>SE</i> ) for nontargeted outcomes
Abplanalp (2001) <sup>a</sup>	405 undergraduates	General behavioral	Anxiety	3 sessions, 2.5 hr, 1.21 weeks	0.24 (0.18) F/U: 0.22 (0.06)**	0.04 (0.11)
Anthony & O'Brien (2002) and Anthony (1999)	57 undergraduates	Social support	Interpersonal problems	4 sessions, 4 hr, 4 weeks	0.06 (0.28)	0.20 (0.28)
Berger & O'Brien (1998)	53 undergraduates	Cognitive-behavioral	General psychological distress	6 sessions, 9 hr, 5 weeks	0.31 (0.28) F/U: 0.31 (0.17)	—
Bernhardsdottir et al. (2014, 2013)	32 female undergraduate and graduate students	Cognitive-behavioral	Both depression and anxiety	4 sessions, 8 hr, 4 weeks	1.04 (0.38)**	—
Charbonneau (2011)	68 female first-year students	General behavioral	General psychological distress	8 sessions, 8 hr, 8 weeks	0.16 (0.25) F/U: -0.07 (0.26)	0.44 (0.25) F/U: 0.01 (0.24)
Curran & Gilbert (1975)	50 undergraduates	Social skills training (Skills training)	Anxiety	8 sessions, 12 hr, 9 weeks	0.84 (0.42)* F/U: 0.93 (0.23)**	—
		Relaxation (Systematic desensitization)	Anxiety	8 sessions, 12 hr, 9 weeks	0.84 (0.42)* F/U: 1.07 (0.27)**	—
Dahlen & Deffenbacher (2000)	54 undergraduates	Cognitive-behavioral	Anger	8 sessions, 8 hr, 8 weeks	0.51 (0.27) F/U: 0.65 (0.14)**	0.08 (0.27) F/U: 0.13 (0.27)
Daley et al. (1983)	45 undergraduates	Relaxation	Anxiety	7 sessions, 7 hr, 8 weeks	0.35 (0.30) F/U: 0.41 (0.26)	-0.03 (0.29) F/U: -0.15 (0.26)
Deffenbacher & Payne (1977)	27 undergraduate education students	Relaxation	Anxiety	7 sessions, 7 hr, 4 weeks	1.22 (0.40)**	—
Deffenbacher et al. (1980) and Deffenbacher & Michaels (1981)	31 undergraduates	Relaxation	Anxiety	6 sessions, 5 hr, 6 weeks	0.50 (0.37) F/U: 0.51 (0.23)*	— F/U: 0.08 (0.20)
Deffenbacher et al. (1986)	29 undergraduates	Relaxation	Anger	6 sessions, 6 hr, 6 weeks	1.03 (0.39)** F/U: 1.69 (0.42)**	—
Deffenbacher et al. (1987) and Deffenbacher (1988)	49 undergraduates	Cognitive-behavioral (Cognitive- relaxation)	Anger	8 sessions, 12 hr, 8 weeks	1.59 (0.37)** F/U: 1.90 (0.24)**	1.46 (0.36)** F/U: 1.60 (0.41)**
		Social skills training (Social skills)	Anger	8 sessions, 12 hr, 8 weeks	1.11 (0.35)** F/U: 1.70 (0.24)**	0.97 (0.34)** F/U: 1.69 (0.42)**
Deffenbacher et al. (1988)	30 undergraduates	Cognitive-behavioral	Anger	8 sessions, 8 hr, 8 weeks	1.01 (0.39)** F/U: 0.97 (0.26)**	0.71 (0.39) F/U: -0.06 (0.42)
Deffenbacher et al. (1990a)	29 undergraduates	Cognitive-behavioral	Anger	8 sessions, 10 hr, 8 weeks	0.74 (0.37)* F/U: 0.70 (0.23)**	1.53 (0.39)** F/U: 1.17 (0.42)**
Deffenbacher et al. (1990b)	48 undergraduates	Cognitive-behavioral (Cognitive- relaxation)	Anger	8 sessions, 8 hr, 8 weeks	0.90 (0.36)* F/U: 0.74 (0.27)**	0.97 (0.35)** F/U: 1.01 (0.36)**
		Social support (Process- oriented group)	Anger	8 sessions, 8 hr, 8 weeks	0.76 (0.35)* F/U: 0.72 (0.26)**	0.99 (0.34)** F/U: 1.00 (0.34)**
Deffenbacher & Stark (1992)	36 undergraduates	Cognitive-behavioral	Anger	8 sessions, 8 hr, 8 weeks	0.92 (0.36)* F/U: 1.62 (0.25)	0.36 (0.33) F/U: 0.63 (0.39)
Deffenbacher et al. (1994, 1995)	138 undergraduates	Cognitive-behavioral (Cognitive-relaxation coping)	Anger	8 sessions, 8 hr, 8 weeks	1.08 (0.21)** F/U: 1.12 (0.09)**	0.55 (0.21)** F/U: 0.68 (0.23)**
		Social skills training (Skill assembly social skills)	Anger	8 sessions, 8 hr, 8 weeks	0.71 (0.21)** F/U: 0.84 (0.09)**	0.33 (0.20) F/U: 0.45 (0.23)

Table 2 (continued)

Study	Initial <i>N</i> (intervention + control) and participants	Primary intervention strategy	Primary presenting problem	Duration (all information reported)	Study-level ES ( <i>SE</i> ) for targeted outcomes	Study-level ES ( <i>SE</i> ) for nontargeted outcomes
Deffenbacher et al. (1996)	78 undergraduates	Cognitive-behavioral (Cognitive-relaxation coping skills)	Anger	8 sessions, 8 hr, 8 weeks	0.70 (0.28)* F/U: 0.95 (0.16)**	0.50 (0.28) F/U: 0.65 (0.28)*
		Social skills training (Inductive social skills training)	Anger	8 sessions, 8 hr, 8 weeks	0.41 (0.28) F/U: 0.75 (0.16)**	0.34 (0.29) F/U: 0.45 (0.29)
Deffenbacher, Huff, et al. (2000)	40 undergraduates	Cognitive-behavioral	Anger	8 sessions, 8 hr, 8 weeks	0.53 (0.32) F/U: 0.43 (0.17)*	-0.01 (0.31) F/U: 0.24 (0.31)
Deffenbacher, Dahlen, et al. (2000)	69 undergraduates	Cognitive-behavioral	Anger	9 sessions, 9 hr, 9 weeks	0.66 (0.25)**	0.42 (0.25)
Deffenbacher et al. (2002)	39 undergraduates	Cognitive-behavioral	Anger	8 sessions, 8 hr, 8 weeks	0.39 (0.33) F/U: 0.55 (0.15)**	—
Dolbier & Rush (2012) <sup>a</sup>	128 undergraduates	Relaxation	General psychological distress	1 session, .33 hr, 1 day	0.22 (0.18)	0.26 (0.18)
Forsyth (2000)	70 undergraduates	Interpersonal psychotherapy	Depression	4 sessions, 6 hr, 4 weeks	1.62 (0.28)** F/U: 2.20 (0.31)**	0.58 (0.24)* F/U: 0.81 (0.25)**
Fremouw & Hartz (1975)	32 undergraduates	General behavioral (Helpers)	Anxiety	5 sessions, 5 hr, 5 weeks	1.12 (0.45)* F/U: 0.26 (0.21)	—
		General behavioral (Helpers)	Anxiety	5 sessions, 5 hr, 5 weeks	1.39 (0.46)** F/U: 0.52 (0.21)*	—
Fremouw & Zitter (1978)	35 undergraduates	Cognitive-behavioral (Cognitive restructuring)	Anxiety	5 sessions, 5 hr, 5 weeks	0.67 (0.41) F/U: 0.54 (0.25)*	—
		Social skills training (Skill training)	Anxiety	5 sessions, 5 hr, 5 weeks	1.07 (0.42)* F/U: 1.16 (0.25)**	—
Gabriel (2008) <sup>a</sup>	124 undergraduates	Cognitive-behavioral	Depression	1 session, 1.25 hr, 1 day	0.11 (0.21) F/U = -0.15 (0.21)	0.03 (0.21) F/U: 0.07 (0.21)
Gardenswartz & Craske (2001)	123 undergraduate and graduate students	Cognitive-behavioral	Anxiety	1 session, 5 hr, 1 day	F/U: 0.28 (0.06)**	F/U: 0.09 (0.18)
Gawrysiak et al. (2009)	30 undergraduates	General behavioral	Depression	1 session, 1.5 hr, 1 day	1.86 (0.42)**	0.78 (0.37)*
Glass et al. (1976)	24 male undergraduate and graduate students	Social skills training	Interpersonal problems	5 sessions, 5 hr	1.05 (0.47)* F/U: 1.04 (0.32)**	—
Goldman & Wade (2012)	112 undergraduates	Cognitive-behavioral (Anger reduction)	General psychological distress	6 sessions, 9 hr, 3 weeks	0.07 (0.28)	0.00 (0.28)
		Other (REACH: forgiveness training)	General psychological distress	6 sessions, 9 hr, 3 weeks	0.35 (0.28)	0.38 (0.28)
Gormally et al. (1981)	28 male undergraduates	Cognitive-behavioral	Interpersonal problems	11 sessions, 14.5 hr	1.05 (0.44)*	0.46 (0.39)
Hamdan-Mansour et al. (2009)	84 undergraduates	Cognitive-behavioral	Depression	10 sessions, 7.5 hr, 10 weeks	1.25 (0.23)** F/U: 1.15 (0.23)**	0.85 (0.23)** F/U: 1.00 (0.20)**
Hazaleus & Deffenbacher (1986)	60 undergraduates	Relaxation (Affect modification)	Anger	6 sessions, 6 hr, 6 weeks	0.10 (0.32)** F/U: 0.20 (0.16)	-0.11 (0.31) F/U: -0.17 (0.28)
		Cognitive-behavioral (Cognitive modification)	Anger	6 sessions, 6 hr, 6 weeks	0.52 (0.33) F/U: 0.61 (0.16)**	0.32 (0.32) F/U: 0.29 (0.29)
Hekmat et al. (1985)	20 undergraduates	Relaxation	Anxiety	3 sessions	0.77 (0.36)*	—
Higgins (2006)	78 undergraduates	Cognitive-behavioral	Anxiety	2 sessions, 4 hr, 2 days	F/U: 0.03 (0.17)	F/U: 0.14 (0.29)

(table continues)

Table 2 (continued)

Study	Initial <i>N</i> (intervention + control) and participants	Primary intervention strategy	Primary presenting problem	Duration (all information reported)	Study-level ES ( <i>SE</i> ) for targeted outcomes	Study-level ES ( <i>SE</i> ) for nontargeted outcomes
Hinton & Gaynor (2010)	22 undergraduates	Cognitive-behavioral	General psychological distress	3 sessions, 3 hr, 3 weeks	1.12 (0.45)*	0.81 (0.43)
Hutchings et al. (1980)	42 undergraduates	Relaxation (Anxiety management)	Anxiety	6 sessions, 7.5 hr, 6 weeks	0.90 (0.43)* F/U: 1.34 (0.20)**	-0.50 (0.55)
		Relaxation (Applied relaxation)	Anxiety	6 sessions, 7.5 hr, 6 weeks	0.48 (0.44) F/U: 0.86 (0.20)**	0.23 (0.50)
Jain et al. (2007)	104 medical/nursing undergraduate and graduate students	Mindfulness (Mindfulness reditation)	General psychological distress	5 sessions, 12 hr, 4 weeks	0.72 (0.27)**	-0.09 (0.27)
		Relaxation (Somatic relaxation)	General psychological distress	5 sessions, 12 hr, 4 weeks	0.56 (0.27)*	0.11 (0.27)
Jaremko (1980)	62 undergraduates	Cognitive-behavioral	Anxiety	2 sessions, 2 hr	0.38 (0.26) F/U: 0.75 (0.19)**	0.60 (0.26)* F/U: 0.81 (0.26)**
Jones (2009)	98 female undergraduates	Psychoeducation	General psychological distress	10 sessions, 15 hr, 10 weeks	0.43 (0.23) F/U: 0.60 (0.21)**	0.18 (0.23) F/U: -0.18 (0.14)
Jones & Johnston (2000)	79 medical/nursing graduate students	Cognitive-behavioral	General psychological distress	6 sessions, 12 hr, 6 weeks	1.01 (0.26)**	-0.02 (0.23)
Kao et al. (2014) <sup>a</sup>	20 graduate students	Meditation	General psychological distress	8 sessions, 4.4 hr, 8 weeks	0.90 (0.45)*	—
Kutlesa & Arthur (2008) and Kutlesa (2002)	81 undergraduate and graduate students	Cognitive-behavioral	Cognitive	8 sessions, 24 hr, 4 weeks	0.48 (0.26)	0.58 (0.26)*
Masuda et al. (2010) <sup>a</sup>	94 undergraduates	Acceptance and commitment therapy (Full-defusion)	Cognitive	1 session, .08 hr, 1 day	0.26 (0.25)	1.15 (0.28)**
		Acceptance and commitment therapy (Full-distraction)	Cognitive	1 session, .08 hr, 1 day	0.06 (0.25)	0.16 (0.25)
McGrady et al. (2012)	42 medical/nursing graduate students	Cognitive-behavioral	General psychological distress	8 sessions, 6 hr, 16 weeks	0.27 (0.23)	-0.10 (0.23)
Meichenbaum et al. (1971) <sup>a</sup>	22 undergraduates	Cognitive-behavioral	Anxiety	8 sessions, 8 hr, 8 weeks	0.61 (0.45)	—
Mokruv & Acri (2013)	84 ethnic minority undergraduates	Cognitive-behavioral	Both depression and anxiety	4 sessions, 8 hr, 4 weeks	1.76 (0.52)** F/U: 3.50 (0.32)**	—
Moon & Eisler (1983) <sup>a</sup>	40 male undergraduates	Cognitive-behavioral (Stress inoculation)	Anger	5 sessions, 5 weeks	0.32 (0.44)	—
		Cognitive-behavioral (Problem-solving)	Anger	5 sessions, 5 weeks	0.90 (0.43)*	—
		Social skills training (Social skills)	Anger	5 sessions, 5 weeks	0.87 (0.44)*	—
Morse et al. (1980)	76 undergraduates	Cognitive-behavioral	Anxiety	5 sessions, 4.5 hr, 6 weeks	0.37 (0.23)	0.06 (0.23)
Pace & Dixon (1993)	78 undergraduates	Cognitive-behavioral	Depression	7 sessions, 5.54 hr, 5.5 weeks	1.18 (0.24)** F/U: .86 (0.24)**	0.55 (0.28)* F/U: 0.46 (0.17)**
Peden et al. (2000, 2001)	92 female undergraduates	Cognitive-behavioral	Depression	6 sessions, 6 hr, 6 weeks	0.73 (0.21)**	0.63 (0.21)**
Rohde et al. (2014) <sup>a</sup>	60 undergraduates	Cognitive-behavioral	Depression	6 sessions, 6 hr, 6 weeks	0.15 (0.27) F/U: -0.04 (0.27)	-0.04 (0.27) F/U: -0.04 (0.27)

Table 2 (continued)

Study	Initial <i>N</i> (intervention + control) and participants	Primary intervention strategy	Primary presenting problem	Duration (all information reported)	Study-level ES ( <i>SE</i> ) for targeted outcomes	Study-level ES ( <i>SE</i> ) for nontargeted outcomes
Russell & Wise (1976)	50 undergraduates	Relaxation (Cue-controlled relaxation—experienced)	Anxiety	5 sessions, 6 weeks	0.35 (0.48)	—
		Relaxation (Cue-controlled relaxation—inexperienced)	Anxiety	5 sessions, 6 weeks	0.68 (0.50)	—
		Relaxation (Systematic desensitization—experienced)	Anxiety	5 sessions, 6 weeks	0.81 (0.47)	—
		Relaxation (Systematic desensitization—inexperienced)	Anxiety	5 sessions, 6 weeks	0.97 (0.50)	—
Seepersad (2005)	40 undergraduates	Cognitive-behavioral	Interpersonal problems	7 sessions, 14 hr, 7 weeks	0.55 (0.34)	0.34 (0.34)
Seligman et al. (1999); Buchanan et al. (1999); Seligman (1998)	225 first-year students	Cognitive-behavioral	Depression	8 sessions, 16 hr, 8 weeks	0.36 (0.13)** F/U: 0.24 (0.10)*	0.30 (0.13)*
Seligman et al. (2007)	227 first-year students	Cognitive-behavioral	Depression	8 sessions, 16 hr, 8 weeks	0.31 (0.14)* F/U: 0.16 (0.10)	0.28 (0.14)*
Sellers (1982)	30 psychology undergraduate and graduate students	Social skills training (Conversation skills)	Interpersonal problems	4 sessions, 6 hr, 4 weeks	0.00 (0.31)	—
		Cognitive-behavioral (Stress inoculation)	Interpersonal problems	4 sessions, 6 hr, 4 weeks	0.00 (0.31)	—
Twentyman & McFall (1975)	31 male undergraduates	Social skills training	Interpersonal problems	5 sessions, 5 hr	0.59 (0.35) F/U: .08 (0.17)	—
Vinson (1979)	23 undergraduate and graduate students	Cognitive-behavioral	Anxiety	4 sessions, 6 hr, 2 weeks	0.54 (0.41)	—
Zamirinejad et al. (2014)	38 female undergraduates	Cognitive-behavioral (Cognitive therapy)	Depression	8 sessions, 12 hr, 3 weeks	1.62 (0.49)** F/U: 1.47 (0.48)**	—
		Other (Resilience training)	Depression	8 sessions, 12 hr, 3 weeks	2.45 (0.59)** F/U: 1.62 (0.51)**	—

Note. Effect sizes are Hedges' *g*. In cases when a study presents more than one intervention, we also list the original researchers' unique terms for the intervention conditions. F/U = Follow-up; ES = effect size. Dashes indicate no nontargeted outcomes were reported.

<sup>a</sup> The intervention(s) was (were) compared to an attention-placebo control condition. All other interventions were compared to a no-intervention/wait-list control.

\* *p* < .05. \*\* *p* < .01.

### Effects for Primary Presenting Problem

Table 3 presents the effect sizes for interventions targeted at the five most common types of presenting problems (anger, anxiety, depression, general psychological distress, and interpersonal problems) averaged across all outcomes and also broken down according to targeted versus nontargeted outcomes. Among targeted outcomes, there was high heterogeneity for depression,  $I^2 = 85.51\%$ ,  $Q(8) = 55.23$ ,  $p < .001$ , but all other presenting problems had low heterogeneity ( $I^2$ s = 0.00 – 34.48%,  $Q$ s = 9.16 – 18.65,  $p$ s = .165 – .823). The study-level mean effects for targeted outcomes were significant for each of the five most common types of presenting problems and ranged from 0.34 to 0.74. Interventions targeting anger or depression also yielded significant effects for nontargeted outcomes but those targeting anxiety or general psychological distress did not. There were only three interventions targeting interpersonal problems that assessed

nontargeted outcomes, and thus they were not interpreted. Mean effects for nontargeted outcomes ranged from 0.13 to 0.51. Results are not presented for interventions targeting both depression and anxiety ( $k = 2$ ) or cognitive vulnerability ( $k = 3$ ), as there were too few interventions targeting these problems to interpret effects.

### Analyses of Moderators Across All Interventions Using a No-Intervention or Wait-List Control

In the moderation analyses we focused exclusively on targeted outcomes. Small samples of interventions prohibited examining moderators separately for each presenting problem so we tested our hypothesis about the use of skills practice, and examined other potential exploratory moderators, across all interventions using a no-intervention or wait-list control group.

Table 3  
*Mean Post-Intervention Effect Sizes for Interventions Compared With No-Intervention/Wait-List Controls (Hedge's  $g$ ,  $SE$ ,  $CI$ ), Within-Group  $Q$ , and  $I^2$  for Presenting Problems and Outcome Categories*

Presenting problem	Targeted outcomes	Nontargeted outcomes
<b>Anger</b>		
ES ( $SE$ )	0.74 (0.07)**a	0.51 (0.07)**x
CI	[0.60, 0.88]	[0.36, 0.65]
$k$	18	16
$Q$	18.65	30.55*
$I^2$	8.84%	50.90%
<b>Anxiety</b>		
ES ( $SE$ )	0.67 (0.09)**a,b	0.18 (0.14) <sup>y</sup>
CI	[0.50, 0.84]	[-0.09, 0.45]
$k$	19	5
$Q$	12.45	4.98
$I^2$	0.00%	19.69%
<b>Depression</b>		
ES ( $SE$ )	0.73 (0.07)**a	0.45 (0.07)**x
CI	[0.59, 0.88]	[0.31, 0.59]
$k$	9	7
$Q$	55.23**	7.99
$I^2$	85.51%	24.86%
<b>General psychological distress</b>		
ES ( $SE$ )	0.46 (0.09)**b	0.13 (0.09) <sup>y</sup>
CI	[0.29, 0.62]	[-0.04, 0.31]
$k$	10	9
$Q$	12.29	7.17
$I^2$	26.74%	0.00%
<b>Interpersonal problems</b>		
ES ( $SE$ )	0.34 (0.13)**b	0.30 (0.19)
CI	[0.09, 0.59]	[-0.07, 0.67]
$k$	7	3
$Q$	9.16	0.32
$I^2$	34.48%	0.00%

Note.  $k$  denotes the number of interventions in each cell.  $Q$  refers to within-group heterogeneity. Significant differences in mean effects among presenting problems are denoted by different superscripts within each column for targeted and nontargeted outcomes. Nontargeted outcomes for interpersonal problems were not compared as  $k < 5$ . ES = effect size; CI = confidence interval.  
 \*  $p < .05$ . \*\*  $p < .01$ .

**Supervised skills practice.** Given our a priori hypothesis about the benefit of supervised skills practice, we examined the relative impact of indicated interventions that practiced skills (ES = 0.66, CI [0.58, 0.73],  $k = 63$ ,  $p < .001$ ) and programs that did not practice skills (ES = 0.38, CI [0.07, 0.69],  $k = 3$ ,  $p = .016$ ). Both were associated with significant positive effects and did not differ significantly from each other,  $Q(1) = 2.97$ ,  $p = .085$ . This result failed to support our hypotheses regarding the importance of supervised skills practice; however, this hypothesis could not be adequately tested because only three interventions failed to include practicing skills.

**Primary intervention strategy.** Table 4 displays the effect sizes for different intervention strategies, by presenting problem. Three types of interventions included more than five studies. Of these, across primary presenting problem, social skills training interventions yielded the highest effects, followed by cognitive-behavioral, relaxation, and general behavioral interventions. Each of these types of interventions was associated with significant positive effects and did not differ significantly from each other,  $Qs = 0.01 - 0.07$ ,  $ps = .789 - .918$ .

**Exploratory moderators.** Fourteen additional variables were tested as possible moderators of treatment outcome: (1)

Publication Status, (2) Experimental Design, (3) Initial Sample Size, (4) Sample Attrition, (5) Differential Attrition, (6) Gender (as percentage Female), (7) Ethnicity (as percentage Non-Caucasian), (8) Primary Presenting Problem, (9) Severity Exclusion, (10) Modality, (11) Facilitator Expertise, (12) Duration (in total hours), (13) Attendance (as percentage of sessions attended), and (14) Outcome Source. Confidence interval comparisons using between-groups  $Q$  (for categorical variables) and metaregressions yielding B values and significance tests (for continuous variables) determined which variables were significantly related to effect size. Among these 14 variables, three emerged as significant moderators: primary presenting problem, modality, and outcome source.

**Primary presenting problem.** Presenting problem emerged as a significant moderator,  $Q(6) = 18.93$ ,  $p = .004$ . Table 3 presents the mean effects for each presenting problem with superscripts noting the significant differences that emerged among presenting problems with more than five interventions. Concentrating on the results for targeted outcomes, interventions directed at anger, depression, or anxiety yielded mean effects that were significantly different from zero, but not from each other. The mean effects for the first two types of presenting problems (anger

Table 4  
 Mean Post-Intervention Effect Sizes for Targeted Outcomes for Interventions Compared With No-Intervention/Wait-List Controls (Hedge's *g*, *SE*, *CI*), Within-Group *Q* Statistics, and *I*<sup>2</sup> values, by Presenting Problem and Intervention Strategy

Presenting problem	Across all strategies	Specific intervention strategies		
		Cognitive-behavioral	Relaxation	Social skills training
<b>Across all presenting problems</b>				
ES ( <i>SE</i> )	0.64 (0.04)**	0.62 (0.05)**	0.63 (0.10)**	0.65 (0.11)**
CI	[0.57, 0.71]	[0.53, 0.71]	[0.43, 0.83]	[0.43, 0.88]
<i>k</i>	66	33	14	8
<i>Q</i>	127.94**	65.59**	8.88	8.95
<i>I</i> <sup>2</sup>	49.19%	51.21%	0.00%	21.76%
<b>Anger</b>				
ES ( <i>SE</i> )	0.74 (0.07)**	0.78 (0.09)**	0.48 (0.25)	0.71 (0.15)**
CI	[0.60, 0.88]	[0.61, 0.96]	[-0.00, 0.96]	[0.41, 1.00]
<i>k</i>	18	12	2	3
<i>Q</i>	18.65	11.31	3.44	2.46
<i>I</i> <sup>2</sup>	8.84%	2.74%	70.96%	18.76%
<b>Anxiety</b>				
ES ( <i>SE</i> )	0.67 (0.09)**	0.43 (0.15)**	0.69 (0.12)**	0.96 (0.30)**
CI	[0.50, 0.84]	[0.14, 0.73]	[0.44, 0.93]	[0.37, 1.54]
<i>k</i>	19	4	11	2
<i>Q</i>	12.45	0.53	4.79	0.16
<i>I</i> <sup>2</sup>	0.00%	0.00%	0.00%	0.00%
<b>Depression</b>				
ES ( <i>SE</i> )	0.73 (0.07)**	0.60 (0.08)**	—	—
CI	[0.59, 0.88]	[0.45, 0.75]	—	—
<i>k</i>	9	6	—	—
<i>Q</i>	55.23**	26.31**	—	—
<i>I</i> <sup>2</sup>	85.51%	80.99%	—	—
<b>Interpersonal problems</b>				
ES ( <i>SE</i> )	0.34 (0.13)**	0.42 (0.20)*	—	0.41 (0.21)*
CI	[0.09, 0.59]	[0.02, 0.82]	—	[0.01, 0.82]
<i>k</i>	7	3	—	3
<i>Q</i>	9.16	4.01	—	3.86
<i>I</i> <sup>2</sup>	34.48%	50.08%	—	48.20%
<b>General psychological distress</b>				
ES ( <i>SE</i> )	0.46 (0.09)**	0.48 (0.13)**	0.56 (0.27)*	—
CI	[0.29, 0.62]	[0.23, 0.72]	[0.03, 1.09]	—
<i>k</i>	10	5	1	—
<i>Q</i>	12.29	9.65	0.00	—
<i>I</i> <sup>2</sup>	26.74%	58.54%	0.00%	—

Note. *k* denotes the number of intervention in each cell. *Q* refers to within-group heterogeneity. The following intervention strategies were evaluated in five or fewer interventions and thus were not included in the table: General behavioral, social support, meditation, mindfulness, psychoeducation, acceptance and commitment therapy, interpersonal therapy, and other. Dashes indicate that no interventions evaluated the combination of intervention strategy and presenting problem. CI = confidence interval.

\* *p* < .05. \*\* *p* < .01.

and depression) differed significantly from the targeted outcome effects for general psychological distress and interpersonal problems, which also attained statistical significance, but did not differ significantly from each other.

**Modality.** Modality emerged as a moderator, *Q*(2) = 10.06, *p* = .002, such that individual interventions (ES = 1.08, CI [0.79, 1.36], *k* = 6, *p* < .001) yielded significantly larger effects than group interventions (ES = 0.60, CI [0.53, 0.68], *k* = 58, *p* < .001), although both were associated with significant positive effects. Two interventions used a combination of individual and group contact, and could not be further assessed.

**Outcome source.** Outcome measurement was related to effect size, such that self-report measures (ES = 0.69, CI [0.65, 0.72], *p* < .001) were associated with larger effects than physiological outcomes (ES = 0.39, CI [0.14, 0.63], *p* = .002), *Q*(1) = 5.58, *p* =

.018; however, behavioral observations (ES = 0.59, CI [0.44, 0.75], *p* < .001) did not differ from self-report measures, *Q*(1) = 1.40, *p* = .237, or physiological measures, *Q*(1) = 1.95, *p* = .163. Too few interventions included diagnostic interviews, behavioral performance measures, reports from peers, academic performance measures, or other expert judgments to assess their effectiveness accurately.

**Examining multiple moderators.** We conducted a weighted, hierarchical metaregression to examine the relative influence of the significant moderators using CMA. Outcome source was not included in the metaregression as including this variable would have violated assumptions of independence, due to multicollinearity. As a conservative approach, we entered the methodological variable, modality, into the first step letting it account for any shared variance with presenting problem, which was entered into the second step of the regression.

When entered together in the first step, modality remained a significant moderator,  $B = -0.47$ ,  $p = .015$ , such that individual interventions continued to yield larger effects than group interventions. In the second step, presenting problem remained a significant predictor,  $Q(4) = 13.80$ ,  $p = .008$ , such that the overall effects presented in Table 3 remained. Overall the final model explained 31% of the variability in the effects (the first step explained 15% and the second step explained an additional 16%).

### Effectiveness of Indicated Prevention Programs at Follow-Up

Also listed in Table 2, 43 interventions assessed outcomes at an extended follow-up period (range = 4.00 to 157.37 weeks; median = 26.14 weeks;  $M = 34.99$ ;  $SD = 29.54$ ), including two interventions that did not assess outcomes at post-intervention. Impact at follow-up was assessed by averaging the effects for the longest follow-up period reported for each intervention. Follow-up effects were collapsed across all outcomes, as cells sizes for different types of outcomes were too small to permit meaningful analyses or interpretation. Overall, these interventions were associated with significantly positive effects at follow-up ( $ES = 0.59$ ,  $CI [0.50, 0.68]$ ,  $k = 43$ ,  $p < .001$ ). There were significantly larger effects for targeted outcomes ( $ES = 0.69$ ,  $CI [0.60, 0.78]$ ,  $k = 43$ ,  $p < .001$ ) than nontargeted outcomes ( $ES = 0.44$ ,  $CI [0.33, 0.55]$ ,  $k = 25$ ,  $p < .001$ ),  $Q(1) = 16.17$ ,  $p < .001$ , although both categories of outcomes were significantly impacted by interventions overall. Targeted outcomes were associated with high heterogeneity,  $I^2 = 87.60\%$ ,  $Q(40) = 322.65$ ,  $p < .001$ , and nontargeted outcomes yielded moderate heterogeneity,  $I^2 = 72.29\%$ ,  $Q(22) = 79.39$ ,  $p < .001$ . Given this significant difference, the remaining follow-up analyses were conducted on targeted outcomes only.

Comparing interventions that assessed targeted outcomes at both post-intervention and follow-up, the average study-level effect at follow-up ( $ES = 0.58$ ,  $CI [0.52, 0.65]$ ,  $k = 43$ ,  $p < .001$ ) was nearly identical to the mean post-intervention effect ( $ES = 0.59$ ,  $CI [0.52, 0.69]$ ,  $k = 43$ ,  $p < .001$ ). Moreover, duration of the follow-up period did not significantly moderate follow-up effect size,  $Q(1) = 0.72$ ,  $p = .380$ .

Programs targeting depression ( $ES = 0.40$ ,  $CI [0.28, 0.52]$ ,  $k = 7$ ,  $p < .001$ ), anxiety ( $ES = 0.58$ ,  $CI [0.46, 0.69]$ ,  $k = 13$ ,  $p < .001$ ), and anger ( $ES = 0.69$ ,  $CI [0.58, 0.81]$ ,  $k = 17$ ,  $p < .001$ ) remained significantly effective at follow-up. There were not enough interventions targeted at general psychological distress or interpersonal problems to assess their effectiveness at follow-up.

### Interventions Compared With Attention-Placebo Controls

Interventions compared with attention-placebo controls yielded significant effects for targeted ( $ES = 0.27$ ,  $CI [0.11, 0.43]$ ,  $k = 11$ ,  $p = .001$ ) and nontargeted outcomes ( $ES = 0.16$ ,  $CI [0.02, 0.30]$ ,  $k = 5$ ,  $p = .028$ ). Each of these means was significantly smaller than the corresponding effects from interventions using no-intervention or wait-list controls,  $Qs = 6.26$  and  $18.05$ ,  $ps < .001$  to  $.012$ . There was not a large enough sample of interventions

compared with attention-placebo controls to examine moderators or effects at follow-up.

## Discussion

The current meta-analysis is the first systematic, large-scale evaluation of published and unpublished indicated preventive mental health programs for higher education students. Given the high prevalence of mental health problems on college campuses (ACHA, 2016), the current data provide a valuable perspective on the effectiveness of programs for students at risk for mental illness based on existing subclinical levels of various presenting problems. Below we emphasize the major findings from the current analyses and then discuss some limitations in the existing literature that have implications for improving future research.

### Major Findings

**Effectiveness.** The current review provides empirical support for the positive impact of indicated prevention programs for higher education students dealing with subclinical levels of depression, anxiety, anger, general psychological distress, or difficulties in interpersonal relationships. The magnitude of the mean ESs obtained for most of these presenting problems generally falls between those achieved in universal prevention programs for higher education students (for a review, see Conley et al., 2015) and those achieved in treatments for college students with various clinical disorders (e.g., depression, Cuijpers et al., 2016). Such findings are expected because those with subclinical symptoms have more room to change than those in the general (universal) population overall, but are unlikely to demonstrate as much change as those with serious and chronic problems. It is possible to translate mean effects into the number needed to treat (NNT), an estimate of how many people would be needed in the intervention group in order to obtain at least one additional favorable outcome compared with another condition (control or treatment). Lower NNTs represent more impactful and efficient interventions. A favorable outcome in this case is a reduction in the severity of the targeted presenting problem. In the current review the NNTs (3.69 overall; 3.19 for no-treatment or wait-list controls; 6.60 for attention-placebo controls) are comparable to the NNT of 5.8 reported for the prevention of depression among elderly adults with subclinical depression symptoms (Schoevers et al., 2006). Current NNTs highlight the practical significance of indicated prevention for higher education students.

Current findings also are important because each of the major presenting problems evaluated in this review is common among higher education students, and places them at risk for a variety of later more serious difficulties, including academic failure and dropout (Eisenberg et al., 2009; National Alliance on Mental Illness, 2012). For example, individuals experiencing subclinical levels of depression and anxiety are at risk for more serious psychological problems, as well as decreased social functioning and quality of life (Cuijpers, de Graaf, & van Dorsselaer, 2004; Filho et al., 2010; Goldney, Fisher, Dal Grande, & Taylor, 2004). Mental health symptoms in college also can have far-reaching implications for occupational problems well into the future, including more missed work days, reduced job performance, and even unemployment (Haller, Cramer, Lauche, Gass, & Dobos, 2014; Martin, Blum, Beach, & Roman, 1996).

Programs targeting anger control are no longer labeled as such and are currently more likely to be described as efforts to improve participants' *self-control* of emotions and behavior, a personal asset or ability that research has confirmed is important at various developmental levels beginning as early as preschool (Duckworth, 2011; Raver et al., 2011). Nevertheless, anger remains a common problem among college students (ACHA, 2016), and depending on its context, intensity, form of expression, and duration, anger is a cardinal feature of several clinical disorders and predictive of important outcomes (Fernandez & Johnson, 2016).

Interpersonal difficulties are also one of the most common sources of distress for college students (Darling, McWey, Howard, & Olmstead, 2007; Jackson & Finney, 2002), with over one quarter of students reporting social relationship problems that were "traumatic or very difficult to handle" in the past 12 months (ACHA, 2016, p. 15). Specific interpersonal difficulties—such as poor social problem solving, low quality of social support, interpersonal conflict, and loneliness—have been associated with an increased risk for mental health problems (e.g., Crouce & Corbin, 2010; Hefner & Eisenberg, 2009; Mushtaq, Shoib, Shah, & Mushtaq, 2014; Ranjbar, Bayani, & Bayani, 2013), underscoring the importance of interventions that target social difficulties.

Although interventions had the strongest effects on outcomes that were targeted by the intervention, overall effects were significant for both targeted and nontargeted outcomes at post-intervention and at follow-up assessments, suggesting that interventions reduced levels of presenting problems and also improved other areas of psychosocial adjustment.

Although interventions using no-intervention or wait-list controls and those employing attention-placebo controls each yielded significant positive findings, mean effects for the former were significantly larger than for the latter, a result consistent with treatment reviews (Lipsey & Wilson, 1993; Wampold et al., 2005). This raises issues about the nature and impact of the active therapeutic ingredients of interventions. Whereas no-intervention/wait-list controls test the effectiveness of an intervention compared with natural history, without participating in any program, attention-placebo controls account for nonspecific factors beyond the passage of time, such as attention, social interaction, and raised expectations for change (Furukawa et al., 2014) and thus provide a more robust test of the effectiveness of an intervention. Unfortunately there were too few interventions compared with attention-placebo in the current review to examine follow-up effects and the impact of moderators for this small subset of studies. Future research should employ attention-placebo controls more commonly, especially once an intervention has demonstrated effectiveness compared with a no-intervention or wait-list control.

Finally, it is encouraging that among the reports in which follow-up data were reported, the mean effects obtained at 35 weeks—the average follow-up period—were similar to those detected at post-intervention. These data suggest the durability of impact from indicated interventions. In sum, current data support the effectiveness of indicated prevention programs to improve both the short and longer-term adjustment of higher education students who are experiencing subclinical levels of symptoms in several areas.

**Moderators of intervention impact.** We could not adequately evaluate our hypothesis regarding supervised skills practice as a moderator, given the small number of interventions that

did not employ supervised skills practice. Results of a hierarchical regression indicated that two other variables, notably intervention modality and type of presenting problem, collectively accounted for 31% of the variability in the effects explained by the model. It is not unreasonable that some types of presenting problems (in the current case, depression and anger) can be influenced more than others. The role of modality has been mixed in prior reviews of prevention in higher education (Buchanan, 2012; Scott-Sheldon et al., 2014); in the current review, there were only nine individual interventions compared with 68 in group format, so this finding needs replication.

Although outcome source could not be included in the metaregression due to collinearity, it had a significant impact on effectiveness such that self-report measures were typically associated with larger effects than physiological outcomes. However, the preponderance of outcomes in the current review were self-report, and several categories of outcome source were too small to examine; as more data on alternative assessment methods become available, future research should reexamine this finding. Because current findings are not definitive, future work should continue to search for potential moderators of outcomes.

**Feasibility and fit in higher education.** Several features of the reviewed programs are notable. In general, programs were brief, and moderation analyses indicated that briefer programs were as effective as longer ones. The overall low attrition rate and attendance figures suggest that programs were effective in attracting and retaining students. Also promising, nearly two thirds of programs were facilitated by paraprofessionals who consisted of university staff, graduate trainees, or peers, and moderation analyses indicated that these paraprofessionals were able to deliver the programs with the same success as fully trained mental health staff.

Overall, the programs attracted both females and males, and were equally effective across gender. Although details on participants' race and ethnicity were limited, of the 25 interventions that assessed ethnicity, 35% of participants were non-Caucasian students, which is consistent with the general demographics in higher education institutions in the United States (Aud, KewalRamani, & Frohlich, 2011), where 90% of the reviewed interventions took place.

Finally, less than half of the studies provided any information about consumers' satisfaction with the interventions and these data were reported using different questions and response formats that were not amenable to quantitative analyses. Nevertheless, when such data were collected, they generally reflected that most participants judged the interventions to be helpful and applicable to their daily lives, and they would recommend the intervention to others (e.g., Dahlen & Deffenbacher, 2000; Mokruue & Acri, 2013).

In sum, current data support the effectiveness of indicated prevention programs to improve both the short- and longer-term adjustment of higher education students who are experiencing subclinical levels of symptoms in several areas. Furthermore, effective programs are brief, attract and retain a variety of students, do not necessarily require professional mental health staff for their delivery, and are usually well-received by students. Collectively, these features suggest the feasibility of offering indicated prevention in higher education settings.

## Limitations and Recommendations for Future Research

Although our conclusions are positive, they must be qualified by limitations in the current literature that should be addressed in further research. Future investigators should focus their attention on answering a fundamentally important three-part question: (a) who benefits, b) how is change achieved, and (c) what is the range of outcomes that can reasonably be expected over the short- and longer term? In reference to this question, the following sections offer recommendations that emphasize the importance of more complete assessment and analysis of sample characteristics, intervention components, and outcome domains. These recommendations are not exhaustive, but focus on several potentially important variables.

**Sample characteristics.** In order to match interventions to various presenting problems effectively, investigators should continue to use reliable and valid screening methods that identify students with subclinical problems. Although ethnicity was not a significant moderator of outcome, less than a third of reports provided information on ethnic or racial characteristics of the sample, which limits the conclusions we can draw. Full reporting of the ethnic and racial composition of samples, coupled with subgroup analyses, will help determine how intervention effects may vary based on students' race or ethnicity. Other sample characteristics that may influence the response to intervention include the presence of disabilities, academic difficulties, and motivation to seek assistance, as well as expectations for change. First-generation, international, and Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, Asexual (LGBTQIA) students may be at risk for more challenges in their academic or social adjustment than other students, so these students' responses to interventions should be assessed whenever possible.

All but three of the reviewed programs involved undergraduate students at four-year colleges and universities. More programming should be offered for students attending two-year community colleges and those in graduate and professional (i.e., medical, nursing, law) programs because these populations are also in need of services that can diminish levels of commonly experienced mental health problems (Dyrbye, Thomas, & Shanafelt, 2005; Oswalt & Riddock, 2007; Napoli & Wortman, 1998; Peterson & Peterson, 2013; Qiao, Li, & Hu, 2011). There is also a need to conduct more studies outside the United States to examine how different societal and cultural factors, and the features of higher education institutions, may influence outcomes.

**Intervention features.** A clear theory of change specifying what components of the intervention should lead to what type of outcomes, accompanied by mediational analyses assessing the veracity of the theory of change, are necessary to discover the active ingredients of interventions. For example, although we could not adequately evaluate our hypothesis that programs with skill practice would be more effective than programs without such a component, mediational analyses are needed to discern whether skill training and practice, or some other elements, are responsible for obtained outcomes. Whenever practical, the relative benefits of individual and group approaches should also be examined.

Criteria for judging the efficacy of prevention programs now include collecting and analyzing data on implementation levels (Gottfredson et al., 2015); future researchers should collect such information and relate it to various program outcomes. Higher

levels of implementation usually are related to better program effects (Durlak & DuPre, 2008). Several components of implementation deserve attention: fidelity, dosage, adaptation, and quality of delivery (also see Conley et al., 2016). Each of these components can influence the amount of change achieved on different types of outcomes or for different subgroups of participants.

**Broadening outcome assessments.** Some interventions were able to achieve significant effects on multiple outcomes in addition to the main target of the intervention. Therefore, researchers should collect data on a range of adjustment outcomes. More information is needed on the extent to which programs affect students' social and emotional skills, interpersonal relationships, physical health, academic performance and school retention. Further, if interventions do reduce the stress and pressures associated with mental health difficulties, some programs might also be able to reduce risky sexual behavior and substance use (Bowers, Segrin, & Joyce, 2015; Kaiser, Milich, Lynam, & Charnigo, 2012). Data obtained at post-intervention and at various follow-up periods are needed in the above outcome areas.

Self-reports are a reasonable way to assess intrapersonal issues relating to depression, anxiety or stress, but depending on the components of the intervention and nature of the presenting problem(s), additional assessments involving behavioral performance, physiology or reports from peers also could be employed to evaluate intervention impact.

## Concluding Comments

Notwithstanding the limited features among reviewed studies, the current meta-analysis contributes to a growing body of literature demonstrating that preventive interventions significantly improve the adjustment of higher education students. Several narrative and meta-analytic reviews have now indicated that positive effects have been obtained for both universal and indicated prevention programs, offered via face-to-face or technology-delivered formats, targeting a variety of emotional, behavioral and interpersonal problems (e.g., Buchanan, 2012; Conley et al., 2015; Conley et al., 2016; Reavley & Jorm, 2010; Regehr et al., 2013; Scott-Sheldon et al., 2014; Shiralkar et al., 2013; Yager & O'Dea, 2008). Continued research is needed to determine the active ingredients of interventions, the range of outcomes that can be expected for different student groups over the short and long term, and how best to coordinate and integrate preventive services at more institutions of higher learning so that more students can benefit.

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Received June 2, 2016

Revision received December 2, 2016

Accepted December 2, 2016 ■