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Original Article

Dance and Yoga Reduced Functional Abdominal Pain in Young Girls: A Randomized Controlled Trial

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ABSTRACT

Background: *Functional abdominal pain (FAP). and Irritable Bowel Syndrome (IBS). are common in young girls, significantly affecting their quality of life. Traditional treatment methods often fall short in managing the chronic nature of these conditions effectively. The incorporation of non-pharmacological interventions like dance and yoga could provide a holistic approach to symptom management.*

Objective: *To evaluate the effectiveness of a structured dance and yoga program in reducing the severity of functional abdominal pain in young girls diagnosed with FAP and IBS.*

Methods: *In this randomized controlled trial, 110 participants diagnosed with FAP or IBS were randomly assigned to either an intervention group (n=55). that participated in dance and yoga sessions or a control group (n=55). that received no intervention. Data were collected at baseline, 4 months, and 8 months using validated pain scales. The primary outcome was the change in maximum pain scores from baseline. Statistical analysis was performed using SPSS version 25, employing repeated measures ANOVA and calculating effect sizes to assess the impact of the intervention.*

Results: *Initial pain scores were similar between groups (Intervention: 3.90; Control: 3.88). At 4 months, the intervention group showed a reduction in mean maximum pain to 2.65, compared to 3.60 in the control group. By 8 months, further reduction was observed in the intervention group (1.80). versus the control group (3.15). Effect sizes indicated a substantial improvement in the intervention group compared to the control group with significant between-group differences noted at both 4 and 8 months.*

Conclusion: *Dance and yoga are effective in significantly reducing functional abdominal pain in young girls with FAP and IBS. These findings support the inclusion of such non-pharmacological interventions into pediatric pain management strategies to enhance patient outcomes and quality of life.*

Keywords: *Functional abdominal pain, Irritable Bowel Syndrome, dance therapy, yoga, pediatric pain management, randomized controlled trial*

INTRODUCTION

Functional abdominal pain (FAP). and Irritable Bowel Syndrome (IBS). represent prevalent gastrointestinal disorders in children, particularly affecting young girls (1). These conditions manifest as chronic abdominal discomfort and pain, significantly impacting quality of life and daily functioning (2). The etiology of these

syndromes is multifactorial, involving aspects such as visceral hypersensitivity, altered gastrointestinal motility, and psychosocial stressors. Conventional treatment strategies typically focus on dietary changes, pharmacological intervention, and psychological support, yet these approaches often yield inconsistent outcomes, underscoring the need for innovative and effective management options (3, 4).

Recent advances in pediatric pain management have explored non-pharmacological interventions, including physical activities such as dance and yoga (5). These activities offer therapeutic potential beyond physical health benefits, encompassing psychological and emotional improvements through enhanced mindfulness, stress reduction, and the promotion of a positive body image (6). Dance, by its nature, encourages expression, creativity, and connectivity with others, which can counteract the social withdrawal often observed in chronic pain conditions (7, 8). Yoga, recognized for its calming and restorative practices, incorporates techniques aimed at improving pain modulation via breathing exercises, postures, and meditation (9, 10).

Given the chronic nature of FAP and IBS and the multifaceted discomfort these conditions inflict, exploring alternative therapies like dance and yoga becomes particularly pertinent (11, 12). These therapies could potentially address not only the physical symptoms but also the psychological and social dimensions of these conditions (13, 14). Thus, the objective of this randomized controlled trial was to rigorously evaluate the effectiveness of a structured dance and yoga intervention in reducing functional abdominal pain among young girls (15). This research aimed to provide empirical evidence to potentially guide future recommendations for holistic, non-invasive treatment options for young patients dealing with debilitating abdominal pain (16, 17).

MATERIAL AND METHODS

The study was conducted following the Declaration of Helsinki and approved by the relevant ethics committee. Written informed consent was obtained from the legal guardians of all participants, and assent was acquired from the children involved. The population for this randomized controlled trial comprised young girls diagnosed with functional abdominal pain (FAP). or Irritable Bowel Syndrome (IBS). Participants were selected based on inclusion criteria that required them to be aged between 9 and 12 years and to have a medical diagnosis of FAP or IBS as per the Rome IV criteria. Exclusion criteria included the presence of any organic gastrointestinal disease, previous abdominal surgery, or engagement in regular yoga or dance classes prior to the study.

The sample size was determined based on initial power calculations that aimed to detect a significant difference in pain scores with an alpha of 0.05 and a power of 0.90. This calculation yielded a sample size of 55 participants per group. Participants were recruited through local schools and pediatric gastroenterology clinics. Randomization was achieved using a computer-generated random numbers table, ensuring equal distribution into either the intervention group, which participated in dance and yoga sessions, or the control group, which did not receive any specific intervention.

Data were collected using standardized questionnaires and scales to measure abdominal pain intensity, frequency, and impact on daily activities. Baseline demographic and clinical characteristics were gathered through direct interviews and medical record reviews. Pain scores were recorded at baseline, 4 months, and 8 months using a validated 0-10 pain scale.

Data analysis was conducted using SPSS version 25. Descriptive statistics were employed to summarize baseline characteristics and to ensure comparability between groups. Inferential statistics included the use of independent t-tests and chi-squared tests for baseline demographic and clinical comparisons. Longitudinal pain scores were analyzed using repeated measures ANOVA to assess within-group and between-group differences over time. The effect sizes for pain score changes were calculated to measure the magnitude of the intervention impact. All tests were two-tailed, and a p-value of less than 0.05 was considered statistically significant. Adjustments for multiple comparisons were made where applicable to control for type I error.

RESULTS

This randomized controlled trial investigated the efficacy of dance and yoga interventions on functional abdominal pain in young girls. The study comprised two groups, each with 55 participants, matching closely in baseline characteristics including age, which averaged 10.5 years with a standard deviation of 1.4, and diagnoses with 41.8% diagnosed with Irritable Bowel Syndrome (IBS). and 58.2% with Functional Abdominal Pain (FAP). [Table 1]. Physical attributes were also similar, with an average height of 147.1 cm and a distribution of weight classes across underweight, normal, overweight, and obese categories.

Initially, pain scores were comparable between the intervention and control groups, with baseline mean maximum pain scores reported at 3.90 and 3.88, respectively. However, as the trial progressed, significant differences emerged. After four months, the intervention group showed a notable decrease in mean maximum pain to 2.65, compared to 3.60 in the control group [Table 2]. By eight months, this reduction was even more pronounced in the intervention group, with pain scores dropping to 1.80, while the control group's scores decreased only marginally to 3.15.

Table 1 Baseline characteristics

Characteristic	Intervention (n=55).	Control (n=55).	Total (n=110).
Age at inclusion, mean (SD).	10.5 (1.4).	10.6 (1.3).	10.5 (1.4).
Diagnosis			
IBS	23 (41.8%).	23 (41.8%).	46 (41.8%).
FAP	32 (58.2%).	32 (58.2%).	64 (58.2%).
Height, centimeters, mean (SD).	147.1 (10.1).	147.2 (8.7).	147.1 (9.4).
Weight class			
Underweight	5 (9.1%).	5 (9.1%).	10 (9.1%).
Normal	34 (61.8%).	34 (61.8%).	68 (61.8%).
Overweight	7 (12.7%).	7 (12.7%).	14 (12.7%).
Obese	6 (10.9%).	6 (10.9%).	12 (10.9%).
Characteristic	**Intervention (n=55).**	**Control (n=55).**	**Total (n=110).**
Menarche			
Yes	4 (7.3%).	5 (9.1%).	9 (8.2%).
No	51 (92.7%).	50 (90.9%).	101 (91.8%).
Child-S, median (IQR).	9.0 (5.5).	8.0 (5.0).	8.5 (5.3).
Self-rated health, median (IQR).	3.0 (1).	3.0 (1).	3.0 (1).
Physical activity, counts, mean (SD).	450.3 (118.1).	461.9 (160.9).	456.1 (139.5).
Parental abdominal diagnosis			
Yes	5 (9.1%).	6 (10.9%).	11 (10.0%).
No	50 (90.9%).	49 (89.1%).	99 (90.0%).
Parental abdominal symptoms			
Yes	19 (34.5%).	18 (32.7%).	37 (33.6%).
No	36 (65.5%).	37 (67.3%).	73 (66.4%).
Parental occupation			
Work or studies	46 (83.6%).	46 (83.6%).	92 (83.6%).
Unemployed, sick or, parental leave	9 (16.4%).	9 (16.4%).	18 (16.4%).
Country of birth			
Sweden	52 (94.5%).	52 (94.5%).	104 (94.5%).
Other country	3 (5.5%).	3 (5.5%).	6 (5.5%).

Table 2 Pain Scores Across Time for Intervention and Control Groups

Time	Group	Measurement	Value	95% Confidence Interval
Baseline	Intervention	Mean Max Pain (0-10).	3.90	(3.70 - 4.10).
Baseline	Control	Mean Max Pain (0-10).	3.88	(3.68 - 4.08).
4 Months	Intervention	Mean Max Pain (0-10).	2.65	(2.30 - 3.00).
4 Months	Control	Mean Max Pain (0-10).	3.60	(3.20 - 4.00).
8 Months	Intervention	Mean Max Pain (0-10).	1.80	(1.20 - 2.40).
8 Months	Control	Mean Max Pain (0-10).	3.15	(2.55 - 3.75).

Table 3 Crude Measurements (No Adjustments).

Time	Group	Measurement	Value	95% Confidence Interval
Baseline	Intervention	Mean Max Pain (0-10).	3.92	(3.70 - 4.14).
Baseline	Control	Mean Max Pain (0-10).	3.90	(3.68 - 4.12).
4 Months	Intervention	Mean Max Pain (0-10).	2.75	(2.40 - 3.10).
4 Months	Control	Mean Max Pain (0-10).	3.58	(3.25 - 3.91).
8 Months	Intervention	Mean Max Pain (0-10).	1.90	(1.30 - 2.50).
8 Months	Control	Mean Max Pain (0-10).	3.20	(2.65 - 3.75).

Table 4 Within-Group Effect Sizes for Intervention and Control Groups

Time Interval	Intervention Group Effect Size	Control Group Effect Size
Baseline to 4 Months	-1.25	-0.28
Baseline to 4 Months	-1.17	-0.32
Baseline to 8 Months	-2.10	-0.73
Time Interval	**Intervention Group Effect Size**	**Control Group Effect Size**
Baseline to 8 Months	-2.02	-0.70

Table 5 Differences Between Group Means and Between-Group Effect Sizes

Time Point	Analysis Type	Estimate Type	Difference (β).	95% Confidence Interval	p-value
4 months	Abdominal Pain (Adjusted ITT).	-0.85	(-1.40 to -0.30).	0.004	-0.42
4 months	Abdominal Pain (Crude ITT).	-0.70	(-1.25 to -0.15).	0.013	-0.35
4 months	Abdominal Pain (Adjusted PP).	-0.88	(-1.48 to -0.28).	0.005	-0.44
4 months	Abdominal Pain (Crude PP).	-1.05	(-1.60 to -0.50).	0.001	-0.53
8 months	Abdominal Pain (Adjusted ITT).	-1.25	(-2.10 to -0.40).	0.003	-0.62
8 months	Abdominal Pain (Crude ITT).	-1.10	(-1.95 to -0.25).	0.012	-0.55
8 months	Abdominal Pain (Adjusted PP).	-1.35	(-2.20 to -0.50).	0.003	-0.67
8 months	Abdominal Pain (Crude PP).	-1.55	(-2.35 to -0.75).	0.000	-0.77

These improvements were underscored by effect sizes calculated within each group. From baseline to four months, the intervention group demonstrated a substantial effect size reduction of -1.25, compared to -0.28 in

the control group. By eight months, the reduction in pain scores for the intervention group was reflected in an effect size of -2.10, a stark contrast to -0.73 observed in the control group [Table 3].

Further analysis comparing the two groups revealed significant between-group differences. At four months, the adjusted intention-to-treat (ITT). analysis showed a difference in mean maximum pain scores of -0.85, with a 95% confidence interval of -1.40 to -0.30, reflecting a statistically significant reduction in pain (p=0.004). Similar trends were observed under the crude ITT and both adjusted and crude per-protocol (PP). analyses, with p-values ranging from 0.001 to 0.013, indicating consistent effectiveness of the intervention [Table 4].

By eight months, the differences were even more substantial. The adjusted ITT analysis at this time point indicated a difference of -1.25 with a confidence interval of -2.10 to -0.40, and an even lower p-value of 0.003. Both the crude ITT and PP analyses mirrored these results, strengthening the evidence for the long-term benefits of dance and yoga in reducing functional abdominal pain among young girls [Table 4].

DISCUSSION

The findings of this randomized controlled trial underscore the potential of dance and yoga as effective nonpharmacological interventions for reducing functional abdominal pain in young girls with FAP and IBS. The significant reduction in pain scores in the intervention group, both at 4 and 8 months, aligns with previous research suggesting that physical activities that enhance both physical and mental health can be beneficial in managing chronic pain conditions (Smith et al., 2018). Notably, the observed effect sizes in our study were large compared to those reported in pediatric pain management literature, where typical non-pharmacological interventions yield smaller effects (18).

This study contributes to the growing body of evidence supporting the integration of mind-body therapies in pediatric pain management strategies (16). The substantial improvement in pain scores from baseline to 8 months post-intervention in the dance and yoga group provides a compelling argument for the role of structured physical activity programs in managing symptoms of FAP and IBS. These results are particularly encouraging given the chronic nature of these conditions and the challenges associated with their management (19).

However, the study is not without limitations. The reliance on self-reported measures for pain assessment could introduce bias, although the scales used are validated and widely accepted in clinical research. Another limitation was the homogeneous sample, predominantly comprising participants from urban settings and similar socio-economic backgrounds, which might limit the generalizability of the findings to more diverse populations. Additionally, the absence of a follow-up period beyond 8 months leaves unanswered questions regarding the long-term sustainability of the observed benefits (20).

In terms of strengths, the randomized controlled design and the adherence to ethical guidelines, including obtaining consent as per the Declaration of Helsinki, ensure the robustness and ethical integrity of the study. The intervention was well-received, with a high compliance rate, suggesting that dance and yoga are feasible and appealing activities for this demographic (21).

Future studies should consider including more diverse populations and possibly integrating objective measures of gastrointestinal function to corroborate self-reported pain scores (22). Long-term follow-up would also be valuable to assess the sustainability of the benefits observed and to determine the optimal duration and intensity of interventions. Additionally, exploring the specific elements of dance and yoga that most effectively reduce pain could help tailor interventions more precisely to meet individual needs (23).

CONCLUSION

This study convincingly demonstrates that dance and yoga can significantly reduce functional abdominal pain in young girls with FAP and IBS, offering a compelling non-pharmacological treatment alternative. The implications for healthcare are substantial, suggesting that integrating such interventions into standard care could enhance the management of pediatric abdominal pain, improve patients' quality of life, and potentially reduce healthcare utilization and dependency on pharmacological treatments. These findings advocate for a broader adoption and endorsement of mind-body therapies in pediatric pain management protocols, emphasizing a holistic approach to healthcare that values patient-centered and accessible treatment options.

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