

## Effect of Social Cognitive Therapy on Mental Improvement in Post Traumatic Stress Disorder: A Meta-Analysis

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### ABSTRACT

**Background:** Post Traumatic Stress Disorder (PTSD) is a mental disorder that develops after experiencing a very threatening or horrific event. Cognitive behavioral therapy or Cognitive Behavior Therapy (CBT) is one of the most popular therapies. The purpose of this study was to analyze the effect of cognitive behavioral therapy on mental improvement in Post Traumatic Stress Disorder patients.

**Subjects and Method:** This study is a systematic review and meta-analysis using PICO model. Population: Post Traumatic Stress Disorder patients. Intervention: cognitive behavioral therapy. Comparison: no cognitive behavioral therapy. Outcome: Mental Improvement. The online databases used are Google Scholar, PubMed, and Science Direct with keywords (“Post Traumatic Stress Disorder” OR “PTSD”) AND (“Cognitive Behavioral Therapy” OR “Cognitive Behavioral Therapy” OR “CBT”) AND (“Randomized controlled trial” OR “RCT”). There were 9 randomized controlled trial studies published in 2005-2023 that met the inclusion criteria. Analysis was performed using RevMan 5.3.

**Results:** A meta-analysis conducted using 9 RCTs from the United States, Australia, the Netherlands, Sweden, and Thailand. A total sample was 6,088 health workers. Cognitive behavioral therapy reduced PTSD (SMD= -6.32; p= 0.020). Forest plots showed high heterogeneity ( $I^2=73\%$ ; p= 0.003), so analysis was conducted using the random effect model.

**Conclusion:** CBT reduces PTSD.

**Keywords:** cognitive behavior therapy, mental improvement, post traumatic stress disorder, randomized controlled trial

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### BACKGROUND

Post Traumatic Stress Disorder (PTSD) is the most common psychopathological consequence of a traumatic event. There are reports of violence, injuries and deaths

appearing every day in the headlines in the news (Shalev, 2017). Events experienced as initial trauma vary widely, for example due to self-attack, fights, natural disasters, rape, childhood sexual abuse, loss of a loved one,

medical crisis or vehicle accident (Kirkpatrick and Heller, 2014).

Adults worldwide experience traumatic events in their lives more than 70% and 31% of them experience traumatic events four times or more (Shalev, 2017). Meanwhile, in the United States, adults who experience lifelong Post Traumatic Stress Disorder are 7.8%. Women are more at high risk around 20.4% despite experiencing less trauma than men around 8.2% (Heather et al., 2014). More than a third of people report experiencing Post Traumatic Stress Disorder 6 years after they experienced the trauma. There is a 50% chance of remission at 2 years (Shalev, 2017).

Pathophysiology of Post Traumatic Stress Disorder is conceptualized as a failure to recover in part due to the learning of altered fear, that is, a failure to extinguish a behavioral response to trauma-related stimuli. After trauma, the symptoms of Post Traumatic Stress Disorder are almost universal. However, many people are eventually able to deal with frightening stimuli such as memories, reminders, or visual cues with gradual reduction of fear. When this decline does occur, people tend to develop cognitive and avoidance strategies in an attempt to avoid distressing emotions. Furthermore, this strategy interferes with fear extinction by limiting exposure to safe reminders (Kirkpatrick and Heller, 2014).

Post Traumatic Stress Disorder is a mental disorder that develops after experiencing a very threatening or horrific event (Bisson et al., 2015). Patients with Post Traumatic Stress Disorder have a high risk of experiencing poor physical health including somatoform, cardiorespiratory, musculoskeletal, gastrointestinal and immunological disorders (Bisson et al., 2015).

Post Traumatic Stress Disorder therapy can be done pharmacotherapy and non-pharmacotherapy. Cognitive behavioral

therapy or Cognitive Behavior Therapy (CBT) is one of the most popular therapies. The best evidence for remission of Post Traumatic Stress Disorder symptoms is cognitive behavioral therapy. Cognitive behavioral therapy engages patients in challenging dysfunctional beliefs about the world or themselves while engaging patients in healthier behaviors such as exercise, sleep management, social activities and substance abuse management (Kirkpatrick and Heller, 2014). Cognitive behavioral therapy that focuses on trauma is the most supported psychological intervention for Post Traumatic Stress Disorder. cognitive behavioral therapy revisits the complicating elements of the traumatic event and the consequences of avoidance and cognitive distortions (Shalev, 2017).

Systematic review is a method used to synthesize data in primary research by utilizing existing data through a systematic-explicit search process to identify the data listed in the review (Gray et al., 2018). Meanwhile, meta-analysis is an epidemiological study that aims to statistically combine and combine primary research data that discusses the same hypothesis so as to obtain quantitative summary results (Mikolajewicz and Komarova, 2019). This research is expected to prove the effect of cognitive behavioral therapy on mental improvement in Post Traumatic Stress Disorder patients.

The specific objective of this study was to analyze the effect of cognitive behavioral therapy on mental improvement in Post Traumatic Stress Disorder patients using a meta-analysis based on primary studies conducted in previous studies.

## **SUBJECTS AND METHOD**

### **1. Study Design**

This study uses a systematic review method and meta-analysis using primary data, namely data from previous research results.

Search for articles using 3 databases, namely: Google Scholar, PubMed and Science direct using the search key "Post Traumatic Stress Disorder" OR "PTSD" AND "Cognitive Behavioral Therapy" OR "Cognitive Behavioral Therapy" OR "CBT" AND "Randomized controlled trial" OR "RCTs". After searching using these keywords, there were 9 primary studies that met the inclusion criteria of this study.

## 2. Steps of Meta-Analysis

Meta analysis was carried out in 5 steps as follows:

- 1) Formulate research questions in PICO format (Population, Intervention, Control/Comparisons, Outcomes).
- 2) Search for articles from various databases PubMed, Embase, Web of Science, ScienceDirect, Google Scholar.
- 3) Screening and conducting critical appraisal on primary studies with the Critical Appraisal Checklist for Randomized Controlled Trials from the Critical Appraisal Skills Program (CASP).
- 4) Perform data extraction and enter the effect size of each primary study into the RevMan 5.3 application.
- 5) Draw conclusions from the results of the research.

## 2. Inclusion Criteria

Full paper articles using the Randomized Control Trial (RCT) study design, the size of the relationship used is the Mean SD, the research subjects were Post Traumatic Stress Disorder patients, the intervention given is cognitive behavioral therapy, the research outcome is mental improvement.

## 3. Exclusion Criteria

Articles published in languages other than English and Indonesian, articles before 2005.

## 4. Operational Definition of Variables

**Post Traumatic Stress Disorder** is a disorder in which a person who directly

experiences a traumatic event develops a series of distinctive symptoms.

**Cognitive behavioral therapy** is an active, problem-focused, and time-sensitive treatment approach that aims to reduce emotional distress and increase adaptive behavior in patients with a number of mental health and adjustment problems.

**Mental improvement** is a decrease in symptoms as measured by CAPS, PDS, PTSD-RI, and PSS criteria. A 5-point ordinal rating scale was used to measure the severity of symptoms.

## 6. Study Instruments

The quality assessment of the main articles in this study used a critical assessment checklist for Randomized Controlled Trial studies published by the Joanna Briggs Institute (JBI).

## 7. Data Analysis

The articles in this study were collected using the PRISMA diagram and analyzed using the Review Manager 5.3 application (RevMan 5.3) by calculating the effect size and heterogeneity ( $I^2$ ) to determine the combined research model and form the final results of the meta-analysis. The results of data analysis are presented in the form of forest plots and funnel plots.

## RESULTS

The process of searching for primary articles related to the effect of cognitive behavioral therapy on mental improvement in Post traumatic Stress Disorder patients in this meta-analysis study was carried out on 3 online databases and the results obtained were 9 articles from 5 countries, namely the United States, Australia, the Netherlands, Sweden and Thailand which can be seen in Figure 1 PRISMA Flow Diagram. The total articles in the initial search process were 451 articles with details of 76 articles from the PubMed database, 321 articles from the Google Scholar database, and 54 articles from the Science Direct database. Then, 122

articles were removed and 54 full text articles met the requirements. Full articles are included in the exclusion criteria because the outcomes of the study do not match the criteria applied and articles do not include a standard deviation (SD). The final result of the article review process, there are 9 articles that meet the quantitative requirements for a meta-analysis of the effect of cognitive behavioral therapy on mental improvement in patients with Post Traumatic Stress Disorder.

Figure 2 shows the distribution area of the 9 primary articles used in this study, originating from 4 continents, i.e America, Europe, Asia and Australia. Which consists of the United States, the Netherlands, Sweden, Australia and Thailand.

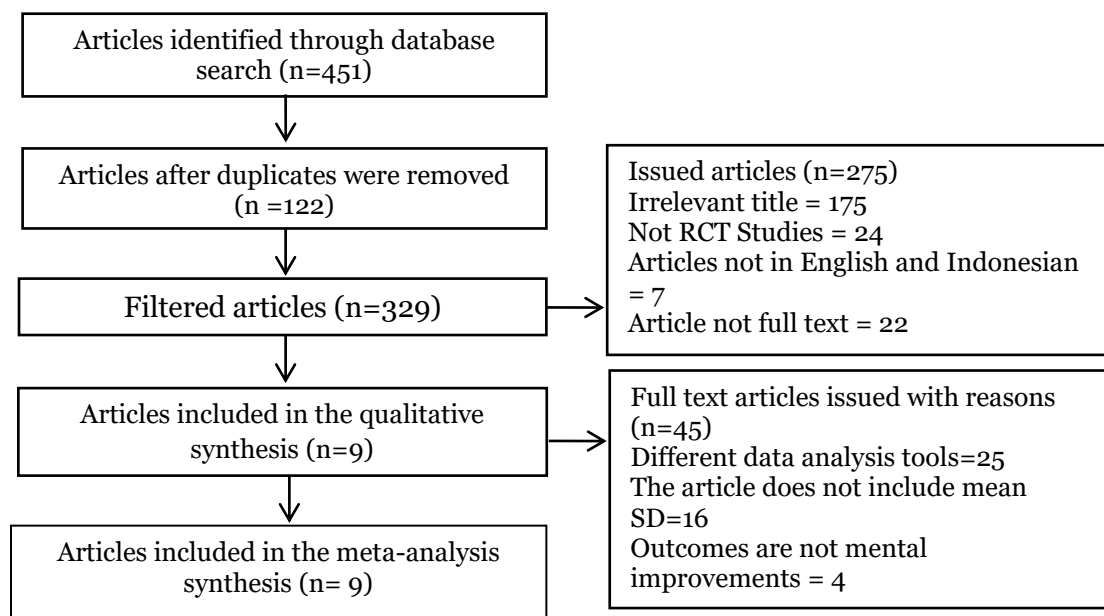
Table 1 shows the results of the primary research quality assessment used for this study. The assessment of the quality

of the primary studies in this study was carried out using the Randomized Controlled Trial study by JBI (Joanna Briggs Institute, 2017).

Based on the results obtained from the study quality assessment, the total score in the 9 selected primary studies was around 13. This indicates that the quality of all primary articles used in this study is worthy of meta-analysis.

Table 2 presents descriptions of 9 randomized controlled trial study articles as a source of meta-analysis of the effect of cognitive behavioral therapy on mental improvement in patients with Post Traumatic Stress Disorder, with a total sample of 557 samples.

Table 3 presents the Mean Standard Deviation Data (Mean SD) on the effect of Cognitive Behavior Therapy on patients with Post Traumatic Stress Disorder.



**Figure 1. PRISMA flowchart diagram of Social Cognitive Therapy on Mental Improvement in Post Traumatic Stress Disorder**



**Figure 2. Map of the study area of the effect of cognitive behavioral therapy on mental improvement in Post Traumatic Stress Disorder patients**

**Tabel 1. Critical appraisal checklist for randomized controlled trial dari critical appraisal skills programme (CASP)**

Author (Years)	Criteria of Questions													Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	
Bryan et al., (2011)	1	1	1	1	1	1	1	1	1	1	1	1	0	12
Pityaratstia et al., (2014)	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Kledow et al., (2017)	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Smith et al., (2007)	1	1	1	1	1	1	1	1	1	1	1	1	0	12
Mueser et al., (2008)	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Sloan et al., (2018)	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Nixon et al., (2016)	1	1	1	1	1	1	1	1	1	1	1	1	0	12
Ivarson et al., (2014)	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Diehle et al., (2014)	1	1	1	1	1	1	1	1	1	1	1	1	1	13

**Description of the question criteria:**

- 1 = Was randomization properly used for assigning participants to treatment groups?
- 2 = Are allocations for treatment groups hidden?
- 3 = Were the treatment groups similar at baseline?
- 4 = Did the participant not know about the treatment assignment?
- 5 = Are those providing the treatment blind to the treatment assignment?
- 6 = Was the outcome rater blind to treatment assignment?
- 7 = Were the treatment groups treated identically apart from the intervention of interest?
- 8 = Was follow-up completed and if not, were there differences between the groups in terms of their follow-up adequately explained and analyzed?
- 9 = Were participants analyzed in randomized groups?
- 10 = Were outcomes measured in the same way for the treatment groups?
- 11 = Are the results measured in a reliable way?
- 12 = Was proper statistical analysis used?

13 = Was the trial design appropriate, and were any deviations from the standard RCT design (individual randomization, parallel group) noted in trial conduct and analysis?

**Description of the answer score:**

- 0 = No
- 1 = Yes

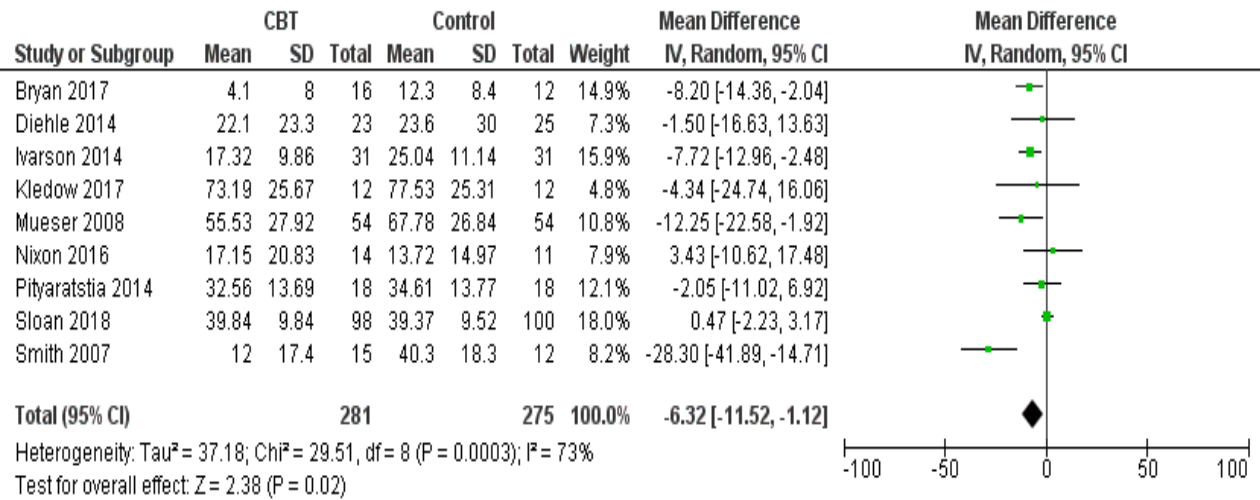
**Table 2. Table PICO summary of cross-sectional articles from primary study sources with sample size (n = 557)**

Author (Year)	Country	Sample	P	I	C	O
Bryan et al., (2011)	Thailand	28	Children 10-15 years	Given CBT (GCBT)	Not given CBT (GPCT)	Mental repair (PSS, BDI II)
Pityaratstia et al., (2014)	Thailand	29	Adult >17 years	Given CBT (GCBT)	Not given CBT (TAU)	Mental improvement (PTSD-RI)
Kledow et al., (2017)	USA	27	Adults 8-18 years	Given CBT	Not given CBT (WL)	Mental improvement (CAPS)
Smith et al., (2007)	USA	24	Age >18 years	Given CBT	Not given CBT (CT)	Mental improvement (CAPS, CPSS)
Mueser et al., (2008)	USA	108	Adult > 18 years	Given CBT	Not given CBT (TAU)	Mental improvement (CAPS, BDI II)
Sloan et al., (2018)	USA	198	Age>18 years	Given CBT	Not given CBT (EMDR)	Mental improvement (CAPS)
Nixon et al., (2016)	Australia	33	Children 7-17 years	Given CBT (GCBT)	Not given CBT (WL)	Mental improvement (CAPS)
Ivarson et al., (2014)	Swedia	62	Adult >18 years	Given CBT	Not given CBT (WL)	Mental repair (PDS, BDI II)
Diehle et al., (2014)	Netherland	48	Adult > 18 years	Given CBT	Not given CBT	Mental repair (CAPS CA)

**Table 3. Mean Standard Deviation (Mean SD) data on the effect of Cognitive Behavior Therapy on patients with Post Traumatic Stress Disorder (n=557)**

Author	CBT		Control	
	Mean	SD	Mean	SD
Bryan et al.,	4.1	8.0	12.3	8.4
Pityaratstia et al.,	32.56	13.69	34.61	13.77
Kledow et al.,	73.19	25.67	77.53	25.31
Smith et al.,	12.0	17.4	40.3	18.3
Mueser et al.,	55.53	27.92	67.78	26.84
Sloan et al.,	39.84	9.84	39.37	9.52
Nixon et al.,	17.15	20.83	13.72	14.97
Ivarson et al.,	17.32	9.86	25.04	11.14
Diehle et al.,	22.1	23.3	23.6	30.0

**1. Forest Plot**

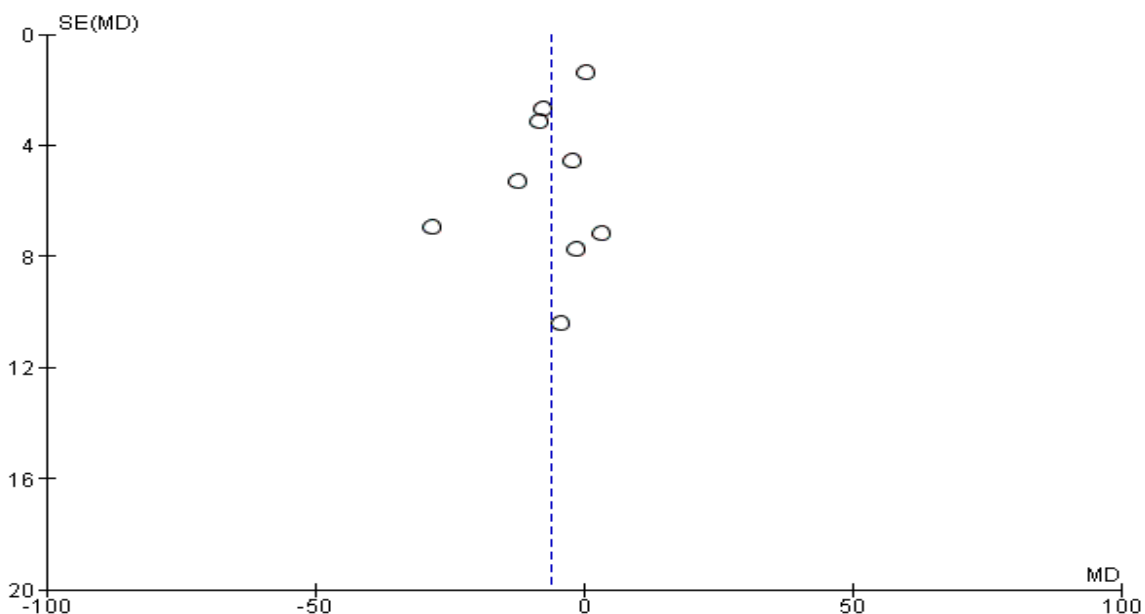


**Figure 3. Forest Plot Effect of Cognitive Behavioral Therapy on Mental Improvement in Post Traumatic Stress Disorder Patients**

The Forest Plot in Figure 3 shows that there is an effect of cognitive behavioral therapy on the mental improvement of Post Traumatic Stress Disorder. Patients who received cognitive behavioral therapy had a Post Traumatic Stress Disorder score of 6.32, which was lower than those without

cognitive behavioral therapy and was statistically significant (p=0.020). Forest plots also show high heterogeneity of effect estimates between primary studies (I<sup>2</sup>= 73%; p= 0.003). Thus the calculation of the effect is done by using the random effect model approach.

**2. Funnel Plot**



**Figure 4. Funnel Plot of the Effect of Cognitive Behavioral Therapy on Mental Improvement in Post-Traumatic Stress Disorder Patients**

## DISCUSSION

This systematic study and meta-analysis research raised the theme of the effect of cognitive behavioral therapy on mental improvement in Post Traumatic Stress Disorder patients. This study discusses symptom improvement data which is considered important because of the high level of stress in Post Traumatic Stress Disorder patients.

Confounding factors affect the relationship or effect of exposure to the occurrence of disease which is estimated (estimated) by the study is not the same as the relationship or effect that actually occurs in the target population (target population), or the study results are invalid (incorrect) (Murti, 2018a). This systematic review and meta-analysis research uses research that has controlled for confounding factors which can be seen from the research inclusion requirements, namely the standardized mean difference.

Estimated combined effect of cognitive behavioral therapy on mental improvement in Post Traumatic Stress Disorder patients was processed using RevMan 5.3 for continuous data. The estimation of the determinant effect uses the effect size or the standardized mean difference on the bivariate data of the two groups which have been controlled for by randomization for confounding factors.

The results of systematic reviews and meta-analyses are presented in the form of forest plots and funnel plots. The forest plot displays information from each study examined in the meta-analysis and estimates the results of the entire study (Murti, 2018a). Forest plots visually show the amount of variation (heterogeneity) between study results (Akobeng in Murti, 2018a).

The primary research included in this meta-analysis totaled 9 articles originating from Thailand, the United States, Australia, Sweden, the Netherlands with a sample size

of 566. This meta-analysis concluded that there was an effect of cognitive behavioral therapy on mental improvement in Post Traumatic Stress patients. Disorder (SMD= -6.32; 95% CI= -11.52 to -1.12; p=0.020). This meta-analysis demonstrated high heterogeneity of effect estimates between primary studies ( $I^2 = 73\%$ ;  $p = 0.0003$ ). Thus, the calculation of the estimated effect is carried out using the random effect model approach. The funnel plot shows no publication bias.

Research conducted by Mueser et al (2008) states that the most common traumatic events that cause clients to report Post Traumatic Stress Disorder are childhood sexual abuse 34%, followed by physical violence in childhood 17%, sudden death of a person. loved one 15%, adult sexual assault 13%, adult physical assault 11%, other traumatic event 4%, sexual and physical assault 2%, witnessing violence 2%, motor vehicle accident 1%, and fighting 1%. Among 54 clients assigned to cognitive behavioral therapy, 81% were exposed to six or more treatment sessions and 70% completed a program of 12 to 16 sessions.

Actively, the severity of Post Traumatic Stress Disorder symptoms can vary with other psychiatric symptoms in clients with severe mental disorders, so that some clients meet the diagnostic criteria for Post Traumatic Stress Disorder intermittently because symptoms fluctuate from time to time. In line with this, severe Post Traumatic Stress Disorder (based on CAPS–Total score - 65) has been shown to be more stable over short periods of time (1–2 weeks) than mild to moderate Post Traumatic Stress Disorder (Mueser et al., 2001). In this study, clients with severe Post Traumatic Stress Disorder benefited more from the CBT program in terms of severity and diagnosis of Post Traumatic Stress Disorder compared to



those with mild-moderate symptoms (Mueser et al., 2008).

Research conducted by Nixon et al (2016) states that imputation, lack of reported symptoms. Although our analysis of long-term outcomes in children has been a strength of the present study is the examination of symptoms who are currently receiving trauma-focused CBT or CT interventions showing ongoing and further trauma as a moderator that post-treatment outcomes are maintained at 1-year follow-up. In terms of potential long-term outcomes, we did not assess specific factors, trauma-related symptoms (Post Traumatic Stress Disorder, unhelpful beliefs) and other important factors including the child's perception of support correlated with PTSD (generalized anxiety, depression) all indicated social support (known to influence child symptoms and outcomes; significant reduction relative to pre-treatment levels (Changes Cohen and Mannarino, 1998; Hitchcock, Ellis, Williamson and Nixon, this is corroborated by reports of mothers on CBCL, and reductions in symptoms of mothers, 2015), we also did not measure stressors non-traumatic Post Traumatic Stress Disorder is maintained. Over time, we observe fewer differences (eg moving, family financial stress). We did not assess outcomes between the two treatment groups for most of the measurements. possible mechanisms that would explain our findings In general symptoms appear to improve over time and with prior follow-up on the moderating role of the mother's adjustment; it was further 1 year, the treatment change effect size for the Post Traumatic Stress Disorder procedure was, ranging between 2.03 and 3.40, and most of the other treatments showed a large treatment effect (D 1.0).

Research conducted by Byan et al (2017) stated that CBT resulted in a marked

reduction in complicated grief reactions. Recent trials of CBT including exposure-based therapy, often supplemented with other strategies to reduce grief (eg, promoting positive memories of the deceased, goal setting) have been successful in reducing symptoms of grief (27,28). The current trial adds to evidence that treatment strategies applied to Post Traumatic Stress Disorder (exposure, cognitive restructuring) have benefits in reducing persistent grief, and suggest that similar mechanisms of change may be involved in reducing this symptom. We note that the conclusions of this study are limited by the small sample size, lack of independent fidelity checks, and short-term follow-up. This limitation is unavoidable due to the hazardous context in which the trials were carried out and the limited resources available in southern Thailand. Nonetheless, this trial is the first demonstration that culturally adapted CBT is effective in reducing Post Traumatic Stress Disorder, depression, and grief reactions in the context of ongoing terrorist attacks.

Then research conducted by Ivarson et al (2014) showed that the treatment program was effective in reducing Post Traumatic Stress Disorder symptoms, with large effects within and between groups, and the results were largely maintained one year later. In terms of response rates, the treatment group was superior to the control group, with a greater proportion of participants in the treatment group showing no Post Traumatic Stress Disorder diagnosis, reliable changes, and clinical global improvements.

Research conducted by Kledow et al (2017) states that the CBT program used in the study (Mueser et al., 2009) is different from other trauma-focused treatments for Post Traumatic Stress Disorder and from stage-based treatments for PTSD and comorbid BPD, and may prove to be a viable

alternative. CBT programs are most similar to Cognitive Processing Therapy (Resick et al., 2014) in that both approaches focus primarily on cognitive restructuring, but differ in several important ways. First, CBT programs were originally designed for individuals with severe mental illness, and thus accommodate challenges such as cognitive impairment, higher sensitivity to stress, psychotic symptoms, and greater emotional dysregulation. For example, early in care, clients are taught breathing exercises to manage stress and are involved in safety planning around suicidal ideation and intentions. Second, CBT programs do not begin with participants writing narratives of their traumatic events and dealing with cognitions about those traumas. The main focus in the CBT program is to teach cognitive restructuring as a self-management skill for dealing with negative emotions through identifying, examining, and changing associated inaccurate thoughts.

Furthermore, research conducted by Smith et al (2007) states that the main findings of this study are summarized as follows. First, after a 4-week symptom monitoring period, 24% of young people with a primary diagnosis of Post Traumatic Stress Disorder improved to the point where they no longer met criteria for the disorder. Second, relative to WL control conditions, trauma-focused CBT resulted in significant reductions in PTSD, depression, and anxiety symptoms; significantly greater recovery from Post Traumatic Stress Disorder (92% compared to 42% in the WL group); and a significant increase in functionality. This treatment is acceptable to young people and families because there are no dropouts and no adverse effects from cognitive behavioral therapy. Specifically, although treatment included addressing the highly traumatic event, none of the patients demonstrated an

overall reduction in Post Traumatic Stress Disorder symptoms.

#### **AUTHOR CONTRIBUTIONS**

Yovita Galuh is the principal researcher who selects topics, searches and collects articles, analyzes data and writes manuscripts. Hanung Prasetya and Bhisma Murti helped analyze the data and review research documents.

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#### **CONFLICT OF INTEREST**

There is no conflict of interest in this study.

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