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UTILITY OF APPRIASALS DURING PERI-TRAUMA AS A PREDICTOR OF POST-TRAUMATIC STRESS SYMPTOMS FOLLOWING PEDIATRIC INJURY

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ABSTRACT

Every year, millions of children experience potentially traumatic injuries placing them at-risk of developing posttraumatic stress symptoms (PTSS). The peri-trauma period (i.e., the time of injury through early medical care) may represent a critical opportunity for screening and intervention by the medical team in order to identify children at risk for developing PTSS. This study examined the relationship between peri-trauma appraisals and subsequent PTSS in children following injury. Children hospitalized for injury (N=95; ages 8-13 years) completed self-report measures of PTSS at baseline (T1), 6-weeks (T2), and 12-weeks (T3) post-injury. At T1, child appraisals were assessed using a self-report measure, the Child Post-Traumatic Cognitions Inventory (cPTCI) and a newly developed, semi-structured interview about appraisals during ambiguous situations the Trauma-Related Ambiguous Situations Interview and Family Discussion Task (the TAS). Self-reported appraisals on the cPTCI during the peri-trauma period significantly predicted PTSS at T2 controlling for age and gender ($\beta = 0.44$, $t(81) = 4.34$, $p < .01$) and T3 ($\beta = 0.47$, $t(66) = 3.52$, $p < .01$), yet this association did not hold after also controlling for T1 PTSS. Meaning in this sample, self-report appraisals did predict later PTSS when controlling for baseline PTSS as previous research suggests. When controlling for age, gender, and T1 PTSS, negative global appraisals derived from the TAS significantly predicted PTSS at T2 ($\beta = 2.41$, $t(81) = 2.29$, $p < .05$), but not T3. These findings suggest a complex relationship between peri-trauma appraisals and subsequent PTSS. Additional research is needed to determine how to best assess appraisals (both global and trauma-specific) in the context of trauma.

TABLE OF CONTENTS

List of Figures iii

List of Tables iv

Acknowledgements V

Chapter 1 Introduction 1

PTSD/PTSS in Children Following Injury 2
Appraisals as a predictor of PTSS following pediatric injury 5
Overview of Current Research 8

Chapter 2 Methods 9

Procedure 9
Measures 10
Data Analysis 13

Chapter 3 Results 15

Descriptive Statistics 15
Main Findings 16

Chapter 4 Discussion 18

Implications 20
Limitations 21
Conclusion 22

Appendix A: cPTCI Questionnaire Items 31

Appendix B: CPSS Questionnaire Items 32

Appendix C: TAS Forced Response Questions 34

BIBLIOGRAPHY 35

ACADEMIC VITA 40

LIST OF FIGURES

Figure 1: Theoretical Model of Expected Findings 23

LIST OF TABLES

Table 1. Descriptive Statistics of Demographic Variables 23

Table 2. Descriptive Statistics of Main Variables 25

Table 3. Pearson Bivariate Correlations between T1 Self-Report Appraisals and T1 PTSS and T1 Self-Report Appraisals and TAS Appraisal Score 26

Table 4. Regressions of 6-week or 12-week PTSS on Self-Report Appraisals Controlling for Age and Gender 27

Table 5. Regressions of Self-Report Appraisals vs. 6-week and 12-week PTSS Controlling for Age, Gender, and Baseline PTSS 28

Table 6. Regressions of TAS Appraisal Score vs. 6-week and 12-week PTSS Controlling for Age and Gender 29

Table 7. Regressions of TAS Appraisal Score vs. 6-week and 12-week PTSS Controlling for Age, Gender, and Baseline PTSS 30

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Chapter 1

Introduction

Pediatric injury, both mild and severe, is highly prevalent in the United States and around the world. Examples of these injuries include motor vehicle accidents, sports injuries, and burns. Millions of children worldwide experience acute medical events every year (Murray and Lopez, 1996). In the USA alone, twenty million children suffer unintentional injuries each year (Grossman, 2000). In 2009 8.7 million United States children and teenagers visited the emergency department (ED) for injuries. More than 225,000 of these children acquired injuries so severe they required hospitalization or were transferred to another hospital for higher level of care (CDC, 2012).

It is not uncommon for the psychological rather than the physical recovery to dictate a child's functioning following an acute, traumatic medical event (Marsac, 2013). The association between pediatric acute medical events and the development of Post-Traumatic Stress Disorder (PTSD) and its symptoms (PTSS) has been well documented (Balluffi et al., 2004; Kean et al., 2006; Mintzer et al., 2005; Walker et al., 1999). Specific to injury, a meta-analysis found the rate of persistent PTSS in pediatric injury patients was 19% (Kahana et al., 2006). Although a great deal of work has been done to establish this relationship, research is still needed to determine the best way to identify which children are at the greatest risk of developing the symptoms of this disorder following injury. Current research has included assessing the predictive ability of many biological measures (i.e., heart rate, genetics, etc.) and psychological measures (i.e., memory formation, perceived threat, etc.). Researchers are looking to identify

screeners for PTSS/PTSD that can be used in the hospital to identify children at high risk while they are still in the hospital. One psychological factor that holds promise as a useful indicator of PTSS/PTSD and is a topic of current research is how threatening a child appraises his or her injury (Marsac, 2014). A better understanding of the degree to which appraisals predict PTSS would help determine if they could be used as a screening tool to help identify children at risk while they are still in the hospital following injury.

PTSD/PTSS in Children Following Injury

Significant research has shown an association between acute pediatric medical events and long-term, significant development of post-traumatic stress symptoms (PTSS) and post-traumatic stress disorder (PTSD) (Balluffi et al., 2004; Kean et al., 2006; Mintzer et al., 2005; Walker et al., 1999). A meta-analysis by Kahana et al. of children who suffered an injury found that 19% developed persistent PTSS (Kahana et al., 2006). According to the DSM-5, diagnosis of Post-traumatic Stress Disorder can be given when a person shows specific symptoms following exposure to a potentially traumatic event. An event is considered potentially traumatic if it involved the possibility of death or serious injury to the individual or to others. A person may experience PTSD if they are directly exposed to the threat, a witness to the event, or indirectly exposed to the threat (i.e., learning about trauma that occurred to a close family member or friend) (American Psychiatric Association, 2013). Examples of a potentially traumatic event include motor vehicle accidents, house fires, or learning about the violent death of a loved one.

PTSD is defined as including symptoms of four distinct clusters: arousal, avoidance, re-experiencing/intrusion, and negative mood or cognitions. Re-experiencing includes spontaneous

memories of the traumatic event (e.g. nightmares or flashbacks). Avoidance with regards to PTSD can include situations such as refusing to talk about the traumatic event, avoiding hospital visits, or staying away from situations that remind the individual of the traumatic event. Arousal symptoms include an increased "fight or flight" or sympathetic nervous system response following an event that the individual associates with the trauma, or a "trauma trigger". An example of this would be a child's heart rate increasing when they go to the doctor's office for a follow-up appointment. Feelings of blame towards self or others, lack of interested in activities, and an inability to remember portions of the trauma are moods and thoughts that are associated with PTSD (American Psychiatric Association, 2013). Even if a child does not meet the cut-off for diagnosis, symptoms of PTSD are still associated with negative outcomes (Holbrook et al., 2005; Stoddard and Saxe, 2001). PTSS are associated with impairments in social and academic functioning, poorer health-related quality of life (HRQOL), and greater use of health services (Giaconia et al., 1995; Holbrook et al., 2005; Landolt et al., 2009; Mintzer et al., 2005; Zatzick et al., 2008).

PTSD and its related symptoms, like other psychological disorders, do not come from one single cause. The development of PTSS is best studied in the context of the patient and his or her environment, using the bio-psycho-social model of medicine (Engel, 1977). Ongoing research has identified biological, psychological, and social mechanisms that may lead to PTSS/PTSD (Alisic et al., 2011; American Psychiatric Association, 2014; Cox et al., 2008; Kahana et al., 2006). Although a great deal of research has been conducted on the development and treatment of PTSD in adults, fewer research models have focused on the development of PTSS/PTSD in children (Marsac, 2014). One biological marker that has proved useful for predicting PTSD development in children is the child's heart rate when admitted to the hospital (Kassam-Adams

et al., 2005; Bryant et al., 2007; De Young et al., 2007; Nugent et al., 2006). It is proposed that a higher heart rate indicates a more heightened "fight-or-flight" response and indicates that the child has appraised the situation as more threatening. Genetics, family environment, and irregular memory formation are all proposed mechanisms that can lead to pediatric PTSS following injury (Marsac, 2014). While these biological markers can be used as easily available screeners, psycho-social factors hold more potential as screeners that could lead to interventions to prevent or reduce sustained PTSS (Marsac, 2014). A great deal of research has shown that objective injury severity has not been found to predict future PTSS in children. Instead, the individual's own subjective interpretation of his or her injury severity seems to be a better indicator of symptom development (Meiser-Stedman, 2009).

Currently, pediatric providers face the challenge of recognizing and treating injured children at risk for PTSS. An increase in understanding of warning signs could lead to better provider education and thus increased understanding and symptom management efforts (Kassam-Adams, 2013). Most existing models of PTSS in children focus on the post-trauma period. The peri-trauma period, which includes the time of injury and the time the child is receiving care from providers and medical interventions, has been rarely studied in pediatric PTSD research. The peri-trauma period is unique to medical trauma because it includes interactions with medical staff, medical interventions, and physical trauma (from the injury, illness, or medical treatment). All of these peri-trauma factors can contribute to the development of PTSS/PTSD. Having a better understanding of the development PTSS/PTSD during the peri-trauma period could lead to better screening and intervention for high-risk children while they are in the hospital. This could also help guarantee that the child's caregivers are given education regarding how to recognize and get treatment for these symptoms in their child when they leave the hospital. Currently, most

children do not receive behavioral health care when they are admitted to the hospital for injury. Therefore, screening by medical providers could help improve the reach of PTSD prevention programs (Marsac, 2014).

Appraisals as a predictor of PTSS following pediatric injury

Cognitive appraisals refer to the way that one's interpretation of an event impacts his or her emotions. More specifically, an appraisal is how a person believes a specific event will affect his or her well-being and what resources he or she believes they possess to deal with the stressor (Smith, 1993). There are two components of the appraisal process, the primary appraisal and the secondary appraisal. The term primary appraisal refers to the significance a person assigns to an interaction with his or her environment. An event can be judged as irrelevant (having no significance), benign-positive (only a good outcome is possible), or stressful.

A stressful event is characterized by threat, challenge, or harm-loss. A threatening situation means there is potential for a negative outcome such as physical or emotional harm or loss. A challenge, although stressful, holds the potential for a positive outcome such as personal growth. A harm-loss situation is a situation where harm has already been done to the individual. This harm could include things such as injury or other health impacts (Lazarus, 1985).

The secondary appraisal refers to the individual's evaluation of how apt their resources are to cope with the given situation. The primary and secondary appraisal processes occur interdependently. For example, if a person does not have significant resources to cope with the effects of an event, the primary appraisal of the event will be that it is more threatening. A person's emotions come as a result of how he or she interprets an interaction with their

environment. Therefore, as a person's appraisal of an event changes, so do his or her emotions and coping mechanisms (Lazarus, 1985).

A proposed mechanism through which negative appraisals lead to PTSD is that they cause increased anxiety and thus a higher use of maladaptive coping mechanisms that can in turn perpetuate PTSS (Ehlers & Clark, 2000). Coping refers to the cognitive and behavioral mechanisms a person uses to better manage an event that is perceived negative or threatening (Lazarus, 1985). Different negative appraisals of a traumatic event can lead to different dysfunctional coping strategies. For example, if a person believes that if they go to sleep they will have nightmares about the traumatic event, they may stay up very late. Another example is that if an individual believes thinking about the event will cause them to go crazy they may try to keep their mind occupied at all times (Ehelrs & Clark 2000). By improving a child's appraisals of their trauma, it may be possible to improve coping strategies and thus improve the health and recovery of the child post-injury.

Emerging research supports a role for negative, maladaptive appraisals in predicting PTSS in children following injury. Examples of maladaptive appraisals include believing that the world is a dangerous place or the view that one's own abilities are incompetent (Meiser-Stedman, 2009). Ehlers, Mayou, and Bryant (2003) studied children ages 5-16 who were involved in a road traffic accident. Although their study found that maladaptive self-reported appraisals of trauma could be related to later PTSS development, they did not find that cognitive factors accounted for the development of PTSS over and above initial PTSS (Ehlers et al., 2003). Another recent study showed that when measured within a month of trauma, a child's maladaptive self-report appraisals independently predicted PTSS at 6 months, even after controlling for initial symptoms. A recent study by Richard Meiser-Stedman found maladaptive self-report appraisals

significantly mediated the relationship between 2-4 week PTSS and 6-month symptoms, even after controlling for initial PTSS in a group of 10-16 year-old assault and motor vehicle accident survivors suggesting that maladaptive appraisals could play a causal role in the development and maintenance of PTSS over time (Meiser-Stedman, 2009).

While the majority of research in pediatric trauma victims has been conducted using self-report measures, other ways of measuring children's appraisals have rarely been studied. Using other methods to measure appraisals might be needed when working with younger populations of children who do not completely understand abstract issues regarding their psychological health that are necessary to answer accurately many self-report questionnaires (Meiser-Stedman, 2008). Measuring children's global appraisals (appraisals not specific to their trauma) might be a useful tool in predicting children at risk for PTSS/PTSD. Child interpretations of ambiguous scenarios have yet to be studied in the field of pediatric PTSS/PTSD and have been shown to be useful for measuring children's global appraisals. Threatening appraisals of ambiguous scenarios, as shown by Barret and Chorpita, are associated with higher levels of anxiety in children (Barret, 1996; Chorpita, 1996). Anxiety has been found to be associated with the increased use of maladaptive coping strategies that have been shown to perpetuate PTSS/PTSD (Ehlers & Clark, 2000).

Currently no research exists studying the relationship between appraisals while the child is still in the hospital (i.e., peri-trauma period) and the development of PTSS/PTSD in children following injury. Inconsistent findings regarding the contribution of maladaptive post-injury appraisals to the development PTSS/PTSD in children call for a need for additional research (Meiser-Stedman 2009). In addition, little research exists on the impact of appraisals on PTSS/PTSD with younger children. Finally, further research must be done to investigate what assessments of appraisals are most valuable for screening children exposed to trauma.

Overview of Current Research

Currently there is a lack of consistent findings relating negative cognitive appraisals and the development of PTSS in pediatric populations following traumatic injury. Additionally, sparse research has been done to study the role of appraisals during the peri-trauma period in the development of PTSS/PTSD (Marsac, 2014). The predictive value of various measures of cognitive appraisals in different pediatric age groups must further be studied to help understand what measures are most useful for predicting PTSS/PTSD development in different age groups.

By studying children who were admitted to the hospital for a potentially traumatic injury, it was expected that baseline/peri-trauma post-traumatic stress symptoms would predict the development of PTSS at 6-weeks and 12-weeks. It was also expected that there would be a correlation between baseline negative appraisals and baseline PTSS. Based on previous research, it was expected that baseline negative self-report would predict future PTSS development at 6 and 12-weeks when controlling for initial PTSS symptoms as seen in Figure 1. It was predicted that children who endorsed more negative appraisals of their injury event on a self-report measure would, on average, report more threat appraisals of hypothetical scenarios. Additionally, it was expected that threat appraisals of ambiguous scenarios would be correlated with PTSS at baseline. Additionally, it was predicted that PTSS would decrease over time from baseline assessment to 6-weeks post-injury and from 6-weeks to 12-weeks post-injury.

Chapter 2

Methods

Procedure

Overview

This research utilized data from larger study conducted from July 2012 to October 2014 at the Children's Hospital of Philadelphia Research Institute's Center for Injury Research and Prevention (IRB# 12-009415). The study aimed to investigate the underlying mechanisms leading to the development of Post-Traumatic Stress Symptoms in children and their parents following pediatric injury.

Children and their legal guardian(s) were approached while in the hospital and given an overview of the study and asked whether or not they would like to participate. If the child and guardian agreed to participate, the child was first consented to screen into the study. Screening consisted of four questions. These statements were used to give a general measurement of the child's threat appraisal of the injury. If the child's score indicated he or she had perceived the injury as a significant threat, the child and his/her guardian were screened into the main portion of the study. Following the screening and consenting processes, the parent(s) of the child and child completed the TAS Task (see below) and self-report measures. Six-weeks (T2) and twelve weeks (T3) following the baseline assessment, a follow-up call was completed during which both the parent and the child completed the same set of self-report questionnaires completed in the

hospital. If the participants could not be reached by phone, hard copies of the measures were sent by mail.

Participants

All children (n = 95) included in this analysis were between the ages of 8 and 13 years old and were admitted to the Children's Hospital of Philadelphia for an injury. The child needed to have sustained the particular injury that brought him/her to the hospital within the last two weeks. Both the child and parent needed to be present to complete the study and both needed to speak sufficient English. The children's hospital records were screened and children were excluded from the study if their injury was due to family abuse, suspected sexual abuse, if the parent or child was arrested or subject to legal proceedings related to his or her injury, or if the child's current medical status or cognitive functioning would interfere with his or her ability to complete the assessments given.

Measures

Self-Reported Child Appraisals: *Child Post-Traumatic Cognitions Inventory (cPTCI)*

As seen in Appedix A, the cPTCI consists of 25 items and is designed from the adult Post-Traumatic Cognitions Inventory (PTCI) (Meiser-Stedman, 2009; Foa, Ehlers, 1999). This measure possesses good internal consistency and good test-retest reliability (Meiser-Stedman, 2009). It was administered at baseline/T1 (in the hospital), T2 (6-week follow up), T3 (12-week follow up) and was used in this study to assess the child's trauma-related appraisals. This measure has good internal consistency and test-retest reliability (Meiser-Stedman 2009). There

are two components of the questionnaire. The first component assesses whether there was perceived "disturbing and permanent change" and includes statements such as "my reactions since the frightening event mean I have changed for the worse", "not being able to get over all of my fears means that I am a failure", and "my life has been destroyed by the frightening event". The other component assesses cognitions indicating the subject feels like a "feeble person in a scary world". Examples of statements in this component include "anyone could hurt me", "everyone lets me down", and "I am a coward". Responses are scored on a scale from 1 ("don't agree at all") to 4 ("agree a lot"). For the purpose of this study, we used the total cPTCI score only. Possible total scores on the cPTCI range from 25-100.

Child Post-Traumatic Stress Symptoms: *Child PTSD Symptom Scale (CPSS) (DSM-IV)*

The CPSS is a self-report questionnaire designed to assess the severity of PTSD symptoms in children (Foa et al., 2001). This 17-item measure, as seen in Appendix B, was administered to children at baseline, T2, and T3 in order to follow the development of post-traumatic stress symptoms (PTSS) over time. The scoring of the DSM-IV version of the CPSS questionnaire was used in this analysis because a version based on the DSM-5 criteria was released after this study had already begun. This measure has good internal consistency and excellent test-retest reliability (Foa et al., 2001).

At Time 1, participants were asked to report how much they had experienced particular symptoms since the time of the injury that brought them to the hospital. During follow-up calls at 6-weeks and 12-weeks, participants were asked to report how much they had experienced particular symptoms in the past month. Examples of statements on the CPSS include "having bad dreams or nightmares", "not feeling close to people around you", and "having trouble falling or

staying asleep". Answers ranged from 0 ("Not at all") to 4 ("Almost always"). A score of 15 or above has been clinically determined to be an appropriate and clinically meaningful cut-off for determining PTSD in children (International Society for Traumatic Stress Studies). For the purpose of this analysis, PTSS severity scores were used instead of classifying the sample into PTSD and non-PTSD groups based on diagnostic cut-off scores for determining PTSD.

Threat Appraisals of Ambiguous Scenarios: Trauma-Related Ambiguous Situations Interview and Family Discussion Task (TAS Task)

The analysis in this paper utilized the child interview portion of the Trauma-Related Ambiguous Situations Interview and Family Discussions Task (TAS Task) as a novel measure of children's global appraisals. The TAS Task is a parent-child interview and interaction task that was adapted by Dr. Meghan Marsac from a previous discussion task used on populations of clinically anxious and non-anxious children and their parents (Barret, 1996; Chorpita, 1996). The TAS Task was adapted from the original interaction task to study parent-child interactions following pediatric trauma.

The child interview portion of the TAS Task involved interviewing the child separately from his or her parents. This interview was developed to study how children appraise ambiguous, potentially physically and socially threatening situations. During the interview, the child was presented with four hypothetical situations that were possible scenarios the children could find themselves in while at the hospital (found in Appendix C). For example, the first scenario stated, "When you wake up tomorrow morning, your tummy feels funny. What do you think could be happening? Why does your tummy feel funny?" The child was encouraged to list as many reasons he or she could think of as to what might be occurring. Next, the child was asked to say

what they thought "is most likely happening". Following this response, the child was prompted to decide from four pre-determined choices (two neutral and two threat appraisals) what they thought could be happening. For the example above, the four choices given were "you might be hungry" (neutral), "you ate some bad food and you are going to be really sick" (threat), "it's okay, it will go away soon" (neutral), or "there is something wrong with your stomach and you will need a big operation" (threat). For the purpose of this analysis, only the forced-choice answers were used. The child's response to each of the four scenarios was scored as "1" for a negative trauma appraisal and a "0" for a neutral appraisal. Total scores for this measure could range from 0 (no negative appraisals) to 4 (appraisal of all scenarios as negative).

Data Analysis

All scales were scored and data was analyzed using SPSS 21. One participant was excluded from the analysis due to lack of demographic information. Descriptive statistics were run for demographic variables including gender, age, and race. Descriptive statistics were also run on cPTCI total scores and TAS total scores. Frequencies were also run for TAS scores to determine how many participants appraised all or no situations as threatening. Descriptive statistics and frequencies were run on the CPSS scores at T1, T2, and T3 to determine how severe the levels of symptoms were in this population and how many participants met the cut-off score for clinically significant symptoms throughout the study.

Pearson bivariate correlations were used to analyze the relationship between self-report appraisals at baseline (T1 cPTCI) and PTSS at baseline (T1 CPSS), TAS appraisal scores and

self-report appraisals at baseline (T1 cPTCI), and TAS appraisal scores and PTSS at baseline (T1 CPSS).

Hierarchical linear regressions were used to analyze the relationship between peri-trauma self-report appraisals and persistent PTSS. First, a regression was run to analyze the relationship between baseline self-report negative appraisals (cPTCI) and 6-week and 12-week PTSS while controlling for age and gender. To see if negative self-report appraisals at baseline could predict PTSS over and above baseline PTSS, additional regressions were run comparing baseline self-report appraisal scores and 6-week and 12-week CPSS scores while controlling for baseline CPSS, age, and gender.

Hierarchal linear regressions were also used to analyze the relationship between appraisals of hypothetical scenarios (TAS Task) and the development of PTSS over time. In an identical process as described for the cPTCI, regressions were initially run without controlling for baseline PTSS and a second set of regressions was run comparing TAS appraisal scores to 6-week and 12-week CPSS while controlling for baseline CPSS.

Chapter 3

Results

Descriptive Statistics

Table 1 provides details on study demographics. The Children's Hospital of Philadelphia is located in a large, urban city and serves a diverse population. According to the United States Census, in 2013 Philadelphia County's population consisted of 45.5% white and 44.2% black; therefore, the sample, as seen in Table 1, is representative of Philadelphia's predominantly white and black population. The sample included slightly more male participants than females and ages were distributed evenly over the 8 to 13 year-old age range, as seen in Table 1.

Table 2 provides descriptive statistics (means and observed ranges) of the scores seen on the cPTCI at T1, CPSS at T1, T2, and T3, and the TAS task. As seen in Table 2, mean score on the CPSS decreased from baseline to 6-weeks and decreased once again from 6-week follow up to 12-week follow up. At T1, 48.1% of children met clinical significance for PTSS 42.7% at T2, and at 41.8% at T3.

As seen in Table 2, the mean score on the TAS Task was 0.92 ± 0.94 with a range from 0.00 to 3.00. This means that no child appraised all four of the hypothetical scenarios as threatening and some children did not appraise any scenarios as threatening. 39 (41.1%) of participants did not interpret any scenarios as threatening, 32 (33.7%) interpreted one scenario as threatening, 17 (17.9%) interpreted two of the scenarios as threatening, and 7 (7.4%) interpreted three of the scenarios as threatening.

Table 3 shows the results of the Pearson bivariate correlations that were run. The results show that there was a correlation between peri-trauma appraisals and peri-trauma and PTSS, r = 0.60. Table 3 also shows the results of a bivariate correlation between peri-trauma period (T1) self-report appraisals and appraisals of ambiguous scenarios on the TAS Task, r = 0.20.

Main Findings

Table 5 shows the results of the hierarchical linear regressions that were run to determine the relationship between baseline self-report appraisals of trauma and the development of PTSS without controlling for baseline PTSS. The model of age, gender, and peri-trauma appraisals accounted for 18% of the variance seen in 6-week PTSS, $R^2 = 0.18$ and 13% of the variance in 12-week PTSS, $R^2 = 0.13$. After controlling for age and gender, peri-trauma appraisals significantly and positively predicted 6-week PTSS development, *b = 0.44, SE = 0.10, t = 4.34,* and *p = <0.001* and 12-week symptom development, *b = 0.47, SE = 0.13, t = 3.52*, and *p < 0.001*.

The results of hierarchical linear regressions that were completed to see if baseline self-report appraisals predicted later symptom development over and above initial symptoms (T1 CPSS) are reported in Table 6. As seen in Table 6 after controlling for gender, age, and baseline PTSS (T1 CPSS), peri-trauma self-report appraisals did not significantly predict PTSS at 6-weeks controlling for baseline PTSS, *b = 0.17, SE = 0.11, t = 1.55*, and *p = 0.13* or at 12-weeks, *b = 0.28, SE = 0.16, t = 1.71,* and *p = 0.09*.

Hierarchical regressions were also run to determine the relationship between negative appraisals on the TAS task and future PTSS. Initial regressions were run controlling for age and

gender while associating TAS appraisal scores to 6-week and 12-week PTSS. As seen in Table 7, this model accounted for 6% of the variance seen in 6-week symptoms, $R^2 = 0.06$. After controlling for age and gender, TAS task scores significantly predicted PTSS at 6-weeks, *b = 3.30, SE = 1.27, t = 2.6, p = 0.01*, but did not significantly predict PTSS at 12-weeks, *b = 2.25, SE = 1.73, t = 1.35, p = 0.18.*

In order to determine if appraisal scores on the TAS task predicted later PTSS over and above baseline PTSS, hierarchical regressions were run controlling for age, gender, and baseline PTSS. As seen in Table 8, this model accounted for 36% of the variance seen in 6-week PTSS, $R^2 = 0.36$. After controlling for age, gender, and baseline PTSS, the TAS scores significantly predicted 6-week symptoms, *b = 2.41, SE = 1.06, t = 2.29, p = 0.03*, but once again did not significantly predict 12-week symptoms, *b = 0.96, SE = 1.66, t = 0.58, p = 0.56*.

Chapter 4

Discussion

At baseline, the mean score on the CPSS indicated the average child in this sample was experiencing clinically significant PTSS according to the International Society for Traumatic Stress Studies (ISTSS). At T1, 48.1% of children met clinical significance for PTSS. As expected, PTSS severity and prevalence decreased over time in this sample. However, even at the 12-week follow-up, 41.8% of participants still endorsed clinically significant PTSS. These results help support the need for screening of children to determine those at high risk for PTSS following injury in order to ensure the appropriate children receive psychological interventions.

A strong correlation was seen between baseline self-report trauma appraisal scores on the Child Post-Traumatic Cognitions Inventory (cPTCI) and baseline posttraumatic stress symptoms on the CPSS. This indicates a strong relationship between trauma related appraisals following injury and acute, peri-trauma PTSS. Further, as anticipated, self-reported appraisals on the cPTCI at baseline predicted the development of post-traumatic stress symptoms (PTSS) at T2 (6-weeks) and T3 (12-weeks) after controlling for age and gender. However, appraisals no longer were a predictor of later PTSS after controlling for baseline PTSS. This suggests that both baseline posttraumatic stress disorder symptomatology and self-report appraisals of trauma have overlap and are accounting for a lot of the same variance in later symptom development. Thus, in the current sample, self-report appraisals during peri-trauma did not predict later development of PTSS over and above baseline PTSS as previous research suggests (Meiser-Stedman, 2009).

However, the present study differs from previous research by the time initial appraisals were assessed (in the hospital/peri-trauma vs. two to four weeks post-trauma in the previous study) and the age of the study population (8-13 year-olds vs. 10-16 year-olds in the previous study).

As expected, children's scores on the forced-choice portion of the Trauma-Related Ambiguous Situations Interview and Family Discussion Task (TAS) were weakly correlated with baseline self-report PTSS. A higher score on the TAS indicated more negative/threat appraisals of hypothetical scenarios. Even after controlling for age, gender, and baseline PTSS, global appraisals measured using the TAS Task were significantly predictive of PTSS development at 6-weeks, but not at 12-weeks after baseline. These results show that although semi-structured interview measures of global appraisals (those not specific to trauma such as measured on the cPTCI) such as the TAS are not strongly correlated with acute PTSS development, these types of appraisals might be useful for further research studying how appraisals predict the development of PTSS over time in these populations. Prior research suggests that children who appraise hypothetical scenarios as threatening on the TAS tend to appraise potentially neutral situations as threats during their everyday lives (Barret, 1996; Chorpita, 1996). Therefore groups of children who report more threat appraisals on the TAS Task might be more anxious children and thus be at a higher risk for developing sustained PTSS (Barret, 1996; Chorpita, 1996; Ehlers & Clark, 2000).

The simplicity of the topics and language on semi-structured interview measures such as the TAS could help account for its predictive ability. The TAS did not require children to understand abstract psychological concepts that are difficult for children to understand such as those that were included in the cPTCI (i.e. "I can't cope when things get tough", "I am a coward") (Meiser-Stedman, Smith, Glucksman, Yule, & Dalgeish, 2008). Consequentially,

children's responses on the TAS may be more representative of their actual appraisals than other self-report measures such as the cPTCI.

Implications

The results of this study provide some limited support for previous research findings that have shown appraisals to be useful tools for identifying children at risk for PTSS/PTSD following injury. Previous studies have documented the strong ability of of self-report appraisals in predicting development of PTSS in these pediatric injury victims (Meiser-Stedman, 2009; Ehlers et al., 2003), but have had mixed findings regarding the extent to which appraisals predict over and above baseline symptoms. This study's results add to this literature, with mixed results depending on the type of appraisal measure. The use of a novel measure of appraisals derived from a semi-structured interview, via the TAS, was the best predictor of future PTSS in this sample. Although self-report appraisals may not be the most accurate screener for at-risk children, global appraisals assessed using a semi-structured interview suggest that children with negative appraisals are at higher risk.

Children who experience injuries are reporting significant symptoms, even up to about three months after the event. Despite the documentation of the negative impacts PTSS can have on a child, currently behavioral interventions are not typically a part of the hospital stay for children following injury (Marsac, 2014). The results of this study show that appraisals and symptoms measured during the peri-trauma are good predictors of long-term symptom development. Further research is important to determine which measures would be the easiest for medical

providers to obtain during their short interactions with patients, but also how meaningful those measurements are as predictors of outcomes.

Limitations

The validity of self-report measures used in this study (i.e. cPTCI and CPSS) must be considered. Some children asked the researchers to clarify terms that they did not understand on the measures, but it is possible that some children did not ask for clarification on abstract topics. Therefore, discrepancies between children's reported symptoms/appraisals and their actual symptoms/appraisals could be present in this sample. Additionally, it is impossible to determine whether children's responses on the cPTCI, CPSS, and TAS were accurate representations of their thoughts, or were altered due to social desirability bias.

Another limitation of this study was the use of a count variable with a limited range of scores, the TAS. The small range of possible scores could limit the ability to detect associations between this measure and other variables. Consequentially, the findings of the present study may represent conservative estimates of these associations.

Additionally, underlying psychological illnesses of the children in this sample were not accounted for in this analysis. Children with underlying mental illnesses such as anxiety may have been included in this sample and such children would naturally have a higher likelihood of appraising events as threatening. If the given sample contained many children with underlying anxiety, generalizability of these results to all children could be lessened (Barret, 1996; Chorpita, 1996)

Although our study sample contained children across a wide age range (8 to 13 years-old), our results may not be generalizable to older and younger groups of children. Previous research has shown discrepancies in the predictive value of certain self-report measures of the cPTCI with different age groups (Meiser-Stedman, Smith, Glucksman, Yule, & Dalgeish, 2008). It is possible that the predictive ability of this self-reported measure could be more or less predictive of future PTSS/PTSD in other age groups that are more or less able to understand the questions being asked on this measure.

Conclusion

The association between children's appraisals and the development of posttraumatic stress symptoms following trauma is still unclear. The results of this study suggest that there is a complicated relationship between appraisals and PTSS. However, appraisals show potential to be a valuable tool in screening children at high risk for PTSS. Further research must be done to determine what types of appraisals (e.g., global vs. specific to trauma) are most predictive of PTSS development following trauma. Additional research must determine what method of assessing appraisals (i.e., self report vs. interview) is most accurate for use in pediatric populations.

The present study has relevance for clinical applications in the psychological treatment of children at high risk for PTSS following injury. Implementation of a quick, accurate assessment of children's appraisals could allow for systematic screening of children at risk while they are still in the hospital (i.e., peri-trauma period). This would allow for medical providers to ensure the allocation of necessary services to lead the best psychological and physical recovery possible.

Figure 1: Theoretical Model of Expected Findings (after controlling for age, gender, and baseline Post-traumatic Stress Symptoms)

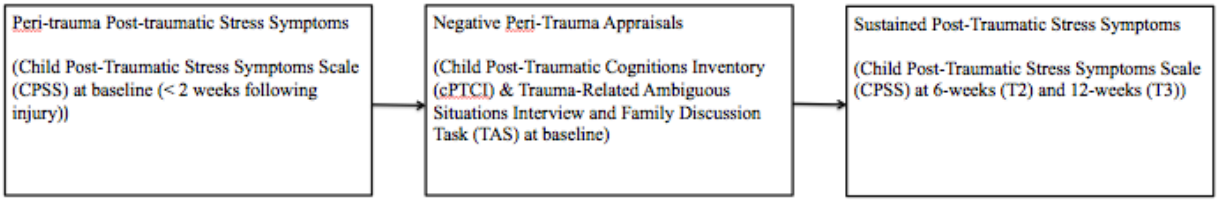

Table 1. Descriptive Statistics of Demographic Variables

	n (%) Male	n (%) Female	
Gender	62 (65.3%)	33 (34.7%)	
	Mean	S.D.	Range
Age	10.58	1.70	8-13
	% White	% Black	% Other
Race	52.6%	41.1%	6.3%

Table 2. Descriptive Statistics of Main Variables

	n	Mean	S.D.	Range
T1 cPTCI Total Score	94	42.22	11.54	25-73
T1 CPSS Total Score	94	16.06	9.36	0-39
T2 CPSS Total Score	82	13.33	11.22	0-51
T3 CPSS Total Score	67	13.27	12.13	0-48
TAS Total Score	95	0.92	0.94	0-3

Table 3. Pearson Bivariate Correlations between T1 Self-Report Appraisals and T1 PTSS and T1 Self-Report Appraisals and TAS Appraisal Score

	r	p
T1 cPTCI Total Score vs. T1 CPSS Total Score	0.60	0.00
Total TAS Score vs. T1 cPTCI Total Score	0.20	0.06
Total TAS Score vs. T1 CPSS Total Score	0.13	0.23

Table 4. Regressions of 6-week or 12-week PTSS on Self-Report Appraisals Controlling for Age and Gender

T2 (6-week) CPSS Total Score	b	SE	Adjusted R^2	t	p
Model 1 (age and gender)			-0.10		
Child age	0.00	0.76	------	0.01	1.00
Child gender	2.80	2.68	------	1.04	0.30
Model 2 (age, gender, and T1 cPTCI)			0.18		
Child age	0.04	0.69	------	0.06	0.95
Child gender	3.02	2.42	------	1.25	0.22
T1 cPTCI Total Score	0.44	0.10	------	4.34	<0.001

T3 (12-week) CPSS Total Score	b	SE	Adjusted R^2	t	p
Model 1 (age and gender)			-0.02		
Child age	0.74	0.95	------	0.78	0.44
Child gender	0.53	3.38	------	0.16	0.88
Model 2 (age, gender, and T1 cPTCI)			0.13		
Child age	0.63	0.87	------	0.72	0.48
Child gender	1.61	3.12	------	0.51	0.61
T1 cPTCI Total Score	0.47	0.13	------	3.52	<0.01

Table 5. Regressions of 6-week or 12-week PTSS on Self-Report Appraisals Controlling for Age, Gender, and Baseline PTSS

T2 (6-week) CPSS	b	SE	Adjusted R^2	t	p
Model 1 (age, gender, T1 total symptoms)			0.33		
Child age	-0.01	8.21	------	-0.02	0.99
Child gender	4.80	2.21	------	2.17	0.03
T1 CPSS Total Score	0.73	0.11	------	6.36	<0.001
Model 2 (age, gender, T1 total symptoms, T1 appraisals)			0.34		
Child age	0.01	0.62	------	0.01	0.99
Child gender	4.57	2.20	------	2.08	0.04
T1 CPSS Total Score	0.61	0.14	------	4.49	<0.01
T1 cPTCI Total Score	0.17	0.11	------	1.55	0.13
T3 (12-week) CPSS	**b**	**SE**	**Adjusted R^2**	**t**	**p**
Model 1 (age, gender, T1 total symptoms)			0.14		
Child age	0.48	0.87	------	0.55	0.58
Child gender	2.98	3.17	------	0.94	0.35
T1 CPSS Total Score	0.57	0.16	------	3.61	<0.01
Model 2 (age, gender, T1 total symptoms, T1 appraisals)			0.17		
Child age	0.51	0.86	------	0.59	0.56
Child gender	2.75	3.12	------	0.88	0.38
T1 CPSS Total Score	0.37	0.20	------	1.87	0.07
T1 cPTCI Total Score	0.28	0.16	------	1.71	0.09

Table 6. Regressions of 6-week or 12-week PTSS on AS Appraisal Score Controlling for Age and Gender

T2 (6-week) CPSS	b	SE	Adjusted R^2	t	p
Model (age, gender, TAS Score)			0.06		
Child age	0.23	0.74	------	0.31	0.76
Child gender	2.69	2.59	------	1.04	0.30
TAS Total Score	3.30	1.27	------	2.6	0.01
T3 (12-week) CPSS	b	SE	Adjusted R^2	t	p
Model (age, gender, TAS Score)			-0.01		
Child age	0.68	0.93	------	0.74	0.46
Child gender	0.58	3.35	------	0.18	0.86
TAS Total Score	2.25	1.73	------	1.35	0.18

Table 7. Regressions of 6-week or 12-week PTSS on TAS Appraisal Score Controlling for Age, Gender, and Baseline PTSS

T2 (6-week) CPSS	b	SE	Adjusted R^2	t	p
Model (age, gender, T1 Total Symptoms, TAS Score)			0.36		
Child age	0.16	0.61	------	0.26	0.80
Child gender	4.63	2.15	------	2.15	0.04
T1 CPSS Total Score	0.69	0.11	-----	6.16	0.00
TAS Total Score	2.41	1.06	------	2.29	0.03
T3 (12-week) CPSS	**b**	**SE**	**Adjusted R^2**	**t**	**p**
Model (age, gender, T1 Total Symptoms, TAS Score)			0.13		
Child age	0.52	0.88	------	0.59	0.56
Child gender	2.88	3.19	------	0.90	0.37
T1 CPSS Total Score	0.55	0.16	------	3.38	0.001
TAS Total Score	0.96	1.66	------	0.58	0.56

Appendix A: cPTCI Questionnaire Items

	Don't agree at all	*Don't agree a bit*	*Agree a bit*	*Agree a lot*
1. Anyone could hurt me.	[ ]	[ ]	[ ]	[ ]
2. Everyone lets me down.	[ ]	[ ]	[ ]	[ ]
3. I am a coward.	[ ]	[ ]	[ ]	[ ]
4. My reactions since the frightening event mean I have changed for the worse.	[ ]	[ ]	[ ]	[ ]
5. I don't trust people.	[ ]	[ ]	[ ]	[ ]
6. My reactions since the frightening event mean something is seriously wrong with me.	[ ]	[ ]	[ ]	[ ]
7. I am no good.	[ ]	[ ]	[ ]	[ ]
8. Not being able to get over all my fears means that I am a failure.	[ ]	[ ]	[ ]	[ ]
9. Small things upset me.	[ ]	[ ]	[ ]	[ ]
10. I can't cope when things get tough.	[ ]	[ ]	[ ]	[ ]
11. I can't stop bad things from happening to me.	[ ]	[ ]	[ ]	[ ]
12. I have to watch out for danger all the time.	[ ]	[ ]	[ ]	[ ]
13. My reactions since the frightening event mean I will never get over it.	[ ]	[ ]	[ ]	[ ]
14. I used to be a happy person but now I am always sad.	[ ]	[ ]	[ ]	[ ]
15. Bad things always happen.	[ ]	[ ]	[ ]	[ ]
16. I will never be able to have normal feelings again.	[ ]	[ ]	[ ]	[ ]
17. I'm scared that I'll get so angry that I'll break something or hurt someone.	[ ]	[ ]	[ ]	[ ]
18. Life is not fair.	[ ]	[ ]	[ ]	[ ]
19. My life has been destroyed by the frightening event.	[ ]	[ ]	[ ]	[ ]
20. I feel like I am a different person since the frightening event.	[ ]	[ ]	[ ]	[ ]
21. My reactions since the frightening event show that I must be going crazy.	[ ]	[ ]	[ ]	[ ]
22. Nothing good can happen to me anymore.	[ ]	[ ]	[ ]	[ ]
23. Something terrible will happen if I do not try to control my thoughts about the frightening event.	[ ]	[ ]	[ ]	[ ]
24. The frightening event has changed me forever.	[ ]	[ ]	[ ]	[ ]
25. I have to be really careful because something bad could happen.	[ ]	[ ]	[ ]	[ ]

Appendix B: CPSS Questionnaire Items

	0		1		2	3
	Not at all or only at one time		Once a week or less/ once in a while		2 to 4 times a week/ half the time	5 or more times a week/almost always
1.	0	1	2	3	Having upsetting thoughts or images about the event that came into your head when you didn't want them to	
2.	0	1	2	3	Having bad dreams or nightmares	
3.	0	1	2	3	Acting or feeling as if the event was happening again (hearing something or seeing a picture about it and feeling as if I am there again)	
4.	0	1	2	3	Feeling upset when you think about it or hear about the event (for example, feeling scared, angry, sad, guilty, etc)	
5.	0	1	2	3	Having feelings in your body when you think about or hear about the event (for example, breaking out into a sweat, heart beating fast)	
6.	0	1	2	3	Trying not to think about, talk about, or have feelings about the event	
7.	0	1	2	3	Trying to avoid activities, people, or places that remind you of the traumatic event	
8.	0	1	2	3	Not being able to remember an important part of the upsetting event	
9.	0	1	2	3	Having much less interest or doing things you used to do	
10.	0	1	2	3	Not feeling close to people around you	
11.	0	1	2	3	Not being able to have strong feelings (for example, being unable to cry or unable to feel happy)	

12.	0	1	2	3	Feeling as if your future plans or hopes will not come true (for example, you will not have a job or getting married or having kids)

0	1	2	3
Not at all or only at one time	Once a week or less/ once in a while	2 to 4 times a week/ half the time	5 or more times a week/almost always

13.	0	1	2	3	Having trouble falling or staying asleep
14.	0	1	2	3	Feeling irritable or having fits of anger
15.	0	1	2	3	Having trouble concentrating (for example, losing track of a story on the television, forgetting what you read, not paying attention in class)
16.	0	1	2	3	Being overly careful (for example, checking to see who is around you and what is around you)
17.	0	1	2	3	Being jumpy or easily startled (for example, when someone walks up behind you)

Appendix C: TAS Forced Response Questions

CHILD SCENARIO #1:
When you wake up tomorrow morning, you notice your tummy feels funny. What do you think could be happening? Why does your tummy feel funny?
Which of these reasons/explanations do you think is the most likely?
1. You might be hungry.
2. You ate some bad food and you are going to be really sick.
3. It's okay. It will go away soon.
4. There is something wrong with your stomach and you will need a big operation.

CHILD SCENARIO #2:
You hear a machine in your hospital room making a new sound that you have never heard before. Then the nurse comes into your room. What do you think could be happening? Why did the nurse come into your room?
Which of these reasons/explanations do you think is the most likely?
1. The nurse wants to check you like he/she does every day.
2. Something really bad is going to happen to you.
3. The nurse forgot to tell you or your parents something and is coming back in.
4. The nurse thinks there must be something really wrong with you.

CHILD SCENARIO #3:
You are alone in your room and notice that your heart is beating fast. What do you think could be happening? Why is your heart beating fast?
Which of these reasons/explanations do you think is the most likely?
1. Your heart beating fast means there is something wrong with you.
2. You are a little nervous, and it's natural for your heart to beat faster when you are nervous.
3. You feel this way because something bad is probably going to happen.
4. Everything's OK, and soon it will stop beating so fast.

CHILD SCENARIO #4:
Your doctor comes in your room and asks to talk to your mom or dad. What do you think could be happening? Why does your doctor want to talk to your mom or dad?
Which of these reasons/explanations do you think is the most likely?
1. Something really bad is going to happen to you.
2. The doctor wants to tell them about what medicines to give you to help you feel better.
3. The doctor thinks there is something wrong with you and wants to tell your parents.
4. The doctor is going on rounds (checking all the children) and wants to ask them how you are doing.

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Research Nontraditional Person/Clinical Research Assistant September 2014 – present

The Stress and Health Lab at Pennsylvania State University University Park, PA
Undergraduate Research Assistant January 2013 - present

Leadership/Activities

HEAL Philanthropic Organization (Benefitting the Penn State IFC/Panhellenic Dance Marathon)
President April 2014- present

Outreach Chair April 2013-March 2014

General Member September 2012-March 2013

Schreyer Honors College Career Development Program Mentor September 2014- Present

Penn State IFC/Panhellenic Dance Marathon (THON)
Special Events Committee Member/Lieutenant Captain September 2013- April 2014

Morale Committee Member/ Arts and Crafts Chair September 2011-April 2013

Professional/Clinical Experience

Penn State University Health Services Clinic Intern Program
Clinic Intern September 2014 – Present

Penn State Global Medical Brigades
Member September 2012-April 2013