A Meta-Analysis of the Literature on the Impact of Problem Solving on Internalizing Problems

Colin Mahler, M.A.

Department of Psychology, Loma Linda University

Author Note

Colin Mahler, Department of Psychology, Loma Linda University.

Correspondence concerning this article should be addressed to Colin Mahler, Department of Psychology, Loma Linda University, 11130 Anderson Street, Suite 106, Loma Linda, CA 92354. Email: cmahler@students.llu.edu

Abstract

Introduction: Adolescents are at increased risk for internalizing problems, or disturbances in emotion or mood, which heavily impact their academic future, their chances of being diagnosed with a mental disorder later in life, and their emotional and sexual health. Prevention programs can significantly reduce the prevalence of internalizing problems, and common elements of these programs are being discovered to better inform future prevention services and research. However, no current study has matched these common elements to positive outcomes, or have found them to be significantly effective. **Purpose:** This meta-analysis will examine the impact of the common element, problem solving, and its effectiveness in reducing internalizing problems in adolescents based on its rate of inclusion and dosage in prevention programs. Articles will be collected through a systematic search and coded based on specific inclusion criteria. **Methods:** Articles were included based on a variety of criteria and were coded for details like prevention type, program setting, and problem solving skills training (PSST) presence and dosage. A random effects meta-regression was run to assess variance in depression and anxiety effect sizes accounted for by PSST presence and dosage. **Results:** The final sample contained 79 articles and 70 unique prevention programs. PSST was included less than 50% of the time and, on average, 13.33% of time was spent on PSST in interventions in which it was included. The effects of PSST presence and dosage on depression and anxiety effect sizes were not statistically significant. **Conclusions:** Future research should focus on testing individual common elements to determine possible effects on internalizing problems, along with a renewed coding strategy that focuses on manuals, more appropriate prevention measures, and prevention skills.

Keywords: Problem Solving, Internalizing Problems, Common Elements, Prevention, Adolescents, Mental health promotion

Literature Review

The United Nations International Children's Emergency Fund (UNICEF) defines "adolescents" as those between the ages of 10 and 19 and are a population who exceed over 1.2 billion members today and make up over 16% of the world's population (*Adolescent Demographics*, 2019). A time of change and development, adolescence is defined by increased independence and focus towards social and sexual relationships (Davidson et al., 2015). While most adolescents can handle this time of transition, one study found that the impact of intrusive negative thoughts and feelings combined with an adolescent's developing executive control leads to various mental disorders when cognitions, emotions, and behaviors cannot be balanced (Davidson et al., 2015). Most adults who have mental disorders met criteria for these disorders during their youth, with 75% of respondents in a National Comorbidity Survey having an age of onset between 12 and 24 years (Kessler et al., 2005). Additionally, a majority of participants in a prospective longitudinal design were diagnosable with a psychiatric disorder before the age of 18 (Kim-Cohen et al., 2003). Adolescence is a time of increased risk for psychiatric disorders, including anxiety and mood disorders, eating and personality disorders, and substance abuse (Paus et al., 2008). In addition, rates of depression and anxiety among teenagers have increased by 70% in the past 25 years (St John et al., 2005). Poor mental health is related to negative impacts in academics, increased risk for substance use and abuse, violence, and reproductive health (Patel et al., 2007). One study of about 14,000 first-year college students across 19 universities in eight countries sought to analyze the prevalence of mental disorders and their impact on role impairment, including roles like social life, close personal relationships, home management, and work (Alonso et al., 2018). Data from this study found that internalizing disorders like major depression and Generalized Anxiety Disorder (GAD) were the most

prevalent, 18.5% and 16,7% respectively, and were the disorders with the highest odds of severe impairment in all measured roles (Alonso et al., 2018). Additional prevalence rates included Panic disorder (4.5%), Broad mania (3.1%), Alcohol abuse/dependence (6.3%), Drug abuse/dependence (3.0%), and it was also found that almost 10% of the sample had more than one mental disorder (Alonso et al., 2018). All in all, the prevalence of mental disorders in adolescence is high and can impact adolescents' emotions, health, and academic future.

Internalizing Problems in Adolescence

Internalizing problems (IP) involve disturbances in emotion or mood and are generally focused on emotional components such as sadness, guilt, and worry (Graber & Sontag, 2009). IP are prevalent among adolescents and are related to maladaptive behaviors such as poor emotion regulation and temperament, withdrawing from peers, and an increased chance of family conflict (Graber & Sontag, 2009). Major Depressive Disorder is the most commonly occurring disorder among adolescents (Graber & Sontag, 2009). A study found that depressive symptomatology is associated with failure to enter college, making the pervasiveness of depression in adolescents and youth especially impactful towards their academic futures, career perspectives, and potential earnings (Needham, 2009). High levels of depression and their negative impacts on the futures of adolescents create new forms of stressors and maintain stress that they already encounter in this developmental period. In a multi-wave study, results indicated that higher levels of depressive and anxiety symptoms lead to increases in all types of stressors for adolescents, including achievement and interpersonal stressors (Shapero et al., 2013). Anxiety symptoms are also pervasive in adolescents, as shown in a community study where anxiety was the most frequently reported type of psychopathology in a sample made up of 3 age groups of 8, 12, and 17-year-olds (Kashani & Orvaschel, 1990). In a study on the life outcomes of adolescents with anxiety

disorders, a positive relationship was found between anxiety disorders reported during adolescence and rates of substance use and abuse, educational underachievement like failing to attend university, major depression, early parenthood, and suicidal behavior (Woodward & Fergusson, 2001). In a report of the leading causes of death for adolescents in the United States from the Centers for Disease Control and Prevention (CDC), suicide was the second leading cause of death in youth from the ages of 12 to 18 in 2019 and it has also been reported that this population also suffers from a high rate of self-harm (Control & Prevention, 2019; Patel et al., 2007).

Sex Differences in Adolescents with Internalizing Problems

The effect of IP on adolescents can be detrimental to their education, futures, and overall health. Females are particularly impacted as they have higher and more severe rates than males. In a multinational epidemiological study, girls overall received significantly higher scores on Total and Internalizing problems, as well as on three syndromes and three DSM-orientated scales that comprise and reflect IP and IP scales compared to boys (Rescorla et al., 2007). Out of 24 countries in the study, within-country results indicated girls received higher scores than boys more consistently for Anxious/Depressed problems (in 21 countries) and IP (17 countries). For depression, overall rates emerge and symptoms, like depressed mood, increase starting at the age of 13 (Ge et al., 1994; Hankin et al., 1998). As they grow older, girls are at a greater risk for developing depressive symptoms, because the female rate of depression rises to double the prevalence of males from the ages of 15-18 (Ge et al., 1994; Hankin et al., 1998). These depressive symptoms that adolescent girls experience as they get older are associated with increased odds of failing to complete high school, showing IP continuously impact their academic prospects and causes them stress. Further analyses found an association between the

increase in girls' depressed mood and environmental difficulties and stress (Ge et al., 1994). Their results conclude that adolescent girls have higher reactivity to those environmental stressors compared to boys, meaning that the risk for developing depressed mood increases as adolescent girls get older and as they experience and are exposed to stressful life events (Ge et al., 1994). Compared to boys, adolescent girls are more prone to and experience more interpersonal stress, which was the type of stress most associated with depressive symptoms (Rudolph & Hammen, 1999). However, the increase in interpersonal stress that adolescent girls experience is also related to anxiousness. Adolescent girls who tend to have anxious attachment exhibit greater dependent interpersonal stressors (Shapero et al., 2013). In general, nearly one in three adolescents in the National Comorbidity Scale Adolescent Supplement (NCS-A) met criteria for an anxiety disorder, with female adolescents being more likely to have mood and anxiety disorders than boys (Merikangas et al., 2010). Among a sample of over 10,000 adolescents aged 13-18 in the United States who took the NCS-A, 24% of adolescents affected by one class of disorder met criteria for an additional class of disorder, with mood disorders being the most likely to co-occur with other classes (Merikangas et al., 2010).

Transgender youth are also highly at risk for IPs. Transgender is a term used to describe individuals whose gender identity does not match with the sex assigned to them at birth and studies have shown that transgender youth have increased rates of depression, suicidality, self-harm, eating disorders, and anxiety compared to peers (Connolly et al., 2016; Durwood et al., 2017). Gender dysphoria, or the distress caused by the difference in a transgender individual's gender identity and their assigned gender, is one of the unique contributors to the IPs that this population experiences (Connolly et al., 2016). Improved psychological functioning for transgender youth has been achieved with medical interventions such as hormone therapy and

general support from family and friends with their social transitioning, which is the youth's process of changing their name, pronouns, hairstyle, and clothing to that of their gender identity (Connolly et al., 2016; Durwood et al., 2017). The pervasiveness of IPs in adolescents, especially female and transgender youth, combined with growing comorbidities generates the question of how IPs can be mitigated or prevented in the first place.

IP Prevention Programs

The recent increase of IP among adolescents makes it imperative to develop programs that support adolescents at risk for IPs and reduce stigma surrounding mental health so that they seek help in the first place (Feiss et al., 2019). In the mental health field, primary prevention is defined as interventions that are intentionally designed to reduce the incidence of future adjustment problems in currently normal populations and efforts that are aimed towards the promotion of mental health functioning (Durlak & Wells, 1997). Overall, the focus of primary prevention has expanded from specifically preventing certain problems to now including the prevention of behavioral and emotional dysfunction along with the general promotion of mental health (Durlak & Wells, 1997). Prevention programs play a unique role in combatting and significantly reducing IPs in adolescents. Prevention programs for children and adolescents are beneficial by significantly reducing academic, social, and behavioral problems according to meta-analyses that contained over 350 treatment outcome studies, which also showed that the average child treated was functioning better than 75% of the children in the control group (Weisz et al., 2005). Along with social and academic benefits, prevention programs have achieved great results that last over time. Most interventions report significantly reduced problems, significantly increased competencies, decreased subclinical levels of internalizing problems, contained few to no negative effects, and participants surpassed the performance of up to 80% of those in a

control group (Durlak & Wells, 1997). These results lasted throughout the follow-up period (up to a year) in the interventions groups (Durlak & Wells, 1997). School-based programs specifically can help ide ntify students with elevated risks of mental health diagnoses, improve their academic performance, or just give them more support outside of school hours (Feiss et al., 2019; Woodward & Fergusson, 2001). Outcomes and benefits of prevention programs combined with growing prevention literature make it valuable and necessary to evaluate the impacts of different programs and determine which factors promote better outcomes (Durlak & Wells, 1998).

Common Elements

To begin to elucidate specific factors and how they may impact different prevention programs into producing beneficial outcomes, a study was conducted to identify common elements across evidence-based prevention programs by coding programs into five categories: mental health, life skills, violence prevention, substance abuse, and sexual health (Boustani et al., 2015). Common elements specifically refer to single practices or techniques (e.g., relaxation) that are included in packaged interventions. The Distillation and Matching Model (DMM) was used to identify the most common elements of effective mental health treatments with the goal to match and tailor specific components to youth characteristics (Boustani et al., 2015). This model creates a method to better guide treatment selection by allowing interventions in the literature to be distilled, or factored, into more specific groupings (by technique, if they have had a replication trial, etc.) while also matching them to individual clients based on demographics, target problems, and other contextual factors (B. F. Chorpita et al., 2005). Their results showed that, across all prevention programs in the five program categories, the element of problem solving (PS) was the most common element by being present in 76% of all programs. PS can be

applied to multiple kinds of life problems and is considered a "meta-skill" that combines affective, cognitive, and behavioral skills in a self-directed, easy-to-follow, step-by-step cognitive-behavioral process to address problems in daily living (Nezu & Nezu, 2001). PS is delivered in a variety of ways such as psychoeducation or active learning (e.g., modeling, roleplay) and can range from simple (e.g., 3-step POD: Problem; Options; Do it) to complex (e.g., 5-step SONGS: Situation; Options; Narrow it down; Go for the best one; sit back and Evaluate) interventions (Hedemann & Frazier, 2017; Michelson et al., 2020). Not only was PS the most common element overall, it was also the most prevalent among the program categories, except in the category of Depression/Anxiety programs, where it came behind cognitive coping's 75% prevalence compared to 63% for PS (Boustani et al., 2015). Cognitive coping can be defined as any technique that is designed to alter a child's interpretations of life events by examining their thoughts (B. F. Chorpita et al., 2005). Despite finding elements that were common among various types of prevention programs, it was beyond the scope of the study to associate any of the elements with positive youth outcomes, so elements that were found to be the most common weren't necessarily the elements that were the most effective (Boustani et al., 2015). This is a long-standing limitation of the DMM (Rith-Najarian et al., 2019). While flexible, the DMM does not allow a determination of the effect size of each common element on its own nor is it meant to be used as a treatment design strategy, instead proving more useful as an analytic summary with the overall goal of being a guide to clinical decision making (Barth et al., 2012; Chorpita et al., 2007; Lindsey et al., 2014).

The idea of finding the common elements of evidence-based treatment by using the DMM procedure emerged as researchers and clinicians found that there were numerous evidence based treatments (EBTs) with overlapping content and goals making it more difficult to find the

right intervention to treat certain populations (Chorpita et al., 2007). The DMM procedure was able to "distill" many EBTs into their individual elements that were common across treatment manuals (B. F. Chorpita et al., 2005). Common elements could then be matched to specific characteristics of clients. This became known as the "common elements" approach. A few approach examples include the Modular Approach to Therapy for Children with Anxiety, Depression, Trauma, or Conduct Problems (MATCH-ADTC), a treatment system that combines common elements to combat a variety of clinical problems, and Managing and Adapting Practice (MAP), a system of resources for clinicians to search for and access effective EBTs for treatment (Chorpita et al., 2014; Chorpita & Weisz, 2009). Common element approaches provide opportunities to develop transdiagnostic intervention approaches (e.g. MATCH-ADTC, MAP) due to their ability to apply therapeutic principles regardless of symptom presentation and being able to treat clients with comorbidity (Boustani et al., 2017). The question of what is common versus what is effective is specifically brought up in a study where an intervention like cognitive-behavioral therapy (CBT), for example, uses an array of interventions that lead to its effectiveness, but the components that actually account for treatment effects are unknown (Weisz et al., 2011). The move towards this approach has been highlighted by a meta-analysis of EBTs that were compared to usual clinical care (Weisz et al., 2006). The study found that EBTs were only slightly more effective in comparison to usual care, and in light of their results, they concluded that EBTs cannot be assumed to be better than usual care and must be adapted to target specific problems, even going so far as to recommend a "deployment-focused model" as a more efficient way to conduct effectiveness trials to adapt EBTs to clinical practice contexts (Weisz et al., 2006). The deployment focused model aims to produce treatments that fit into everyday practice using direct tests of EBTs versus usual care in practice contexts in order to

generate evidence needed by clinicians to assess their value (Weisz, 2004). Other studies have found success outside of the use of EBTs in favor of a more common elements-like approach. One particular study adapted EBTs and pursued a modular approach known as MATCH to target a variety of internalizing problems in youth by providing treatment modules with menu options and flowcharts to allow clinicians to modify treatments to the participants (Chorpita & Weisz, 2005; Weisz et al., 2012). Their results supported the effectiveness of their modular approach. This unique approach catered to the needs of clinicians to provide care for diverse and comorbid populations by outperforming and establishing faster improvements for youth compared to standard treatment (Weisz et al., 2012). Modularity in general is described as a decomposable, independent, and standardized approach to treatment that acts as a therapeutic guide to inform treatment delivery by applying common elements to treatment manuals while keeping client-specific variables in mind (Boustani et al., 2017; Chorpita, 2007). This approach is efficient when combining different programs and protocols into a singular system to reduce the burden on clinicians and has been found to be preferred by therapists compared to standard manuals due to their ability to boost their decision-making power (Borntrager et al., 2009; Bruce F. Chorpita et al., 2005).

Problem-Solving Skills Training

Youth who have deficits in their problem solving skills tend to respond poorly and inappropriately in social situations and they are associated with child psychopathology like depression, which makes strong problem solving skills valuable for adolescents (Spence, 2003; Spence et al., 2002). Problem orientation refers to one's ability to solve problems based on cognitive, emotional, and behavioral variables that reflect their awareness and beliefs about the occurrence of problems in their lives (Spence et al., 2002). A negative problem solving

orientation (NPSO) relates to emotions and cognitions that inhibit problem solving, and has strong associations with depression, hopelessness, and suicidal ideation (D'Zurilla et al., 1998; Spence et al., 2002). Those with an NPSO have a large number of unresolved problems that are perceived as a threat, which leads to dysfunctional problem solving that ultimately results in higher levels of psychological distress and directly affects one's psychological well-being (Kant et al., 1997). This relationship impacts other areas of daily life as well, with a high NPSO also being found to be a significant moderator of romantic partner conflicts and anxiety symptoms (Londahl et al., 2005). Overall, having an NPSO can negatively affect someone throughout their lifetime, resulting in internalizing symptoms in college-aged, middle-aged, and elderly populations (Kant et al., 1997; Nezu & Ronan, 1985). This especially affects women, as they have more daily stress and internalizing symptoms, lower problem solving skills, and a higher NPSO while also having a low positive problem solving orientation (Bell & D'Zurilla, 2009). On the other hand, women with a high positive problem solving orientation were less likely to have internalizing or externalizing symptoms, with a positive problem solving orientation being found to mediate daily stress and internalizing symptoms (Bell & D'Zurilla, 2009). Further, a deficiency in social problem-solving skills or having a negative problem solving orientation has been associated with maladaptive coping, feelings of hopelessness, and an elevated risk of suicidal thoughts and behaviors (Ghahramanlou-Holloway et al., 2012). Similarly, a deficiency in problem solving relates to a greater severity in depressive symptoms (Quiñones et al., 2015). PS moderates the effects of stress on hopelessness, which then affects the occurrence of suicidal ideation, making one's problem-solving appraisal or problem orientation a key variable in mitigating those maladaptive emotions and behaviors (Dixon et al., 1991; Spence et al., 2002). A meta-analysis concluded that problem-solving skills training, among other treatments, had great

potential to improve care for individuals across a variety of intervention contexts (Weisz et al., 2006). Problem solving as a skill and as an intervention has done just that, showing effectiveness in the reduction of depression, anxiety, hopelessness, and suicide potential compared to usual care in several contexts, including school, group, and internet-based interventions (Biggam & Power, 2002; Eskin et al., 2007; Joiner Jr et al., 2001; Kleiboer et al., 2015).

Problem Solving Scalability

PS has great transdiagnostic potential in the mitigation of internalizing disorders and daily stress while also showing greater effectiveness and fidelity compared to treatment-as-usual interventions (Creed et al., 2016; Joiner Jr et al., 2001). In this case, treatment-as-usual consisted of both inpatient and outpatient interventions, including antidepressant medicines and individual and group treatments (Joiner Jr et al., 2001). PS's potential as a transdiagnostic treatment is widely accepted by clinicians in community behavioral health settings, along with being highly retained by trained clinicians and delivered well in multiple settings (Creed et al., 2016). Scalability has been defined as the ability of a health intervention to remain efficacious and effective on both a small scale and when expanded to reach a greater proportion of the eligible population (Milat et al., 2013). Evidence of this can be found in a study where problem solving was used in a brief intervention to address mental health problems in Indian secondary schools (Michelson et al., 2020). Not only was problem solving the primary element of the intervention, but it was also delivered successfully by a team of non-specialist counsellors, showing the ease in which problem solving can be implemented, scaled, learned, and taught as a skill in low-intensity interventions designed for low- and middle-income countries (Michelson et al., 2020). In addition, after-school programs that implement problem solving have been found to promote high levels of engagement while also reducing risky behaviors and mental health

symptomatology (Frazier et al., 2015; Hedemann & Frazier, 2017; McKay et al., 2011). Problem-solving can be adapted and scaled to settings of various types and sizes, treat various internalizing disorders, have significant treatment effects, and is easily learned by those not in the psychology field.

Current Study

Understanding the common elements of prevention literature is an important part of informing prevention goals and priorities of community and school programming, enhancing clinical care delivery, and integrating specific content and elements that will yield more effective curriculums to mitigate internalizing problems (IP) in adolescents (Boustani et al., 2015). The growing literature on prevention makes it necessary to evaluate the impact of different programs and determine which factors promote better outcomes (Durlak & Wells, 1998). This study will focus on the common element of problem solving and its effectiveness in reducing IP in adolescents.

As such the aims and hypotheses are as follows:

Aim 1: Determine the frequency of problem solving skills training in adolescent internalizing prevention programming.

Hypothesis 1: A majority (over 50%) of adolescent internalizing prevention programs will include problem solving skills training.

Aim 2: Determine the dosage (percentage of time spent) of problem solving in internalizing prevention programs.

Hypothesis 2: This is an exploratory aim, no a priori hypothesis is made.

Aim 3: Determine if the inclusion of problem solving improves/mitigates internalizing problems when present in a prevention program.

Hypothesis 3: Prevention programs with larger doses of problem solving will have a significantly greater impact on internalizing problems compared to prevention programs with lesser or no amounts of problem solving.

Methods

Literature Search

A systematic search of journal articles was conducted on online databases like Google Scholar, PsychInfo, and PubMed. The search identified articles describing trials of prevention programs that targeted adolescents aged 12-18 years. The prevention programs that were targeted included internalizing problem symptoms. We used the following keywords: prevention, mental health promotion, adolescent, universal prevention, school-based prevention, suicide prevention, depression prevention, anxiety prevention, stress management.

Inclusion Criteria

Articles were eligible for this study if they meet the following criteria: (1) at least one published outcome study from December 31, 1987 to December 31, 2020; (2) the intervention must be specifically designed as a prevention program, whether it is universal (Tier 1), targeted/indicated (Tier 2), or tertiary (Tier 3); (3) the sample includes youth from the ages of 12-18; (4) study must include a control group; (5) the intervention must measure at least one youth internalizing outcome, defined as any measure that looks at functioning in the areas of stress, depression, suicide, coping, well-being, and anxiety; and (6) program has a manual. Coding will be done from the description of the intervention in the published articles.

Coding Procedure

Collected articles were coded for the following: (1) prevention tier; (2) location of program; (3) if the program took place in a rural or urban environment; (4) total participants (N); (5) mean, standard deviation, and range of participant ages; (6) participant grade level; (7) percentage of male and female participants; (8) percentage of participants by race (including White, Latin, Black, Asian, and Other); (9) setting of the program (school, after-school, clinic, or other); (10) if problem solving was present, along with the number and percentage of problem solving sessions compared to the total number of program interventions; (11) internalizing measures; and (12) baseline, post, and follow-up means, standard deviations, and total participants (N) for each internalizing measure in each program (along with the number of weeks from to post and follow-up interventions).

Coders, Procedures, and Training

A codebook adapted from prior work conducted by this team was used to code all articles. A group of five graduate students were trained by an expert rater who is experienced and well versed in the coding materials. The expert rater hosted an introduction to the codebook and coding materials and facilitated an initial training session for the coders. The coders then independently coded two programs as practice and later reviewed and compared coding with the rest of the members to identify any differences while being supervised by the expert rater. Afterwards, coders were paired into random teams of two (with one member being in two of the three groups) to independently code a collection of programs. They met bi-weekly for an hour-long meeting to identify any discrepancies amongst the code and discuss any adaptations. Every program was coded independently by at least two of the coders. All disagreements or ambiguities

were discussed during meetings and were resolved with a general consensus led by the expert rater.

Data Analysis Plan

We used random effects meta-regression to assess variance in depression and anxiety effect sizes (ESs) accounted for by PSST presence and dosage, which has previously been done (Rith-Najarian et al., 2019). Presence was a binary variable (yes/no) and dosage was a continuous variable (%). Between-group (intervention-comparison) ESs was calculated using hedges $g_{average}$ formula, based on Ms, SDs, and sample sizes. We expected these within-group ESs *(continuous DV)* to be (conditionally) normally distributed; thus, analyses used restricted maximum-likelihood random-effects models with a Knapp and Hartung adjustment. There were several models each with the same covariates, but we tested IVs separately (to avoid collinearity) in predicting the two DVs (depression and anxiety ESs) separately. We identified 70 programs for inclusion in this study; thus, the planned analyses are more than adequately powered (Valentine et al., 2010).

Two internalizing groups, one for Depression and one for Anxiety, were made to represent the range of internalizing problems in this study. This was done for multiple reasons. Our data had multiple ESs for each study in terms of outcome and reporter type. Outcome was coded Depression (1), Anxiety (2), Both (3), Other (4), and Problem solving (5). Outcome was reduced to just Depression and Anxiety due to better account for the meta-regression analyses and both groups accounted for the majority of outcomes. Articles that include measures of anxiety and depression (e.g. Hospital Anxiety and Depression Scale, HADS) were included in the Both outcome category and its shared effect size was then added to the separate Depression

and Anxiety groups. The Other category was not included due the wide variety of different outcomes within it and the Problem solving category was not included due to the low number of outcomes (6). One article was visually and statistically determined to have a large effect size and sample size and it had a large influence on the pooled effect size after reviewing the data (Perry et al., 2017). The presence and percentage of problem solving was analyzed with and without Perry et al. (2017) in the Depression and Anxiety groups to account for this. Reporter type was coded Youth/Self-Report (1), Parent (2), and Other (3). However, only self-report was used due to its high level of reliability when measuring internalizing symptoms in this adolescent-focused study (Smith, 2007). For studies that had multiple experimental or control groups, data was merged to create one experimental group and one control group for each article.

Results

The final article sample contained 79 articles representing 70 unique programs.

	# (%) of Articles that Reported	# (%) of Articles that did not Report
Location		1 (1.2%)
USA	33 (41.7%)	
AUS/NZ	19 (24%)	
Europe	18 (22.7%)	
Asia	5 (6.3%)	
Other	3 (3.7%)	
Location Type		18 (22.8%)
Urban	53 (67.1%)	

Rural	7 (8.9%)	
Suburban	2 (2.5%)	
Grade Range (contains article overlap)		14
1st-6th Grade	21	
7th-8th Grade	36	
9th-12th Grade	48	
College +	3	
Setting Type (contains article overlap)		7
School	48	
After-School	10	
Clinic	10	
Other	12	
Type of Prevention		
Tier 1	27 (34.2%)	
Tier 2	50 (63.3%)	
Tier 3	3 (2.6%)	
PSST Presence		
Yes	35 (44.3%)	
No	44 (55.7%)	

# of sessions of PSST		17 (48.5%)
1 session	16 (45.7%)	
2 sessions	2 (5.7%)	
3 sessions	1 (2.8%)	
	# of Articles reported (average % of participants)	
Race		
White	38 (50.62%)	
Latino	33 (24.17%)	
Black	31 (14.53%)	
Asian	34 (13.88%)	
Other	33 (12.86%)	

The mean number of male participants across all articles was 154, the mean number of female participants across all articles was 186, and the mean age of all participants across all articles was 14.5. The majority of articles did not describe providing Problem Solving Skills Training (PSST) as part of their interventions (55.7%), while 44.3% indicated including some PSST as part of their intervention. This result does not support Hypothesis 1, as we expected more than 50% of adolescent internalizing prevention programs would include PSST. Amongst the 35 articles that reported including a PSST component as part of their intervention, 16 articles

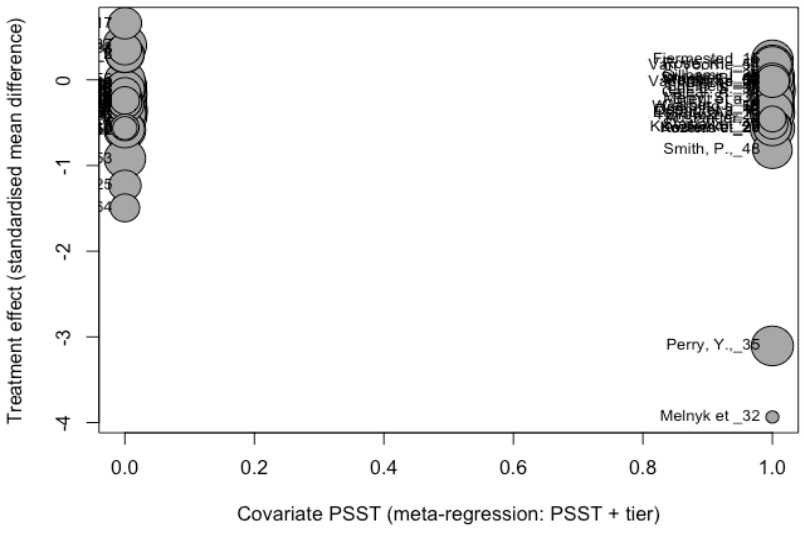
reported at least one full session of PSST (45.7%), 2 articles reported at least two sessions of PSST (5.7%), 1 article reported at least three sessions of PSST (2.8%), and the remaining 17 articles did not report the dosage, or time spent on PSST. On average, 13.33% of time was spent on PSST in interventions reporting dosage (number of sessions spent on PSST over total number of sessions of the intervention).

Three models were fit within the analyses of whether PSST had an impact on internalizing outcomes: one included no predictors in order to see the pooled estimate, one used the prevention tier and PSST presence as predictors, and the other one used prevention tier and PSST percentage as predictors. Because one study was an outlier and had a lot of influence over the analyses (Perry et al., 2017), the analyses were conducted with and without the inclusion of this article.

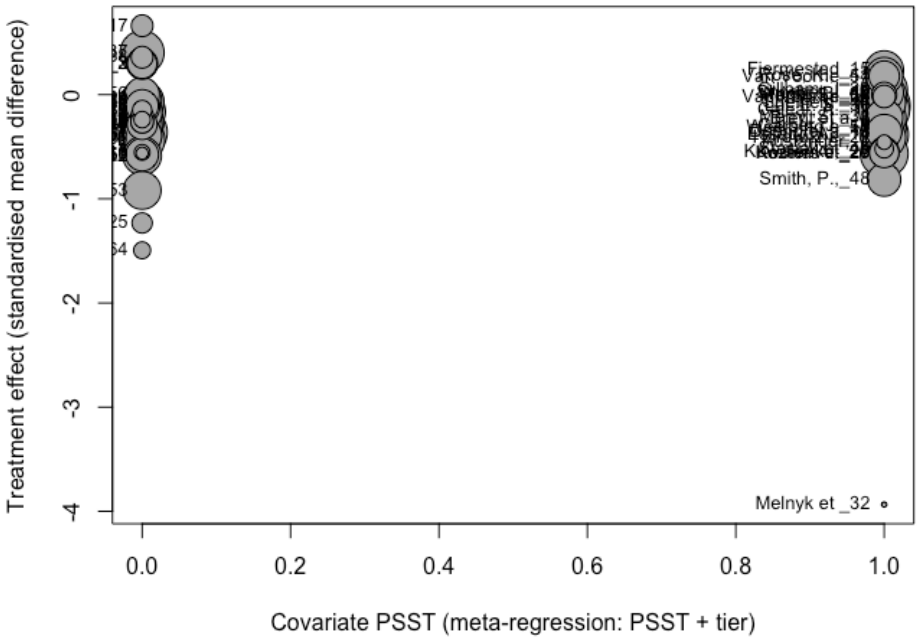
Tables

Depression (controlling for prevention tier, PSST presence predictor)

With Perry et al. (2017)



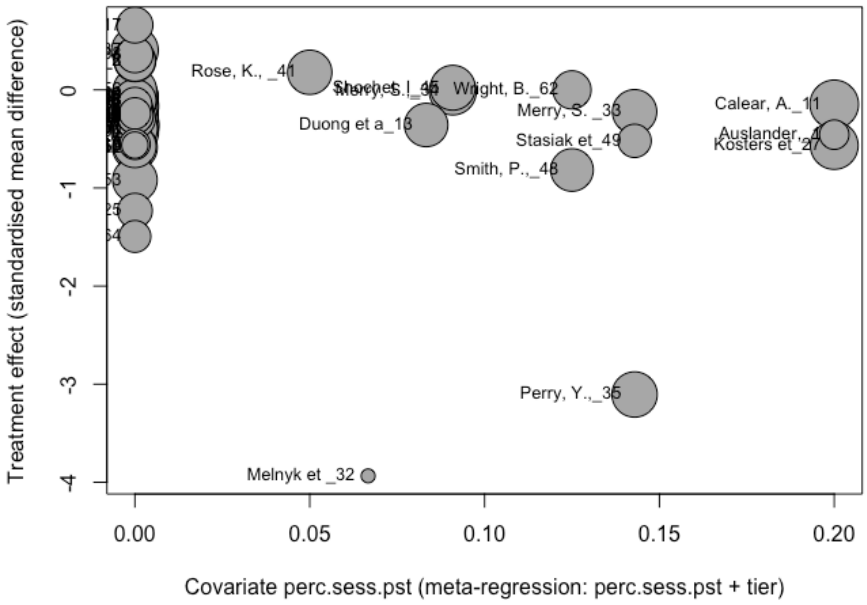
Without Perry et al. (2017)



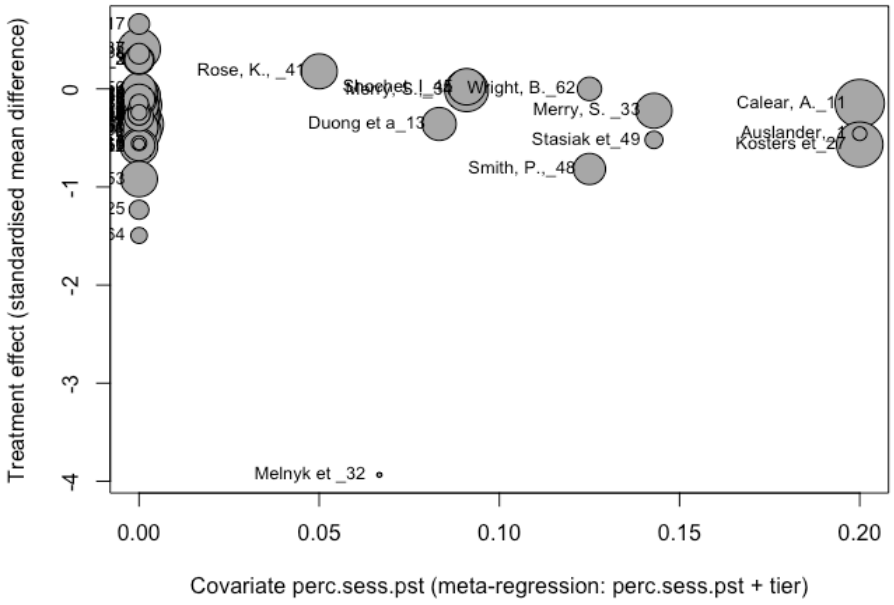
After controlling for prevention tier, studies that used PSST were estimated to have depression effect sizes that were -.14 (95% CI = [-.46, .18]) or -.02 (95% CI = [-.23, .18]) units stronger (i.e., more negative) than studies that did not use PSST (depending on whether the Perry et al., 2017 study was included or excluded, respectively).

Depression (controlling for prevention tier, PSST % predictor)

With Perry et al. (2017)



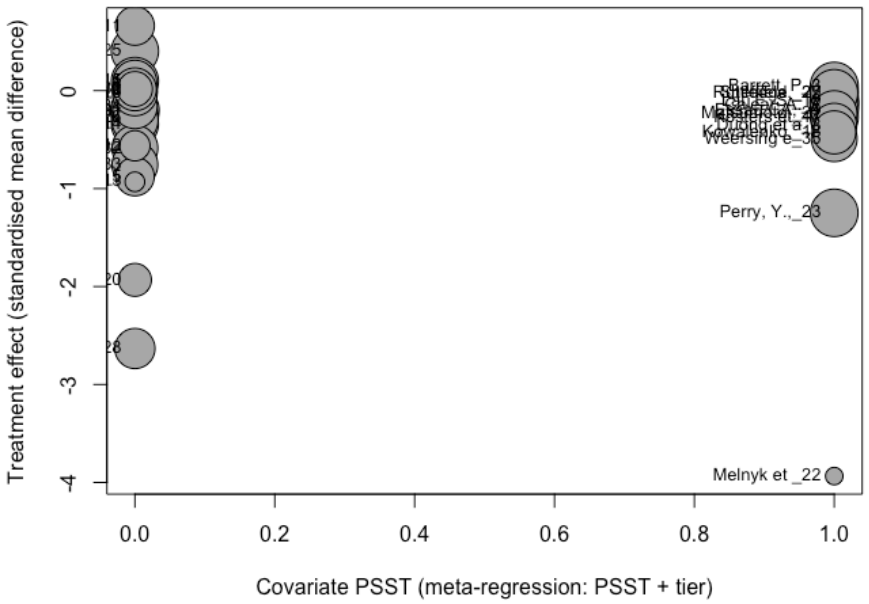
Without Perry et al. (2017)



When PSST percentage was used as the primary predictor, studies that differed in their PSST percentage by 10% were estimated to differ in their depression effect sizes by -.25 (95% CI = [-.56, .07]) or -.07 (95% CI = [-.28, .14]) units, where studies that had a higher percentage of PSST use were estimated to have stronger (i.e., more negative) effect sizes.

Anxiety (controlling for prevention tier, PSST presence predictor)

With Perry et al. (2017)



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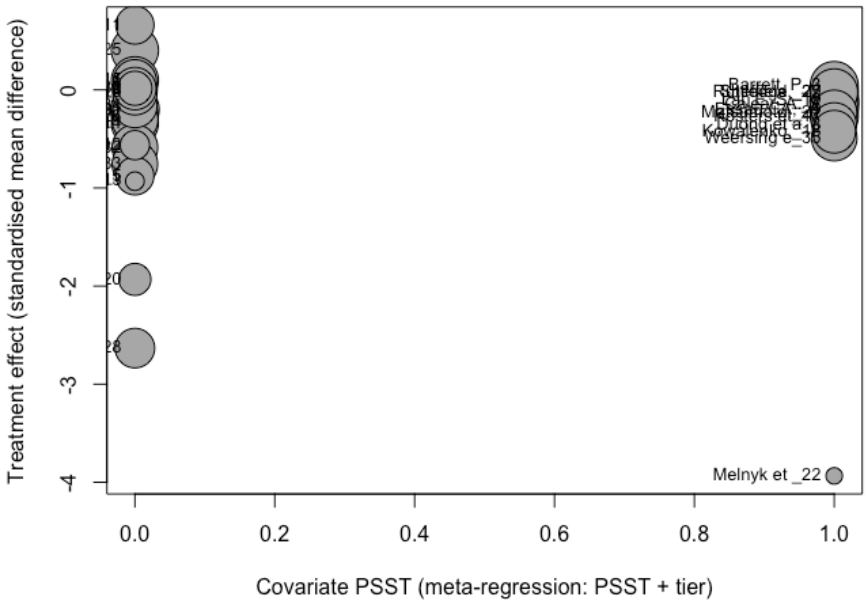
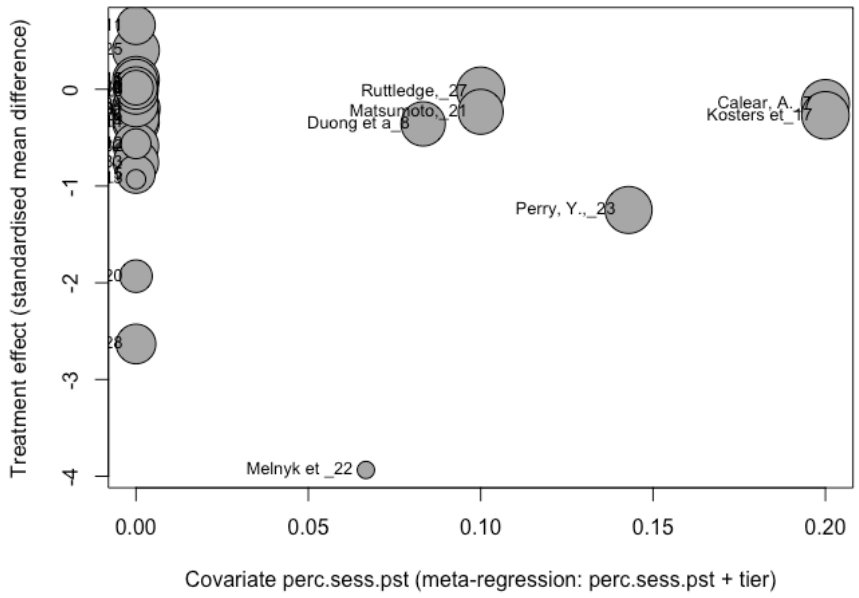


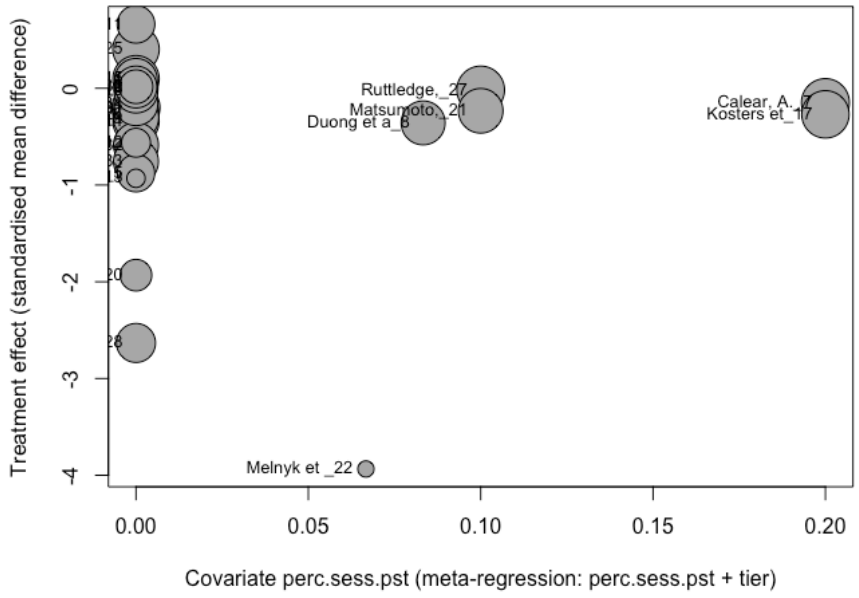
After controlling for prevention tier , the difference in anxiety effect sizes between PSST presence/absence were estimated to be -.16 (95% CI = [-.69, .38]) or -.08 (95% CI = [-.59, .44]) units.

Anxiety (controlling for prevention tier, PSST % predictor)

With Perry et al. (2017)



Without Perry et al. (2017)



When PSST percentage was used as the primary predictor, studies that differed in their PSST percentage by 10% were estimated to differ in their anxiety effect sizes by -.15 (95% CI = [-.68, .38]) or -.05 (95% CI = [-.59, .49]) units, where studies that had a higher percentage of PSST use were estimated to have stronger (i.e., more negative) effect sizes.

Although the estimated relationship between PSST presence and percentage and both depression and anxiety effect sizes are in the hypothesized direction, there were considerable uncertainty in these estimates and therefore the effects were not statistically significant. The uncertainty stems from a low sample size of articles that reported on PSST presence and percentage which leads to less precision, certainty, and power. This makes it harder to estimate a difference or test for an effect, along with creating a larger confidence interval. Because the effects of PSST presence and percentage on depression and anxiety effect sizes were not statistically significant, there is not enough evidence to conclude that these effects are non-zero and, thus, there is not strong support for hypothesis 3.

Discussion

We systematically examined 70 prevention programs described in 79 peer-reviewed articles that target a variety of internalizing problems in adolescents. Our results provide preliminary insight around whether common elements are effective simply because they are common or present in many interventions. Past research on common elements of prevention ((Boustani et al., 2015; Boustani et al., 2020) and intervention (B. F. Chorpita et al., 2005) indicate the presence of elements (discrete therapeutic strategies such as relaxation) but not their effectiveness in improving outcomes. Specifically, we were interested in understanding whether the inclusion of PSST – the most common element of prevention programming for adolescents (Boustani et al., 2015) – in internalizing programs improved internalizing outcomes. We

examined whether presence and dosage had an effect on internalizing problem outcomes in adolescents across various school and clinical settings. While a majority of programs coded did not include PSST (55.7%), a large portion still did (44.3%). Of those programs, at least one session was dedicated to PSST. In line with previous research, our data indicates that problem solving is present across multiple intervention contexts and is scalable across age groups and around the world (Milat et al., 2013; Weisz et al., 2006). Despite our inability to firmly claim that PSST had an effect on internalizing problems, we do not have enough evidence to conclude that there was no effect, either. This is an important finding because, as referenced by the Evidence-Based Services (EBS) Committee, processes that may or may not tell us what elements account for treatment effects can still lead us to common elements that may also be active ingredients in explaining effects of certain interventions (Weisz et al., 2011). This means it is likely that problem solving is not individually effective but is foundational and could build upon other elements that are effective. Though, there was a visual trend in our data that a higher dosage of PSST was leading towards more improvement in internalizing outcomes, but this was not statistically significant.

Precision Measurement

One possibility for why no statistically significant effect was found was because the bulk of articles included in this study did not use measures that are appropriate for prevention programming. Measures like the Beck Depression Inventory (BDI), the Depression Anxiety and Stress Scale (DASS), and the Spence Children's Anxiety Scale (SCAS) are all meant to measure clinical levels of internalizing problems. However, in a school prevention program, it would be hard for the measures to be precise or measure effects when the sample is not presenting with clinically significant internalizing problems. Therefore, it can be difficult for certain measures to

capture a decrease in internalizing problems when the sample is not representative of the population the assessments typically measure. Prevention programs would benefit from more accurate measures that can find effects prior to an internalizing disorder by measuring protective factors such as self-esteem, coping/social support, emotion regulation, and problem solving skills (Cairns et al., 2014; Deković, 1999; Garnefski et al., 2005; Spence, 2003).

Missing Information

An important aspect of this study is that only dosage was coded and measured, but there is more to consider when it comes to delivery of PSST. Role play or in-session practice, for example, is a great method to teach students problem solving skills, especially when what is being taught is clearly identified, taught effectively, and opportunities for practice and feedback are given (Glenn et al., 1982). The effectiveness of this approach would then be dependent on using relevant and appropriate examples (based on age, culture, etc.) during the role plays that can be generalized to the targeted sample. Alongside this consideration, adherence to teaching problem solving skills training thoroughly is also important. This can typically be done by defining the problem, making solutions, interpreting feasibility and outcomes, and then picking a solution while measuring the results (e.g. 5-step SONGS: Situation; Options; Narrow it down; Go for the best one; Sit back and evaluate) (Hedemann & Frazier, 2017). Because we coded research articles rather than treatment manuals for these prevention programs, it is unclear how problem-solving was meant to be delivered in these programs, and if role plays and rehearsals were part of the process. It is also unclear which types of examples were used to illustrate problem solving and if these examples were developmentally and culturally appropriate.

Limitations

Our analyses were made up of many universal programs, in which participants were possibly not exhibiting a significant presentation of an internalizing problem at the time of the program, and inappropriate measures were used that attempted to capture clinical effects. This could be true for the portion of programs that focused on tier 1 prevention (34.2%), as opposed to the majority that focused on tier 2 prevention (63.3%). Our coding also focused on the articles of the programs and not the manuals of the programs. It is likely that more information could have been gathered from collecting data directly from programs with manuals, such as adherence, flexibility, and generalizability of teaching problem solving. There is also unused data due to the reduction of our internalizing measure codes being organized into two overarching categories of Depression and Anxiety. The same can be said for focusing on self-report only in regards to reporter type, as well as combining multiple experimental and control groups in order to accurately run a meta-regression where each study could represent a single effect size for one experimental and one control group. Also, because we included all studies regardless of treatment effects, there is likely some publication bias because these studies are more likely to have positive treatment outcomes.

Future Directions

This study focused on problem solving, a single common element that was notable due to its overall commonality amongst various types of prevention programs (Boustani et al., 2015). While our results did not expand on the bigger question of if common elements are effective due to the fact that they are common in the way we would have liked, problem solving is only one of many common elements that can be examined and analyzed. In fact, cognitive coping (75%) was found to be more common than problem solving (63%) in the category of Depression and Anxiety programs (Boustani et al., 2015). A rigorous process of testing singular, different

common elements to determine if they can independently promote change and have an effect against internalizing problems is imperative to further understand if an intervention works, lest we begin combining common elements together only to be unable to explain why some combinations work better than others (Hamby, 2013). Coding program manuals over articles is likely a better approach to data collection to better code for quality and generalizability, along with the inclusion of measures that focus on skills that aid prevention of internalizing problems. Overall, this is a small step forward in discovering more about the effectiveness of common elements in prevention research.

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