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Yoga to Reduce Trauma-Related Distress and Emotional and Behavioral Difficulties Among Children Living in Orphanages in Haiti: A Pilot Study

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Abstract

Objectives: To measure trauma-related distress and evaluate the feasibility, acceptability, and preliminary efficacy of an 8-week yoga intervention (YI) in reducing trauma-related symptoms and emotional and behavioral difficulties (EBD) among children living in orphanages in Haiti.
Design: Case comparison with random assignment to YI or aerobic dance control (DC) plus a nonrandomized wait-list control (WLC) group.
Setting: Two orphanages for children in Haiti.
Participants: 76 children age 7 to 17 years.
Intervention: The YI included yoga postures, breathing exercises, and meditation. The DC group learned a series of dance routines. The WLC group received services as usual in the institutional setting. After completion of data collection, the WLC group received both yoga and dance classes for 8 weeks.
Outcome measures: The UCLA PTSD Reaction Index and the Strengths and Difficulties Questionnaire were used to indicate trauma-related symptoms and EBD, respectively. A within-subject analysis was conducted to compare pre- and post-treatment scores. A post-treatment yoga experience questionnaire evaluated acceptability of the YI.
Results: Analyses of variance revealed a significant effect ($F[2,28] = 3.30$; $p = 0.05$) of the YI on the trauma-related symptom scores. Regression analyses showed that participation in either 8 weeks of yoga or dance classes suggested a reduction in trauma-related symptoms and EBD, although this finding was not statistically significant ($p > 0.05$). Respondents reported satisfaction with the yoga program and improved well-being.
Conclusions: Children with trauma-related distress showed improvements in symptoms after participation in an 8-week yoga program compared to controls. Yoga is a feasible and acceptable activity with self-reported benefits to child mental and physical health. Additional research is needed to further evaluate the effect of yoga to relieve trauma-related distress and promote well-being among children.

Introduction

On January 12, 2010, a 7.0-magnitude earthquake struck the Republic of Haiti, generating a wave of immeasurable trauma for Haiti's most vulnerable population. Approximately 420,000 children lost one or both parents, and thousands were placed into temporary care to await reunification with family members.[1–3] Although affected by violence, bereavement, abandonment, and hunger, most did not receive any mental health services.

One of the most common trauma-related disorders present among youth exposed to a large-scale traumatic event is post-traumatic stress disorder (PTSD). This anxiety disorder, classified by the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM-IV*), is characterized by re-experiencing, hyperarousal, and avoidance symptoms related

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to a traumatic event, which manifests into a persistent state of hyperawareness and heightened stress.[4–8] Trauma-related distress affects youth by interfering with relationships, schoolwork, and completion of routine tasks.[9] Difficulty functioning in society is associated with an increased risk for substance-use disorders, depression, self-harm, and additional trauma in adult life.[10,11] The substantial challenges that PTSD and a range of trauma-related symptoms pose to youth development and functioning necessitates interventions that enhance resilience to trauma's compounding effects.

In 2012, the Institute of Medicine appealed for research on the effectiveness of complementary and alternative medicine (CAM) mind–body approaches to treat PTSD.[12] One such promising therapeutic approach to mental and physical health conditions is the ancient practice of yoga.[13] A regular yoga practice reduces symptoms of PTSD, depression, schizophrenia, chronic pain, and attention-deficit–hyperactivity disorders.[14–18] It promotes educational achievement, behavior regulation, and cognitive development among school-aged children and adolescents.[18,19] The breathing and meditation components of yoga interventions are effective coping strategies to relieve stress in adult survivors of natural disasters.[20,21]

The primary objective of this study was to measure trauma-related distress among children living in orphanages in Haiti. The secondary objective was to determine the feasibility and acceptability of a yoga program for children in this setting. The tertiary objective was to conduct a preliminary efficacy evaluation of an 8-week Hatha yoga intervention to reduce trauma-related symptoms and emotional and behavioral difficulties (EBD). In this case comparison study, orphanage A was randomly assigned to a twice-weekly, 45-minute 8-week yoga intervention (YI) or aerobic dance control (DC) and orphanage B was nonrandomly assigned to the 8-week wait-list control (WLC) group.

Materials and Methods

Participants

The institutional review board at Duke University in Durham, North Carolina, approved all study activities. Children age 7–17 years and residing in orphanage A or B were eligible to participate. Exclusion criteria included (1) severe cognitive or physical disability and/or illness, as determined by the institution director, that may restrict the ability to provide valid assent for study participation and (2) any condition in which exercise could threaten the child's health. Orphanage directors provided consent for individuals who satisfied inclusion criteria. A trained research assistant (fluent in Haitian Creole and English) interviewed each participant and explained the assent form.

Seventy-six children were enrolled in this study (Fig. 1). After completion of baseline assessments, participants at orphanage A ($n = 61$) were stratified by age range (7–11 and 12–17 years) and sex. Participants in each group were randomly allocated to the YI group ($n = 34$) or DC group

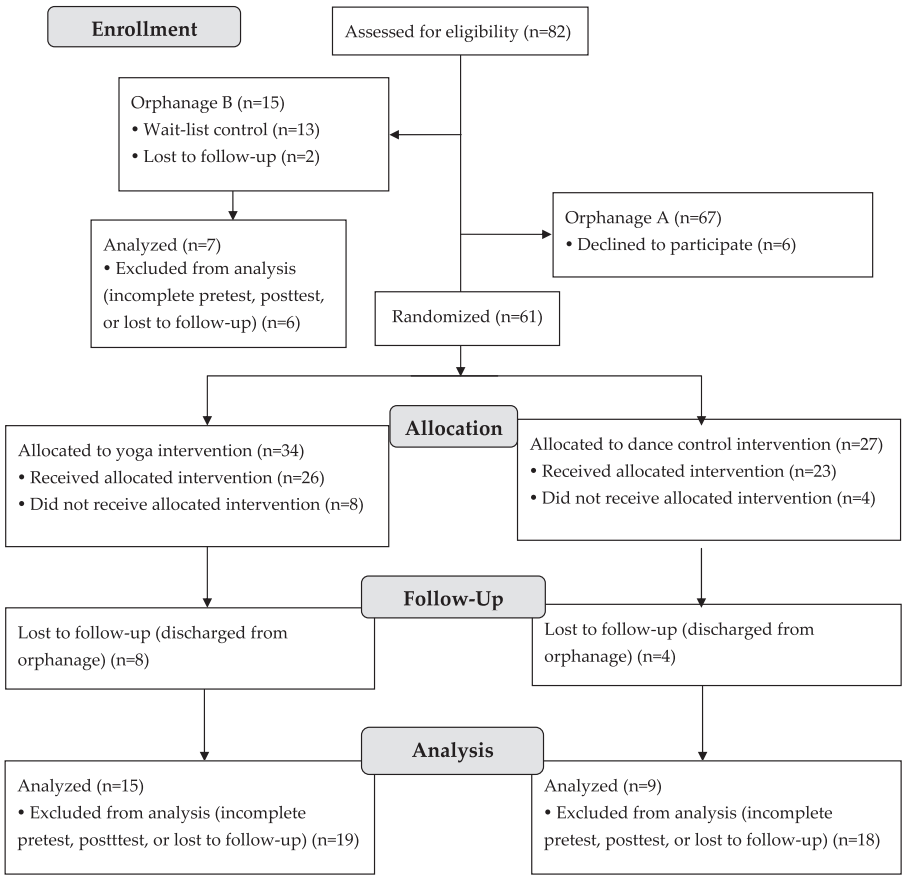

FIG. 1. Participant flow diagram.

($n=27$). The YI and DC groups were separated into two YI groups and two DC groups according to age (7–11 years and 12–17 years). The research team was blinded to the baseline scores during the randomization procedures. The WLC group ($n=15$) located at orphanage B was not randomly assigned.

Procedure

Each of the two YI groups participated in twice-weekly 45-minute yoga classes for 8 weeks in a schoolroom onsite. The specific objectives of the yoga program include (1) reintegrate the mind and body processes; (2) promote tranquility, peace, and resilience; (3) improve mindfulness and self-awareness; and (4) promote trust and comfort in the presence of peers. Every class included four main components: (1) warm-up sequence of poses and breathing techniques, (2) sequence of approximately 10 yoga poses, (3) game or story involving yoga poses, and (4) guided meditation. Class themes included nature, kindness, stress management, nonviolence, trust, and friendship.

Children in each of the two DC groups participated in twice-weekly 45-minute aerobic dance classes for 8 weeks in a schoolroom onsite. Classes were structured with four main components: (1) warm-up dance and stretches, (2) approximately five aerobic dance routines, (3) dance-inspired game, and (4) cool-down. All sessions included a 10-minute water break.

Outcome measures

The UCLA PTSD-Reaction Index–children and adolescents–*DSM IV (*revision) is one of the most widely used instruments to assess trauma exposure and trauma-related symptoms among individuals age 7 to 17 years.[22] It includes three sections: (1) a lifetime trauma assessment, (2) an evaluation of A2 criteria (intense fear, helplessness, or horror) in response to the potentially traumatic event (PTE) declared most traumatic (criterion A1), and (3) an assessment of the severity of trauma-related symptom frequency during the past month (criteria B, C, and D).[22] A frequency-rating sheet accompanies part 3.[22] However, for this study this component was replaced by images of water bottles with incremental levels of water to assess frequency of symptoms.

The Strengths and Difficulties Questionnaire (SDQ)–adolescent self-report version is a behavioral screening instrument used to identify symptoms of psychopathology among individuals age 11–16 years.[23] The SDQ contains five subscales: emotional symptoms, conduct problems, hyperactivity, peer problems, and prosocial behavior. All scale scores except prosocial behavior sum to produce a total difficulties (TD) score for the EBD outcome measure.[24,25] The defined SDQ symptom classification ranges were used to categorize the TD and subcategory scores into normal, borderline, and abnormal according to norms published with the SDQ tool, which may or may not apply to this population.

The post-intervention follow-up assessment included the Yoga Experience Questionnaire, a brief 15-item questionnaire, to assess yoga participants' perceptions of the yoga program. This questionnaire was adapted from a survey created by Uebelacker et al. to assess a Vinyasa yoga program for clinically depressed adults.[26]

Data analysis

Statistical analyses were conducted by using Stata software, version 13.1 (Stata Corp., College Station, TX).[27] Means ± standard deviations were calculated for baseline and follow-up characteristics. Change scores were computed by subtracting post-treatment scores from pretreatment scores. One-way analysis of variance followed by independent post hoc Šidák t tests investigated baseline mean differences between groups. Linear regression analyses determined the significant predictors of variation in outcome variables. Confounding variables were included in the final adjusted model.

Participants who did not report at least one potentially traumatic event on the pretreatment or post-treatment questionnaire were excluded from data analysis (YI: $n=11$, DC: $n=14$, WLC: $n=6$). Analyses of EBD were restricted to participants age 11–17 years ($n=36$) according to the age restrictions of the SDQ adolescent self-report version. Levels of significance are reported at $p<0.05$.

Results

Eighty-two youth were deemed eligible for participation in this study, of whom 76 assented to participate (42% female). The average age of all participants ($n=76$) at baseline was 11.23 ± 2.15 years (range, 7–16 years). Baseline demographics revealed that one third of the study population are abandoned children. The mean number of PTEs reported by participants ($n=46$) at baseline was 2.52 ± 1.59 (range, 1–7). Approximately 43% of participants ($n=46$) reported experiencing more than one PTE in their lifetime. Participants most commonly reported experiencing a big earthquake

Table 1. Baseline Comparison of Means Across Treatment Groups

Characteristic	*Yoga*	*Dance control*	*Wait-list control*
Trauma-related symptoms ($n=39$)	28.60 ± 9.36	22.60 ± 6.98	18.11 ± 4.34
Total difficulties score ($n=36$)	13.38 ± 3.50	14.50 ± 4.07	17.50 ± 5.61
Emotional symptoms	5.13 ± 2.63	5.43 ± 2.38	5.17 ± 2.71
Conduct problems	1.56 ± 1.82	2.57 ± 1.95	4.00 ± 1.10
Hyperactivity	2.56 ± 1.41	3.14 ± 1.70	4.50 ± 1.22
Peer problems	4.00 ± 2.16	3.29 ± 2.27	3.83 ± 2.48
Prosocial behavior	9.00 ± 2.07	9.57 ± 0.51	9.83 ± 0.41

Values are expressed as the mean ± standard deviation.

(53%) and witnessing injury or death of another person (8%) as the most traumatic PTE ($n=38$). Participants who enrolled in the study but did not reach completion included participants who were discharged from their children's home ($n=14$).

PTSD-RI

The mean trauma-related symptoms score for participants at baseline ($n=39$) was 24.6 ± 8.86 (range, 0–80). The baseline trauma-related symptoms scores for each group are summarized in Table 1. Only 31 participants completed pretest and post-test UCLA PTSD-RI questionnaires (42% female).

SDQ

The mean SDQ TD score for participants (age 11–17 years) ($n=36$) at baseline was 14.5 ± 4.25 (range, 0–25). The baseline SDQ categorical scores for each group are summarized in Table 1. Only 62 participants age 11 and older completed both SDQ pretest and post-test questionnaires (47% female).

Post-test–pretest change

There was a statistically significant difference between YI and the WLC groups for mean baseline trauma-related symptoms scores ($p=0.01$): The YI group had a 10-point higher mean baseline score than the WLC group (Table 2). However, trauma-related symptoms scores at follow-up did not significantly differ between groups ($p=0.19$). Over time, all three groups experienced a reduction in the frequency of trauma-related symptoms as measured by the UCLA PTSD-RI. The post hoc model indicates significance between groups for the trauma-related symptoms change scores ($F[2,28]=3.30$; $p=0.05$) (Table 2). Within this model, there was a significant effect of treatment on trauma-related symptoms, as shown by a greater reduction in trauma-related symptoms change scores for the YI group compared with the WLC group ($p=0.05$).

No statistically significant differences were seen among the TD scores between groups at baseline ($p=0.13$) or follow-up ($p=0.06$). From baseline to follow-up, there were no significant differences between groups for the TD change scores ($F[2,33]=2.65$; $p=0.09$) (Table 2).

Linear regression analyses

Univariate linear regression analyses indicated that the YI ($\beta=-8.24$; $p=0.02$) and baseline trauma-related symptoms ($\beta=-0.47$; $p=0.002$) scores significantly predicted the trauma-related symptoms change scores ($p<0.05$). The final multivariate linear regression model revealed that the baseline trauma-related symptoms score ($\beta=-0.41$; $p=0.02$) was the only significant predictor of the trauma-related symptoms change scores (Table 3).

Univariate linear regression analyses revealed that the baseline TD score ($\beta=-0.40$; $p=0.03$) was the only significant predictor of the TD change scores ($p<0.05$). The final multivariate linear regression model indicated that the baseline TD score ($\beta=-0.43$; $p=0.03$) was the only significant predictor of TD change scores (Table 4).

TABLE 2. MEAN PRETREATMENT, POST-TREATMENT, AND POST/PRETREATMENT CHANGE SCORES

		Pretreatment			*Post-treatment*			*Post-treatment – Pretreatment*		
Outcome measure	*Group*	*Participants* (n)	*Mean score*	Post hoc p-*Value*	*Participants* (n)	*Mean score*	Post hoc p-*Value*	*Participants* (n)	*Mean score*	Post hoc p-*Value*
Trauma-related symptoms score	YI	15	28.60±8.48		15	18.93±7.81		15	−9.67±6.87	
	DC	9	21.78±6.87		9	14.33±7.02		9	−7.44±4.30	
	WLC	7	18.14±4.45		7	16.71±8.64		7	−1.43±9.74	
	YI–DC		6.82±1.61	0.169		4.60±0.79	0.535		−2.22±2.57	0.842
	YI–WLC		10.46±4.02	*0.007		2.22±−0.83	0.237		−8.24±−2.87	0.047*
	DC–WLC		3.63±2.42	0.534		−2.38±−1.62	0.867		−6.02±−5.44	0.271
				*Model (Prob>F)		0.006 0.193	0.052			
Total difficulties score	YI	16	13.38±3.50		16	16.63±5.19		16	3.25±4.42	
	DC	14	14.50±4.07		14	13.93±3.97		14	−0.57±3.96	
	WLC	6	17.50±5.61		6	19.67±5.85		6	2.17±6.27	
	YI–DC		−1.13±−0.57	0.842		2.70±1.22	0.362		3.82±0.46	0.085
	YI–WLC		−4.13±−2.11	0.125		−3.04±−0.67	0.489		1.08±−1.85	0.947
	DC–WLC		−3.00±−1.54	0.373		−5.74±−1.88	0.062		−2.74±−2.32	0.543
				Model (Prob>F)		0.127 0.058	0.085			

*$p<0.05$.
YI, yoga intervention; DC, dance control; WLC, wait-list control.

Table 3. Final Multivariate Regression Model Assessing Predictors of Change in Trauma-Related Symptoms ($N=31$)

Predictor variables	*Adjusted* R^2	β	*SEM*	p-*Value*	*95% CI*
Final model	0.25				
Intervention group					
Yoga		−3.84	3.44	0.329	−11.83 to 4.16
Dance control		−4.84	3.28	0.166	−11.86 to 2.17
Wait-list control		−3.45	7.52	0.668	−19.30 to 12.40
Trauma-related symptoms		−0.41	0.17	0.02*	−0.76 to −0.04
Age		0.84	0.60	0.175	−0.43 to 2.09
Sex		0.67	2.65	0.803	−4.79 to 6.12

*$p<0.05$.
SEM, standard error of the mean; CI, confidence interval.

Feasibility and acceptability of yoga

The mean number of yoga classes attended was 14.65 ± 2.17 out of 16. Reasons for missing classes included responsibilities in the kitchen, illness, and indifference. Participants reported liking yoga for increased muscle strength, protection from injury, healthy exercise, or relaxation. Participants did not state dislike of the yoga teacher. Twenty-four respondents reported satisfaction with the yoga program; the two were not satisfied reported indifference or mild dissatisfaction. Several participants requested that the yoga program continue.

Yoga Experience Questionnaire

Participants favored baby, snake, sun, car, tree, frog, warrior II, and warrior III yoga poses. Some described their preference for certain poses in comments such as ''happy baby pose because I love to see when babies are happy,'' ''tree pose because I feel like I am a tree when I'm doing it,'' and ''warrior III because when you do it you're concentrated.'' Children reported enjoying certain poses that helped relieve muscle tension and pain. However, some ($n=3$) children expressed disliked for poses because of physical discomfort. The majority ($n=18$) preferred slower-paced classes that dedicate more time to learning and practicing poses.

Most respondents ($n=23$) reported that a good yoga class would include both poses and meditation components equally. Eleven respondents selected poses as the most important aspect of a yoga class, and 10 selected meditation. Two thirds ($n=17$) of respondents stated they would not include games in future yoga classes.

Yoga participants declared positive effects on mood. Children reported feeling calmer, less angry, and less stressed. Responses included the following: ''Yes, it helps me to be calmed down. When I'm angry I breathe,'' ''Yes, it helped me because when I'm stressed out I do some poses and I feel good,'' and ''Yes, it helps me to respect my friends.''

Discussion

This preliminary study of child mental health is the first to evaluate symptoms of trauma-related stress and EBD among Haitian children living in orphanages. It is also the first to implement and evaluate a yoga program for children in this setting. The newness of this research protocol provides insight into the mental health and traumatic experiences of Haitian orphaned and abandoned children. The observed reductions in the frequency of trauma-related symptoms and EBD among the YI and DC groups reveal that mind–body CAM approaches can benefit well-being.

Although research on trauma-related distress affecting this population is limited, it is known that children exposed to natural disasters experience adverse effects on mental health. Almost half of this study population reported experiencing more than one PTE in their lifetime, in which the most traumatic PTE was the 2010 Haiti earthquake. These findings are supported by the report by Whetten et al., which found high rates of PTEs reported among orphaned and

Table 4. Final Multivariate Regression Model Assessing Predictors of Change in Total Difficulties ($N=36$)

Predictor variables	*Adjusted* R^2	β	*SEM*	p-*Value*	*95% CI*
Final model	0.15				
Intervention group					
Yoga		−0.20	2.36	0.933	−5.03 to 4.63
Dance control		−3.63	2.30	0.125	−8.34 to 1.07
Wait-list control		11.00	7.02	0.128	−3.34 to 25.34
Total difficulties score		−0.43	0.19	0.033*	−0.82 to −0.04
Age		−0.10	0.52	0.855	−1.16 to 0.96
Sex		−1.00	1.57	0.530	−4.22 to 2.22

Data restricted by ages 11–17 years.
*$p<0.05$.

abandoned children across five low- and-middle-income countries.[28]

Trauma-related symptoms

Results of the current baseline evaluation of trauma-related symptoms are consistent with findings from prior research on PTSD among similar populations. The mean trauma-related symptoms score at baseline ($n=39$) was 24.6 ± 8.86, which is similar to the score of 19.5 ± 15.97 among children and youth attending school near the 2008 Mumbai terrorist attacks.[29]

In the preliminary analyses, we observed a reduction in trauma-related symptoms across groups (Table 2). There was a statistically significant effect ($F[2,28]=3.30$; $p=0.05$) of the YI on the change in trauma-related symptom scores (Table 2). Results of the regression analyses showed a consistent reduction in trauma-related symptoms scores across groups. The final multivariate regression analyses revealed a 3.8-point reduction, 4.8-point reduction, and 3.5-point reduction in trauma-related symptoms scores for the YI, DC, and WLC groups, respectively (Table 3). However, no evidence of a significant relationship was found between the changes in trauma-related symptoms and any of the groups ($p>0.05$). The only significant predictor of the change in trauma-related symptoms score was the baseline trauma-related symptom score, indicating that participants with high baseline scores may have benefitted more. These results suggest that engagement in yoga or dance alleviates trauma-related symptoms compared with no treatment at all.

Emotional and behavioral difficulties

Results of the baseline evaluation of EBD are consistent with findings from prior research among similar populations. The average TD score for the current study participants at baseline ($n=36$) was 14.5 ± 4.25. This result is similar to findings from a study by Smith Fawzi et al., which found an average TD score of 14.7 (normal) among HIV-affected Haitian youth.[30]

In the current preliminary analyses, the effects of treatment on TD scores varied considerably across groups. Treatment groups had no significant effect on the change in TD scores ($p=0.09$) (Table 2). Results of the analysis of variance and regression analyses revealed a consistent decrease in TD change scores among the dance group and worsening of symptoms among the YI and WLC groups (Table 2).

However, after adjustment for variables included in the multivariate regression model, the negative effect of the YI on TD scores was reversed. The multivariate regression analyses revealed a 0.2-point reduction and a 4-point reduction in the TD scores among the YI and DC groups, respectively (Table 4). TD scores within the WLC group increased 11 points, signifying that EBD worsened over time. However, no evidence of a significant relationship was seen between the changes in TD scores and any of the groups ($p>0.05$). The only significant predictor of the change in TD score was the baseline TD score, indicating that participants with high baseline scores may have benefitted more. These results suggest that yoga and aerobic dance may relieve EBD compared with no treatment. Of course, the effect could reflect the natural trajectory of symptoms over time; without a randomized, controlled trial treatment effects cannot be assumed.

Perceptions of yoga program

Our tertiary research question addressed whether yoga is an acceptable and feasible intervention in the context of children's homes in Haiti. Average class attendance of participants in the yoga group was high (92%), and most (92%) reported satisfaction with yoga.

Responses on the yoga experience questionnaire provide insight into participants' perceptions of the yoga program and its ability to meet the stated goals. As children were encouraged to use their imagination to create and embody yoga poses, the child who reported feeling like a tree while in tree pose provides evidence that some children were able to accomplish this. In addition, the child who reported feeling concentrated while in warrior III pose reveals his ability to practice mindfulness while engaging in a standing yoga pose. One girl's account that yoga helped her respect friends reveals that yoga fosters collective peace.

Participants' responses suggest that yoga enhanced their self-regulation, coping mechanisms, and resilience. Improved self-regulation was indicated by the response ''it helps me to be calmed down. When I'm angry I breathe.'' Additionally, participants experienced the stress-releasing effects of practicing yoga poses. The reported use of breath to release stress and negative emotions reveals that children's awareness of breath served as coping strategy. In this way, the yoga program reduced participants' anxiety, improved self-regulation, and cultivated resilience.

Limitations

It is recognized that assessment of mental health within a culture different from that in which the instrument was created can interfere with the quality of data collected. Because the UCLA PTSD-RI is based on *DSM-IV* PTSD diagnostic criteria founded in Western definitions of mental health, it is unknown whether it captured symptoms of traumatic stress as they relate to Haitian expressions of mental health. However, the tool has been validated in other resource-poor countries (e.g., Zambia).[31] Additional limitations include the inability to blind participants, interviewer and reporting bias due to use of self-report measures, small sample size, and no long-term follow-up.

Conclusions

Yoga may positively affect mental health and well-being in vulnerable children. This research supports yoga as a feasible and acceptable mind–body CAM therapy. The adverse effects of untreated childhood trauma necessitate further research and implementation of early intervention strategies that require limited training and resources. Further investigation into the benefits of yoga for orphaned and abandoned children is needed to support the integration of yoga into evidence-based mental health therapy and alternative care programs worldwide.

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Author Disclosure Statement

No competing financial interests exist.

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