

A Randomized Controlled Clinical Treatment Trial for Children of First Responders involved in
the World Trade Center Attack

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Abstract

Previous research has suggested a relationship between exposure to the 9/11 terrorist attacks and a resulting diagnosis of posttraumatic stress disorder (PTSD). Prior research has focused on Cognitive Behavioral Treatment (CBT). However, this relationship has not been closely examined with children in regards to virtual reality exposure. This study examined both the previously researched imaginal exposure and experimental virtual reality exposure in children and whether there was a lower incidence of PTSD in relation to one treatment.

Keywords: virtual reality CBT, 9/11, first responders, children, PTSD

On Tuesday September 11, 2001, a series of coordinated terrorist attacks were carried out on various United States landmarks and institutions, forever changing the outlook of traumatic events in the twenty-first century. Four different passenger airliners were hijacked and subsequently flown into both of the Twin Towers of the World Trade Center in New York City, the Pentagon in Washington D.C. and a field near Shanksville Pennsylvania. These attacks occurred from 8:46-10:28 am EST. These attacks killed 3,000 people, injured over 6,000 people and adversely affected thousands of others. These attacks altered the view of the effect that traumatic events have on victims, particularly in the development of Post Traumatic Stress Disorder and Axis I mental disorders.

For instance, one study looked at whether Axis I mental disorders are associated with the level of exposure in terrorist attacks, such as 9/11. This interactional hypothesis looked at the interaction of exposure and subsequent Axis I mental disorders within a dose response modeled study. This particular study suggested that there was a dose-response relationship between exposure to 9/11 attacks and PTSD (Bolton et al. 2010). There has been a greater attention paid to disorders such as PTSD following traumatic events, particularly from a cognitive behavioral model. To illustrate, one study looked at 31 veterans and ran an interactional hypothesis looking at the interaction between needs of post 9/11 veterans under 30 years old and over 30 years old. In this study, both age groups expressed a need for services to help cope with PTSD (Bokhour et al. 2012). This need for services is a common theme found throughout studies. For example, research, conducted by Bowler et al. (2014), looks at the aims of identifying social integration as a beneficial resource factor that accounts for a less severe stress response in those who are socially more integrated. This main effect hypothesis looked exposure levels and stress responses in correlation with the New York police officers following the 9/11 attacks. Social integration

(was found to be) a beneficial resource factor that accounts for a less severe stress response in police officers who are socially more integrated. Another study found that faculty members were more likely to endorse negative feelings about serving in civil service position, such as in the military or police department, as well as they would likely endorse having self-efficacy to work with certain students (Barnard-Brak). These feelings do not accompany 9/11 attacks alone, as seen in the study, conducted by Canetti-Nisim et al. (2009), where exposure to terrorism predicted psychological distress which then predicted perceived threat from Palestine citizens of Israel which in turn predicted exclusionist attitudes towards Palestinian citizens of Israel.

There are several treatments that have been researched following 9/11, focusing primarily on treating PTSD and Axis I disorders. For instance, Eye movement Desensitization and Reprocessing (EMDR) has been used as a method of treatment intervention for post 9/11 clients; however concrete results haven't been established (Colelli et al. 2005). Similarly, prolonged exposure treatment has been used to examine depression and whether this depression will remiss and will increase day-to-day functioning following treatment. In this study, participants experienced a relapse of symptoms 75% improvement to 60% (Blanche Freund, Kazi & Ironson 2008).

Another type of treatment, virtual reality exposure therapy, can be used when a patient was not responding to the traditional use of standard imaginal exposures usually accompanied by Cognitive Behavioral Treatment. The study in question asked a patient to wear a helmet that would allow her to view scenes from the day of the trauma and help her to cope with her emotional responses (Difede and Hoffman 2002). Manualized Treatment may also be used, due to its inherent flexible application, such as the case in a study conducted by Cloitre et al. (2007). This study used prolonged exposure (STAIR) and prolonged imaginal exposure (MPE) as

methods of treatment. Another similar study by Brown, Goodman and Pearlman (2004) looked at whether a main treatment of CBT would be able to be used in a manual intervention case, therefore allow for a flexible manner when dealing with child traumatic grief.

Several studies have looked at the impact of the 9/11 terrorist attack on both people who only happened to be in close proximity to the event (Difede & Hoffman 2002) and first responders called to the scene of the disaster (Schwarzer, Bowler & Cone 2014). Consequently many studies have examined a diverse range of interventions with this population. Most frequently these studies have integrated some form of Cognitive Behavioral Therapy (CBT) although this has been combined with less traditional approaches as well. For example, a 2013 article by Haugen, Splaun, Evces and Weiss examines a psychosocial intervention that combines elements of psychodynamic intervention and CBT. This particular intervention places a strong emphasis on “meaning making” for first responders or how the events particular, idiosyncratic meaning for them. Although the process of this approach is outlined in detail, no statistics or explanatory information is provided in the article about the efficacy of such a combined intervention. Given this, it may be more prudent to focus on intervention such as traditional CBT, which have much more empirical support and have been shown to be effective.

This more traditional course of intervention could be seen in article, “The Engagement in Trauma-Specific CBT for Youth Post 9/11” examined youth enrolled in an evaluation of CBT for trauma after the 9/11 World Trade Center disaster. The purpose of this study was to examine predictors of treatment participation across a large demographic. Cognitive Behavioral Therapy was used among nine agencies from the Child and Adolescent Trauma Treatments and Services (CATS) community based service. Four hundred and forty five children and adolescents were assessed on evidence-based CBT treatments. The study measures demographic variables,

posttraumatic stress symptoms on the UCLA PTSD Reaction Index for DSM-IV, and treatment engagement and retention. The major findings from this study include that the average PTSD Total Severity score was 36 at baseline indicating high sensitivity and specificity for probably diagnosis of full PTSD. Overall, it was found that a majority of children in CATS remained in treatment, therefore reversing retention drop by about 75% after only 3 sessions. Support for structured engagement strategies in addition to the use of evidence based treatment can increase the likelihood of youth to receive an adequate dose of trauma specific CBT. The study lacked of an appropriate community comparison group and lack of a formal mechanism to assess commitment to engagement strategies.

Another example of a more traditional CBT approach is found with in a study conducted by Difede et al. (2007). With the continued threat of terrorism, it is important that we find a successful and efficient treatment strategy to implement after an attack. According to Difede et al. (2007), experts in the field recommend Cognitive Behavioral Therapy (CBT) with an exposure component. While this treatment strategy is suggested, no randomized controlled clinical trials (RCT) have tested the effectiveness of CBT on mitigating the negative consequences of PTSD. RCT's are important to know the true success of a treatment and for internal and external reliability and validity. The authors of this study wanted to compare the effectiveness of CBT with a treatment as usual (TAU) strategy in a controlled setting. Researchers hypothesized that those randomly assigned to the CBT with exposure treatment would show a greater decrease in PTSD symptoms than those randomly assigned to the TAU treatment group (Difede et al., 2007).

Along with exposure treatment, the body releases certain types of hormones in an attempt to deal with the new stressful situation that the system is encountering. One of the hormones

released in response to stress is cortisol. Yehuda and her colleagues studied the relationship between cortisol levels and PTSD in their study (Yehuda, Bierer, Sarapas, Makotkine, Andrew, & Seckl, 2009). 28 survivors of the September 11th attacks who were seeking psychological treatment were recruited and received either exposure therapy or supportive counseling, followed by subsequent sessions of prolonged exposure. They measured many biological factors concerning cortisol and other hormones and related enzymes. Those that did not respond to therapy (non-responders) had a lower level of cortisol when compared to those that did respond to therapy (responders). Yehuda et al. concluded that lower cortisol levels and lower 5a-reductase activity is correlated with severity of avoidance and also predicts participants to be unresponsive to psychological treatment concerning symptomatology for PTSD.

Further research has been completed outside of the medical field, for instance, by community based interventions. These interventions can be particularly helpful when working with trauma and healing loss. According to Beaulieu et al. (2003), a community-based approach was actually preferred by union families, plus family therapy using the lens of ambiguous loss are proposed as necessary additions to disaster work. In this study, a team of therapists from Minnesota and New York worked with labor union families of workers who had fled or gone missing on September 11th 2001, from the World Trade Center where they had worked. This study chose to build on the unions pre-existing community framework and worked within this community to stage the intervention. Group and social therapy were the main treatments used, allowing for a multi-cultural approach to the study. Overall, this therapy was seen as successful as rated by the participants in the study.

After a review of previous studies, a substantial lack of virtual reality studies with a concentration in the effect to children have not been conducted, particularly in comparison to

traditional imaginal exposure. In the present study, both a main effect and interactional hypothesis were tested with particular attention paid to children. The main effect hypothesis tested is that the virtual reality/CBT group will have greater symptom reduction and at three month follow up as compared to the control and traditional (imaginal exposure) CBT groups. Within this main effect hypothesis the two interactional hypothesis looked at whether higher SES children will be more likely to experience symptom reduction (due to likelihood of attrition) and whether children in either CBT based intervention will have greater symptom reduction than children in the control group.

Methods

Participants

Participants included a sample of n=300 children at least one of whose parents was a first responder at one of the world trade center sites during the terror attack on September 11, 2001. Participants were recruited using an existing database called the The World Trade Center Health Registry (WTCHR). This database accumulated a large longitudinal set of data regarding the health of people affected by the 2001 attack. Participants in this database who identified as having been a first-responder during the attacks or its direct aftermath and who had consented to be contacted regarding future studies were contacted and asked to allow their children to participate. Parents and children were asked to sign an assent form for participation in the study (Appendix A). The sample consisted of 90 Caucasian children, 90 black/African American children, 66 Hispanic/Latino children, 30 Asian children and 24 children who identified as other/declined to report. Additionally, the sample consisted of 140 males and 160 females. Ages of the children ranged from 7-18 years old.

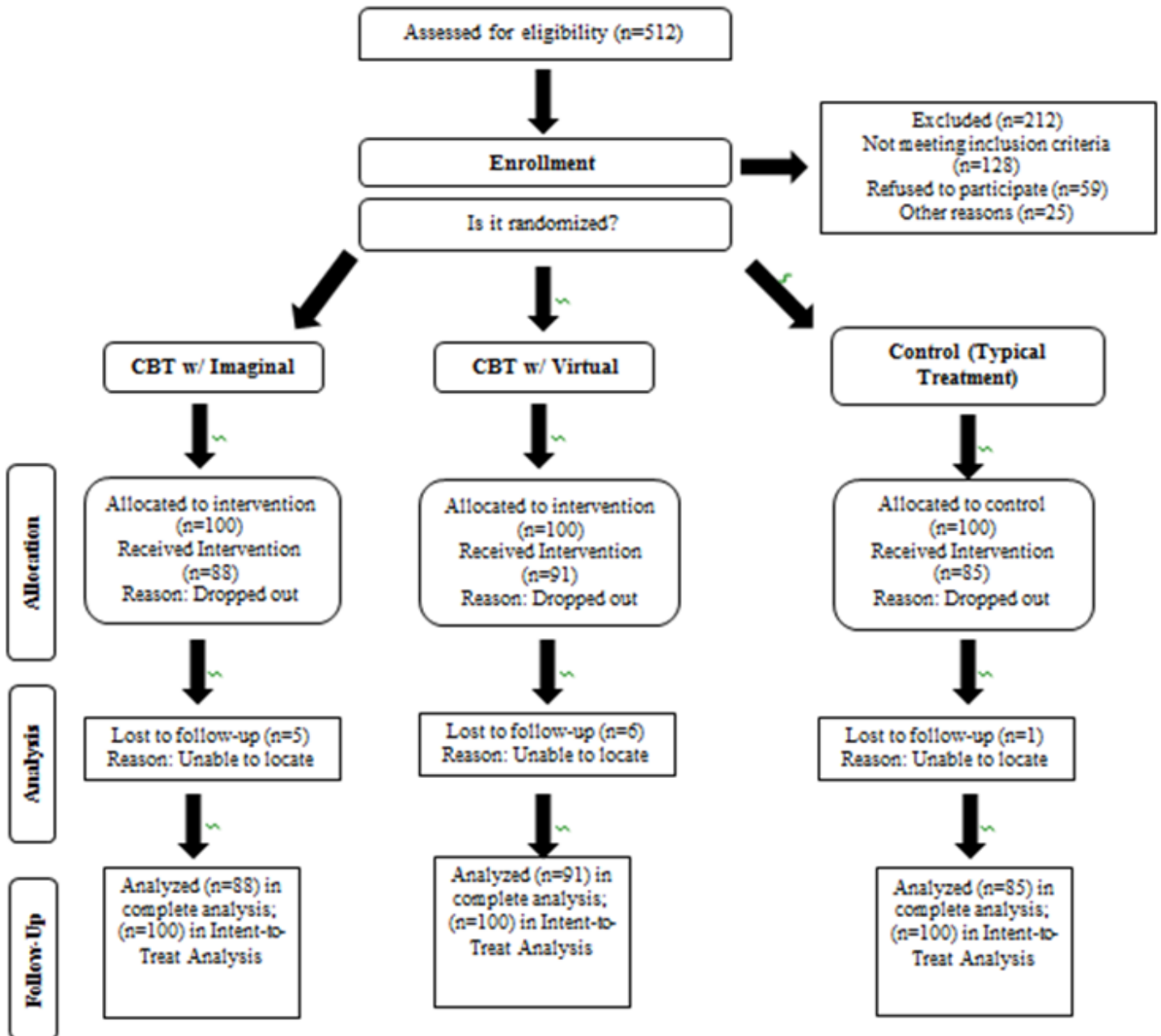


Figure 1. Participant Flow Chart.

Measures

Children’s Depression Inventory 2(CDI-2) (Bae 2012; modified from Kovacs & Devlin 1998). The Children’s Depression Inventory 2 (CDI 2) was published by Multi-Health

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Systems (MHS) to assess depressive symptoms in 7- to 17-year-old children and adolescents. It is a 28 item measure that originally evolved from the CDI, a 27 item measure, developed by Kovacs in 1977. The CDI 2 was designed for youth to respond easily to the scales with three choices per item and items written at a low reading level. The CDI 2 contains two self-rated scales of a full-length and a short version and two adult-rated scales of parent report and teacher report. Only the full length self-report scales were used for the purpose of these assessments. The CDI-2 showed high or acceptable levels of internal consistency with the Cronbach's alpha values from .67 to .91. Test-retest reliability of the self-report forms was tested for 79 children within a 2- to 4-week interval. The results showed excellent short-term stability with and almost no change during the time interval. The instrument has also been found to have good construct validity. The T-scores and percentile ranks are categorized into five classifications: Very Elevated (T-score 70+, Percentile Rank 98+), Elevated (T-score 65-69, Percentile Rank 93-97), High Average (T-score 60-64, Percentile Rank 84-92), Average (T-score 40-59, Percentile Rank 16-83), and Low (T-score <40, Percentile Rank <16). Both 90% and 95% confidence intervals are available for all scales. This instrument was found to have good internal consistency/reliability in this study with a Cronbach's alpha of 0.82.

Child PTSD Symptom Scale (CPSS; Foa, Johnson, Feeny, & Treadwell, 2001). The CPSS is a self-report scale designed to diagnose or assess severity of PTSD symptomatology in children. The CPSS has shown high internal consistency and test-retest reliability for both the total score and the three subscales. Good convergent validity has been established using the Child Post-Traumatic Stress Disorder Reaction Index (CPTSD-RI). In addition, the correlations of the CPSS with depression and anxiety measures were lower than those with the CPTSD-RI. This provides some support for discriminant validity of the CPSS. The CPSS contains 17

items that encompass DSM-IV-TR reexperiencing (five items), avoidance (seven items), and hyperarousal (five items) symptoms of PTSD. Children indicate how often they have experienced each symptom in the past months by rating on a 4-point Likert scale (0 = not at all, 3 = 5 or more times a week). A total PTSD severity score is calculated by summing all items. Foa et al. 2001 recommend using a PTSD severity clinical cutoff score of 11. This instrument was found to have good internal consistency/reliability in this study with a Cronbach's alpha of 0.75.

The Screen for Child Anxiety Related Emotional Disorders (SCARED; Birmaher et al. 1997; Simon & Bögels 2009). The SCARED is a screening instrument used to assess a range of DSM-IV based symptoms. These include symptoms of panic disorder (13 items), generalized anxiety disorder (9 items), social phobia (9 items), separation anxiety disorder (12 items), obsessive-compulsive disorder (9 items), post-traumatic stress disorder (4 items), and specific phobia (15 items). It consists of 71 items rated on a three-point scale (0 = almost never, 1 = sometimes, 2 = often). The minimum score that can be obtained is 0 and the maximum score that can be obtained is 142. A higher score indicates higher levels of anxiety or the presence of more anxiety or mood disorder symptomatology. It has been shown to have good internal consistency, test-retest reliability and discriminative validity. This instrument was found to have good internal consistency/reliability in this study with a Cronbach's alpha of 0.83.

Interventions

CBT with imaginal exposure. Cognitive Behavioral Therapy with imaginal exposure is a traditional treatment used for those with PTSD symptoms or diagnosed with PTSD. It typically includes sessions in which the client repetitively describes the traumatic experience he or she underwent. Patients are encouraged for their descriptions to be detailed and to be as emotionally engaged as possible. In this treatment, patients often undergo psychoeducation, cognitive

restructuring and reprocessing, relapse prevention, etc. In the present study, CBT with imaginal exposure was chosen in order to harness children's natural imagination and channel it towards habituate memories of traumatic exposure of 9/11.

CBT with virtual reality exposure. Cognitive Behavioral Therapy with virtual reality exposure is not as commonly used as imaginal exposure, but according to research, seems to be effective (Difede & Hoffman, 2002). Difede and Hoffman (2002) saw that “many patients are unwilling or unable to self-generate and re-experience painful emotional images,” and so virtual reality exposure was another option for treatment. Especially for children that may have not had direct exposure to the event, imagining the events of 9/11 may be particularly difficult. Virtual reality exposure allows the client to virtually re-experience the traumatic event through various means, such as virtual planes crashing into the World Trade Center for those diagnosed with PTSD following the September 11th attacks. For the current study, children will be virtually exposed to traumatic events and situations that are most commonly found as triggers or causes of PTSD symptoms.

Control Group. The control group did not receive any treatment. The participants in the control group were assessed without being treated pre- and post-treatment, as well as during a 3-month follow-up.

Procedures

After participants were collected through the The World Trade Center Health Registry (WTCHR) and the consent and assent forms were complete, children were tested on a number of scales. Twenty trained research teams of 4 researchers per team were assembled to assess the children using the *Children's Depression Inventory 2* and the *Child PTSD Symptom Scale*. Each trained researcher split up the 300 participants randomly with 100 in each group (2 treatment

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groups and 1 control group). Each assessment was given before and after the interventions. Additionally, one of the children's parents was asked to fill out a demographic form pertaining to their child. The demographic form collected information on children's race, gender, age and IQ.

First, the Children's Depression Inventory 2(CDI-2) (Bae 2012; modified from Kovacs & Devlin 1998) was used to find depressive symptoms in 7- to 17-year-old children and adolescents. Individual assessment was used with the self-rated scale to obtain any clinical diagnosis or therapy that may be needed for treatment. The CDI 2 paper based version was used testing Emotional Problems and Functional Problems (Kovacs, & Devlin,1998). The Emotional Problems tested included negative mood and negative self-esteem, which indicated guilt, insomnia, lack of appetite (Kovacs, & Devlin,1998). While the Functional Problems, tested ineffectiveness and interpersonal problems indicating lack of positive social relationships or irritability (Kovacs, & Devlin,1998). Participants answered items on a three-choice scale from 0 (none) to 2 (definite) and parents, respectively, used a 4-point-scale from 0(not at all) to 3(most of the time) (Kovacs, & Devlin,1998). Higher scores on the CDI 2 indicated expressive depressive symptoms in the children (Kovacs, & Devlin,1998). The CDI 2 was intended to easily assess the children with the least amount of trauma.

A scoring software was used to take a sum of the values on the answered items and into T-scores with a mean of 50 and a standard deviation of 10 with norms based on gender and age. There were two ages groups tested: young (7-12 years) and older (13-17 years). Girls and boys were tested independently. T-scores were ranked from high (70+) to Low (<40-<16).

Next, the children were tested by the Child PTSD Symptom Scale (CPSS; Foa, Johnson, Feeny, & Treadwell, 2001). A therapist conducts the interview measure and then allows 10 minutes for the self-report portion. The CPSS was used to assess PTSD symptomatology in

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children 8-18 years of age (Foa, Johnson, Feeny, & Treadwell, 2001). The CPSS lasts about 20 minutes with two parts: 17 items in part 1 and 7 items in part two all corresponding to DSM-IV symptoms (Foa, Johnson, Feeny, & Treadwell, 2001). The respondents are first asked to fit the description of his/her symptoms in the last two weeks. Answers vary from 0 (not at all), 1 (once in a while), to 5 (almost always). The second portion of the questionnaire indicates functional impairment scored as absent (0) or present (1). Higher scores indicate more likelihood of functional impairment (Foa, Johnson, Feeny, & Treadwell, 2001).

Five hundred children were screened using the above instruments. Because no child was directly exposed to the traumatic event in question none of the children met full diagnostic criteria for PTSD. However, after assessment 300 children who met many criteria or showed several symptoms of PTSD were engaged in the intervention program. A clinical cut-off score of 11 was used when assessing children for participation. Children who met participation criteria were assigned to either a usual care control group (from here forward referred to only as the control group), a standard CBT intervention group or a CBT group utilizing virtual reality exposure. For both groups CBT included a psychoeducation, exposure and cognitive restructuring component. Exposures (either imaginal or virtual reality) centered around situations children expressed had caused them stressed or have been found to be common in children of parents of exposed to traumatic situations. Examples of events used for exposures are an adult describing an aspect of their experience as a first responder or some kind of distressing media coverage of the event their parent was served as a first responder for. The intervention consisted of 6 sessions over the course of 2 months. Children were assessed again at the conclusion of treatment and 3 months after the conclusion of treatment. At the conclusion of data collection

researchers analyzed the data without knowledge of which group each data set was associated with.

Results

Descriptive Statistics

All participants were between the ages of 7 and 18 years old, with a mean age of 14.2. The sample was diverse, with 90 white (30%), 90 black/African American (30%), 66 Hispanic (22%), 30 Asian (10%), and 24 participants who identified as “other” (8%). There was also a relatively equal gender proportion, with 140 males (46.7%) and 160 females. The average time to implement a treatment was 2.3 months, with a range of 1.9 to 3.4 months. All participants were matched on IQ, age, and gender and were randomly assigned to one of the three groups. Median scores for the CDI-2 fell in the high average range: Control group, $M (SD) = 63.4 (9.4)$; CBT with imaginal, $M(SD) = 62.8 (8.7)$; CBT with virtual, $M (SD) = 65.1 (10.1)$, with no significant differences between groups. Similarly, there were no differences between groups for the CPSS measure: Control group, $M (SD) = 22.3 (5.5)$; CBT with imaginal, $M(SD) = 24.5 (6.7)$; CBT with virtual, $M (SD) = 26.1 (6.1)$. Finally, scores for the SCARED measure ranged from low to moderate: Control group, $M (SD) = 61.4 (9.7)$; CBT with imaginal, $M(SD) = 63.9 (10.6)$; CBT with virtual, $M (SD) = 65.1 (8.6)$ with no significant differences between groups.

Outcome for Treatment Completers

In total, 88 participants were analyzed in the CBT with imaginal group, 91 were analyzed in the CBT with virtual group, and 85 in the Control group. Table 1 (below) shows the means and standard deviations of each of the measures. An analysis of variance was performed for the main effects of Time and Group, along with the interaction of Time X Group. The ANOVA

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examining pre/post changes in the CDI-2 found a significant main effect for Time ($p = 0.03$); a significant main effect for Group ($p=0.005$); and a significant interaction effect for Time X Group ($p=0.009$), with a significantly greater post-treatment decline in CDI-2 scores for the CBT groups over the Control group. Specifically, while both CBT groups significantly decreased in scores, the CBT with virtual group had a higher effect size (.85) and showed a great magnitude of differences from pre to post-treatment scores than did the CBT with imaginal group (.79). An ANOVA examining pre/post changes in the CPSS showed a significant main effect for Time ($p=0.008$); a significant main effect for Group ($p=0.004$); and a significant interaction for Time X Group ($p=0.001$), with a significantly greater post-treatment decline in CPSS scores for both CBT groups over the Control group. Even greater differences in effect sizes were shown for the magnitude of the difference scores for CPSS. The CBT with virtual showed a significantly greater difference (.93) in pre/post scores than did the CBT with imaginal (.75). A final ANOVA conducted for pre/post changes in the SCARED found a significant main effect of Time ($p=0.04$); a significant main effect for Group ($p=0.01$); and a significant Time X Group interaction ($p=0.007$), with a significantly greater post-treatment decline in SCARED scores for the CBT groups over the Control group. While both CBT groups showed a significantly greater decline in scores than the Control group, no significant differences were found when comparing the CBT with imaginal with the CBT with virtual for the SCARED.

Variable	Pre-test T1	Post-test T2	Follow-up T3	Effect size T1-T2	Effect size T1-T3
CDI-2					
Control	63.4 (9.4)	60.4 (8.9)	62.3 (7.5)	.23	.28
CBT w/ imaginal	62.8 (8.7)	49.9 (7.8)	51.4 (10.2)	.79	.77
CBT w/ virtual	65.1 (10.1)	44.3 (9.1)	43.2 (8.5)	.85	.89
CPSS					
Control	22.3 (5.5)	21.8 (5.1)	23.3 (6.1)	.20	.21
CBT w/ imaginal	24.5 (6.7)	10.9 (7.2)	11.4 (5.9)	.75	.74
CBT w/ virtual	26.1 (6.1)	8.2 (6.6)	8.8 (7.1)	.93	.91
SCARED					
Control	61.4 (9.7)	58.7 (8.8)	59.5 (7.5)	.15	.13
CBT w/ imaginal	63.9 (10.6)	51.2 (9.2)	52.4 (8.2)	.74	.72
CBT w/ virtual	65.1 (8.6)	47.4(10.1)	46.7 (9.3)	.86	.87

Table 1. Means and SDs of assessments for the Control (n=85), CBT with imaginal exposure (n=88), and CBT with virtual reality exposure (n=91) along with the effect sizes.

Analysis of Treatments Dropout

A total of 12 participants dropped out for the CBT with imaginal, 9 dropped out of the CBT with virtual, and 15 dropped out of the Control group, for a total of 36 participants (12%). A *t* test revealed that dropouts were of a lower socioeconomic status ($p=0.04$) and had parents who received less education ($p=0.006$). Additionally, there was a trend for dropouts to have a higher score on the CPSS than those that continued with the study ($p=0.023$). There were no differences among race, gender, or age.

Discussion

Due to the lack of research completed using Cognitive Behavioral Therapy in combination with virtual reality exposure therapy, the current study analyzes the effect of CBT with traditional imaginal exposure therapy in comparison with CBT with virtual reality exposure

and a control group with no received treatment. According to our analyses, our hypotheses were supported.

To illustrate, the CDI-2 measure indicated that participants undergoing either CBT treatment showed an increased reduction in depression symptoms. In addition, when compared with both the control group and the imaginal exposure therapy group, the participants that underwent CBT with virtual reality exposure had a higher rate of reduction in depression symptoms.

The CPSS revealed similar results as the CDI-2, with an even higher reduction in PTSD symptoms in the virtual reality exposure group when compared to depression symptoms that the CDI-2 screened for. Again, both CBT therapies were shown to be more successful than the children that did not participate in any therapy.

The SCARED measure showed the least significant results comparatively, although still exemplifying that the CBT treatment groups had a higher rate of symptom reduction than the control group. This could be because children may be generally anxious, and their anxiety may or may not be tied directly to the trauma they experienced from the events of 9/11 and following distress.

Overall, these findings suggest that when compared with no treatment or CBT with imaginal exposure therapy, virtual reality exposure therapy not only decreases depression symptoms, but also even further reduces PTSD symptoms. The same can be said for virtual reality exposure therapy reducing anxiety symptoms, although the results are not as significant. These findings extend the support for the effectiveness of CBT with imaginal exposure therapy, as well as provide more support for the less studied treatment of CBT with virtual reality exposure therapy.

Virtual reality exposure therapy may be a more effective treatment for children for several reasons. Although children have a vivid imagination, the nature of the events of 9/11 or the distress of having their parents as first-responders may inhibit children from being able to accurately imagine these situations and events again. Children also may be distracted during the therapy sessions and may be less focused on what they are imagining internally than they would be when visually seeing the images and situations in a more direct manner. Children are often visually stimulated, and so virtual reality exposure therapy may be a more effective way to trigger certain memories that they can then work through with the therapist. In addition, CBT with imaginal therapy also showed decreases in symptoms of PTSD and depression, although not as significant as virtual reality exposure therapy reductions. This may be explained simply in the fact that the children are receiving some type of therapy. As stated before, children typically have vivid imaginations, and so if their memories are clear when concerning the events during and following 9/11, their imaginations and memories may be effective in exposing them to the traumatic events and situations they may have experienced.

Despite the findings, there were limitations in the current study. In our research, no data was collected on the parent's mental health status, including previous diagnoses of depression, anxiety, or PTSD. This could have limited our understanding of the effects the parents, as first-responders, had on the children. The way parents react to trauma is typically an effective predictor of how their child or children subsequently react. Additionally, measures were not obtained concerning children's functioning prior to their parents' exposure to a traumatic event. Therefore, our research would dictate the child's functioning only at the time of the sessions or treatments. We had no indication the child's behavior or symptomology before the sessions. Previous knowledge of the child's functioning prior to their parent's exposure to a

traumatic event would enhance our ability to understand the child's overall symptoms, coping, PTSD, and ability to make diagnoses.

Future studies could further research concerning the effectiveness of CBT with virtual reality exposure therapy, especially when compared to CBT with imaginal exposure therapy. Researchers could also design a longitudinal study, which could look at the changes of children's symptomology over time – before, during, and after a traumatic event. This is a hard study to construct, due to the fact that traumatic events are almost always unexpected. Perhaps researchers could retrieve past psychological records of the children they are studying in the aftermath of a trauma in order to compare their PTSD, depression, or anxiety before and after the trauma, in combination with an intervention.

References

- Bae, Y. (2012). Test Review: Children's Depression Inventory 2 (CDI 2). *Journal of Psychoeducational Assessment, 30*(3), 304-308. doi: 10.1177/0734282911426407
- Barnard-Brak, L., Bagby, J.L., Jones, N., & Sulak, T. (2011). Teaching post 9/11 student-veterans with symptoms of PTSD: The influence of faculty perceptions and self-efficacy. *Journal of Vocational Rehabilitation, 35*, 29-36. doi: 10.3233/JVR-2011-0551
- Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., & Neer, S. M. (1997). The Screen for Child Anxiety Related Emotional Disorders (SCARED): Scale Construction and Psychometric Characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*(4), 545-553. doi: 10.1097/00004583-199704000-00018
- Boss, P., Beaulieu, L., Wieling, E., Turner, W., & LaCruz, S. (2003). Healing Loss, Ambiguity, And Trauma: A Community-Based Intervention With Families Of Union Workers Missing After The 9/11 Attack In New York City. *Journal of Marital and Family Therapy, 455-467*.
- Brown, E., Pearlman, M., & Goodman, R. (2004). Facing Fears And Sadness: Cognitive-Behavioral Therapy For Childhood Traumatic Grief. *Harvard Review of Psychiatry, 187-198*. (2004, July 1). Retrieved September 23, 2014.
- Canetti-Nisim, D., Halperin, E., Sharvit, K., & Hobfoll, S. (2009). A New Stress-Based Model of Political Extremism: Personal Exposure to Terrorism, Psychological Distress, and Exclusionist Political Attitudes. *Journal of Conflict Resolution, 363-389*.
- Difede, J., & Hoffman, H. G. (2002). Virtual reality exposure therapy for World Trade Center Post-traumatic Stress Disorder: a case report. *Cyberpsychology & behavior : the impact*

of the Internet, multimedia and virtual reality on behavior and society, 5(6), 529-535.

doi: 10.1089/109493102321018169

Difede, J., Malta, L.S., Best, S., Henn-Hasse, C., Metzler, T., Bryant, R., & Marmar, C. (2007).

A Randomized Controlled Clinical Treatment Trial for World Trade Center Attack-Related PTSD in Disaster Workers. *The Journal of Nervous and Mental Disease*, 195(10), 861-865. doi: 10.1097/NMD.0b013e3181568612

Foa, E. B., Johnson, K. M., Feeny, N. C., & Treadwell, K. R. H. (2001). The child PTSD

symptom scale: A preliminary examination of its psychometric properties. *Journal of Clinical Child Psychology*, 30, 376–384.

Haugen, P. T., Splaun, A. K., Evces, M. R., & Weiss, D. S. (2013). Integrative Approach for the

Treatment of Posttraumatic Stress Disorder in 9/11 First Responders: Three Core Techniques. *Psychotherapy*, 50(3), 336-340. doi: 10.1037/a0032526

Henriksen, C.A., Bolton, J.M., & Sareen, J. (2010). The psychological impact of terrorist attacks:

examining a dose-response relationship between exposure to 9/11 and axis I mental disorders. *Depression and Anxiety*, 27, 993-1000. doi: 10.1002/da.20742

Kazi, A., Freund B., & Ironson, G. (2008). Prolonged Exposure Treatment for Posttraumatic

Stress Disorder Following the 9/11 Attack With a Person Who Escaped From the Twin Towers, *Clinical Case Studies*. 100-117. doi: 10.1177/15365017306290.

Kovacs, M., & Devlin, B. (1998). Internalizing disorders in childhood. *Journal of Child*

Psychology and Psychiatry, 39(1), 47-63. doi:10.1017/S0021963097001765.

Levitt, J. L., Loretta, S. M., Martin, A., Davis, L., & Cloitre, M. (2007). The flexible application

of a manualized treatment for PTSD symptoms and functional impairment related to the

9/11 World Trade Center attack. *Behavior Research and Therapy*, 45, 1419-1433.

doi:10.1016/j.brat.2007.01.004

Rodriguez J, Hoagwood KE, Gopalan G, Olin S, McKay MM, Marcus SM, Radigan M, Chung M, Legerski J. Engagement in Trauma-Specific CBT for Youth Post-9/11. *Journal of Emotional and Behavioral Disorders* 2012 Jun 1;20(2). pii: 1063426611428157. Epub 2012 Feb 28.

Schwarzer, R., Bowler, R. M., & Cone, J. E. (2014). Social integration buffers stress in New York police after the 9/11 terrorist attack. *Anxiety, Stress and Coping*, 27(1), 18-26. doi: 10.1080/10615806.2013.806652

Silver, S.M., Rogers, S., Knipe, J., & Colelli, G. (2005). EMDR therapy following the 9/11 terrorist attacks: a community-based intervention project in New York City. *International Journal of Stress Management*, 12(1), 29-42. doi: 10.1037/1072-5245.12.1.29

Simon, E., & Bögels, S. M. (2009). Screening for anxiety disorders in children. *European Child & Adolescent Psychiatry*, 18(10), 625-634. doi: 10.1007/s00787-009-0023-x

Yehuda, R., Bierer, L.M., Sarapas, C., Makotkine, I., Andrew, R., & Seckl, J.R. (2009). Cortisol metabolic predictors of response to psychotherapy for symptoms of PTSD in survivors of the World Trade Center attacks on September 11, 2001. *Psychoneuroendocrinology*, 34, 1304-1313.