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Cognitive Behavioral Therapy for Child Posttraumatic Stress Disorder: Testing Direct and Reciprocal Effects on Maternal Depression

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Cognitive Behavioral Therapy for Child Posttraumatic Stress Disorder:
Testing Direct and Reciprocal Effects on Maternal Depression

A Thesis

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Abstract

Children exposed to trauma experience many negative outcomes including posttraumatic stress disorder (PTSD). Fortunately, cognitive-behavioral therapy (CBT) is an effective treatment for PTSD. Theoretically it may be that not only do children do better in treatment when their parents are involved, but that there is also a reciprocal relationship such that as children improve their parents feel better as well (and vice a versa). Using data from a randomized trial (Scheeringa & Weems, 2014), this thesis used Hierarchical Linear Modeling (HLM) to test if change in child PTSD symptoms mediates change in parent depression symptoms, and vice a versa, across treatment sessions. Results indicated that maternal depression mediates child PTSD symptoms, and that the reciprocal relationship is present. However, this was only true when child PTSD symptoms were measured by parent report. The addition of this reciprocal relationship finding to the literature and future directions are discussed.

Keywords: Cognitive behavioral therapy, posttraumatic stress disorder, maternal depression, hierarchical linear modeling

Introduction

Children exposed to trauma often experience many negative outcomes, some of which include acting out, poor school performance, regressive behaviors, and the development of mental health disorders such as depression, anxiety, or posttraumatic stress disorder (PTSD). Fortunately, cognitive-behavioral therapy (CBT) is an effective treatment for treating PTSD. Research has begun to indicate that parents' own mental health symptoms may affect their children's treatment outcomes. Theoretically, it may be that not only do children do better in treatment when their parents are involved, but that there is also a reciprocal relationship such that as children improve their parents may feel better as well (and vice a versa). A clearer empirical understanding of how parent and child symptoms are related and change over the course of child treatment for PTSD is needed. The purpose of this thesis is to examine the direct and reciprocal effects of maternal depression on cognitive behavioral therapy for children with posttraumatic stress disorder.

In the following sections, the background for the study is developed. In section II, "Trauma and PTSD", data on the consequences of exposure to trauma and data on the prevalence of PTSD in youth is reviewed. Section III (Effective Treatments) reviews the extant literature on CBT interventions for youth with PTSD. In section IV (Mediators and Moderators of CBT for Anxiety Disorders and PTSD in Youth) the extant research on variables that may affect treatment is reviewed with an eye toward showing the potential of maternal depression to influence child treatment outcomes. Finally, section V, outlines the main goals and hypotheses of the study.

Trauma and PTSD

Trauma and traumatic events are unfortunately part of many children's lives. Events such as abuse and neglect, community or school violence, domestic violence in the home, vehicle or

other accidents, natural or man-made disasters, war or terrorism, and the sudden death of a family member are just some examples of traumas to which children can be exposed (Cohen, Mannarino, & Deblinger, 2006). The American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders IV Text Revision (DSM-IV-TR) defines trauma as directly experiencing, witnessing, or learning that an event has happened to a loved one, repeated exposure to extreme traumatic events such as those that would cause "actual or threatened death, serious injury, or sexual violence" (American Psychiatric Association, 2000). The DSM includes a non-inclusive list of traumatic events, such as military combat, violent personal assault, being kidnapped or taken hostage, terrorist attack, natural or manmade disasters, automobile accidents, or being diagnosed with a life-threatening illness (APA, 2000). Estimates on the prevalence of children who experience trauma vary. General trauma exposure is difficult to estimate because many instances of trauma, such as physical or sexual abuse, happen in secret and may not be disclosed until well after the event has occurred. Many times trauma exposures are never reported or treated.

Costello, Erkanli, Fairbank, and Angold (2002) studied a sample of 1,420 children and one of their parents in the general population over four time points, and found that 25% of these participants reported experiencing a traumatic event (over the course of their lifetime) that was in the "extreme stressor" category. Of those children reporting an extremely stressful event, 72% reported only one such event, the most common being the death of a loved one (Costello et al., 2002). Other common traumatic events in this study included witnessing or learning about a traumatic event and sexual abuse (Costello et al., 2002). Studies such as this show the prevalence of children's exposure to traumatic events in the general population, not only in clinic samples, is quite high.

While children's response to trauma can be affected by many factors, posttraumatic stress disorder (PTSD) is one of the most studied consequences of exposure (Cohen et al., 2006). The DSM-IV-TR has several requirements for a diagnosis of PTSD. First, a person's response to a traumatic event must involve intense fear, helplessness, or horror (APA, 2000). For children, this response must involve disorganized or agitated behavior (APA, 2000). The DSM also states that for PTSD, the symptoms that result after a trauma exposure include persistent re-experiencing the traumatic event, avoidance of things associated with the event, numbing of general responsiveness, and persistent symptoms of increased arousal (APA, 2000). These symptoms must be present for at least one month, and they must cause clinically significant distress or impairment in social, occupational, or other areas of functioning (APA, 2000).

Children who experience PTSD symptoms after trauma may exhibit numerous problems, among them: self-injury, substance abuse, affective instability, and impaired interpersonal relationships or trust (Cohen et al., 2006). Cohen and colleagues (2006) divide these issues into categories of affective, behavioral, cognitive, complex PTSD, and psychobiological trauma symptoms. Affective trauma symptoms include expressions such as fear, depression, anxiety, anger, and affect dysregulation, or mood lability and difficulty tolerating negative affective states (Cohen et al., 2006). Behavioral trauma symptoms may include avoidance, emotional numbing, dissociation, associating only with "troubled" peers for fear of associating with "normal" peers, self-injury, among other maladaptive behaviors and coping strategies (Cohen et al., 2006). Cognitive trauma symptoms include thought distortions about oneself, perpetrators, others, and the world itself, as well as irrational beliefs, and generalizations (e.g., "no one in the world is trustworthy"), and other thoughts that generally reinforce negative views of self, others, or the world (Cohen et al., 2006).

Data from the National Comorbidity Study estimated lifetime prevalence of PTSD is 7.8% (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). It also found that women were twice as likely as men to experience PTSD in their lifetime (Kessler et al., 1995). Among women, the most common types of traumas associated with developing PTSD were rape and other sexual assault; for men the most common were combat exposure and witnessing someone being badly injured or killed (Kessler et al., 1995). They found that for both men and women, the trauma experience most likely to lead to PTSD was rape, with 65% of men and 45.9% of women reporting this as their most upsetting trauma experience (Kessler et al., 1995). Other trauma experiences most associated with development of PTSD were combat experience and child abuse and neglect (Kessler et al., 1995). Moreover, PTSD is highly comorbid with other DSM disorders (88.3% of men and 79% of women had another comorbid disorder at some point in their lives), and often persistent, in that one third of individuals do not recover after many years (Kessler et al., 1995). The most common comorbid disorders are depression, anxiety, and phobias, which may be in part because some of the symptoms of these disorders overlap with symptoms of PTSD. In terms of the persistence of PTSD, this study found that the median time to remission was 36 months for those who sought treatment, and 64 months for those who did not seek treatment (Kessler et al., 1995).

The finding that one third of people did not recover from their PTSD symptoms after many years is particularly concerning, as it was found to be true not only in the sample of people who did not receive treatment, but also in the sample of those who did receive treatment. This shows how necessary treatment can be for some individuals to experience a faster relief of symptoms, but also that not all treatments are working for all individuals. This finding highlights

the importance of understanding the mechanisms underlying successful PTSD treatment, so that more people can be successfully treated for their symptoms.

While lifetime prevalence and risk for PTSD highlights the extent of the problem, research pertaining specifically to children and youth is less clear. First, the DSM criteria for meeting a PTSD diagnosis has often been criticized for inaccurately diagnosing or capturing the specific symptoms children exhibit when experiencing PTSD. In a review of 15 years of PTSD literature, Scheeringa, Zeanah, and Cohen (2011) examine PTSD in children and how it can be more accurately captured in diagnoses with DSM criteria. First, the authors found that like the results in adult samples described above, children with PTSD symptoms often do not recover quickly either. Shaw, Applegate, and Schorr (1996) found that 21 months after surviving Hurricane Andrew, 70% of a sample of 6 to 11 year old children still had PTSD symptoms in the moderate to severe range (as cited in Scheeringa, et al., 2011). In a sample of 35, 1 to 6 year old children exposed to trauma, Scheeringa, Zeanah, Myers, and Putnam (2005) found no significant decrease in PTSD for over two years (as cited in Scheeringa, et al., 2011).

Similarly, Meiser-Stedman, Smith, Glucksman, Yule, and Dalgleish (2008) studied a group of 2 to 10 year old children who had been involved in motor vehicle accidents and found that 69% of this sample continued to have a PTSD diagnosis at a 6 month follow-up. Scheeringa and colleagues (2011) also found in their review that prevalence of PTSD in clinical samples of youth ranges from 13 to 20%, which is much lower than expected considering adult clinical samples range from 32 to 59%. The authors speculate that the prevalence of PTSD in youth may be low because of children being somewhat protected from developing PTSD due to their developmental levels, or because DSM-IV criteria for PTSD does not accurately capture and diagnose children. Accurately diagnosing PTSD in children is essential because it allows for

accurate treatment of symptoms, as well as setting the criteria for many treatment studies. This research shows that not only is childhood PTSD persistent, it is also probably undiagnosed in many children. The problem of PTSD may be even greater than is thought, and more children would meet the diagnosis of PTSD if the DSM criteria more accurately captured children and their symptoms.

Summary: Experiencing a traumatic event is common. Developing PTSD symptoms after such an event is also common, and those who do develop PTSD are likely to experience chronic distress. Whether or not a person develops PTSD after a traumatic experience is determined by a number of factors such as individual differences in the way people process these experiences, and their own tools for dealing with difficult events. Some children seem more protected from developing PTSD after trauma due to their age and/or developmental level, resiliency, and availability of external support (Cohen et al., 2006). Children who experience traumatic events, and especially those who develop PTSD, need help finding meaning in traumatic events in relation to themselves, accessing support systems, and coping with the psychological and physiological stress in order to integrate these events into their own sense of self (Cohen et al., 2006). One way to help children do these things is through a treatment modality that can take into account these different factors that help children heal, and can account for individual differences in the way they process events. Treatments that are most successful in treating PTSD in children can be tailored to address the needs of the individual child. This in turn will help alleviate present symptoms for more successful, happy childhoods and less chance of a continuation of troublesome symptoms into adulthood.

Silverman and colleagues (2008) conducted a meta-analysis of current literature on the treatment of PTSD in children and adolescents. Their results showed that Cognitive Behavioral Therapy (CBT) is effective in treating PTSD in children (Silverman et al., 2008). According to Silverman's review, and using Chambless and Hollon (1998) definitions, CBT is a "probably efficacious" empirically supported therapy. "Probably efficacious" treatments have been manualized and examined in replicated studies using a wait list or placebo control group for comparison (Chambless & Hollon, 1998). To date more than a dozen studies have tested CBT techniques using a manualized treatment protocol with a randomized control group with results indicating these techniques to be efficacious in treating PTSD in youth (Cohen, Deblinger, Mannarino, & Steer, 2004; Cohen & Mannarino, 1996a, 1997; Deblinger, Lippmann, & Steer, 1996; Deblinger, Stauffer, & Steer, 2001; Deblinger, Steer, & Lippmann, 1999; Nixon, Sterk, & Pearce, 2012; Pollio, McLean, Behl, & Deblinger, 2014; Salloum, Scheeringa, Cohen, & Storch, 2014; Scheeringa, Weems, Cohen, Amaya–Jackson, & Guthrie, 2011; Silverman et al., 2008; Smith et al., 2013). Parent factors have emerged as linked to children's treatment success in many of these studies, however exactly how or why parents' involvement is helping children's treatment remains unknown.

In an early study by Cohen and Mannarino (1996a), the researchers developed a CBT intervention called CBT for Sexually Abused Preschoolers, or CBT-SAP. They found that when compared to a control group receiving nondirective supportive therapy, CBT-SAP was significantly more effective at reducing PTSD symptoms in child sexual abuse survivors aged 2 to 7 years old (Cohen & Mannarino, 1996a). In a one-year follow-up study of the intervention, the researchers focused on the effects of the parent component to the treatment. As is further

discussed below, Cohen and Mannarino (1997) began to look at mediating factors in children's treatment outcome. Overall, they found that parental modeling of distress and other maladaptive behaviors predicts some child symptoms, and that this association was moderated by age (Cohen & Mannarino, 1997). That is, younger children were more likely to model parents' maladaptive behaviors than older children. The authors concluded that regardless of the type of treatment children receive, parent distress in response to their child's sexual abuse disclosure strongly affects the outcome of the child's symptoms and treatment (Cohen & Mannarino, 1997). The reasons for parents' behaviors predicting children's treatment outcome needs more investigation.

The CBT-SAP intervention was an early attempt at tailoring CBT interventions to be more sensitive to and specifically treat trauma reactions in children. Current studies investigate this intervention, now called Trauma-Focused Cognitive Behavioral Therapy (TF-CBT), as an empirically supported treatment for trauma and PTSD symptoms. In fact, Silverman and colleagues (2008) found that TF-CBT can be considered a "well-established treatment." Even more recently, Smith and colleagues (2013) agree, and state that TF-CBT has the most empirical evidence of all treatments for PTSD in children.

TF-CBT incorporates trauma-sensitive interventions, including involving parents in children's treatment, with already established CBT principles. Although many of the original researchers who worked on TF-CBT interventions specifically studied children who had been sexually abused, TF-CBT has also been shown to be effective for children who have experienced varied types of trauma and multiple traumas. Developed to treat PTSD, the therapy recognizes that survivors of trauma experience symptoms of anxiety and depression, in addition to trauma-specific symptoms such as self-blame, issues about safety, and trusting others and the world in general (Cohen, Deblinger, & Mannarino, 2004). In accordance with a trauma-informed and

strengths-based perspective, TF-CBT also works to help children fit the trauma(s) into their lives in such a way that they do not identify themselves as a "victim" (Cohen, Deblinger, & Mannarino, 2004). Specifically, the main components of TF-CBT are psychoeducation about trauma and PTSD; affective modulation skills; stress-management skills tailored to the individual receiving them; an introduction to the cognitive triad, that is beginning to understand the relationships between thoughts, feelings, and behaviors; creating a trauma narrative, wherein children describe increasingly distressing details of their trauma as in a gradual exposure intervention; cognitive processing; body safety skills; and a parental treatment component (Cohen, Deblinger, & Mannarino, 2004).

For the parent component of TF-CBT, parents are seen by the therapist separately from their children, and receive therapy modules that parallel those the child receives, with an added focus on parenting skills (Cohen, Deblinger, & Mannarino, 2004). At least a dozen studies have been conducted using TF-CBT compared to other common treatments for trauma exposure, such as nondirective play therapy, supportive therapies, and waitlist control groups, and TF-CBT has consistently been found to be the superior treatment modality (Cohen, Deblinger, Mannarino, et al., 2004; Cohen & Mannarino, 1996a, 1996b, 1997; Deblinger et al., 1996, 2001, 1999; King et al., 2000; Pollio et al., 2014). As these studies show, TF-CBT currently has the most empirical evidence for its efficacy in treating PTSD in children due not only to its superiority to other treatment modalities, but also to the successful treatment gains shown in numerous studies (Cohen & Mannarino, 1996a, 1997; Deblinger et al., 1996, 2001, 1999; King et al., 2000; Scheeringa, Weems, et al., 2011). Many of these studies also examine parent factors and if parental involvement is a beneficial or necessary component to TF-CBT treatment for children.

Deblinger, Lippmann, and Steer (1996) conducted a study where participants (children and their mothers) were randomly assigned to either a community–based support model, or were treated using a TF-CBT treatment manual developed specifically for treating children who have experienced sexual abuse. In this study, mothers and their children receiving the treatment condition were divided into three treatment groups – either mothers-only, child-only, or mother and child. The researchers found that mothers in the mothers-only or in the mother-and-child groups reported decreases in their children's externalizing behaviors and increases in their own parenting skills (Deblinger et al., 1996). Children in either the child-only or mother-and-child groups reported decreases in depressive symptoms and larger reductions in PTSD symptoms when compared to children in the non-experimental control and mother-only groups (Deblinger et al., 1996). A follow up study conducted with the same participants two years after this initial report found that these changes from pre to post-treatment continued two years after treatment (Deblinger et al., 1999). These studies are particularly notable because they are the first to show that an intervention incorporating a parent component to treatment for sexual abuse was superior to treatments that did not involve parents. However, although these early studies show the importance of parent involvement, they do not seek to understand the mediating and moderating effects parents have on children's treatment outcome.

Summary: While CBT and TF-CBT are effective treatments for PTSD, mediating and moderating influences of treatment outcomes are just starting to be examined. Silverman et al. (2008) caution that currently only limited research has examined what factors and predictors affect children's CBT treatment outcome. Further exploration of mediating and moderating influences on treatment is needed as these other factors may be key to understanding which parts of treatment lead to changes in children's symptoms and maintaining that change over time.

Critical mediators and moderators of successful treatment can be targeted in future CBT

treatment models. More research is needed to identify which factors may be mediators and

moderators of CBT for the treatment of anxiety and PTSD in youth.

Parent Variables as Mediators and Moderators of CBT for Anxiety Disorders and PTSD in

Youth

Mediators and moderators are variables that affect the relationship between two other

variables. A moderator is a variable that affects the strength and direction of the relationship

between a predictor variable (independent variable) and a criterion variable (dependent variable)

(Baron & Kenny, 1986). In other words, a moderator interacts with a predictor variable and

impacts the level of the dependent variable (Holmbeck, 1997). Different levels of the moderator

may result in different levels of the dependent variable. Baron and Kenny (1986) note that

moderator variables can be qualitative, such as gender, race, or class, or quantitative, such as

level of reward etc. Moderator variables specify when certain effects will happen; in comparison,

mediator variables specify how or why such effects occur (Baron & Kenny, 1986). That is,

mediating variables account for the relationship between the criterion variable and the predictor

variable (Baron & Kenny, 1986). A mediator specifies how (the mechanism by which) a given

effect occurs (Holmbeck, 1997). As noted in the review of PTSD treatment literature above,

mediating and moderating variables have just started to be examined as mechanisms for change

in children's treatment. Parent variables are likely to be mechanisms for change in children's

treatment outcomes.

Extant research shows that children tend to have more beneficial treatment outcomes

when parents are involved. Specifically, the Deblinger, et al. (1996) study found that when

parents were included in their child's treatment for PTSD, there were significant reductions in

their child's Child Depression Inventory scores (CDI; Kovacs, 1981). Similar results have been

found in studies on parents involved in treatment for children with PTSD, however, here the

results seem to be more mixed on whether parent involvement is needed for symptoms to

improve (Cohen, Deblinger, Mannarino, et al., 2004; King et al., 2000). Cohen and colleagues

(2004) compared parents of children receiving a TF-CBT treatment with parents of children

receiving child-centered therapy (CCT) for PTSD. This study found that not only did children in

the TF-CBT group experience a decrease in PTSD and related symptoms than those children in

the CCT group, but parents of these children experienced less depression and distress, and felt

more able to support their child and effectively parent than those in the CCT group (Cohen,

Deblinger, Mannarino, et al., 2004). Therefore, parents feeling less negative emotions, such as

depression and distress, and feeling more able to support their child and effectively parent may

be important for their children to do better during treatment as well. These treatment gains for

parents and children co-occur, however, this study did not look at a mediating relationship of

these variables.

The findings of Cohen and colleagues (2004) are similar to an earlier study by Cohen and

Mannarino (1996b) in which parents' depression and emotional distress regarding their child's

sexual abuse was significantly correlated with children's emotional and behavioral problems,

regardless of the type of treatment the child received. The authors also concluded that including

parents in treatment would be necessary for both parents and children to be effectively treated.

King and colleagues (2000), using a smaller sample size than the Cohen et al. study, ($n = 36$

compared to $n = 67$) found that parents involved in a TF-CBT treatment were actually not

necessary as their involvement did not improve the efficacy of the treatment. Therefore, a

treatment for children that also involves their parents may be beneficial to children's overall

treatment goals. However, the literature on parental involvement in children's PTSD treatment remains limited and inconclusive. More research is needed to understand what aspects of a treatment program should be emphasized, and if and when treatments should include parents.

Parental participation in their child's treatment after a traumatic event may be a mechanism of change. However, what happens when parents are also struggling with depression, trauma, or other mental health issues? Extant research shows that when mothers have depression, children are less likely to succeed in treatment (Cohen & Mannarino, 1996b; Kinard, 1995). Kinard (1995) found that in a sample of sexually abused children, maternal depression was correlated with more behavior and emotional symptoms (as cited in Cohen & Mannarino, 1996b). For some parents, depression or other mental illness may be an organic part of their lives, while for others it may be a reaction to their child experiencing PTSD symptoms. Parent's own psychopathology is in fact a risk factor for children's development of PTSD after trauma (Cohen et al., 2006).

Research studies have also found that depression and other psychopathology in parents is a reaction to their child's trauma and development of PTSD. For example, in a review of literature on children who had experienced sexual abuse and their non-offending parents, Elliott and Carnes (2001) found that parents experienced extreme distress after their child disclosed the abuse. They also found that although many mothers in the literature are supportive and protective after such a disclosure, even those mothers can be inconsistent and ambivalent in their responses to their children (Elliott & Carnes, 2001). This inconsistency and ambivalence from parents can be hard for children to understand. Elliott and Carnes (2001) also point out that reactions parents may believe emphasize their belief of the veracity of the allegation, such as threatening to hurt the perpetrator, may be considered unsupportive by a child who needs a different type of

emotional response. By participating in their child's therapy, some researchers believe parents' own symptoms may improve, by way of receiving benefits such as learning coping skills, which they can use to reduce stress, emotional reactions, and negative thoughts (Cohen et al., 2006). Still other theories suggest that parents' symptoms improve because they see that their child is being taken care of and getting help, or that their children are having fewer problem behaviors and improved mood. Thus, parents' symptom reduction is a result of seeing a reduction of symptoms in their child (Carrion, Kletter, Weems, Berry, & Rettger, 2013). These multiple, sometimes conflicting, theories illustrate the need to examine the direct and reciprocal effects of maternal depression on Cognitive Behavioral Therapy for children with PTSD.

Parental involvement may be necessary for children's success in CBT treatment, but the direction of change in symptoms is still unclear. What direction is the change in symptoms occurring? Do parents need to see their children improving first, or do children do better because their parents are improving? Some researchers have begun to see a not only a direct relationship between children and parents improving, but also a reciprocal relationship. That is, *both* parents *and* children need to have symptom improvement, and perhaps this relationship is interrelated and both relationships are occurring. Silverman and colleagues were among the first to examine this reciprocal relationship theory.

In a randomized clinical trial treating youth with anxiety disorders through CBT, Silverman, Kurtines, Jaccard, and Pina (2009) sought to examine the change in youth symptoms as well as the changes in parent variables when parents were involved in treatment. Although the study examines anxiety, not PTSD, symptoms, it is illustrative of the reciprocal relationship model. Silverman et al. (2009) examined a sample of 119 youth (aged 7 to 16 years) diagnosed with anxiety disorders and found that not only did the children's anxiety decrease over time with

CBT treatment, parents' anxiety decreased as well, while positive parenting behaviors increased. The authors believe that it may be the parents' reduction in anxiety and increase in positive parenting behaviors that allowed children's anxiety levels to improve in this way (Silverman et al., 2009). This study is theoretically significant as it shows that change in youth symptoms may be occurring bi-directionally between youth and parents. That is, improvement in youth variables (anxiety) results in improvement in parent variables (anxiety and positive parenting behaviors), and that the reciprocal relationship – improvement in parent variables (anxiety and positive parenting behaviors) results in improvement in youth variables (anxiety), is also at work at the same time.

The Silverman study shows that we cannot be sure if it is children's improvement that is also allowing parents to get better. It could be that when parents improve their positive parenting and experience less anxiety, children's anxiety symptoms improve as well. This has significant implications for treatment and treatment research because if the mechanism for change can be targeted more accurately, outcomes can be further improved. More research needs to be done to understand the mechanism of change, and what other variables, such as parental involvement in treatment, are critical to children's treatment. The current study seeks to extend this theory from the treatment of children with anxiety and apply the model to the treatment of children with PTSD symptoms.

Carrion, Kletter, Weems, Berry, and Rettger (2013) drew from Silverman et al.'s (2009) bidirectional theory in a treatment study of PTSD, hypothesizing that in a trial of cue-centered therapy, caregiver symptoms would improve as youth symptoms improved, as a result of having a less symptomatic child. Carrion and colleagues (2013) examined a group of 65 youth aged 8 to 17 years and found that although parents were not required to be part of the treatment trial, the

caregivers in the treatment group experienced a significant decrease in anxiety symptoms. The authors hypothesized possible reasons for this reduction such as: the parent receiving psychoeducation about their child's condition, a reaction to seeing an improvement in their child's behavior and mood, the parent participating in some sessions, or feeling supported in getting help for their child (Carrion et al., 2013). Whether these or other variables are mediating the change this study again showed that parent symptoms decreased as youth symptoms decreased and that changes in parent symptoms in relation to changes in their child's symptoms likely represents a mechanism in treating children with any disorder, including PTSD. Although Carrion et al. (2013) analyzes parent variables in this study, the researchers did not test mediation.

Most recently, Holt, Jensen, and Wentzel-Larsen (2014) conducted a randomized control study comparing TF-CBT and Therapy as Usual (TAU) while investigating parent depression and emotional reactions as mediators for the difference between the two treatment conditions on child PTS and depressive symptoms. The researchers found that although the parents' emotional reactions and depression decreased significantly from pre-treatment to post-treatment, the changes did not significantly mediate the difference in treatment conditions for child PTS symptoms (Holt et al., 2014). There was however, a mediating effect of these parent variables on the difference in treatment conditions for child depressive symptoms. Specifically, there was a significant indirect effect of change in parent depression score (on the CES-D) over time on the child depressive score (using the "Mood and Feelings Questionnaire" – MFQ). The researchers concluded that since there was only one association between parental and child improvement (parental depression mediating child depression), the theory that the reduction in parent symptoms was due to an improvement in children's symptoms was not supported (Holt et al.,

2014). Holt et al., represents an addition to the youth PTSD treatment mediation literature; future research that builds upon their work and tests session level changes in parent and child symptoms among youth receiving treatment for PTSD is needed.

The Current Study

Recent studies (Carrion et al., 2013; Holt et al., 2014; Silverman et al., 2009) have begun to examine parent outcomes in child anxiety disorder treatment and focus on parent variables as mediators of children's anxiety disorder treatment outcomes. The studies suggest parents' reactions and symptoms (specifically, maternal depression) may have direct, and reciprocal, effects on CBT treatment for children with PTSD. Specifically, they have tested how parent and child variables work together for symptom improvement and have suggested there may be bidirectional change such that as children improve their parents improve and vice a versa. The current study will add to the literature by using a reciprocal relationship theory (Silverman et al., 2009) to investigate maternal depression as a mechanism for change in youth's PTSD symptom treatment (Carrion et al., 2013; Toth, Rogosch, Sturge-Apple, & Cicchetti, 2009). Conversely, the reciprocal relationship of youth's symptom change mediating mothers' change in depression will also be studied. Session level data will be used, which increments data from previous studies. Previously (i.e. Holt et al., 2014) only pre-treatment and post-treatment data were analyzed. The availability of data at each session of treatment allows this study to have a more fine-grained understanding of when and in what direction change in symptoms is occurring and is an addition to the literature due to its ability to look at how the variables change over time.

Using data from a randomized trial (Scheeringa & Weems, 2014), hierarchical linear modeling (HLM) was used to test the hypotheses. Scheeringa and Weems (2014) reported that child symptoms significantly decreased over sessions with symptom reduction maintained at

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post-treatment and at a three month follow up. There were no significant differences on child PTSD symptoms across conditions, that is, child PTSD symptoms decreased over time in both the CBT treatment + drug group and CBT treatment + placebo group. In this session level data, PTSD symptoms decreased across sessions and at three month follow up, regardless of the group the participant was assigned.

In the current study, bidirectional mediation, and its multiple requirements, were tested. Therefore, based on Scheeringa and Weems' (2014) findings, as well as Carrion and colleagues (2013) findings, it was predicted that both maternal depression and child PTSD would significantly decrease over the course of treatment. Next, based on previous studies by Silverman, et al. (2009) and Carrion, et al. (2013) it was hypothesized that change in maternal depression would mediate change in child's PTSD symptoms, (i.e., as maternal depression decreased over treatment, so would the child's PTSD symptoms). Additionally, to test the reciprocal bidirectional effect, such as in Silverman, et al. (2009) it was hypothesized that a change in a child's PTSD symptoms over the course of treatment would also mediate change in maternal depression.

Hypothesis testing was supplemented with three sets of additional exploratory analyses: 1. The role of age, gender, or treatment condition as moderator of mediated effects were also examined (i.e., additional analyses tested a moderated mediation model for these variables); 2. Cross lag models were used to explore direction of effects across individual treatment sessions; and 3. Qualitative data on perception of change is examined.

Method

The data for the analyses in this thesis came from a randomized trial of treatment for PTSD (Scheeringa & Weems, 2014). The study sought youth aged 7 to 18 years old who had been exposed to trauma and experienced PTSD symptoms as participants. Potential participants were screened according to the criteria and method described below, and those fitting the criteria and consenting to participate in the study were randomly assigned to one of two groups – either CBT treatment and dosage with D-cycloserine (DCS; CBT + DCS), or CBT treatment and a placebo drug (CBT + placebo). Recent research suggests DCS may enhance exposure-based behavioral treatment for anxiety disorders.

Six hundred forty-four potential participants aged 7 to 18 years old were referred or contacted and screened for inclusion in this study. These youth were recruited from multiple sources including local service agencies, local clinicians, schools, radio and television advertisements, and the local Level 1 Trauma Center registry. Of the 644 potential participants, 206 were contacted, responded, and found eligible after being screened for inclusion criteria. Of those 206, 65 declined to participate and 141 were evaluated in a lab at Tulane University.

Inclusion criteria included: 1) experienced or witnessed at least one life threatening event; 2) age 7 through 18 years; 3) five or more PTSD symptoms plus functional impairment. Exclusion criteria included: 1) Glasgow Coma Scale score of five or less in the emergency room; 2) moderate mental retardation (standard scores below 50 on the Peabody Picture Vocabulary Test), autistic disorder (from clinical observations by a psychiatrist), blindness, deafness, and foreign language speaking families; 3) suicidal, homicidal, or gravely disabled; 4) concurrent counseling outside the study; 5) any kidney or liver ailment; 6) epilepsy or history of seizures; 7)

bipolar disorder or schizophrenia. Psychoactive medication use was allowed if the dose had been stable for at least four weeks prior to treatment and remained stable throughout the study.

Of the 141 potential participants evaluated in the lab for inclusion in the study, 98 continued to be eligible for the study and were offered treatment. Twenty-eight of these potential participants did not return for any therapy sessions. Thirteen participants dropped out of the study before the fifth treatment session (when randomization and assignment to drug therapy occurred), leaving 57 participants randomly allocated. Twenty-nine participants were assigned to the CBT + DCS group and 28 were assigned to the CBT + placebo group. Of the 29 participants randomized into the CBT + DCS treatment group, 23 completed the study attending all sessions. In the CBT + placebo group, 24 participants attended all sessions and completed the study. In total, 47 participants completed the entire study, and will be included in analyses. Descriptive statistics for the children and mothers included in the sample can be found in Table 1.

Treatment for all 47 participants included a 12-session manualized TF-CBT treatment protocol called Youth PTSD Treatment (YPT), created for this study. YPT includes TF-CBT components such as psychoeducation, skill-building in identification and expression of feelings, relaxation exercises, exploration of negative thoughts, narrative processing of trauma events, graded exposure exercises in and out of the office, safety plans, and involvement of parents in every session. The YPT treatment was conducted by two masters-level clinicians, who were trained in CBT, and supervised by a psychiatrist.

Randomization of participants occurred after session four of the study. The 7 to 12 year old and 13 to 18 year old participants were randomized separately to ensure a balanced representation of ages. Microsoft Excel 2007 random number generator was used to assign participants to either the CBT + DCS or CBT + placebo condition of the study. All research staff

Table 1

Participant Demographics.

	M	*SD*
Child age (years)	12.01	3.14
Mother age	46.51	11.86

Median Family Income		$30,001 – $40,000

Child gender	Male	Female
	23 (48.9%)	24 (51.1%)

Ethnicity	American Indian	Black	White	Mixed
	2.1%	40.4%	40.4%	17.0%

members were blinded, except for the pharmacist who had no contact with the study's subjects. In the CBT + DCS condition, seven doses of 50mg each were given before sessions 5-11. Children swallowed either the DCS or placebo pill in the presence of a staff member one hour prior to their YPT session.

The Tulane University Committee on the Use of Human subjects approved this study. When participants came into the laboratory, the study was explained to caregivers and their youth both verbally and in writing. Written informed consent was obtained from both caregivers and written assent was obtained from the youth.

Measures

Child PTSD Symptom Scale (CPSS; Foa, Johnson, Feeny, & Treadwell, 2001) – The CPSS is a self-administered measure, with both a child and parent version, used to rate the

severity of PTSD symptoms on a four point (0-3) Likert scale. Questions ask children to rate how often in the past two weeks the problem described has bothered them. This measure was selected due to its ability to capture changes in the intensity and frequency of PTSD symptoms, rather than simply counting the number of PTSD symptoms based on the DSM-IV diagnostic criteria. Both child and parent versions of this measure were used in the study to measure the children's PTSD symptoms. Foa and colleagues (2001) found that in a sample of 8 to 15 year old youth, test-retest reliability 1 to 2 weeks after the first administration was moderate, with a κ of 0.55 for PTSD diagnosis.

   Center for Epidemiological Studies – Depression Scale (CES-D; Radloff, 1977) – The CES-D is a self-report measure used to assess depressive symptoms in the general population. Participants are asked to rate statements about depressive symptoms on a four point (0-3) Likert scale based on how often in the past week they felt the statement was true [e.g., 0 = *Rarely or none of the time (Less than 1 day)*]. All 20 items on the measure are statements about depressive symptoms that would be normal to experience in everyday life. However, a depressed person would be likely to score higher than a non-depressed person, as they would report experiencing more of the symptoms. Radloff (1977) found that in samples of both the general population as well as a clinical population, the measure was valid and reliable. That is, test-retest reliability was moderate, with a κ above .40 for all participant subgroups measured except for three – there was a difference for those who identified their race as, "Black," those who were under the age of 25, and those classified as "needing help." The CESD and CPSS measures were completed at a pre-treatment appointment, as well as during each of the 12 weekly sessions of the study. Scores on these measures will be analyzed using Hierarchical Linear Modeling (HLM).

Who Changed First Questionnaire (WCF) – The WCF is a self-report measure created

for this study to ask parents qualitatively how their own symptoms and their child's symptoms

changed after participation in the study (i.e., we asked mothers to rate if their child improved

during the course of treatment, and if the mother's own mental health and parenting practices

improved as well. Additionally, the questionnaire asked the mothers how much each of the

following statements were true on a three point (0-2) Likert scale (0 = none, 1 = some, 2 =

much): "My child started improving first, and then I improved," "We improved at exactly the

same time," and "I started improving first, and then my child improved."

Data Analysis

Bauer, Preacher, and Gil (2006) recommend a repeated measures mediation model using

Hierarchical Linear Modeling (HLM). These authors state that repeated observations on the same

individuals, described as repeated measurements nested within individuals (such as in a

treatment study), are likely to be correlated within persons (Bauer et al., 2006). This correlation

compromises the assumption of independence needed to conduct a mediation analysis. Since this

independence assumption is violated, Bauer and colleagues (2006) state that a multiple linear

regression analysis or a path analysis will produce biased tests of the effects in the model. An

acceptable alternative way to model such data is to use a multilevel or hierarchical linear model

(Bauer et al., 2006). In the proposed study, each child and mother dyad was measured at a pre-

treatment appointment, and over the course of 12 weeks of treatment. Since these are repeated

observations on the same individuals, the repeated measurements are likely to be correlated,

violating the assumption of independence, as described above.

The HLM model to be used in this study will test indirect effects as outlined by Bauer, et

al. (2006). The analyses will test mediation of the variables, which requires several assumptions

be met. According to Baron and Kenny (1986), four conditions must be met for a variable to be considered a mediator. The first condition is that the predictor variable is associated with the mediator variable. The second condition is that the predictor variable is associated with the outcome variable. The third condition is that the mediator variable is associated with the outcome variable. Condition four is satisfied if the predictor variable is no longer associated with the outcome variable when controlling for the mediator variable. These conditions will be tested for both models proposed. In the first model, I will test maternal depression as a mediator for child PTSD symptoms over time. In the second model, the reciprocal relationship will be tested, that is, child PTSD as a mediator for maternal depression over the time of treatment.

Bauer et al. (2006) also set forth conditions that must be met in order for mediation to occur in multilevel models. These assumptions include that the random effects are normally distributed, their means are equal to the average effects in the population, and all of the random effects covary (Bauer et al., 2006). These assumptions will also be tested for the data analyses.

Hypothesis one. Maternal depression will significantly decrease over time. This hypothesis will be tested using SPSS to show that there is a change in maternal depression over the course of their child's CBT treatment.

Hypothesis two. Maternal depression mediates the effect of a child's PTSD treatment outcome, so that as maternal depression decreases over treatment, so will the child's PTSD symptoms. There will be a significant reduction in the slope of child PTSD symptoms due to a decrease in maternal depression. This hypothesis will be tested using the method described by Bauer, et al. (2006) for lower level mediation models with indirect effects.

Hypothesis three. A reduction in a child's PTSD symptoms over the course of treatment mediates maternal depression. There will be a significant reduction in the slope of maternal

depression due to a decrease in child PTSD symptoms. This hypothesis will be tested in the same way as the model above. The procedures will show whether there is a significant reduction in slope of the association between time and maternal depression when child PTSD symptoms is added to the model as a mediating variable.

Exploratory analysis one: Age, gender, or treatment condition were tested as moderators of any the hypothesized mediated effects. This was examined using the procedure for moderated mediation set forth by Bauer, et al. (2006). Finding significant results for moderated mediation would mean the strength of the indirect effect of the level 1 predictor depends on the level 2 predictor (moderator) (Bauer et al., 2006).

Exploratory analysis two: Cross lag associations were used to explore direction of effects across individual treatment sessions using AMOS 7.0. Bayesian imputation was used to provide robust parameter estimates and the direction of effects in cross lagged analyses as described by McArdle (2009) for multiple-occasions were the focus of interpretation (as opposed to overall model fit).

Exploratory analysis three: We explored if mothers will respond that they needed to see their child's symptoms improve first, before they felt their own symptoms improve. Data were analyzed descriptively from the WCF questionnaire.

Results

Means and standard deviations for the maternal depression and child PTSD symptoms variables over time are summarized in Table 2. Changes across time were tested using $n = 47$ with multilevel modeling analyses using HLM 7 further described in the "Data Analysis" section and for each hypothesis described below (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2011).

Hypothesis 1: Maternal depression will significantly decrease over time.

Means and standard deviations for maternal depression scores on the CESD measure are reported in Table 2. Maternal depression is depicted graphically in Figure 1 and shows an initial increase followed by decrease and then general decrease in symptoms over time. Results (described further below in the mediation testing showed that time (across treatment sessions) had a significant effect on maternal depression [$b = -0.84$, (*S.E.* = 0.09), $t(46) = -5.38$, $p < 0.001$].

Hypothesis 2: Maternal depression mediates the effect of a child's PTSD treatment outcome, so that as maternal depression decreases over treatment, so will the child's PTSD symptoms.

Data was first restructured for use in HLM by the methods Bauer, et al. (2006) described, and by instructions from Mathiowetz and Bauer (2008) for such models. The variables created were then analyzed on Level 1 of HLM, with the model built according to Mathiowetz and Bauer's (2008) instructions. HLM output was analyzed, as well as the resulting files used for calculating random indirect and total effects by methods suggested by Mathiowetz and Bauer (2008) and using the "calculator for random indirect and total effects in multilevel model equations," made by Bauer, et al. (2006). These procedures show if there is a significant reduction of slope or change in the association of maternal depression (level 1) as a function of

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Table 2

Means and Standard Deviations for Maternal Depression and Parent and Child Report of the Child's PTSD symptoms

	CES-D		CPSS-Child		CPSS-Parent	
	M	*SD*	*M*	*SD*	*M*	*SD*
Pre	11.33	11.32	19.62	12.33	20.87	11.21
Week 1	14.83	13.89	19.67	13.23	23.35	14.49
Week 2	10.05	12.10	14.72	11.85	22.93	13.58
Week 3	13.24	11.69	16.13	14.52	19.02	13.11
Week 4	12.91	12.05	14.22	12.97	18.48	13.02
Week 5	13.13	10.18	15.93	14.29	18.70	14.09
Week 6	12.20	11.68	14.74	14.03	17.49	13.93
Week 7	10.89	11.14	14.80	13.70	17.21	12.71
Week 8	10.13	10.64	14.23	14.74	13.47	12.02
Week 9	9.13	9.85	13.11	13.60	13.27	12.91
Week 10	8.88	9.05	13.02	13.59	13.12	12.05
Week 11	7.64	7.87	13.38	12.48	10.98	11.14
Week 12	8.19	9.77	8.65	11.11	10.40	11.36

Note. CES-D = Center for Epidemiological Studies – Depression Scale; CPSS = Child PTSD Symptom Scale.

time (level 1) and the child's PTSD symptoms (level 1). All variables for the analyses were level one variables, as the models were analyzed using a 1-1-1 model, as outlined by Bauer et al. (2006) and Mathiowetz and Bauer (2008).
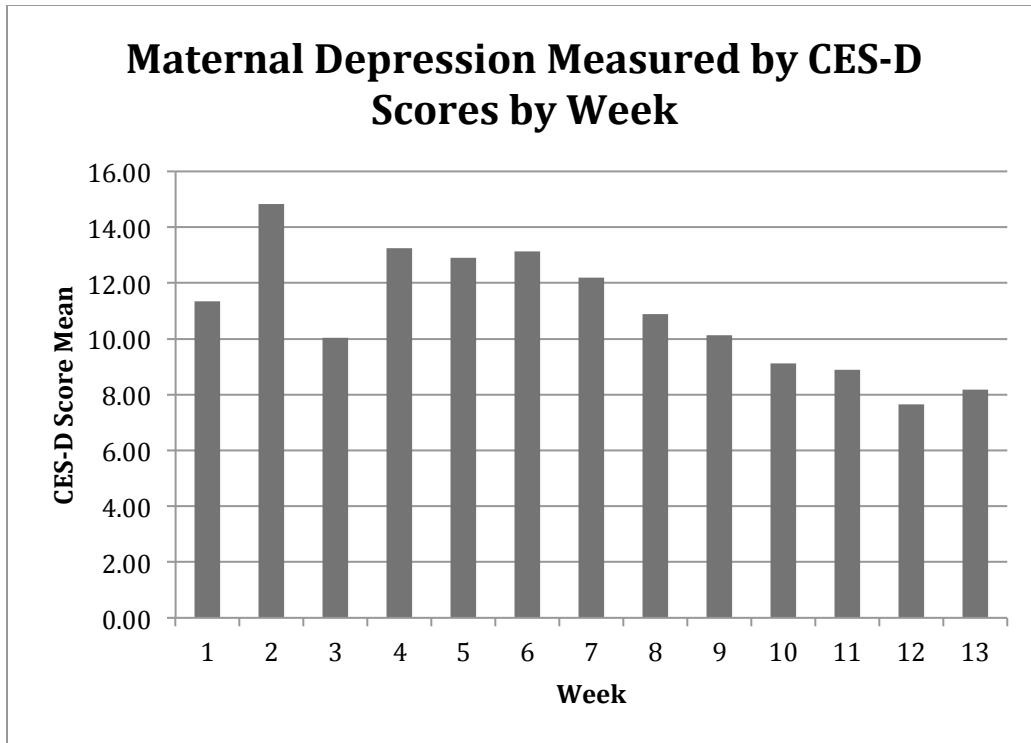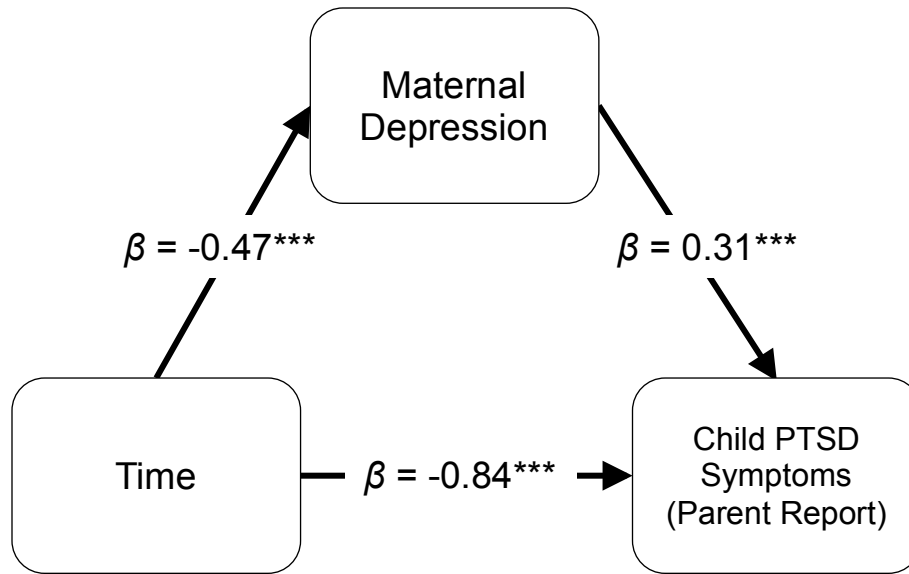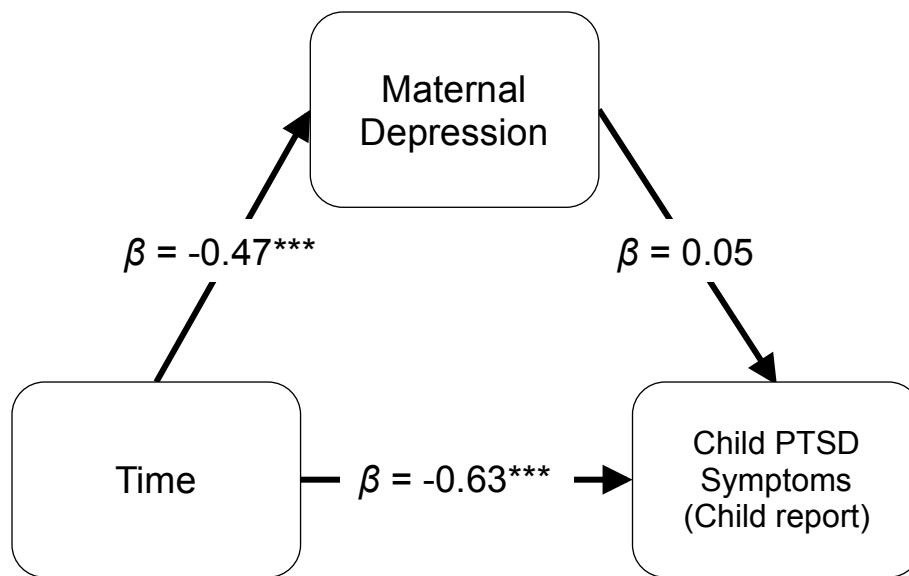
Figure 1. Maternal depression over time.

The first model examined the effect of maternal depression as a mediator of their child's PTSD symptoms as reported by the parent over time (see Figure 2 Panel A). The HLM analyses tested change in maternal depression (level 1) as a function of time (level 1) and the child's PTSD symptoms as reported by the parent (level 1).

The results of an HLM analysis of the overall within subject Child PTSD symptom change by the parent report indicated a significant linear effect of time; this satisfies Baron and Kenny's (1986) second condition [$b = -0.84$ (*S.E.* $= 0.12$), $t(46) = -7.13$, $p < 0.001$]. Maternal depression was associated with PTSD symptoms by parent report, therefore Baron and Kenny's (1986) third condition, that the mediator variable is associated with the outcome variable, was also met [$b = 0.31$ (*S.E.* $= 0.06$), $t(46) = 5.24$, $p < 0.001$]. Baron and Kenny's (1986) fourth is satisfied if the predictor variable (time) is no longer associated with the outcome variable (child

A

B

$***p < .001$

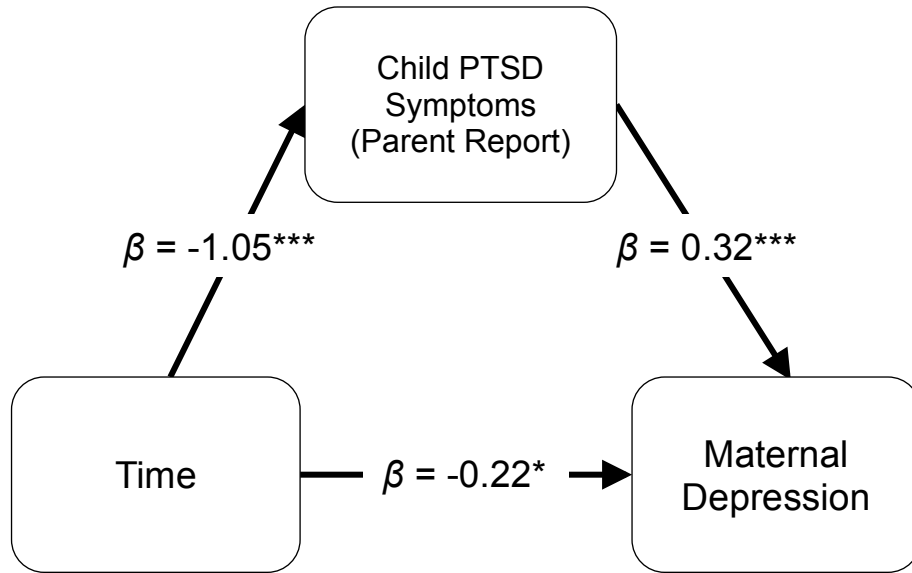*Figure 2*. The effect of maternal depression as a mediator for their child's PTSD symptoms.
Panel A**:** Child's PTSD symptoms as reported by the parent over time.
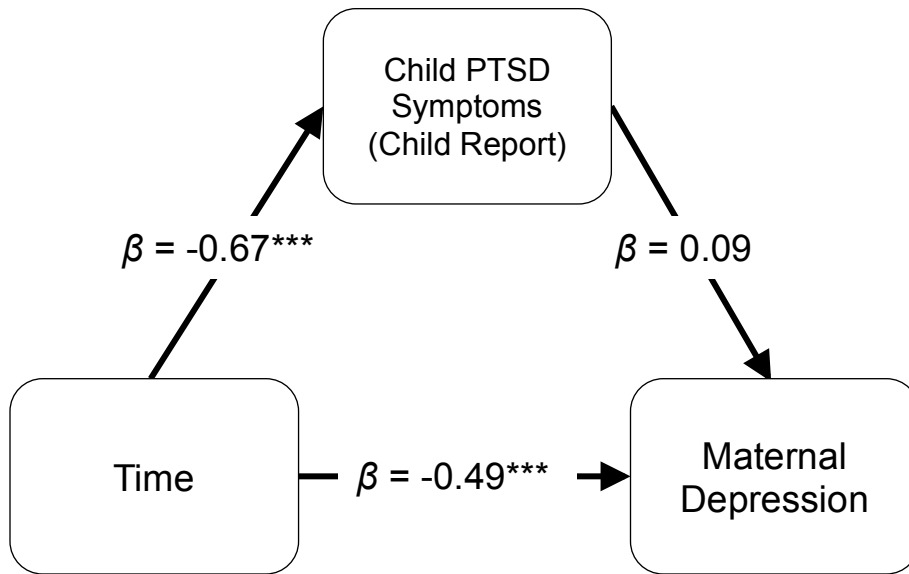Panel B: Child's PTSD symptoms as reported by the child over time.

PTSD by parent report) or is substantially reduced when controlling for the mediator variable (maternal depression). In order to test this, the random indirect and total effects were then calculated as suggested by Mathiowetz and Bauer (2008). The random indirect effect was significant ($Z = -3.02$, $p < 0.01$), which means Baron and Kenny's fourth condition for mediation is met. Therefore, as predicted by the hypothesis, there was a significant reduction in the slope of the association between time and the variable child PTSD symptoms by parent report when the variable maternal depression is added to the model as a mediator.

Next, the same model was tested again, this time using PTSD symptoms as reported by the child (instead of by parent report) as the outcome variable. A model was created to examine if maternal depression was a mediator of the child's PTSD symptoms as reported by the child over time (see Figure 2 Panel B). The HLM analyses tested change in PTSD symptoms as reported by the child (level 1) as a function of time (level 1) and maternal depression (level 1). The results of an HLM analysis of the overall within subject PTSD symptom change indicated a significant linear effect of time, which satisfies Baron and Kenny's (1986) second condition [$b = -0.63$ ($S.E. = 0.14$), $t(46) = -4.57$, $p < 0.001$]. The predictor variable (time) also had a significant effect on the mediator variable (maternal depression) satisfying Baron and Kenny's (1986) first condition for mediation [$b = -0.47$ ($S.E. = 0.09$), $t(46) = -4.96$, $p < 0.001$]. However, Baron and Kenny's (1986) third condition, that the mediator variable is associated with the outcome variable was not met; there was no association between maternal depression and child PTSD symptoms by child report [$b = 0.05$ ($S.E. = 0.04$), $t(46) = 1.24$, $p = 0.22$]. Therefore, although both maternal depression and child PTSD symptoms as reported by the child improved over time in treatment, maternal depression is not a mediator of child PTSD symptoms by child report.

A

B

***p < .001. *p < .05.

Figure 3. The effect of child's PTSD symptoms as a mediator of maternal depression over time.
Panel A: Child's PTSD symptoms by parent report.
Panel B: Child's PTSD symptoms by child report.

Hypothesis 3. A reduction in a child's PTSD symptoms over the course of treatment

mediates changes in maternal depression. There will be a significant reduction in the slope of

maternal depression due to a decrease in child PTSD symptoms.

All variables for the analyses were level one variables, as the models were analyzed

using a 1-1-1 model, as outlined by Bauer et al. (2006) and Mathiowetz and Bauer (2008). This

hypothesis examined the effect of child's PTSD symptoms as reported by the parent on maternal

depression over time (see Figure 3 Panel A). The HLM analyses tested change in child PTSD

symptoms as reported by the parent (level 1) as a function of time (level 1) and maternal

depression (level 1). The result of an HLM analysis of the overall within subject PTSD symptom

change indicated a significant linear effect of time, which satisfies Baron and Kenny's (1986)

second condition of mediation [$b = -0.22$ (*S.E.* $= 0.09$), $t(46) = -2.38$, $p = 0.02$]. The predictor

variable (time) also had a significant effect on the mediator variable (child PTSD symptoms by

parent report) satisfying Baron and Kenny's (1986) first condition for mediation [$b = -1.05$, (*S.E.*

$= 0.12$), $t(46) = -9.00$, $p < 0.001$]. Baron and Kenny's (1986) third condition, that the mediator

variable is associated with the outcome variable was also met as the effect was significant; child

PTSD symptoms by parent report is associated with maternal depression [$b = 0.32$ (*S.E.* $= 0.05$),

$t(46) = 6.15$, $p < 0.001$]. Condition four is satisfied if the predictor variable is no longer

associated with the outcome variable, or is substantially reduced, when controlling for the

mediator variable; in this model, if time is no longer associated with maternal depression when

controlling for child PTSD symptoms by parent report. In order to test this, the random indirect

and total effects were then calculated as suggested by Mathiowetz and Bauer (2008). The

random indirect effect was significant ($Z = -4.17$, $p < 0.001$), satisfying the fourth condition for

mediation. Therefore, as predicted by the hypothesis, there was a reduction in the slope of the

association between time and maternal depression when the variable child PTSD symptoms by parent report is added to the model as a mediating variable.

The model was also tested using child PTSD symptoms by child report (instead of by parent report) as the mediating variable. This model examined the reciprocal effect of child's PTSD symptoms by child report as a mediator of maternal depression over time (see Figure 3 Panel B). The HLM analyses nested change in maternal depression (level 1) as a function of time (level 1) and child PTSD symptoms as reported by the child (level 1). The results of an HLM analysis of the overall within subject maternal depression change indicated a significant linear effect of time, which satisfies Baron and Kenny's (1986) second condition [b = -0.49 (*S.E.* = 0.11), $t(46)$ = -4.66, $p < 0.001$]. The predictor variable (time) also had a significant effect on the mediator variable (PTSD symptoms by child report) again satisfying Baron and Kenny's (1986) first condition for mediation [b = -0.67 (*S.E.* = 0.14), $t(46)$ = -4.93, $p < 0.001$]. However, Baron and Kenny's (1986) third condition, that the mediator variable (PTSD symptoms by child report) is associated with the outcome variable (maternal depression) was not a significant effect [b = 0.09 (*S.E.* = 0.05), $t(46)$ = 1.71, p = 0.09]. Therefore, the variable, PTSD symptoms as reported by the child, was also not a mediator of maternal depression.

Exploratory Analyses

EA 1: The data was restructured in the same way described above for a mediation model. Then, age, gender, and treatment condition were added separately to level 2 of the HLM equation in order to test moderated mediation in the models. Adding these factors to the model on level 2 would allow for a way to explain any variability found on level 1. Finding significant results for moderated mediation would mean the strength of the indirect effect of the level 1 predictor depends on the level 2 predictor (moderator) (Bauer et al., 2006). For example, assuming there is

mediation in the above models, female gender may moderate this association. Follow up procedures to investigate indirect effects, that is the strength of the moderated mediation at the various levels of the mediator, could be tested, again using the procedures described by Bauer et al. (2006).

All models above were examined for moderated mediation. Analyses were conducted using the method described by Bauer and colleagues (2006). This model contained variables on both level one and level two. Moderated mediation was examined for the effect of treatment condition (either receiving the DCS drug or the placebo), gender, and age, as moderators for maternal depression mediating the effect of their child's PTSD treatment outcome. The reciprocal relationships were also examined. Although mediation was not found in the relationship between maternal depression and child PTSD treatment outcome as reported by the child, moderated mediation was also tested in these models. All analyses were not significant. Therefore, treatment condition, gender, or age did not moderate the associations between child PTSD symptoms and maternal depression during treatment.

EA 2: Cross-lagged models were created in AMOS 7.0 to explore directionality of parent and child symptom associations across treatment sessions. Specifically, cross-lagged models were created to test the relationship between maternal depression and child PTSD symptoms by both parent and child report across sessions controlling for the correlation of the variables across time (i.e., does parent depression at session 2 predict child PTSD at session 4 and vice a versa, controlling for the association between parent depression at session 2 and session 4 and child PTSD at session 2 and 4). The model is illustrated in Figure 4. Analyses focused on all even number sessions –to reduce the number of parameters in the model. Standardized coefficients and significance for each model are reported in Tables 3 and 4. For both models, all pathways

across maternal depression were significant, supporting that reports of maternal depression were

correlated over time. Child PTSD symptoms were similarly significant over time for both parent

and child report.

For the model of maternal depression and child PTSD symptoms by parent report, several

pathways were significant. Maternal depression in week two of treatment significantly predicted
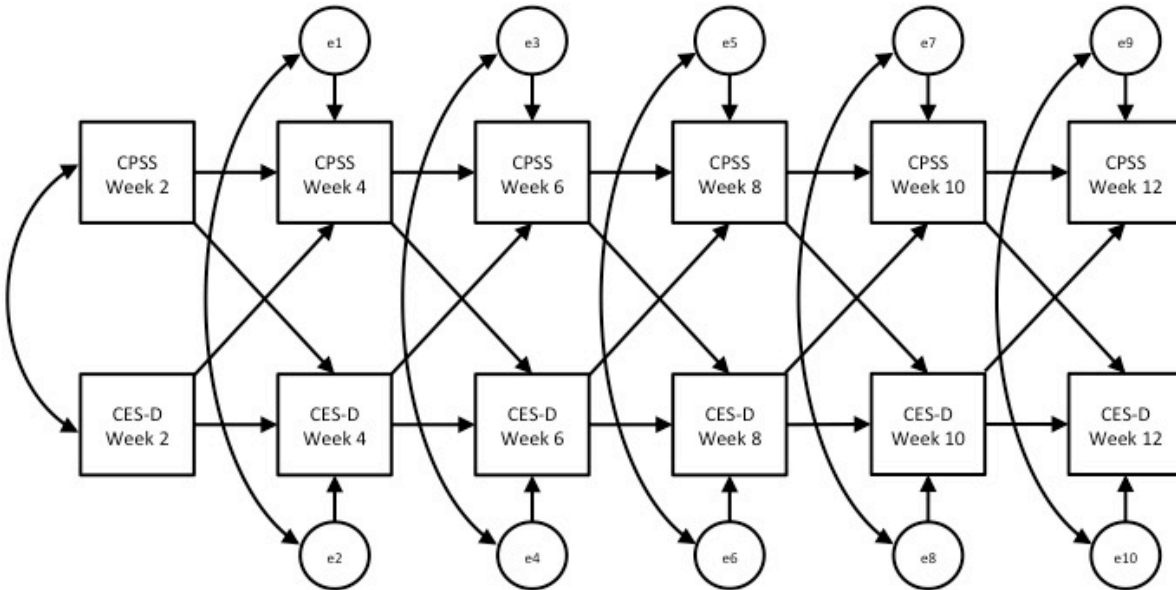
Figure 4. Multiple-occasion structural equation model, based on time-series concepts for a cross-lagged regression over many occasions. The model uses maternal depression scores (CES-D) and either child report or parent report of child PTSD (CPSS) at even treatment weeks.

child PTSD symptoms in week four of treatment ($p < .001$). There was also a significant

relationship between child PTSD symptoms in week two, with maternal depression symptoms in

week four ($p = .01$). From week four to week six of treatment, a bidirectional relationship was

shown. That is, there were significant associations of both maternal depression to child PTSD

symptoms and vice versa. From week eight to week ten of treatment, there was only a significant

relationship between child PTSD symptoms in week eight and maternal depression symptoms in

week ten ($p < .001$). Finally, from week ten to week twelve, a bidirectional relationship was seen

Table 3

Standardized Coefficients and Significance Values for Maternal Depression and Child PTSD Symptoms by Child Report from the SEM Cross-lagged Model.

		b	*SE*
CESD week 2	CPSS week 4	- 0.22***	.03
CPSS week 2	CESD week 4	0.19***	.03
CESD week 4	CPSS week 6	0.16***	.03
CPSS week 4	CESD week 6	- 0.12***	.02
CESD week 6	CPSS week 8	0.00	.02
CPSS week 6	CESD week 8	0.01	.03
CESD week 8	CPSS week 10	- 0.11***	.03
CPSS week 8	CESD week 10	0.09***	.02
CESD week 10	CPSS week 12	0.30***	.04
CPSS week 10	CESD week 12	- 0.04	.03

Note. PTSD = Posttraumatic Stress Disorder; SEM = Structural Equation Modeling; CES-D = Center for Epidemiological Studies – Depression Scale; CPSS = Child PTSD Symptom Scale.
*** $p < .001$, ** $p \leq .01$.

again where there was a significant relationship between mothers depression and mothers rating their child's PTSD symptoms and vice versa. While the pattern of associations is illustrative of the linkages between parent and child symptoms the model's fit was relatively poor CFI = .81, $X^2 (45) = 913.97$, $p < .001$.

For the model examining maternal depression and child PTSD symptoms by child report, several pathways again showed significance. Maternal depression ratings in week two of treatment significantly predicted child PTSD symptoms in week four of treatment ($p < .001$).

Table 4

Standardized Coefficients and Significance Values for Maternal Depression and Child PTSD Symptoms by Parent Report from the SEM Cross-lagged Model.

		b	*SE*
CESD week 2	CPSS week 4	0.19***	.03
CPSS week 2	CESD week 4	- 0.09**	.03
CESD week 4	CPSS week 6	0.27***	.02
CPSS week 4	CESD week 6	0.08**	.03
CESD week 6	CPSS week 8	- 0.04	.03
CPSS week 6	CESD week 8	- 0.02	.03
CESD week 8	CPSS week 10	- 0.06	.04
CPSS week 8	CESD week 10	0.12***	.03
CESD week 10	CPSS week 12	0.26***	.04
CPSS week 10	CESD week 12	0.08**	.03

Note. *** $p < .001$, ** $p \leq .01$.

There was also a significant relationship between child PTSD symptoms in week two and maternal depression symptoms in week four ($p < .001$). From week four to week six of treatment, a significant bidirectional relationship was shown. That is, there were significant associations of both maternal depression symptoms to child PTSD symptoms, and vice versa. From week eight to week ten, a similar bidirectional relationship is seen. Finally, maternal depression scores in week ten significantly predicted child PTSD symptoms in week twelve ($p < .001$). Again, while the pattern of associations is illustrative of the linkages between parent and child symptoms, the model's fit was relatively poor CFI = .91, X^2 (45) = 537.91, $p < .001$.

EA 3: Two qualitative measures were given to mothers who participated in the study after the treatment intervention was completed. The "Who Changed First" (WCF) questionnaire specifically asked mothers to rate if their child improved during the course of treatment, and if the mother's own mental health improved as well. Of the 47 participants who completed the study, only 36 completed this follow-up questionnaire. There were no significant demographic differences found between those who completed the questionnaire ($n = 36$) and those who did not ($n = 11$). Of those 36 mothers who completed the questionnaire, all but one (97.2%) reported that their child improved from completing the treatment. Additionally, 91.7% ($n = 33$) reported that their own mental health "improved somewhat also." Next, the questionnaire asked the mothers how much each of the following statements were true: "My child started improving first, and then I improved," "We improved at exactly the same time," and "I started improving first, and then my child improved." Nineteen mothers (52.8%) agreed with the statement that their child started improving first, and then they improved. Six mothers (16.7%) thought that they and their child improved at exactly the same time. Nine mothers (25%) agreed with the statement that they started improving first and then their child improved.

Discussion

This is one of the first studies to show that maternal depression symptoms decreased over time during the course of their child's treatment (see Figure 1 and Table 2). Furthermore, as hypothesized, a decrease in maternal depression was shown to partially mediate child PTSD symptom improvement in this clinical CBT trial. The reciprocal relationship was also found; child PTSD symptom decrease was also a partial mediator for maternal depression symptom improvement. A bidirectional relationship was shown between improvement in child PTSD symptoms and improvement in maternal depression symptoms. Interestingly however, these findings were only true when child PTSD symptoms were measured by parent report. In fact, the mediation models were not significant when child PTSD symptoms were measured by child report, but were significant when measured by parent report. This may be for several reasons. First, it is likely that as mothers are feeling better and are less depressed, they are more likely to view their child as getting better as well. Also, the children in the study are as young as 7 years old and may be too young to accurately report their own PTSD symptoms. This is similar to the Carrion et al. (2013) finding in the trial of cue-centered treatment that there were the strongest effect sizes for reduction in PTSD symptoms as measured by parent report versus child report. Or, as the data in this study suggests, children may not need their parents involved in treatment in order to improve their PTSD symptoms. Perhaps children view their parents as non-essential to their treatment, and are more generally not aware of, or affected by their parents' mood.

Age, gender, and treatment condition were also added as moderating variables on level 2 to the existing mediation models. These moderated mediation models were examined to see if adding moderators strengthened the models and the mediation findings. These models examined whether there were differences in mediation based on a condition of a fixed effect. For example,

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older children might be better at self-reporting their own PTSD symptoms, and separating age like this might allow the model to also be significant with child PTSD symptoms by child report. However, adding a moderator to the mediation models showed that no pathways under any of the moderation conditions were significant. Therefore, the moderators age, gender, and treatment condition did not significantly improve the models. The mediation effects were the same regardless of these fixed effect conditions.

The SEM model shows that bidirectional change is occurring. That is, changes in maternal depression symptoms are occurring after changes in child's PTSD symptoms, and vice versa. This bidirectional relationship was seen when child PTSD symptoms was measured both by child report and by parent report. This allows additional inference that both parent and child symptoms improve together. However, these models are not the best fit for the data. Future studies could use this technique to parcel out directionality of change and further examine bidirectional relationships, but it would be more beneficial with a larger sample size. A larger sample size would also allow for additional time points to be added to the model, which may be a further improvement in analysis. An additional improvement would be if change in chi-squares were significant when both maternal depression and child PTSD symptoms were added to the model.

The qualitative data gathered at a post-treatment follow up session allowed the study to ask participant mothers whether they thought they or their child improved first. Just over half of the participants felt that their child started improving first and then they improved. This is interesting data as it may help strengthen the assertion that mothers perceived their children getting better first, which allowed them to begin feeling better as well. Far fewer mothers (25%)

felt that they improved first and then saw their child improve. This data is qualitative but is also important in showing the direction of change that mothers themselves felt that they observed.

Based on the qualitative data described, as well as the fact that the mediation models were only significant for the parents' rating of their child's PTSD symptoms and not their child's rating, it appears as though parents may need to see their children getting better first before they themselves can start to feel better. However, there is a bidirectional change in symptoms occurring, and both mothers and children are improving over time that the child is in treatment. Children seem to get better with treatment regardless of when their parent is getting better. However, positive parenting practices and showing more warmth to children may allow parents to feel that they are more able to meet their child's needs and allow their children to improve. Children may also be showing less symptoms as a result of their parents increase in positive parenting practices and parenting warmth. It does appear that both children and parents improving PTSD and depression symptoms respectively, is most beneficial for treatment outcomes. In this study, Cognitive Behavioral Therapy for child with PTSD was shown to have direct and reciprocal effects on maternal depression.

A major strength of this study is the availability of session level treatment data. Previous studies, such as Holt, et al. (2014), were only able to examine pre and post treatment data. Being able to examine session-by-session data allows us to more closely examine how the variables are changing over time during a treatment protocol. We may be able to more easily elucidate subtle changes and effects that other pre and post treatment studies would miss. Another strength of this study is its significant findings despite a relatively small sample size (n=47). Although the Silverman et al. (2009) study had 119 participants, the Carrion et al. (2013) study had 56 participants, which is closer to the sample size in the current study. We were also able to have

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some qualitative follow-up data that asked mothers whether they thought they or their child improved first during the course of treatment. This augments our findings as mothers supported the hypothesis that they needed to see their child's PTSD symptoms improving first before they felt their own symptoms were improving. Other studies have also not had this kind of qualitative follow-up data.

A future study looking to replicate these findings would further add to the limited literature on the topic, and should look to have a larger sample size with less participant drop out. Additionally, perhaps adding a measure that could allow children to rate their parents' depression would be an interesting addition to examine. This would allow us to look not only at parents' views of their child's improvement, and children's views of their own improvement, as well as children's views of their parents' symptom improvement. A clinician measure of maternal depression or child PTSD symptoms may also be more objective than self-report measures. Even a teacher rating of child symptoms or behavior would be a good addition for a third party observation that could further improve the accuracy of the reported data.

Consistent with past research, this study suggests that as mothers' depression improves, child symptoms, here specifically PTSD symptoms, also improve. The study also found that the reciprocal relationship – when child (PTSD) symptoms improve, mothers' (depression) symptoms also improve – also exists. This study shows that Cognitive Behavioral Therapy for children with PTSD has direct and reciprocal effects on maternal depression. The exact reasons for this bidirectional relationship are still unclear, and further research may help to elucidate these. It may be that as children's PTSD symptoms improve, mothers feel less depressed as a result of seeing their child feel better. Children may be more able to improve when their parents are feeling better and likely exhibiting more positive parenting characteristics. Whatever the

reason for the relationship, it is clear from this study and previous literature that parental

variables and parental involvement in children's mental health treatment are indeed a mechanism

of change that should be addressed in treatment protocols.

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University Committee for the Protection of Human Subjects in Research
University of New Orleans

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Campus Correspondence

Principal Investigator: Carl Weems

Co-Investigator: Erin Neill

Date: August 27, 2014

Protocol Title: "Maternal Depression and Child Posttraumatic Stress Disorder (PTSD) Treatment"

IRB#:   08Aug14

Human subjects are defined in CFR 46 as follows:
"Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains: (1) Data through intervention or interaction with the individual, or (2) identifiable private information."

The IRB has deemed that the research and procedures described in this protocol application do not qualify as human subject research as defined in CFR 46 and as such, the research is not subject to review by the Committee for the Protection of Human Subjects in Research.

Should the scope of activities change to include Human Subjects, it is necessary to seek approval from the committee prior to implementing such changes.

Best wishes on your project!

Sincerely,

Robert D. Laird, Chair
UNO Committee for the Protection of Human Subjects in Research

Vita

The author is a native of Centreville, Virginia. She obtained her Bachelor of Arts degree in Psychology from The Catholic University of America in 2007. Ms. Neill also obtained a Master of Social Work degree in 2009 from the University of Pennsylvania's School of Social Policy and Practice. Following graduation, she spent several years working as a social worker in the Washington, DC area, and obtained clinical social work licensure in DC. Ms. Neill joined Dr. Carl Weems' Lab at the University of New Orleans in 2013 to pursue a PhD in Developmental Psychology.