

Breathing Focused Mind-Body Approach for Treatment of Posttraumatic Stress Disorder among Children and Adolescents: A Systematic Review

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Abstract

Background: Numerous forms of breathing techniques have been frequently incorporated in treatment of Posttraumatic Stress Disorder (PTSD) for children and adolescents. Whereas major treatment approach such as Trauma-Focused Cognitive Behavioural Therapy (TF-CBT) has incorporated breathing techniques as an auxiliary function to teach relaxation skills, mind-body approach has utilized different kinds of breathing techniques as primary components of intervention. Mind-body approach has been used as an alternative to TF-CBT for both adults and children, and found to be effective in varying degree for adult PTSD. Most of the systematic review on child PTSD has been conducted on TF-CBT and a systematic review on mind-body approach has been limited to adults PTSD. Hence we decided to conduct a systematic review of published articles on PTSD treatment using mind-body approach with breathing as a primary component for children and adolescents.

Methods: We searched PsychINFO, MEDLINE, Web of Science, and PubMed for eligible articles in addition to hand searching references of the related articles. Interventions that incorporate breathing techniques but do not identify such techniques as a primary component (e.g., TF-CBT) were excluded from the search.

Results: The review found only one Randomized Controlled Trial (RCT), two open trials, and one randomized comparative trial. No quantitative analysis was conducted due to insufficient numbers of studies and statistical heterogeneity. Hence data was synthesized qualitatively.

Conclusions: There is a relative lack of research in breathing techniques and mind-body approach on child and adolescent PTSD. Preliminary data suggest that mind-body approach may be effective for high school students traumatized by war and political conflict, and may be as effective as exposure treatment for children and adolescents traumatized by war and tsunami. Age is a potential factor impacting the efficacy of the approach but is yet to be researched further. Future research is necessary for more controlled trials and large-scale comparison trials, but mind-body approach can be a promising alternative to TF-CBT.

Background

Children who were exposed to traumatic events such as natural disasters are reported to be vulnerable to PTSD more so than adults [1,2]. PTSD is a trauma and stressor-related disorders triggered by direct/indirect exposure to traumatic events including natural and man-made disasters [3] (American Psychiatric Association, 2013). According to the DSM-V, symptoms of PTSD include intrusion such as re-experiencing, alterations in arousal and reactivity such as in hyper arousal, avoidance of the trauma related stimuli, and negative alterations in cognitions and moods such as persistent negative emotions. Diagnosis of PTSD require for these symptoms to cause significant distress or impairment in daily functioning for more than 1 month. Psychological impact of children and adolescents who have been exposed to significant trauma also includes decreased cognitive capacity, verbal functions, lower academic performance, more challenges with interpersonal relationships and self-esteem [4,5].

When traumatic incidents hit the areas with limited mental health resources as in many cases including the Great East Japan Earthquake which devastated mostly rural areas of Tohoku region, it is a challenge to allocate mental health professionals and/or send professionals to the affected areas. This results in disparities in resources among equally affected areas. These challenges pose a need for interventions that can be easily implemented by trained non-professionals and prove to be effective.

Among treatment approaches for children and adolescent PTSD, Trauma Focused Cognitive Behavioral Therapy (TF-CBT) is the most researched with evidence and first-line therapy for PTSD [6,7].

However, potential challenges are indicated for TF-CBT. Some patients are reported to be vulnerable to initial adverse effects after exposure, which is a major component of TF-CBT [8-10]. Another potential challenge is its' feasibility in areas that lack mental health resources. TF-CBT is typically facilitated by mental health professionals who are trained in the method but it could be a challenge to allocate or to have access to such therapists.

Breathing techniques used in relaxation and meditation are easily taught and learned, and are known to reduce symptoms of anxiety, prevent hyperventilation, stress reaction [11]. According to Benson [11], breathing related techniques bring physiological changes to our brain. More brain waves associated with relaxation (i.e., alpha) were observed and less oxygen consumption, lower heart rate, and blood pressure were reported during meditative state [11]. These skills are reported to increase sense of control and decrease anxiety [12].

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Breathing techniques have been integrated into many treatment approaches for PTSD among children. For instance in TF-CBT, breathing techniques are taught as a part of relaxation and affective modulation skills for managing physiological and emotional stress, among other essential components such as exposure and cognitive restructuring [13]. Children and parents are taught several relaxation skills (e.g., focused breathing, progressive muscle relaxation), and encouraged to practice at home, and checked back in during each session. Variants of TF-CBT have been developed (e.g., Cognitive Behavioral Intervention for Trauma in Schools, Trauma and Grief Component Therapy) and relaxation skills have been incorporated consistently in these interventions [14,15].

On the other hand, many alternative interventions to first-line TF-CBT have used breathing techniques as a primary component of interventions. Such approach is defined as a mind-body approach or mind-body medicine and typically includes meditation, relaxation, and exercise therapy and, is often used as alternative or complementary therapies for PTSD [16].

Mind-body approach has been researched with increasing interest for treatment of PTSD among the veterans in the US (U.S. Department of Veterans Affairs) [16]. Among Complementary and Alternative Medicine (CAM), the most commonly utilized interventions included mindfulness and relaxation techniques involving breathing and muscle relaxation, offered by more than 50% of PTSD treatment programs in the VA [16]. A systematic review by Strauss et al. [17] suggests that, at least for adult PTSD, breathing and muscle relaxation interventions as well as meditation are promising but, need for better designed investigations with scientific rigor was noted as a limitation.

Mindfulness training, in which breathing is used as a way to cultivate awareness of here and now in the context of meditation, has been known to reduce anxiety among children and adolescents [18], though study has not been conducted for children with PTSD. In recent years, a number of mind-body approaches have been developed for children and adolescent with PTSD and their efficacy has been examined. Yet most of the RCT has been conducted to examine the efficacy of TF-CBT or variants of CBT. While there are numerous systematic reviews of TF-CBT, review of mind-body approach for children and adolescent PTSD is almost non-existent. We decided to conduct a systematic review on PTSD treatment using breathing focused mind-body approach for children.

Methods

Search strategy

A systematic review of clinical trials on efficacy of breathing focused mind-body approach to treat PTSD symptoms among children was conducted. The following electronic databases were searched through 2014: PubMed, MEDLINE (1946-), PsychINFO (1967-), Web of Science. The search was limited to English and Japanese languages. The following keywords were used: PTSD/posttraumatic stress disorder/post-traumatic stress disorder/trauma/traumatized, randomized control trial/RCT/randomized clinical trial/randomized trial/clinical trial, breathing/relaxation/mind-body/meditation/mindfulness, and children/child/adolescents. In addition to the electronic databases, we also retrieved a previously published systematic review on PTSD

treatment for children and on mind-body approach for adults, and hand-searched the references.

Study Selection

Studies were included if they involved children and adolescents diagnosed with PTSD or those who met the criteria for PTSD and if they involved research on mind-body interventions for PTSD incorporating breathing technique such as deep breathing and relaxation exercise as a predominant feature of the program. Studies were excluded if breathing technique is not identified as a predominant feature. Hence such programs as TF-CBT were excluded even though the program uses breathing exercise. Theoretical articles, reviews, book chapters, theses, case studies were also excluded.

Results

Systematic review

The systematic literature search identified 56 references as a result of the electronic data search summed from all the databases searched. The final result of the search can be found in the flowchart (Figure 1), and the list of 17 articles screened can be found in Table 1. After screening titles and abstracts, we excluded 11 non-relevant articles. The 6 remaining articles were retrieved in full text for formal review. After full review, one study was excluded because the predominant feature was imagery exposure through hypnotic guidance and another was excluded as it was a combination of CBT and mind-body skills.

We identified only 1 RCT from the full systematic review. Other studies were 2 open trials and 1 randomized trial without controls. There were not sufficient studies to perform meta-analysis. Hence qualitative synthesis was conducted. Summary of study characteristics can be found in Table 2.

Gordon et al. [19] conducted a first RCT of mind-body approach with eighty-two war-traumatized adolescents in Kosovo 5 years after the war who met criteria for PTSD according to the Harvard Trauma

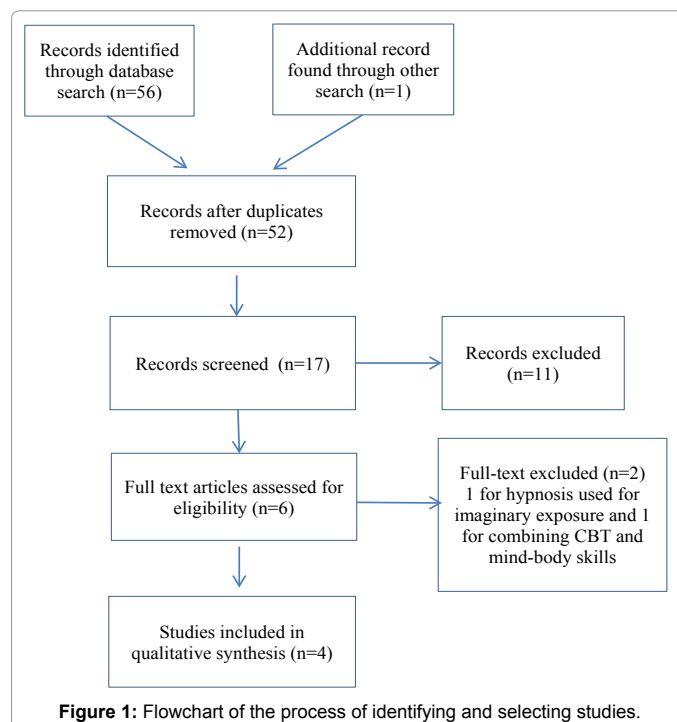


Figure 1: Flowchart of the process of identifying and selecting studies.

| | |
|--|---|
| Berger R, Pat-Horenczyk R, Gekkopf M (2007) | School-based intervention for prevention and treatment of elementary students' terror-related distress in Israel: A quasi-randomized controlled trial. <i>Journal of Traumatic Stress</i> 20(4): 541-555. |
| Catani C, Kohiladevy M, Ruf M, Schauer E, Elbert T, et al. (2009) | Treating children traumatized by war and tsunami: a comparison between exposure therapy and meditation-relaxation in North-East Sri Lanka. <i>BMC Psychiatry</i> 9 (22): 5. |
| Cohen JA, Mannarino AP (2008) | Trauma-focused cognitive behavioural therapy for children and parents. <i>Child and adolescent mental health</i> 13(4): 158-162. |
| DeRosa RR, Rathus JH (2013) | Treating complex traumatic stress disorders in children and adolescents: scientific foundations and therapeutic models. In Ford JD, Courtois CA editors. <i>Dialectical behavior therapy with adolescents</i> . New York, Guilford Press. p. 368. |
| Dorsey S, Briggs EC, Woords, BA (2011) | Cognitive-behavioral treatment for posttraumatic stress disorder in children and adolescents. <i>Child and adolescent psychiatric clinics of North America</i> 20(2): 255-269. |
| Echeburua E, de Corral P, Zubizarreta I, Sarasa B (1997) | Psychological treatment of chronic posttraumatic stress disorder in victims of sexual aggression. <i>Behavior Modification</i> 21(4): 433-456. |
| Fernandez S, Demarni Cromer L, Borntrager C, Swopes R, Hansen RF et al. (2013) | A case series: cognitive-behavioral treatment (exposure, relaxation, and rescripting therapy) experienced by children. <i>Clinical Case Studies</i> 12 (1): 39-58. |
| Foa, EB, Street GP (2001) | Women and traumatic events. <i>Journal of Clinical Psychiatry</i> 62(17): 29-34. |
| Forman-Hoffman V, McKeeman J, Zolotor A, Blanco R, Lyod S (2013) | Child and adolescent exposure to trauma: comparative effectiveness of interventions addressing trauma other than maltreatment or family violence. <i>AHRQ Comparative Effectiveness Reviews</i> . |
| Gordon JS, Staples JK, Blyta A, Bytyqi M (2004) | Treatment of posttraumatic stress disorder in postwar Kosovo high school students using mind-body skills groups: a pilot study. <i>Journal of Traumatic Stress</i> 17(2): 143-146. |
| Gordon JS, Staples JK, Blyta A, Bytyqi M, Wilson AT (2008) | Treatment of posttraumatic stress disorder in postwar Kosovar adolescents using mind-body skills group: A randomized controlled trial. <i>Journal of Clinical Psychiatry</i> 69(9): 1469-1476. |
| Heike M, Parzer P, Resch F, Brunner R (2005) | Psychosocial support for war-traumatized child and adolescent refugees: evaluation of a short-term treatment program. <i>Australian and New Zealand Journal of Psychiatry</i> 39 (1-2): 81-87. |
| Kimbrough E, Magyar T, Langenberg P, Chesney M, Berman B (2010) | Mindfulness intervention for child abuse survivors. <i>Journal of Clinical Psychology</i> 66(1): 17-33. |
| King NJ, Tonge BJ, Mullen P, Myerson N, Heyne D et al. (2000) | Treating sexually abused children with posttraumatic stress symptoms: a randomized clinical trial. <i>Journal of American Academy of Child Adolescence Psychiatry</i> 39(11): 1347-1355. |
| Lesmana CB, Suryani LK, Jensen GD, Tiliopoulos N (2009) | A spiritual-hypnosis assisted treatment of children with PTSD after the 2002 Bali terrorist attack. <i>American Journal of Clinical Hypnotherapy</i> . 52(1): 23-34. |
| Ralfsnes ES, Idsoe T (2011) | School-based intervention program for PTSD symptoms: A review and meta-analysis. <i>Journal of Traumatic Stress</i> , 24(2): 155-165. |
| Staples JK, Abdel A, Jamil A, Gordon JS, et al. (2011) | Mind-body skills group for posttraumatic stress and depression symptoms in Palestinian in Gaza. <i>International Journal of Stress Management</i> 18(3): 246-262. |

Table 1: List of studies screened.

| | Intervention | Study design (n) | Trauma and location | Duration | Outcome measures * |
|-----------------------|--|-------------------------|--|-----------------------|---|
| Catani et al. (2009) | Meditation-relaxation vs. Narrative Exposure Therapy | Randomized trial (n=31) | Children traumatized by war and tsunami in Sri Lanka | 6 sessions | UPID, five item scale to assess problems in functioning, five questions related to the tsunami experience |
| Gordon et al. (2008) | Mind-body skills group vs. Delayed intervention | RCT (n=82) | Adolescents exposed to war in Kosovo | 12 sessions (6 weeks) | HTQ |
| Staples et al. (2011) | Mind-body skills group | Open trial (n=129) | Children and adolescents exposed to political violence in Gaza | 10 sessions (5 weeks) | CPSS |
| Gordon et al. (2004) | Mind-body skills group | Open trial (n=139) | Adolescents exposed to war in Kosovo | 6 sessions (6 weeks) | PTSD Reaction Index |

*Outcome measures limited to those relevant to current review (i.e., PTSD related)

Abbreviations: UPID = UCLA PTSD Index for DSM-IV, HTQ = Harvard Trauma Questionnaire, CPSS = Child PTSD Symptom Scale

Table 2: Summary of study characteristics.

Questionnaire. Participants were all the students at local high school who were identified to meet the PTSD criteria as a result of screening to determine eligibility. Participants were stratified by gender and then randomly assigned to mind-body skills program (n=41) or to wait-list control group (n=41). The program consisted of 2 hours twice a week sessions for 6 weeks (12 sessions in total) and was facilitated by the school's teachers who were trained by The Center for Mind-Body Medicine (CMBM). The program taught such mind-body techniques as guided imagery, relaxation techniques, different forms of meditation, autogenic training, and biofeedback. The program also incorporated drawings of how students felt, their main problems, and how they would like to be as well as drawing of genograms to explore students' place in their families, family strengths/weaknesses. Each group began with deep belly breathing and sharing of the experiences of using techniques and how participants were feeling, and ended with a slow, deep breathing.

Outcomes were assessed at baseline (before participating in the program for the treatment group and before waiting time for the control group), post treatment (immediately following completion of the program for the treatment group and control group), and at 3-month following the completion of the program (only for the treatment group). After the first intervention program was completed, the wait-list control group participated in the same 12-session program. Outcome was assessed for the control group immediately upon completion of their program but no 3-month follow-up assessment was conducted due to school year ending. The HTQ that was used to screen for eligibility was also the outcome measure. No trauma exposure scale was used in order to prevent participants feeling obligated to discuss trauma when the authors assumed trauma exposure by almost all participants given the widespread nature of trauma.

PTSD score reported by the immediate treatment group upon completion of the program was significantly decreased compared

to the wait-list group ($F=29.8$, $df=1,76$; $p<0.001$). Large effect size is reported. There were no between-groups differences in the HTQ scores at the baseline and post treatment (upon immediate completion of the program). Their PTSD scores remained decreased at the 3 months follow-up, with significant decrease from the baseline ($p<0.001$). However, the decrease in the HTQ score was reported for the wait-list group. The authors hypothesized this to be possibly due to the wait-list group waiting with much expectation as participants went to the same school and blinding was not possible. The wait-list group also showed significant decrease in PTSD scores upon completion of the program ($p<0.001$).

Significant decrease in all the symptom clusters of PTSD (re-experiencing, avoidance, and arousal) were observed upon completion of the program and maintained at the 3-month follow-up for intervention group. When compared to the control group, while significant improvement in re-experiencing and avoidance was observed, no improvement was observed in arousal because there was also a decrease in arousal observed among control group during waiting time.

The programs were initially planned to be facilitated by outside psychologists/psychiatrists from screening to post intervention assessments but changed to the school's teachers who were trained in the program due to students' expressing discomfort with outside professionals. Hence, the bias is possible as teachers screened and assessed students and ran the programs. However the social support from the teachers was reported to outweigh the risk of bias. Aside from the report on 2 dropouts from the program (not from leaving school), no possible adverse effects or absence from group rate is reported.

Information is not available on attempts made to decrease bias. It is unclear how teachers were assigned to facilitate and interview for screening and outcome, if the same teachers interviewed and facilitate, if these teachers have taught the participants before.

Given that social support was assumed to play a role in efficacy of the program, future research may include measures for perceived social support. Overall the study shows promising result for mind-body program for war-traumatized adolescents.

What preceded RCT by Gordon et al. [19] was an open trial on mind-body skills group conducted by Gordon et al. [20]. In this pilot study, 181 high school students participated in the program four months after the bombings in Kosovo. These students were allocated to three groups with different starting time for each over the 9 months period. How they were allocated to each group is not reported. The program was facilitated by the school teachers who went through 5 day training in The Center for Mind-Body Medicine (CMBM). The program consisted of 3 hours weekly sessions for 6 weeks and no dropouts were reported, and absence was reported to be rare.

The program content is the same as the one used in Gordon et al. [19], consisting of numerous breathing techniques, check-in, drawings of their feelings/thoughts, and genograms. Baseline and outcome were assessed by the PTSD Reaction Index, which was translated into Albanian and internal validity was found to be adequate. Participants were assessed before the program started and upon completion of the program. Follow-up assessment was conducted at different times for each group due to scheduling difficulties, the first group at 15 months after, the second group at 9 months after, and no follow-up for the third group due to many students graduating.

Significant decrease in PTSD Reaction Index scores were observed

in all three groups upon completion ($p <0.001$). Effect size ranged from moderate to large. The authors also found that time alone did not decrease PTSD symptoms when comparing the baseline data for all three groups two of which were assessed 4 months after and 8 months after the first group was assessed for baseline.

Another study on mind-body skills program developed by the CMBM was conducted by Staples, Atti, and Gordon [21] to assess applicability of the program to children in Gaza experiencing on-going political conflict and violence and to assess reduction not only in PTSD symptoms but also in depressive symptoms which are often comorbid with PTSD symptoms.

Participants were 571 children and adolescents whose age ranged from 8 to 18 years, and they were recruited from schools, nongovernment organizations, and the United Nations Relief and Works Agency. Participants were screened by the Child PTSD Symptoms Scale (CPSS) and, 129 children and adolescents who met the criteria for PTSD according to DSM-IV were included in data-analysis. All participants, regardless of meeting the criteria, attended this program consisting of total of 10 sessions with twice a week 2 hours session. Each group had 8 to 10 participants and groups were facilitated by 37 trained health and mental health professionals as well as teachers who were trained and supervised by CMBM faculty in Gaza.

The program used the same components as mind-body program described in a study by Gordon et al. [19,20]. The program consisted of psycho education on mind-body connection, drawings of their feelings and problems as well as genogram, and numerous techniques using breath and body. Each session started with a slow, deep breathing meditation followed by check-in on how the participants are feeling, how they have used the techniques, and ended with the same breathing. Every time the new technique was introduced for participants to try, they were invited to share what they have experience and if/how the techniques have helped them in their feelings or situations.

Pre-tests were conducted before the first session and measures consisted of Arabic version of CPSS, the Children's Depression Inventory (CDI), and the Hopelessness Scale for Children (HSC). In addition, trauma exposure checklist developed by the clinical director was also administered to assess participants' exposure to trauma such as witnessing military violence in the past two years. Post-treatment outcome was measured after the last session, and at 7 month follow-up. At 7 month follow-up, trauma exposure checklist asked about exposure only during the time period between post treatment and follow-up in order to assess how much additional trauma exposure occurred. There was a weak, but significant correlation between exposure to military violence and PTSD scores. There was no significant difference in trauma exposure between the baseline and follow-up, suggesting that exposure was on-going at the time of follow-up.

Linear mixed-effects models were used to take into account variation among different groups. Effect of time was found to be significant for total PTSD symptoms, re-experiencing, avoidance, and arousal. Significant reduction in symptoms was observed at post-treatment, and it was maintained at 7 month follow-up to a lesser extent. It was also found that higher symptoms score at baseline resulted in greater symptoms for all measures.

The effect of age was significant for PTSD total, avoidance and arousal symptom, resulting in older children showing more improvement from baseline to follow-up than younger children. There was no association between higher baseline PTSD symptoms and age, which suggests that bigger improvement on older children is not

because they had higher baseline scores. For avoidance score, there was a significant effect of sex, showing that girls had more improvement at the time of follow-up, with their scores remaining significantly lower than boys.

Overall, the study showed that mind-body skills group was effective in decreasing symptoms at post-treatment and maintaining the decrease with varying degree at follow-up. While the higher symptoms participants presented at the time of baseline, the bigger improvement they showed at the time of post-treatment and follow up, age was found to be the factor in PTSD symptoms. The participants' age range of 8 to 18 years is wide for one study, and significant developmental differences can impact the outcome. It was suggested that mind-body program may be more effective for older children than younger children. Age appropriate modification may be necessary but it is hard to know what components work better for younger children as the study was meant to test efficacy of the program as a whole.

The randomized comparative trial by Catani et al. [22] attempted to examine the efficacy of two treatment programs, a children's version of Narrative Exposure Therapy (KIDNET), and meditation-relaxation techniques (MED-RELAX) on children who were exposed to tsunami in north-eastern part of Sri Lanka where it had already been impacted by civil war. Thirty-one children aged 8-14 who presented with preliminary diagnosis of PTSD were randomly assigned to 6 sessions of either KIDNET or MED-RELAX. A coin flip was used for randomization but the actual procedure is unclear as to who did a coin flip and assigned students. Each session in both interventions lasted 60 to 90 minutes and all 6 sessions were completed within two weeks period. Both interventions were conducted by former schoolteachers who were trained as counsellors. The authors chose not to include the wait-list group for ethical considerations. Because these interventions were to be conducted within the month after the disaster hit the area, it was considered unethical to have children wait for the intervention.

In KIDNET group, participants were assisted by the therapist to create their own biography that includes any traumatic experiences including the tsunami and war. Details were added and/or corrected in written form by the therapist every time the biography was read, and such exposure was repeated until the decrease in symptoms were indicated. In MED-RELAX group, the participants first received psycho education, assessment of the problems, and breathing exercise. Different types of meditation, progressive muscle relaxation, and mantra chanting were introduced in subsequent sessions. Participants were instructed to practice these techniques for one hour as homework. Adherence to homework is not reported.

UCLA PTSD Index for DSM-IV (UPID) which was translated into Tamil and validated with previous studies was used to assess severity of PTSD symptoms. UPID was used in an interview form. In addition, five-item scale developed by the authors was used in the interview to assess children's functioning in their family and social lives, and five "yes" or "no" questions were added to ask for somatic complaints. For the pre-test only, five "yes" or "no" questions were added to ask about Tsunami experiences. UPID was used as an outcome assessment at 1 month post-test and 6 months follow-up. A group of local counsellors who were blind for participants' treatment condition conducted assessment interviews both at 1 month post-test and 6 months follow-up. These interviews were conducted at either a transitory camp or relatives' houses.

Both intervention groups showed significant decrease in PTSD symptoms. 1-month post-test effect size for the KIDNET was .76 and

for MED-RELAX was .83. 6 months-follow up effect size was .96 for KIDNET and 2.20 for MED-RELAX. No significant differences were found between these two treatment conditions. Recovery rates from PTSD symptoms were 81% for KIDNET and 71% for MED-RELAX.

Given that there was no control with wait-list condition and that the screening was conducted when the participants were still in acute stress state with preliminary diagnosis of PTSD, it is hard to know if spontaneous recovery played a role in the result. As a short-term intervention that can be implemented soon after the disaster, the study shows promising result for breathing focused approach to be as effective as exposure treatment. Small sample size (15 and 16 in each group) poses challenges for meaningful comparison to be made due to insufficient power. Replication with control group and bigger sample size would be needed. The authors note that meditation and chanting is part of Tamil culture, and it suggests the importance of approach being culturally sensitive and applicable to indigenous culture.

Discussion

This systematic literature search yielded one RCT, one randomized comparison, and open trials relevant to effectiveness of breathing focused mind-body approach for children and adolescent PTSD. Relative lack of studies suggests that this field is yet to grow and warrants future research.

Review of four studies suggests that breathing focused mind-body approach is promising for children and adolescents who experience PTSD symptoms. Mind-body approach can be an effective alternative to the first-line TF-CBT. A study by Catani et al. [22] shows that breathing focused approach may be as effective as exposure therapy. Whereas TF-CBT requires some level of verbalization and abilities to reflect as well as some resilience to cope with exposure, mind-body approach is more concrete and can be easier for children who have trouble verbalizing their thoughts and feelings and have limited reflective abilities. Furthermore, facilitators of mind-body skills group in three studies reviewed [19-21] included trained non-mental health professionals. This suggests that these programs can be implemented in areas where mental health resources are scarce.

Unfortunately, none of the studies reported adverse effects of the interventions, so it is unclear if adverse effects should be considered in implementing these programs. This review includes diversity of studies reviewed with respect to type of trauma, age, timing of intervention, and culture/context. Heterogeneity of the studies makes it hard to delineate synthesized conclusion. These studies have been only conducted in particular regions of the world. Given the increase in interest in mind-body approach in adult treatments of PTSD as an alternative to TF-CBT in the countries such as in the United States, further research on children and adolescents in this field is expected.

Study by Staples et al. [21] suggests that the mind-body programs may be more effective for older children. While the mind-body program allows different children to practice techniques that work best for them, the diversity in components of the program makes it difficult to determine if the whole program better suits older children and what components work better for younger children. Age appropriate modification becomes possible if we know what components contribute to symptoms improvement in what age group. The systematic review on mind-body approach with adult PTSD is limited and indicates the need for better designed RCT, but such approach with war-traumatized

veterans is found to be promising [17]. There are no studies comparing the effectiveness of this approach between adults, adolescents, and children, and it would be informative to compare the differential effects given the possible impact of age on effectiveness.

The limitation of this systematic review is that the search was limited to English and Japanese and it is possible that there are other qualified, eligible studies in the field. Quantitative analysis was not conducted because of the limited number of studies.

In summary, more well-designed controlled trials are required for the future. For comparison trials, more large-scale studies would be necessary to be more generalizable. This review finds that age appropriate modification is necessary for the program and future research is needed to identify necessary modification and test modified approach particularly for younger children.

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