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Effectiveness of Early Interventions for Children and Adolescents Exposed to Potentially Traumatic Events

Angela Grove
University of North Florida

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EFFECTIVENESS OF EARLY INTERVENTIONS FOR CHILDREN AND ADOLESCENTS
EXPOSED TO POTENTIALLY TRAUMATIC EVENTS

by

Angela Y. Grove

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Certificate of Approval

The thesis of Angela Grove is approved:

(Date)

Dr. Brian Fisak

Dr. Kristine Webb

Accepted for the Psychology Department:

Dr. Michael Toggia
Chair

Accepted for the College of Arts and Sciences:

Dr. Barbara Hetrick
Dean

Accepted for the University:

Dr. Len Roberson
Dean of The Graduate School

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Abstract

The purpose of this analysis was to present a systematic review of the effectiveness of child and adolescent PTSD early intervention programs implemented within 3 months following a potentially traumatic event (PTE). The mean weighted effect sizes of the early interventions were calculated, and study variables were encoded for potential moderator variables. A statistically significant mean weighted effect size of -.26 was calculated at final follow up measures, indicating that children receiving early interventions reported lower scores on PTSD outcome measures. The individual studies' effect sizes at follow-up showed mixed results, thus CBT-based interventions were used as a moderator variable which showed to be a significant moderator in the effectiveness of early interventions. Early interventions programs also seemed to be effective in reducing anxiety outcomes measures, but not depression. Study implications and directions for future research are presented, explaining the need for more long-term follow-up, more early interventions for different types of trauma, and more research in general so that additional potential moderator variables can be identified, allowing experts and researchers valuable information needed to develop effective early interventions following potentially traumatic events.

Effectiveness of Early Interventions for Children and Adolescents Exposed to Potentially Traumatic Events

Exposure to potentially traumatic events (PTEs) is commonplace during childhood and adolescence (Wethington et al., 2008). A PTE is any exposure to a life- or a physically-threatening event to oneself or witnessing this event happening to another person (Berkowitz, Watson, & Brymer, 2011; Wethington et al., 2008). In particular, approximately 25% to 60% of children and adolescents encounter a PTE before adulthood (Berkowitz, Stover, & Marans, 2011; Kowalik, Weller, Venter, & Drachman, 2011; Wethington et al., 2008), and approximately 60 to 90% of individuals experience a PTE at some point in their lifetime (Litz, Gray, Bryant, & Adler, 2002). More specifically, roughly 8 million children in the United States suffer from a physical injury each year (Schreier, Ladakakos, Morabito, Chapman, & Knudson, 2005). Further, an estimated one in eight children under the age of 18 will experience maltreatment, one in 12 will be sexually abused, and at least one in every three children will be exposed to either direct or indirect violence (Wethington et al., 2008). It is estimated that over 6.1 million adolescents ages 10 to 16 have been assaulted and victimized (Boney-McCoy & Finkelhor, 1995). Although some children are considered at higher risk of exposure to trauma or violence than others, approximately one in six children classified as “low-risk” still experience at least one PTE before adulthood (Costello, Erkanli, Fairbank, & Angold, 2002).

Potentially traumatic events can be a single or a reoccurring incident, natural or manmade, and deliberate or accidental (Kenardy, Cobham, Nixon, McDermott, & March, 2010; Wethington et al., 2008). Potentially traumatic events can have a negative impact across a number of domains of functioning and exposure to one can be severe and disabling in children and adolescents (Kowalik et al., 2011). Children can become so consumed by the event that it

affects social and school functioning, and appears to increase the development of a number of psychiatric disorders, including posttraumatic stress disorder (PTSD), anxiety disorders, mood disorders, and learning disorders (Stoddard et al., 2011). Unfortunately, despite the high rates of exposure to PTEs and the elevated risk of developing a psychiatric disorder such as PTSD, only about 4% of children and adolescents receive professional help within three months of trauma exposure (Costello et al., 2002).

Posttraumatic Stress Disorder

Posttraumatic stress disorder is among the most common negative consequences following a PTE (e.g., Ronan & Johnson, 1999). In addition to exposure to a PTE, the clinical diagnosis of PTSD requires intrusion symptoms, avoidance symptoms, negative alterations in cognitions and mood, increased arousal, and reactivity associated with the event (5th ed.; DSM; American Psychiatric Association, 2013; Schreier et al., 2005). The likelihood of children's development of PTSD tends to vary depending on the nature of the event and time following the incident (Cox et al., 2010). For instance, following a natural disaster, 5 to 50% of children and adolescents exhibit significant PTSD symptoms (Dyregrov & Yule, 2006). Roughly 35% of children involved in road traffic accidents developed post-traumatic stress symptoms (Zehnder, Meuli, & Landolt, 2010). Between 6 and 27% of children who experience hospitalizing injuries develop PTSD or related symptoms (Nixon et al., 2010). Further, 25% to 70% of children who experience war and up to 90% of children who are sexually abused are diagnosed with PTSD (Dyregrov & Yule, 2006).

The number of children experiencing PTE is estimated to be in the millions (Berkowitz, Stover, & Marans, 2011). Although prevalence rates may vary based on the nature of a PTE, approximately 20% of children develop PTSD following an accidental injury review conducted

by Kahana, Fenny, Youngstrom&Drotar (2006). These rates highlight the demand for interventions aimed at reducing and preventing trauma-related psychiatric difficulties and impairments in functioning (Berkowitz, Stover, &Marans, 2011; Kenardy et al., 2010). Also, because many individuals exposed to a PTE demonstrate PTSD symptoms within the first few weeks following the incident (Litz, Gray, Bryant, & Adler, 2002), there is a growing interest in the implementation of early intervention programs (Cohen, 2003; La Greca, & Silverman, 2009)

Categorizing PTSD and Related Responses: Implications for Early Intervention.

The necessity and effectiveness of early interventions may depend on the nature of the response to a PTE. For instance, in some cases, PTEs cause little to no harm or causes very brief symptoms, but for others, they can cause significant psychological issues such as PTSD or acute stress disorder (ASD; Roberts et al., 2009; Wethington et al., 2008) or even partial PTSD, which is when an individual experiences some impairment and symptoms without the meeting the full diagnosis (Cobham et al., 2012; Cohen, 2003; Schreier et al., 2005). Further, reactions to PTEs can occur immediately following exposure, or they may not ensue until weeks or months later (Wethington et al., 2008).

In relation to initial response to trauma, the distinction between PTSD and acute stress disorder (ASD) is noteworthy. The primary differences between PTSD and ASD relates to the duration of time elapsed since the trauma (Litz et al., 2002). In particular, the duration of disturbance must persist for more than a month following a PTE for a child or adolescent to be diagnosed with PTSD (5th ed.; DSM; American Psychiatric Association, 2013). Further, although many children exhibit symptoms within the first month of a trauma, ASD is diagnosed when an the symptoms following the trauma are particularly distressing and an individual exhibits persistent and disruptive avoidance, distress, and re-experiencing of the event between 3

days to 1 month of the PTE (5th ed.; DSM; American Psychiatric Association, 2013; Bryant, 2007).

In both adults and children, a significant number of those who experience ASD symptoms will progress to develop full PTSD, and there are also a large number of people who do not meet the ASD criteria, and will at some point, meet full PTSD diagnostic criteria (Bryant, 2007).

Although the treatment for PTSD has been well studied, few researchers examined the effectiveness of intervention within the first month, when ASD can be diagnosed but before PTSD can be diagnosed. Consequently, little is known about the degree intervention is indicated within the first month of a PTE, and evidence-based guidelines are needed. It is also noteworthy that children who do not meet the full criteria for ASD or PTSD, may still experience some trauma-related symptoms and similar impairment in functioning, which has been referred to as “partial PTSD”(Cobham et al., 2012; Cohen, 2003; Schreier et al., 2005). In particular, partial PTSD is a term used when individuals meet two of the three clusters, or when they exhibit one re-experiencing, one avoidance symptom, which are persistent effortful avoidance of distressing stimuli related to the event, and two hyperarousal symptoms, which are changes in arousal and reactivity (5th ed.; DSM; American Psychiatric Association, 2013; Cobham et al., 2012). Recent research indicates that children suffering from partial PTSD have similar levels of distress, social impairment, and academic decline when compared to those with full PTSD (Cobham et al., 2012), indicating that even mild trauma may have negatively affect children’s development (Schreier et al., 2005). Partial PTSD has been reported in over 47% of children following mild injuries (Schreier et al., 2005). Consequently, in addition to individuals who meet criteria for ASD and PTSD, research is needed to examine the degree to which individuals with partial

PTSD benefit from early intervention (Cobham et al., 2012) and whether early intervention can prevent additional symptoms from developing for these children.

Finally, although many children and adolescents do encounter some level of grief or suffering following a PTE, not all children exhibit negative symptoms following a trauma and many of the children show resilience, and recover naturally, without professional help and are minimally affected (Cobham et al., 2012; Kenardy et al., 2010). There is no clear evidence showing the effects of interventions on asymptomatic children; however, it is possible that intervention may be indicated, as the onset of PTSD and other trauma-related symptoms may be delayed. Consequently, evidence-based guidelines are needed for this group.

Secondary Effects of Trauma

In addition to PTSD, common difficulties that may emerge following exposure to a traumatic event include anxiety disorders, depressive disorders, externalizing disorders, internalizing disorders, substance abuse, or traumatic grief (Roberts, Kitchiner, Kenardy, & Bisson, 2009; Wethington et al., 2008). Further, those who do not meet the full criteria of PTSD may still experience the related emotional issues associated with these traumas (Kenardy et al., 2010).

The symptoms following a PTE may greatly impact school performance and peer relationships during such a critical developmental period (Berkowitz, Watson, & Brymer, 2011). Other behavioral symptoms often displayed by traumatized children and adolescents are disruptiveness, impulsivity, inattention, reduced social skills and decreased academic achievement (Lyshak-Stelzer, Singer, St. John, & Chemtob, 2007). Further, they may express decreased trust for adults, express fear of re-experiencing the event (Wethington et al., 2008), exhibit higher rates of emotional and behavioral issues, and even report diminished quality of life

(Kenardy et al., 2010; Schreier et al., 2005). It is common for children to overgeneralize fears that develop in response to trauma, triggering a feeling of a constant state of threat and fear, which may interfere with the capability adapt and recover from the incident (Lyshak-Stelzer et al., 2007). Also, children are inclined to view their reactions and emotions to the event as terrifying and strange, and their lack of ability to cope with the associated negative evaluations of the PTE, which are likely to produce a higher probability of psychological issues following a trauma (Cox, Kenardy, & Hendrikz, 2010).

Children who experience PTEs may also be at increased risk for substance abuse, suicide attempts, delinquency, risk-taking behavior, depression, and personality disorders in adulthood (Cohen, 2003; Wethington et al., 2008). Later in life, trauma-exposed children report higher rates of marital conflict, lower job success, and poor mental and physical health (Berkowitz, Watson, & Brymer, 2011). Overall, it is important to have an understanding of these secondary symptoms, as distress may be harder to detect in children since they tend to express their suffering in less obvious manners, which are often manifested in play, drawing, and storytelling, and even the development of separation anxiety (Lyshak-Stelzer et al., 2007). However, these symptoms may go unrecognized, and as a result, children may not receive needed treatment.

Evidence-Based Treatments

Due to the potential long-term risks linked to PTEs and the significance of early childhood for emotional, behavioral, and brain development, empirically-based prevention and intervention strategies for children and adolescents exposed to PTEs are essential (Brigg-Gowan, Ford, Fraleigh, McCarthy, & Carter, 2010). Fortunately, there has been effective treatment programs developed for individuals exposed to PTE (e.g. Cohen, 2003; La Greca & Silverman, 2009).

Cognitive behavioral therapy has shown to be a successful treatment following a PTE and has been adapted for children and adolescents who experience trauma (Wethington et al., 2008). Cognitive-behavioral interventions typically include exposure therapy, stress management or relaxation, and cognitive restructuring and anxiety management (Bryant, 2007; Wethington et al., 2008). Cognitive-behavioral interventions have been used to treat a number of childhood traumas including, sexual abuse, physical abuse, violence, natural disasters, and illness (Wethington et al., 2008). Further, both individual and group CBT have been found to be associated with decreased PTSD symptoms following a traumatic event (Wethington et al., 2008).

There have been numerous reviews performed in search of the most effective evidence-based interventions for children and adolescents who have been exposed to trauma (Wethington et al., 2008). Based on a meta-analysis conducted by Kowalik et al. (2011), CBT was found to be more effective in reducing pediatric PTSD symptomatology than active control groups, especially in internalizing and externalizing measures. Further, for children and adolescents, trauma-focused cognitive behavioral therapy (TF-CBT) is likely the most effective intervention following trauma; however, neither the specific component nor the optimal amount of TF-CBT sessions that is the most beneficial has been identified (Cohen, 2003). Still, it is noteworthy that interventions are typically not implemented until 3 months after the occurrence of the PTE and applied only to symptomatic children and adolescents (Cohen, 2003). Thus there is a need to assess the effectiveness of evidence-based early interventions implemented within 3 months of the trauma.

Early intervention and prevention of trauma symptoms. Early interventions are performed within the first 3 months of exposure and are aimed at preventing or reducing

psychological dysfunction, disorder, or maladaptation following a PTE (Berkowitz, Watson, & Brymer, 2011). To date, only a small number of studies have used TF-CBT as an early intervention for children and adolescents exposed to PTEs (Kenardy et al., 2010). There is a pressing need to examine whether TF-CBT and other forms of early intervention programs are effective in reducing and preventing PTSD symptoms for children and adolescents, but more research is required to establish any evidence-based intervention guidelines. However, the studies employing TF-CBT as an early intervention for PTSD have shown promising results for children who experienced accidental injuries (Kenardy et al., 2010). Currently, there are arguments both for and against implementing interventions immediately following a PTE, such as limited evidence, lack of clinical guidelines regarding when to intervene, and concern of possible negative effects of intervening too early (Cohen, 2003; La Greca & Silverman, 2009; Litz et al., 2002; Roberts et al., 2009).

Advantages of early intervention. There are numerous potential advantages to the implementation and investigation of early intervention programs for children and adolescents who experience trauma. In particular, as these programs have the potential to prevent or minimize aversive outcomes (Cohen, 2003; Cox et al., 2010; Roberts et al., 2009). As mentioned above, a large number of children who show trauma-related symptoms immediately following a PTE will later develop PTSD if they are untreated (Kenardy et al., 2010). Although modest, there is initial support that early interventions are successful in preventing the development of PTSD in adults (O'Donnell, Bryant, Creamer, & Carty, 2008). Early interventions are beneficial not only to the individuals receiving treatment, but are cost effective as well (O'Donnell et al., 2008). The symptoms following a PTE can be costly to the individual, society, and the health care system, and successful early interventions are a very efficient method for managing the

psychopathology related to PTEs by reducing early symptoms in individuals who do and do not meet the criteria for PTSD, thus lowering the potential of chronic trauma-related issues (O'Donnell et al., 2008). Given this evidence, early interventions are likely to be effective since they provide proactive rather than reactive methods of managing symptoms. Early intervention allows aversive symptoms to be caught early and minimized or prevented from developing.

Challenges and limitations related to early intervention. One concern related to the implementation of early intervention programs is balancing the need to find optimal time for the children who need intervention while allowing others to recover spontaneously or follow a natural recover process (Kenardy et al., 2010). Although there seem to be various reasons for providing immediate support following a traumatic event, there is also an increased concern for the lack of efficacy and even potential harm caused by certain early interventions (Cobham et al., 2012; Litz et al., 2002). Providing early psychological interventions may actual stigmatize the event for those who experience it, or may disrupt the natural recovery process for some individuals (Cobham et al., 2012; Cohen, 2003). However, many of these concerns arise from the research on psychological debriefing.

Psychological debriefing. Psychological debriefing is a one-time, semi-structured conversation and intervention, typically implemented 24 to 72 hours after a PTE, which aims to normalize individuals' reactions and foster emotional processing of the PTE by allowing individuals to discuss their experience and the event (Stallard, Velleman, Salter, Howse, Yule, & Taylor, 2006). The most commonly used form of debriefing is Critical Incident Stress Debriefing (CISD; Bryant, 2007). Consistent with the general literature on psychological debriefing, it has not shown to be an effective intervention (Stallard et al., 2006). One review found no evidence for the effectiveness of CISD in prevention PTSD in adults (Zehnder et al., 2010). It appears that

debriefing may hinder the natural recovery that people demonstrate after a trauma (Cobham et al., 2012). Overall, psychological debriefing has been a popular early intervention method used to mitigate the effects of PTEs, yet research has failed to show significant effects and in some cases may be detrimental (Bryant, 2007; Cobham et al., 2012; Roberts et al., 2009).

Psychological debriefing can disturb the typical recovery processes which naturally lessen emotional suffering and the associated memories (Wei, Szumilas, & Kutcher, 2010) thus most clinicians now advise against it (Bryant, 2007; Cobham et al., 2012; Roberts et al., 2009).

One limitation of psychological debriefing is that it is based on the assumption that being exposed to a PTE is the sole risk factor contributing to development of PTSD, and debriefing typically ignores how other factors contribute to individuals' adjustment following a PTE (Litz et al., 2002). However, most experts of crisis response now recognize that single-session interventions are not sufficient, and typically have little to no influence on an individuals' PTSD symptomatology (Berkowitz, Watson, & Brymer, 2011).

Recent Reviews on Early Intervention

In addition to psychological debriefing, other evidence-based early intervention programs have been developed and studied. The few literature reviews on previous research seemed to mostly focus on CBT-based treatments. Ideally, early interventions should reduce trauma-related symptoms and prevent and later development of PTSD and associated disorders in individuals exposed to PTEs (Dyregrov & Yule, 2006). However, recent studies which have administered early intervention to children within the first month following a traumatic event have reported mixed results (Cohen, 2003; Kenardy et al., 2010). Some of the studies found little to no benefit of early intervention when compared to wait-listed or no intervention controls (Kassam-Adams et al., 2011; Kenardy et al., 2010; Schreier et al., 2005; Stallard et al., 2006; Zehnder et al.,

2010), whereas others have found that intervention implemented within 90 days yields a reduction in trauma-related symptoms (Berkowitz, Stover, & Marans, 2011; Cox et al., 2009).

The available meta-analysis specific to interventions implemented within 3 months of a PTE were performed on adults and showed no conclusive overall effects of early intervention (Kornor et al., 2008; Roberts et al., 2009). However, both analyses claimed that TF-CBT was slightly more effective in reducing trauma-related symptoms than the control groups (Kornor et al., 2008; Roberts et al., 2009), which was most evident in the individuals diagnosed with ASD and acute PTSD (Roberts et al., 2009). Furthermore, the meta-analyses on early interventions performed on children and adolescents exposed to PTEs did not restrict the time of the intervention following the PTE (Kowalik et al., 2011; Wethington et al., 2008). To date, TF-CBT delivered within 3 months following a PTE has shown to be the most beneficial treatment in reducing PTSD for adults; similar findings are beginning to emerge in child and adolescent research (Berkowitz et al., 2011).

Randomized control studies have been performed to assess the effectiveness of early intervention techniques following a PTE; however, there are still questions of effectiveness, who the target population should be, the best timing of implementing the intervention, and the best methods (Robert et al., 2009). Still, the available research for early intervention for children and adolescents exposed to a PTE is incomplete and fragmented, thus experts cannot provide solid evidence based recommendations of early interventions for children exposed to trauma (Zehnder et al., 2010). The research in this area has yet to be systematically reviewed, therefore it is not yet known if early interventions are effective and under what circumstances it is most effective.

Focus of Current Study

Although there have been promising results from systematic reviews performed on adult populations, this study aims to clarify these questions specifically with a child and adolescent population. Since childhood and adolescent exposure to traumatic events is common not only in the U.S., but all over the world, there is a serious need for the investigation of PTSD prevention programs in order to determine an effective method of reducing symptoms. In the current study, a systematic review and meta-analysis of psychological interventions for the prevention or treatment of PTSD in children and adolescents within 3 months following the potentially traumatic event was conducted. The purpose of this review is to examine the effectiveness of early PTSD interventions for children and adolescents as described in recent literature by investigating the available relevant studies, thus contributing to the establishment of evidence-based early interventions for children and adolescents exposed to trauma.

Method

Literature Review Strategies

The electronic databases PsychINFO, PsychARTICLES, MEDLINE, PILOTS, ASSIA, CINAHL, JSTOR, ProQuest, PubMed, Science Direct, and SocialScienceswere searched December 2012 through May 2013 using combinations of the following keywords: posttraumatic stress, PTSD, acute stress, prevention, intervention, early intervention, treatment, crisis intervention, psychological debriefing, cognitive behavioral, therapy, trauma, potentially traumatic event, violence, accident, children, and adolescent. Secondary searches were conducted on the reference sections of relevant manuscripts. Experts in the field were also contacted, and questioned about additional studies that may have been obtained from the above

mentioned reviews.

Study Selection and Inclusion Criteria

The inclusion criteria for this analysis were as follows. For primary analyses, the study had to include at least one psychological intervention intended to prevent or reduce PTSD symptomatology within 3 months following a potentially traumatic event. Further, the study must have been a primary study (i.e., not a conceptual or review study), a non-pharmacological intervention, available in English, included child or adolescent participants 18 and younger, and the study was required to include at least one outcome measure assessing PTSD and trauma-related symptoms and/or a diagnosis of PTSD at follow-up. Studies for the primary analyses required a comparison group. Studies with no comparison and multiple interventions groups were obtained for secondary analyses.

Data Extraction

Extracted data from relevant studies included study authors' names, age of participants, type of trauma, type of treatment or intervention, follow up times, the time between trauma and intervention, and the outcome measures used at pre- and post-test and the reported measures (Table 1). A research team of 3 individuals reviewed the extracted data and any disagreements on important variables or outcome measure scores were discussed and resolved by the researchers.

Data Synthesis

Data were analyzed and summarized using the Comprehensive Meta-Analysis—version 2 software program. When the studies lacked the information needed for inclusion in the analysis, additional information was requested from the study's authors.

Measure of effect size. Effect sizes were measured by calculating Cohen's d values, which assesses the mean difference in between treatment and comparison groups divided by the pooled standard deviations (Cohen, 1988). The mean weighted average effect sizes for the differences between the intervention groups and comparison groups was calculated, and a fixed-effects model was used. A negative effect sizes represented lower score on an outcome measure indicating improvement in the intervention group on the outcome measure in relation to the comparison group.

Measure of heterogeneity. Cochran's Q -test and the I^2 statistic were used to measure heterogeneity. The Q -test determined the presence or absence of statically significant heterogeneity (Pereira, Patsopoulos, Salanti, & Ioannidis, 2010). The I^2 estimates the percentage of variability in the effect sizes that was not due to chance (Pereira et al., 2010).

Results

Study Characteristics

The searches led to the identification of 106 seemingly relevant abstracts, after reading the abstracts, 45 were disgarded as unrelated and 71 full text articles were acquired for further screening (Figure 1). Of the 71 studies obtained, 23 were excluded because treatment was implemented more than 3 months following the trauma. Further, 16 studies did not specify the duration of time between occurrence of the trauma and intervention, 8 did not actually include an intervention, 2 included participants over 18- years-old, 8 were pharmacological interventions , and 4 met the criteria but did not provide enough data to be included in the meta-analysis (e.g., standard deviations were not included). Attempts were made to contact the authors of the studies with missing data. In all cases, either the authors could not be contacted, or the missing data was not available.

The 10 articles obtained for this analysis included 8 randomized control studies with a comparison group (Berkowitz et al., 2011a; Cox et al., 2010; Kassam-Adams et al., 2011; Kenardy et al., 2008; Ronan & Johnson, 1999; Stallard et al., 2006; Wolmer et al., 2011; Zehnder et al., 2008). In addition, one study without a comparison group (Giannopoulou, Dikaiakou, & Yule, 2006), and two studies that compared two types of early interventions (Catani et al., 2009; Ronan & Johnson, 1999) were obtained for secondary analyses.

The primary analysis comparing intervention and comparison groups included a total of 2063 participants, of which 1055 participants received intervention and 1008 participants were in a comparison condition. An additional 94 individuals participated in the studies that were only included in secondary analysis since these studies did not include a comparison group. There was minimal variation in gender representation across studies because the percentage of female participants ranged from 31% to 55%, and all individuals were between 7 and 18 years old at the time of the exposure. The majority of the studies included exposure to accidental injuries (Cox et al., 2010; Kassam-Adams et al., 2011; Kenardy et al., 2008), in particular road traffic accidents (Stallard et al., 2006; Zehnder et al., 2010), and natural disasters (Catani et al., 2009; Giannopoulou et al., 2006; Ronan & Johnson, 1999). One study focused on children exposed to bombings (Wolmer et al., 2011), and another included children exposed to a number of different PTEs (Berkowitz et al., 2011).

Clinical Effectiveness

Intervention versus comparison. Intervention and comparison group means were assessed at post-intervention and follow-up intervals. A total of eight effect sizes were evaluated at initial and final follow up intervals. The first analysis compared intervention and comparison groups at the initial post-intervention data, the duration of time after the intervention ranged from

1 month to 8 months post-intervention. At the initial follow-up, the overall effect size of $-.26$ (95% CI $-.35, -.17$) favored the intervention group and was found to be significant ($z = -5.68, p < .01$). Further, the distribution of effect sizes was significantly greater than what would be expected due to chance, $Q(7) = 87.58, p < .01, I^2 = 92.07$. To address the concern of publication bias resulting from unpublished studies and the file-drawer phenomenon, a fail-safe N was calculated (Rosenthal, 1979). The fail-safe N for this study was 39, which implies that it would take 39 non-significant studies to reduce this current study's effect size to non-significance. Thus, it is unlikely that 39 unknown studies currently exist that would affect this studies results.

A second analysis was conducted in which the intervention and comparison group means were compared at the final follow-up interval reported in the study. Final follow-up intervals ranged from 3 months to 8 months. At final follow up, the overall effect size of $-.26$ (95% CIs $[-.35, -.17]$), showed that the intervention group score significantly less on PTSD outcome measures at final follow up than comparison groups ($z = -5.60, p < .01$; Figure 2). The distribution of effect sizes was significantly greater than what could be due to chance, $Q(7) = 66.31, p < .01, I^2 = 89.44$.

Pre- and post-intervention outcome measures. An analysis of PTSD outcome measures for intervention groups at pre- and post-intervention was conducted. These analyses included 7 of the studies in the initial review except for one study that did not include pre-intervention data (Wolmer et al., 2011), and added one study that did not include a comparison group (Giannopoulou et al., 2006). For these analyses, the pre-intervention measures were compared to the post-intervention outcome measures at the initial and final follow ups. Analyses were also conducted comparing the outcome measures of comparison groups at pre- and post-intervention.

The effect size for the pre and post-intervention measures for the nine intervention groups was .69 (95% CIs [.53, .86]), which significantly favored the post-intervention measures ($z = 8.33, p < .01$), indicating a reduction in symptoms. The distribution of effect sizes was significantly larger than what would be predicted by chance, $Q(7) = -195.60, p < .01, I^2 = 96.42$. The effect size of the differences in scores between pre-intervention and final follow-up was .81 (95% CIs [.64, .98]), which also significantly favored post-intervention ($z = 9.26, p < .01$), and the distribution of these effects were significantly larger than would could be estimated by chance, $Q(7) = 224.62, p < .01, I^2 = 96.88$.

Six studies included pre- and post-measures for comparison groups (Berkowitz, Stover, & Marans, 2011; Cox et al., 2010; Kassam-Adams et al., 2011; Kenardy et al., 2008; Stallard et al., 2006; Zehnder et al., 2010). The analysis calculated an initial follow up effect size of .70 (95% CIs [.52, .88]), which was significantly larger than what could be expected due chance alone, $Q(5) = 115.72, p < .01, I^2 = 95.68$. The analysis for final follow times showed an effect size of .65 (95% CIs [.47, .84]), with distribution of effect sizes being significantly greater than what could be caused by chance, $Q(5) = 185.44, p < .01, I^2 = 97.30$. Both of these analyses showed significant differences between outcome measures at pre-intervention and both post-intervention measures ($p < .01$). Overall, changes in effect sizes were found for both groups indicating the both intervention and comparison groups reported significantly lower PTSD symptoms at follow-up measures.

CBT versus non-CBT interventions. Of the 8 studies comparing intervention and comparison groups, 5 studies used CBT-based interventions (Berkowitz et al., 2011; Cox et al., 2010; Kassam-Adams et al., 2011; Ronan & Johnson, 1999; Wolmer et al., 2011). Because CBT is common form of treatment for PTSD and ASD, treatment type (CBT-based or non-CBT) was

analyzed as a possible moderator of effect size. The other forms of treatment used in this analysis were video exposure, debriefing, single-session interventions, and mediation-relaxation therapy. At initial follow-up, CBT-based interventions yielded a larger effect sizes ($d = -.33$, 95% CIs [-.43, -.23]) when compared to non-CBT treatments ($d = .171$, 95% CIs [-.07, .41]), $Q_{between}(1) = 14.40$, $p < .01$. The effect size for CBT was also larger at final follow-up interval ($d = -.33$, 95% CIs [-.42, -.23]) when compared to non-CBT-based interventions ($d = .15$, 95% CIs [-.09, .39]), $Q_{between}(1) = 13.15$, $p < .01$ (see Figure 4).

Follow-up analyses at different time intervals were performed to determine the relative effectiveness and stability of CBT-based treatments. The analysis of CBT versus non-CBT treatments at the 1 to 3 month follow up interval demonstrated a significant difference between the effect sizes for CBT-based ($d = -.31$, 95% CIs [-.41, -.21]) and non-CBT treatment ($d = .19$, 95% CIs [-.14, .52]), $Q_{between}(1) = 8.14$, $p = .04$. At the 4 to 8 month follow up interval, the effect sizes were $-.22$ (95% CIs [-.53, -.09]) for the CBT-based treatments and $.15$ (95% CIs [-.09, .39]) for the non-CBT treatments, which were no longer significantly different $Q_{between}(1) = 3.49$, $p = .06$.

Studies comparing two treatments. Although the primary focus of this analysis was to evaluate intervention and comparison group in outcome measures for PTSD symptoms following a PTE, two studies examined two types of intervention in the absence of a comparison group (Catani et al., 2009; Ronan & Johnson, 1999). Meta-analysis was not possible due to limited number of studies that fall under this category, consequently only effect sizes are reported for the two studies. Catani and colleagues (2009) reported an effect size of $-.01$ (95% CIs [-.72, .69]), indicating that there was no significant difference between the outcome measures of the two treatments ($z = -.04$, $p = .97$). They reported effect sizes for the narrative exposure therapy group

scores at pre- and one month post-intervention were 1.76 (95% CIs [.90 to 2.5]) and 1.96 (95% CIs [1.10, 2.8]) at 6 month follow up. The pre-intervention and post-intervention effect sizes for the mediation-relaxation group were 1.83 (95% CIs [.90, 2.60]) at one month and 2.2 (95% CIs [1.20, 3.0]) at 6 month follow up. This indicates that both intervention conditions for PTSD were significantly lowered 1 month following the intervention and these scores consistent over time.

Ronan and Johnson (1999) compared an exposure-normalizing condition and a cognitive-behavioral condition. The resulting effect size comparing pre- and post-intervention measures for the cognitive-behavioral condition was .95 (95% CIs [.54, 1.35]). For the exposure condition, the effect size was .70 (95% CI [.10, 1.29]). The comparison of exposure and cognitive-behavioral conditions produced an effect size of -.21 (95% CIs [-.59, .17]). Although the effect shows that the cognitive-behavioral condition reported lower PTSD symptoms, the difference was not significant, ($z = -1.07, p = .28$).

Additional outcome measures. In addition to PTSD symptoms, PTEs often lead difficulties in other domains of functioning, and may lead to increases in anxiety, depression, and related internalizing symptoms (Roberts et al., 2009; Wethington et al., 2008). Consequently, these domains are often included as outcome measures in trauma-based intervention studies. Perhaps the two most commonly observed additional constructs assessed are anxiety and depression.

Four studies included general anxiety outcome measures (Berkowitz et al., 2011; Cox et al., 2010; Kenardy et al., 2008; Stallard et al., 2006). Examination at post intervention produced an overall between groups effect size of -.29 (95% CIs [-.54, -.50]), with a significant difference in the intervention and comparison group anxiety outcome measures ($z = -2.37, p = 0.02$). The

distribution of effect sizes was not significantly greater than what would be expected due to chance, $Q(3) = 5.47, p = .14, I^2 = 45.14$.

The four studies that included depression scales (Cox et al., 2010; Kassam-Adams et al., 2011; Stallard et al., 2006; Zehnder et al., 2010) produced an overall effect size of $-.01$ (95% CIs $[-.24, -.22]$) and showed no significant difference in intervention and comparison group mean outcome measures for depression ($z = -.10, p = .92$). The distribution of effect sizes was not significantly greater than what could be expected due to chance, $Q(3) = 2.83, p = .42, I^2 = 0.00$.

Discussion

The primary purpose of this study was to provide a systematic examination of the effectiveness of early interventions programs for children and adolescents exposed to a PTE. Studies in which intervention was implemented within 3 months of the PTE were examined. A total of 8 studies with comparison data were identified, and two additional studies that closely fit the criteria and were included in secondary analyses (Catani et al., 2009; Giannopoulou et al., 2006).

The effect sizes obtained in the primary analysis of this review show support for the overall efficacy of early intervention programs for children and adolescents exposed to PTEs. In particular, children and adolescents who received early intervention scored significantly lower on PTSD outcome measures relative to individuals in comparison groups. This effect was significant at first ($d = -.26$) and last follow-up ($d = -.26$). Although significant, this effect size is considered small (Cohen, 1988). Eventhough the effect sizes are considered small, interventions may alter the symptom trajectory of children and adolescents exposed to a trauma, and possibly develop larger effects of the intevention over time. In addition to reductions in PTSD and related trauma symptoms, the interventions seemed effective for reducing anxiety

scores in children; however, no differences were found for depression, indicating that these interventions may not be directly or effectively targeting depressive symptoms that are likely to follow after experiencing a PTE. Moderator analyses revealed that CBT-based treatments resulted in significantly lower scores PTSD outcome measures at initial and final follow up. These preliminary results suggest that CBT may be the most promising direction for future research.

The analyses at pre- and post-interventions demonstrated similar effect sizes for comparison and intervention group, both considered to be medium values by Cohen's (1988) guidelines. The reported effect sizes show that the overall means for both treatment and comparison conditions scored significantly lower on PTSD symptoms from initial to final assessment. This indicates that the spontaneous recovery in the comparison group is similar to the recovery rate in the intervention group. However, it is notable that at final intervention, the comparison group remained consistent with the initial effect size, whereas the intervention group overall mean effect size was greater than the initial effect size, suggesting that it was a large value by Cohen's guideline (1988) indicating a bigger difference between the pre- and post-outcome measures for the intervention groups than the comparison groups.

Overall, the current results should be viewed tentatively. In particular, the small sample size of this analysis limits the generalizability of these findings. In general, it appears that children and adolescents who received early intervention following exposure to a PTE exhibit lower PTSD scores, at least within the year following exposure to the PTE. Further, although tentative due to small sample sizes, only CBT interventions were significantly more effective, which is consistent with previous meta-analyses that reported that CBT was an early effective intervention for individuals exposed to PTEs (Kowalik et al., 2011; Wethington et al., 2008).

Previous research reported mixed findings when observing the effects of early interventions aimed at reducing or preventing PTSD following a PTE (Cohen, 2003). Also, findings from the adult literature have indicated that TF-CBT is the most effective form of intervention for reducing or preventing PTSD after a PTE, (Kornor et al., 2008; Roberts et al., 2009). However, only one study in this analysis implement TF-CBT (Kassam-Adams et al., 2011) which does not provide enough evidence to make definitive claims regarding the effectiveness in preventing PTSD following a trauma.

This is the first known systematic review to focus on the effectiveness of early interventions executed within 3 months of PTEs specifically for the child and adolescent population. Previous analyses for child and adolescent trauma intervention have not exclusively focused on interventions implemented within this time-frame (Kowalik et al., 2011; Wethington et al., 2008) or are not limited to pediatric populations (Kornor et al., 2008; Roberts et al., 2009). Overall, based on the current findings, CBT may be promising early intervention strategy following exposure to a PTE. In contrast, other intervention approaches were found to be effective. However, as mentioned above, these results should be considered tentative, due to the small sample size. Further, it is noteworthy that, all eight of the studies included in the primary analysis were implemented within the first month of the occurrence of a PTE, providing preliminary evidence for the effectiveness of intervention implemented before PTSD can be diagnosed.

Although preliminary results are promising, the findings from this review also highlight the need for more research and highlight gaps in the early trauma prevention literature. In particular, it is surprising that only 8 studies met criteria for preliminary analysis, which indicates the degree to which data on the effectiveness of early intervention programs is limited.

Consequently, more research is needed regarding the optimal timing of intervention. Some researchers simply recommend that the sooner the implementation of early interventions, the better (Peltonen & Punamaki, 2010); however, other researchers assert that early intervention may be detrimental to recovery after a PTE (Cobham et al., 2012; Litz et al., 2002). This analysis has provided some evidence of the beneficial effects of early interventions, with no indication of harmful effects of intervening following a PTE. Thus, this review aims to add to the current literature and promote further research of the development of evidence-based early interventions for children and adolescents exposed to PTEs.

Study Limitations and Future Directions

Although there has been significant progress in developing successful child and adolescent PTSD early intervention programs, this review uncovers several limitations in the current research as well as some practical suggestions for future research. First, as mentioned above, is the relatively small sample size ($n=8$). Only 14 relevant studies were found that implemented an early intervention program to children and adolescents within the first 3 months of a PTE, 4 could not be included in the analysis due to insufficient data, and 1 did not contain a comparison group. Considering the vast amount of children who are exposed to trauma each year, and the known potential psychological side effects of PTEs, there is a relatively small amount of accessible literature on the topic, thus it is evident that more research on PTSD early interventions is warranted.

Although prevention and trauma researchers have highlighted the importance of examining long-term effects of early interventions (Gillham, Shatte, & Revich, 2001), there is not enough current evidence to draw conclusions for the long-term effectiveness of these programs on the prevention and reduction of PTSD symptoms. In particular, only two studies

include follow-up data after 6 months (Giannopoulou et al, 2006; Ronan & Johnson, 1999; Stallard et al., 2006). Furthermore, only 2 of the 10 studies contained more than two follow-up time intervals (Giannopoulou et al., 2006; Ronan & Johnson, 1999). Consequently, more research needed to assess the long term effectiveness of early intervention programs for children and adolescents exposed to PTEs. A related direction for future research is provide direction comparison of interventions implemented at different time intervals following a traumatic event, in order to assess the optimal time for intervention.

It is also noteworthy that a majority of the studies included in this analysis focused on children exposed to accidental injuries (Cox et al., 2010; Kassam-Adams et al., 2011; Kenardy et al., 2008; Stallard et al., 2006; Zehnder et al., 2010) or natural disasters (Catani et al., 2009; Giannopoulou et al., 2006; ; Ronan & Johnson, 1999). Consequently, the results of the current review may have limited may not be generalizability to other categories of PTEs, such as sexual abuse and domestic violence.

Further, given that children and adolescents experience different levels of PTSD-related symptoms, such as full PTSD, partial PTSD or even asymptomatic, it is important to investigate the effectiveness of interventions at the various symptomatic levels. It is possible that some interventions may be more effective for those with full PTSD than those exhibiting fewer symptoms or it may be more beneficial in preventing those who do not meet criteria, such as the asymptomatic children or those with partial PTSD, from developing further symptoms. But currently there is not enough research on the topic to allow for any empirically supported recommendations.

Additionally, since there is a gap in the research on the asymptomatic children and adolescents' responses to early intervention, future research is to examine the degree to which

generally asymptomatic children benefit from early intervention. whether these children are helped or harmed by treatment.

In addition to the above limitations, a direction for future research is to examine potential moderators of intervention effects, including treatment duration, inclusion of exposure direct comparisons between two types of treatment. Younger age has shown to be a risk factor for the development of PTSD following a PTE (Litz et al., 2002), thus it could be a potential moderator in treatment effectiveness. Future studies should observe the overall effectiveness and as well as the effectiveness by age to determine whether early interventions are successful for all age groups. In conclusion, based current review provides preliminary support for the generally effectiveness of CBT-based early interventions for reducing PTSD symptoms and anxiety in children and adolescents exposed to PTEs. The findings are also highlight gaps in the research literature and direction for future research. Although the current findings provide evidence that early trauma interventions may be indicated, the results are inconclusive at this time, and for younger children working with a younger population the least intrusive and most conservative approach is to provide that provides support, information about the event in order to facilitate coping and aid in recovery following a PTE (Cox et al., 2010). Research is still needed to determine which treatment is most effective at reducing or prevention PTSD for children and adolescents exposed to PTEs (Cox et al., 2010; La Greca & Silverman, 2009)

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Table 1. Summary of Descriptive Characteristics and Results of Included Studies^a

Study	Age	N	Outcome Measures	Type of Trauma	Type of Treatment	Type of comparison group	Time since trauma	Follow up times	Effect Sizes FFU	Effect Sizes Pre-Post	
Berkowitz, Stover, & Marans, 2011	7 to 17	106	TSCC-PTS	Mixed	CF-TSI	Supportive Comparison Condition	30 days	1 month	-1.80	9.97	
			TSCC-Anxiety					3 months	-.64		
Catani, Kohiladevy, Ruf, Schauer, Elbert, & Neuner, 2009	8 to 14	31	UPID	Natural Disaster	Narrative Exposure	no control	3 weeks	1 month	NA	1.96	
								3 months	NA	2.20	
Cox, Kenardy, & Hendrikz, 2010	7 to 16	85	TSCC-PTS	Accidental Injury	CBT-based booklet or website	Assessment Only Condition	3 days	6 weeks			
			TSCC-Anxiety TSCC-Depression					6 months	-.24 -.20 -.15	.62	
Giannopoulou, Dikaiakou, & Yule, 2006	8 to 12	20	CRIES	Natural Disaster	Short-term CBT	no control	2 months	4 months	NA	6.53	
			DSRS					18 months 4 years	NA		
Kassam-Adams, Garcia, Espana, Marsac, & Kosher, 2011	8 to 17	85	Child PTSD Symptom Scale	Accidental Injury	TF-CBT	Usual Care	2 weeks	6 weeks			
			CES-D					6 months	-.04 .33	.40	
Kenardy, Thompson, Le Brocque, & Olsson, 2008	7 to 16	103	CRIES	Accidental Injury	Information booklets	Standard Care	3 days	1 month			
			SCAS					6 months	.89 .03	.95	
Ronan & Johnson, 1999	7 to 16	113	PTSD-RI	Natural Disaster	CBT	Untreated	1 month	1 month			
									3 months	-.71	.95
									7 months		
					Video-Based Exposure						

Stallard, Velleman, Salter, Howse, Yule, & Taylor, 2006	7 to 18	158	CRIES	Road Traffic Accidents	Debriefing	Neutral- Focused Discussion	4 weeks	8 months		
			Revised Children's Manifest Anxiety Scale						-.05	.42
			Birleson Depression Scale						-.08	
Wolmer, Hamiel, & Laor, 2011	9 to 10	1402	PTSD-RI	Bombing	CBT-based Teacher- intervention	Standard Care	3 months before	3 months		
									-.26	NA
Zehnder, Meuli, & Landlot, 2010	7 to 16	99	IBS-KJ	Road Traffic Accidents	Single- session intervention	Untreated	10 days	2 months		
			DIKJ					6 months	.12	.62
									-.09	

Notes (Table 1).^aEffect sizes were calculated using means and standard deviations reported in the selected articles.

Abbreviations: CBT = Cognitive-Behavioral Therapy, TF-CBT = Trauma-Focused Cognitive-Behavioral Therapy, CF-TSI= Child and Family Traumatic Stress Intervention, FFU = final follow-up, UPID = UCLA PTSD Index for DSM-IV, TSCC = Trauma Symptom Checklist for Children,PTS = Posttraumatic Stress, CRIES = Children's Revised Impact of Events Scale,PTSD-RI = PTSD-Reaction Index,DSRS= Depression Self-Rating Scale, CES-D = Center for Epidemiologic Studies Depression Scale,SCAS - Spence Child Anxiety Scale, IBS-KJ = German Version of the PTSD Scale for Children and Adolescents,DIKJ = German Version of Children's Depression Inventory.NA = Not Applicable.

Figure 1. Flow chart of study inclusion process.

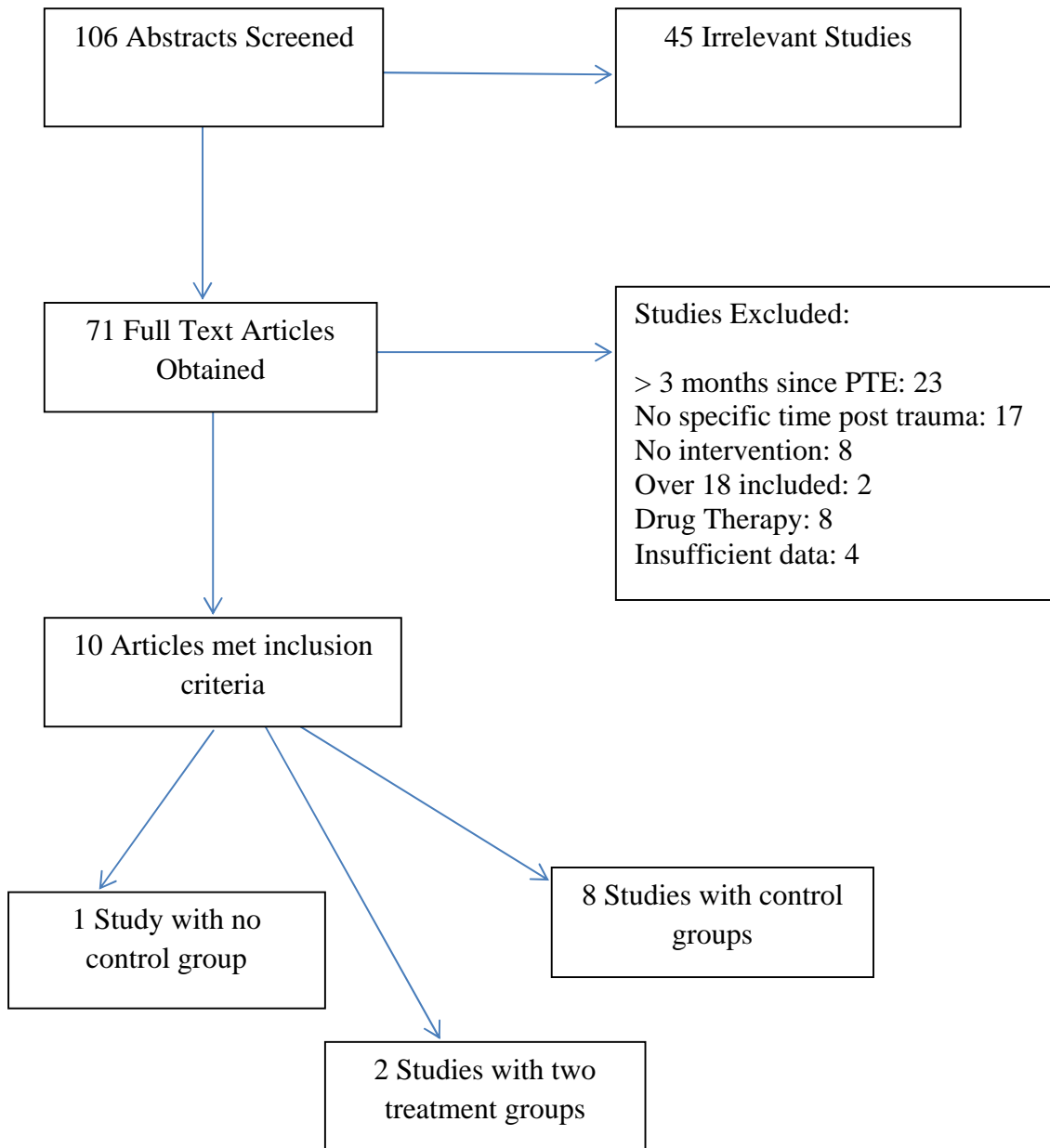


Figure 2. Forest plot comparing intervention and control group means for PTSD outcome measures at final follow up

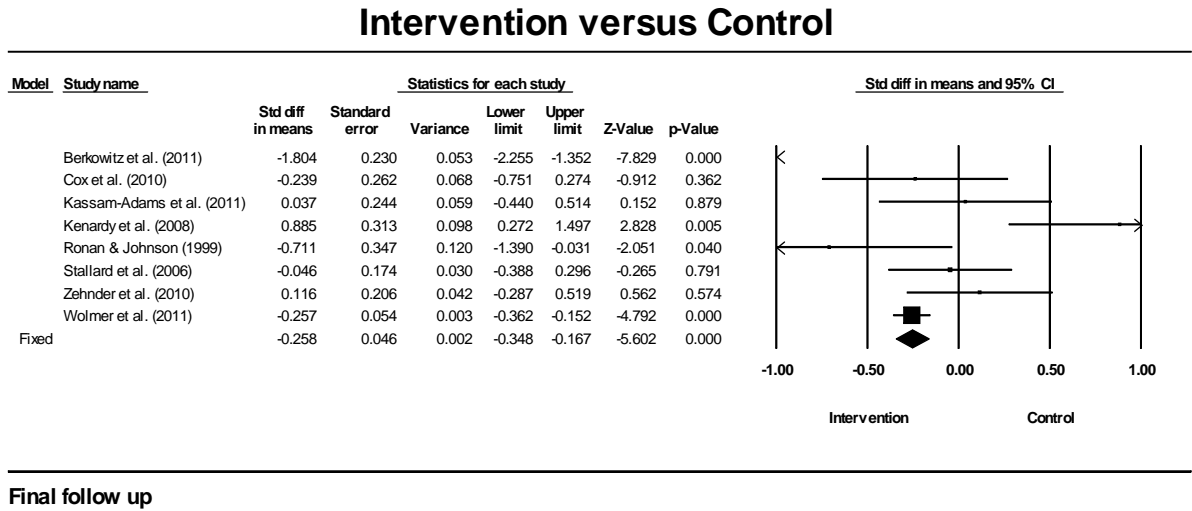
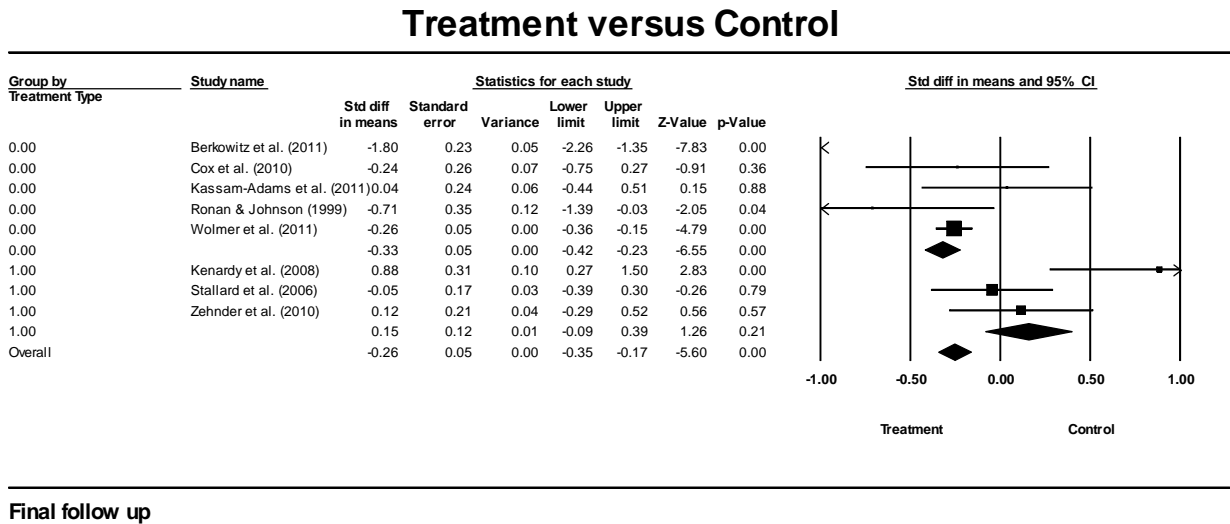


Figure 3. Forest plot comparing intervention and control group means for PTSD outcome measures at final follow up using CBT-based treatment as a moderator variable.



Vita

Angela Grove was born _____ and was raised there by her parents, Gary and Christine Grove. She attended McGill-Toolen Catholic High School and graduated with an Honors Diploma in 2006. Following high school she attended Birmingham-Southern College in Birmingham, AL, from 2006 to 2010, receiving a Bachelor of Science in Psychology with a minor in Art in 2010. In 2011, Angela pursued a Master's of Arts in General Psychology at the University of North Florida in Jacksonville, FL. Currently Angela works for Watson Property Management as an Administrative Assistant at the Jacksonville Regional office. In the fall of 2013, Angela will be pursuing her Education Specialist degree in School Psychology at Mississippi State University, in Starkville, MS.