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## **A Meta-Analysis of the Association between Appraisals of Trauma and Posttraumatic Stress in Children and Adolescents**

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Running Head: META-ANALYSIS OF TRAUMA APPRAISALS IN CHILDREN

A Meta-Analysis of the Association between Appraisals of Trauma and Posttraumatic Stress  
in Children and Adolescents

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### Abstract

Cognitive models of posttraumatic stress disorder (PTSD) place emphasis on the role of negative appraisals of traumatic events. It is suggested that the way in which the event is appraised determines the extent to which posttraumatic stress symptoms will be experienced. Therefore, a strong relationship between trauma appraisals and symptoms of PTSD might be expected. However, this relationship is not as firmly established in the child and adolescent literature, and this review aimed to address this. A systematic literature review of this relationship returned 467 publications, of which 11 met full eligibility criteria. Random effects meta-analysis revealed a large effect size for the relationship between appraisals and PTSD symptoms in children and adolescents ( $r = .63$ , 95% CI [.58 to .68],  $Z = 17.32$ ;  $p < .001$ ), with significant heterogeneity present. Sensitivity analysis suggested that this relationship was not contingent on one specific measure of appraisals. Results were consistent with the cognitive behavioural theory of PTSD, demonstrating that appraisals of trauma are strongly related to posttraumatic stress in children and adolescents. However, this relationship was not observed in a sample of 4-6 year olds, indicating that further research is required to explicate cognitive processing of trauma in very young children.

A Meta-Analysis of the Association between Appraisals of Trauma and Posttraumatic Stress  
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Posttraumatic stress disorder (PTSD) encompasses a pattern of negative psychological consequences subsequent to experiencing a traumatic event, including intrusive flashbacks, avoidance of trauma-related places/thoughts/feelings; negative alterations in cognition/mood, alterations in arousal/reactivity, and functional impairment in social/occupational domains. Epidemiological studies suggest 5% of adolescents have met criteria for PTSD in their lifetime (Merikangas et al., 2010).

In attempting to explain how trauma may lead to PTSD, cognitive behavioural models have emphasised the role of appraisals (Ehlers & Clark, 2000). It is suggested that the way the event is appraised, (i.e. thought about/given meaning) determines the extent to which symptoms are experienced. Using the Posttraumatic Cognitions Inventory (PTCI), several appraisal types have been shown to discriminate adults with PTSD from those without, including negative cognitions about self/world, and self-blame, (Foa, Ehlers, Clark, Tolin & Orsillo, 1999). However, the three-appraisal structure of the PTCI was not replicated in the children's version (CPTCI; Meiser-Stedman et al., 2009). Rather, Meiser-Stedman et al., (2009) found a two-subscale structure of Permanent and Disturbing Change and Feeble Person in a Scary World.

Both traditional and third wave cognitive theories implicate dysfunctional/unhelpful appraisals in PTSD, and predict a positive relationship between appraisals and symptoms. Multiple cross-sectional and prospective studies support this relationship in adults (Dunmore, Clark & Ehlers, 2001), and children (Hitchcock, Ellis, Williamson & Nixon, 2015; Meiser-Stedman, Dalgleish, Glucksman, Yule & Smith, 2009; Stallard & Smith, 2007), suggesting that appraisals correlate with posttraumatic stress (PTS), and mediate the relationship between initial/later symptoms. However, no comprehensive evaluation of the strength of the

relationship between appraisals and PTS in children and adolescents yet exists. The present review aimed to evaluate and quantify this key theoretical pathway using meta-analysis.

## **Method**

### **Search Strategy**

Studies were identified by searching Web of Science, SCOPUS and Psycinfo databases, up to/including the 21<sup>st</sup> December 2015, with the terms: (PTSD OR 'post-traumatic stress' OR 'posttraumatic stress') AND (appraisal\*) AND (child\* OR adolescen\*).

Eligible studies met the following criteria: (a) included participants aged 18 or under, (b) included quantitative measures of post-trauma appraisals and PTS, (c) included participants who had experienced at least 1 DSM-IV or 5 criterion A stressor, (d) reported a correlation between appraisals and PTS, or this info was obtainable from authors, (e) assessed PTS and appraisals more than 1 month after the traumatic event, (f) were peer reviewed, English language articles.

### **Meta-Analytic Procedure**

MedCalc, version 16.2 was used (MedCalc Software, Ostend, Belgium) to analyze the results. In line with Hedges and Olkin (1983) *r* values were transformed using Fisher's *Z* to correct for standard error skew. For presentation of results, *Z* values were transformed back to *r* values. Given the variability in appraisal/PTSD measures and populations across studies, random effects meta-analysis was selected a-priori.

Heterogeneity of effect sizes was assessed via *Q* and *I*<sup>2</sup> statistics. *Q* tests whether effect sizes are significantly further from the mean than would be expected via sampling error, and *I*<sup>2</sup> estimates a percentage of total variance attributable to variance across studies (Macbeth & Gumley, 2012). *I*<sup>2</sup> heterogeneity values may be interpreted as: 0-40% (minimal), 30-60% (moderate), 50-90% (substantial) and 75-100% (considerable).

PRISMA guidelines were followed (Moher, Liberati, Tetzlaff, & Altman, 2009).

There were no missing data.

## Results

### Selection of Studies

There were 467 publications that were identified; 144 from Psycinfo, 177 from Web of Science, and 146 from SCOPUS. After removing duplicates, 299 articles were screened by abstract and title. From these, 245 were excluded (106 were reviews, dissertations, etc., 105 had participants over 18, 5 were qualitative, 5 were conducted within 1 month of trauma, 25 did not provide quantitative measures of PTS or appraisal of trauma/sequelae, and 3 were not in English). The remaining 50 were full-text screened, and 39 were excluded (2 were reviews, 3 featured participants without trauma exposure, 6 had participants over 18, 7 were conducted within 1 month of exposure, 14 did not measure PTS or appraisals of trauma/sequelae, 3 had data unobtainable from the paper or by request, and 4 used the same sample as another included paper.) Agreement between raters after full-text review was high ( $\kappa = .80$ ).

Disagreement was resolved by discussion and consensus.

The final 11 studies included 4 prospective and 7 cross-sectional studies. A total of 1,578 participants were included, with studies having a mean sample size of 143.45 ( $SD = 119$ , range = 48 to 285) and participants having a weighted mean age of 12.34 (range = 4 to 18).

\*Insert Figure 1.

### Data Extraction and Effect Size Coding

Sample size and correlation coefficient ( $r$ ) values were extracted. Three studies did not present full appraisal scale correlations with PTS. For these studies, mean full appraisal scale correlations were calculated by taking the mean of the subscale correlations, weighted by number of subscale items. Miller et al., (2012), did not present number of items in each

subscale, so an estimated full scale correlation was calculated as the unweighted mean of the subscale correlations with PTS.

### **Effect Size for the Relationship between Trauma Appraisals and PTSD Symptoms**

Table 1 provides information on all included studies. Untransformed effect sizes are presented, along with information on measures, participants, design, age, and gender.

For the relationship between appraisals of trauma and symptoms of PTSD, random effects meta-analysis revealed an aggregate effect size of  $r = .58$ , with 95% confidence intervals between .47 and .67. ( $Z = 8.45$ ;  $p < .001$ ). This large effect size suggests that as trauma appraisals become more severe, so too does PTS. Heterogeneity was high ( $Q = 84.32$ ;  $p < .001$ ), with 88.14% of the variance in effect size due to between study variance ( $I^2 = 88.14$ ; 95% CI = [80.75, 92.69]). As Figure 2 shows, all effect sizes were in the medium/large range, with the exception of Miller et al., (2012), for whom there was no significant effect. Visual inspection of a funnel plot suggested no significant publication bias.

To evaluate the influence of the distant outlier Miller et al. (2012) on the overall effect size, the analysis was rerun with this study excluded. Random effects meta-analysis revealed a large aggregate effect size of  $r = .63$ , (95% CI = [.58, .68];  $Z = 17.32$ ;  $p < .001$ ). Heterogeneity was in the moderate range ( $Q = 19.53$ ;  $p = .021$ ), with 53.91% of the variance in effect size due to between study variance ( $I^2 = 53.91$ ; 95% CI = [5.87, 77.43]).

### **Sensitivity Analysis of Trauma Appraisal Measures**

The CPTCI (Meiser-Stedman et al., 2009) was the most commonly used measure of appraisals, being included in 6 of the 11 studies. Given that the CPTCI has the capability to assess appraisals of all kinds of traumata, and that it has been well- validated, the CPTCI was arguably the most appropriate measure for addressing the primary question in this review. For comprehensiveness, a decision was made to include all appraisal measures at the search

stage. To determine whether this influenced the meta-analysis, a sensitivity analysis was conducted with the more stringent inclusion criteria of CPTCI studies only.

For the relationship between appraisals of trauma and PTSD symptoms, when only studies utilizing the CPTCI were included, meta-analysis revealed a large total effect size of  $r = .65$ , (95% CI = [.59, .70];  $Z = 16.06$ ;  $p < .001$ ). Heterogeneity was moderate ( $Q = 8.49$ ;  $p = .131$ ), with 41.08% of the variance in effect size attributable to variance between studies ( $I^2 = 41.08$ ; 95% CI = [0.00, 76.66]). This effect size is similar to the effect size for the less stringent inclusion criteria with Miller et al. (2012) excluded, suggesting that the results are robust independent of appraisal measure.

### Discussion

A strong positive association between negative appraisals of trauma and symptoms of PTS in children and adolescents was found. Despite heterogeneity in type of trauma and measures of PTS and appraisals, the effect was consistently large across studies ( $r = .45$  to  $.75$ ), except for Miller et al. (2012), supporting the cognitive theory of PTSD. Crucially, this review also tentatively supports the applicability of cognitive models to children and adolescents. However, it should be noted that the CPTCI differs in factor structure from the adult PTCI. The additional factor of self-blame appraisals observed in adults but not children may reflect increased autonomy/responsibility in adulthood. Adults may be more inclined to view themselves as responsible for their circumstances, and thus deserving of blame when unwanted events occur. Nevertheless, the relationships between appraisals in general and trauma symptoms are largely equivalent in children and adults. Moreover, the emphasis on cognition found here supports the introduction of the new symptom cluster of negative alterations in cognition and mood in the DSM 5.

Regarding Miller et al. (2012), the effect size of  $r = -.01$  was a distant outlier in the study. Participants in the Miller et al. study were aged 4 to 6, with a mean of 4.96. The



youngest participant in any other study was 7, and the overall child mean age was 12.34 years. These very young participants may not yet have developed the cognitive capacity to make complex appraisals.

Concerning limitations, the PILOTS database was not searched, potentially overlooking other relevant studies, and the analysis was correlational, preventing casual inferences. The significant heterogeneity implicates multiple other factors across studies. However, findings are consistent with prior theory and prospective research.

In conclusion, this report is the first to summarise research on the relationship between trauma appraisals and PTS in children and adolescents, finding evidence of a strong association. By extension, these results suggest that therapies targeting appraisals may alleviate PTS in children and adolescents.

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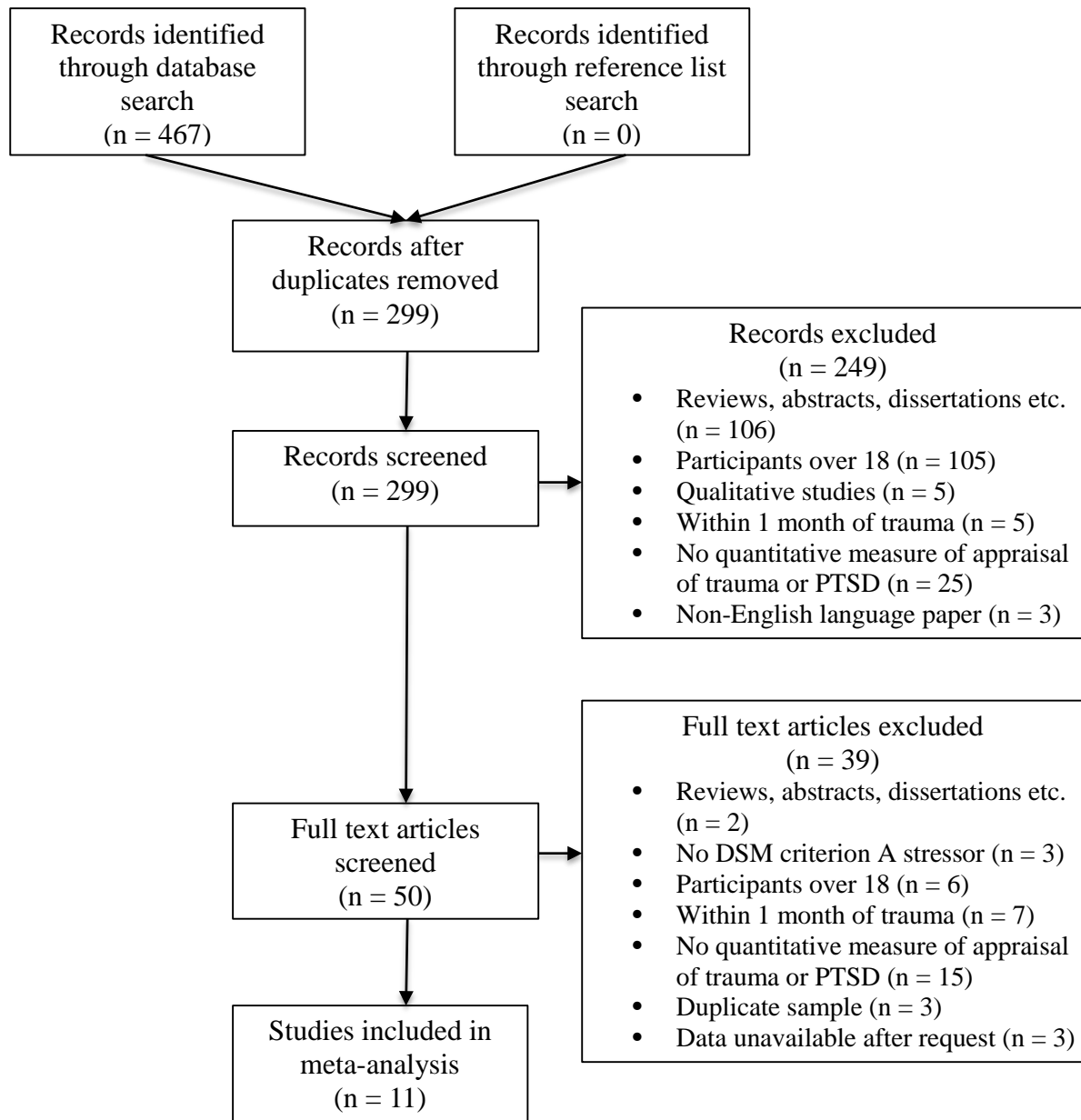


Figure 1: Summary of Search

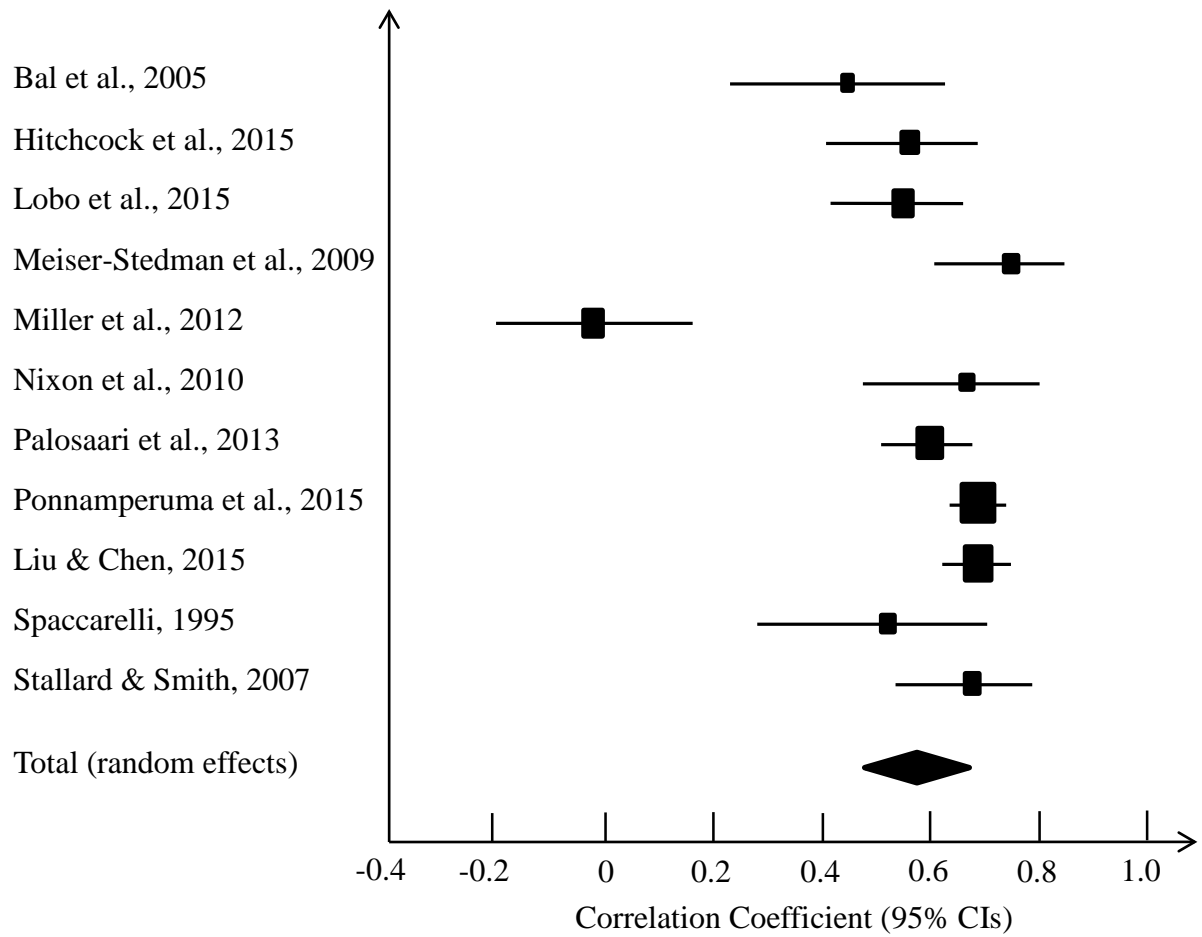


Figure 2: Trauma Appraisals and PTSD Symptoms by Study

Table 1.

*Summary of Included Studies*

Study	<i>n</i>	Measure PTSD	Measure Appraisal	Participants	Design	Mean age	Gender ratio	Full scale <i>r</i>
Bal et al, (2005)	65	TSCC	NASAS	Sexual abuse	Prospective	14.38 (1.72)	84.6% F	.45
Hitchcock et al, (2015)	97	CAPS CPSS	CPTCI	Single incident trauma	Prospective	12.08 (2.8) 7-17	62.9% M	CAPS – .461 CPSS - .663 Mean = .562
Liu & Chen, (2015)	285	Chinese UCLA PTSD index	Chinese CPTCI	Students (trauma exposed)	Cross-sectional	13.5 (2.7) 9-17	43.9%M	.69
Lobo et al, (2015)	131	TSCC	CPTCI	Trauma exposed youth	Cross-sectional	11.3 (2.8) 7-17	58.0% F	.55
Meiser-Stedman et al, (2009)	59	CRIES	CPTCI	Experienced or witnessed	Cross-sectional	14 (1.8) N/A	N/A	.75

				assault/road accident				
Miller et al, (2012)	116	PTSD Semi-Structured Interview and Observational Record for Infants and Young Children (Scheeringa & Zeanah, 1994)	CPIC	Witnessed parental intimate partner violence	Cross- sectional	4.96 (.87) 4-6	51.7% M	-.01
Nixon et al, (2010)	48	CPSS	CPTCI	Potentially traumatic event	Prospective	11.8 (2.67) 7-17	68.7% M	.67
Palosaari et al, (2013)	240	CIES Arabic	CPTCI Arabic	War trauma	Prospective	11.35(0.57) 10-12	N/A	.60 (SEM standardized estimate)
Ponnamperuma et al, (2015)	414	UCLA PSTD-RI	Adapted Stallard	Tsunami	Cross- sectional	13.6 12-16	54.3% F	.69



Smith (2007)								
measure								
Spaccarelli, (1995)	48	Some TSCC items and some from Horowitz (1979)	NASAS	Sexual abuse	Cross- sectional	11-18 median 14	100% F	.48
Stallard & Smith, (2007)	75	CAPS-C	Own Measure	Road accident	Cross- sectional	14.01 (3.36)	50.7% F	.68