International Journal of Community Medicine and Public Health
Hegde JR et al. Int J Community Med Public Health. 2020 Jul;7(7):2532-2541
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: http://dx.doi.org/10.18203/2394-6040.ijcmph20202973

Original Research Article

Indian aesthetic dance and yoga improves mental health among caregivers of children with neurodevelopmental disorders: a randomized trial

Jayashree R. Hegde[1], Sridhar K. Melukote[1], T. M. Srinivasan[2], Deepeshwar Singh[3]*

[1]Department of Yoga and Humanities, [2]Department of Physical science, [3]Department of Yoga and Life Sciences, Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA), Bangalore, Karnataka, India

Received: 20 May 2020
Accepted: 18 June 2020

***Correspondence:**
Dr. Deepeshwar Singh,
E-mail: deepeshwar.singh@svyasa.edu.in

ABSTRACT

Background: This study aimed to assess the effects of Indian aesthetic dance (IAD) and yoga on psychological behavioral and mental health-related problems among the caregivers of children with neurodevelopmental disorders (NDDs).
Methods: One hundred one caregiver participants were randomly allocated to either intervention of IAD or a structured yoga program or in a control group. The invention groups received supervised eight-weeks IAD or yoga training for 3 alternative days, 75 min each day. In total, 96 subjects completed the study with after high adherence of 95% to intervention sessions. Caregivers were assessed with self-rated primary measures including the Zarit burden scale (ZBS), depression, anxiety, and stress (DASS-21) scale; and secondary measures were revised caregiver's appraisal scale (RCAS) and WHO Quality of Life WHOQOL (BREF) scale. The assessments were done at pre (1st day), mid (ENT of 4th week), and post (end of 8th week) of interventions.
Results: Statistical analysis showed there was a significant reduction in scores of ZBS ($p<0.001$), DASS-21 ($p<0.001$), and significant improvement was found in the subscales of RCAS and WHOQOL (BREF) ($p<0.001$).
Conclusions: The outcome of the study suggests that IAD and Yoga can be feasible interventions for alleviating symptoms of mental health-related issues among caregivers.

Keywords: Caregivers, Dance, Mental health, Neurodevelopmental disorders, Yoga

INTRODUCTION

Globally, the prevalence of neurodevelopmental disorders (NDDs) in children is increasing at 1-3%.[1] In India, nearly 12% of children aged 2-9 years are prone to NDDs.[2] In caring such children, family caregivers (CGs) are the primary source of support who need to face and deal with challenges substantially.[3] In the process of caring, caregivers experience a higher incidence of stress, reduced quality of life, depression, anxiety, lower levels of subjective well-being, and can develop negative attitudes such as rejection, pessimism about future, aggression, avoidance, irrational belief about child's disability, hostility, and social withdrawal.[4-7]

Unfortunately, the current medical health care system focuses primarily on the individual patient and does not adequately engage, educate, and support informal care providers.[8] Few meta-analyses with psychoeducational interventions for CGs have produced moderate evidence on coping outcomes demanding specific remedies with more targeted interventions.[9] These meta-analysis does not include psychological interventions such as Indian aesthetic dance (IAD) and yoga.

Yet, few studies on creative dance movements have shown fostering positive emotions relating to mental health scores.[10] But these studies have limitations with a limited number of intervention sessions and demanding more participants.

Indian dance based on the core of *'rasa theory'* introduced by the Indian dramaturgical text 'Natya-Sastra'(a magnum opus, dated back to 1500 B.C.) put forth not only wide variety of physical movements but emotions.[11] *Rasa* means savoring 'essence,'' relish,' or 'aesthetic delight which brings integration of mind and body through the emotion of pleasure'. Performance philosopher Daniel Meyer-Dingkraffe theorizes *rasa* as an elevated consciousness.[12] *Rasa* is a kind of energy being partly physical and partly mental and is an essential link between body and mind, which affects our thought and emotion. It is a feeling with the nature of both the self and the universe, both inside and outside.[13] The practice of IAD based on the *'rasa theory'* is a bundle of varieties of dance movements, expression of intense feelings set to music, and lyrics prompt a positive atmosphere. This atmosphere makes the practitioner 'be' in the state of *'rasa'*.[14] The holistic view of the rasa theory involves the emotional experience concerning the human condition and coping with its problems.[13] Additionally, few studies reported that the yoga program is a safe, feasible, acceptable, and subjectively useful for the physical and mental health of informal CGs.[16] In the category of mind-body medicine, yoga therapy has been emerging a novel alternative medicine and gaining popularity worldwide.[17]

The primary concern of the research was to develop a mechanism of self-management of emotions through the medium of IAD and yoga, rather than CGs just enjoying the intervention sessions and return to the previous atmosphere back home. Hence, the rationale behind the study was to help the participants to culture their emotions that could enhance their positive mental health indicated by the reduced burden, stress, depression, anxiety, and improving the quality of life and caregiver's appraisal. The study aimed to enable the CGs to accept their children unconditionally while managing the negative emotional conditions.

With this background, the present study tried to explore the impact of IAD and yoga training for positive mental health with reduced burden, depression, anxiety, stress, and enhanced CGs' appraisal and quality of life in CGs of children with NDDs.

METHODS

Subjects

The subjects included were: close relatives, and mostly mothers caring for children with NDDs: aged between 28-65 years; both male and female; could able to understand Kannada, English and Hindi languages; and willing to participate the number of sessions designed. The exclusion criteria set were to ensure the underlying conditions not to affect the outcome or limit the benefits of intervention, or increase the likelihood of dropout. The exclusion criteria for the subjects' recruitment were as follows: subjects consuming medication influencing cognitive abilities, mood balance, or coordination; prone to hearing impairment; having another relative with neurologic and psychiatric illness; had formal yoga training or practicing yoga regularly for the past one month. Subjects were agreed for randomization into any of the three groups with a commitment to attend classes. Subjects were randomized based on the scores of the Zarit Burden scale (ZBS).

Study design

The institutional ethics committee approved the research study and a clinical trial registered in the clinical trial registry of India (CTRI/2018/08/015256), Government of India. This randomized controlled study conducted on CGs of NDDs (n=101, males=2; and female=99), recruited subjects from three different special schools. CGs were informed about the study objectives and signed written informed consent was obtained. These participants were enrolled in the study from August to November 2018. The demographic information pertaining to baseline characteristics of the subjects was collected (Table 1). Further, the concealed allocation of participants was performed using sealed, opaque envelopes generated by a statistician. The research investigator was blinded to the randomization sequence to prevent them from predicting allocation to groups. Figure 1 shows the trial profile of the recruitment of the participants in the study (Figure 1).

Intervention

The three groups consisted two active interventions, i.e., IAD and yoga. The third group was the control group, and subjects were engaged in their regular activities. We chose eight weeks of intervention since, it was challenging to hold the CGs for more extended intervention sessions, and also to reduce dropouts because of the unexpected health issues of their children with NDDs. Interventions were given by more than ten years of experienced trainers in different halls of the same premise simultaneously to match the timings. The control group was engaged in their regular activities. The duration of practices was designed for 75 minutes/day, thrice in a week considering the trouble in commutation of a long distance by some CGs. The adherence of the participants to the study was monitored by maintaining an attendance register.

IAD

The dance group began with warm-up exercises to train the physical constitution of the participants to facilitate flexibility of joints, reduce lethargy.[18]

Table 1: Baseline characteristics of caregivers (n=96).

Variables	Dance	Yoga	Control	Total
Age group (mean±SD)	41.71 (9.11)	41.03 (9.09)	41.56 (9.09)	41.43 (9.01)
Gender (%)				
Males	1 (3.13)	0 (0)	1 (3.13)	2 (2.08)
Females	31 (96.87)	32 (100)	31 (96.87)	94 (97.92)
Relation with child				
Mother	29 (90.63)	32 (100)	31 (96.88)	92 (95.83)
Other relative	3 (9.38)	0 (0)	1 (3.13)	4 (4.17)
Employment status				
Homemakers	23 (71.88)	31 (96.88)	26 (81.25)	80 (83.33)
Employed	9 (28.12)	1 (3.12)	6 (18.75)	16 (16.67)
Education N (%)				
Illiterate	1 (3.13)	1 (3.13)	2 (6.25)	4 (4.17)
Primary school	0 (0)	0 (0)	1 (3.13)	1 (1.04)
Middle and high school	7 (21.87)	15 (46.87)	18 (56.25)	40 (41.67)
Secondary school	15 (46.87)	7(21.87)	5 (15.62)	27 (28.12)
Graduation	9 (28.13)	9 (28.13)	6 (18.75)	24 (25.00)
Income N (%)				
High income group	1 (3.12)	0	0	1 (3.12)
Mid income group	12 (37.5)	13 (40.63)	13 (40.63)	38 (39.58)
Low income group	19 (59.37)	19 (59.37)	19 (59.37)	57 (59.37)
Languages known N (%)				
Single	10 (31.25)	12 (37.5)	22 (68.75)	44 (45.83)
Multiple	22 (68.75)	20 (62.5)	10 (31.25)	52 (54.17)
Child with neurodevelopmental disorders				
Single disorder	18 (56.25)	12 (37.5)	19 (59.37)	49 (51.04)
Multiple disorder	14 (43.75)	20 (62.5)	13 (40.63)	48 (48.96)

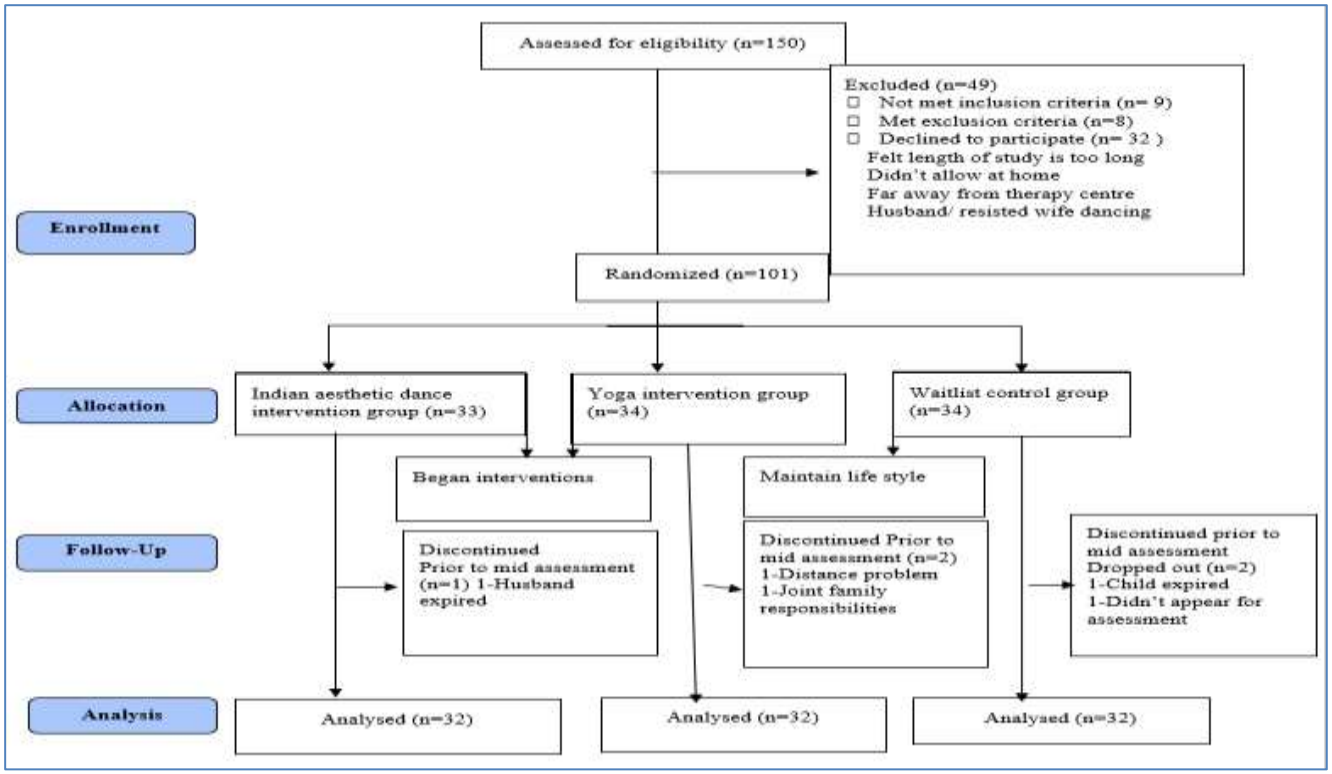

Figure 1: Trial profile of participants' recruitment (n=96).

In the next step, varieties in hand gestures and movements of various parts of the body, i.e., hand, neck, head, eyebrows, eyes, shoulder, chest, waist, thighs, shanks, feet were taught as per Natyasastra, a magnum opus, dates back to 1500 B.C.[19] Those who wished to mime the negative incidents mediated by the child were provided an opportunity. Then steps and song with lyrics were taught. The participants were given a short discussion on the content and emotion of the lyrics taught. At the end relaxation was given.

Yoga

Yoga group participants were given loosening exercise (*shithila*), physical postures (*Asana*) in standing, sitting, supine and prone postures, breathing practices (*pranayama*), meditation, and instant and quick relaxation techniques. Then a short discussion on yoga philosophy and health aspects were given as per the intervention protocol.

Assessments

The subjects were assessed using psychological questionnaires administered three times, *i.e.*, pre (prior to intervention on day 1), mid (4th week), and post (8th week) of intervention sessions. During the intervention, five participants were dropped out, and the remaining 96 participants' data were collected.

Primary outcome measures

Zarit Burden Inventory (ZBI): English version contains 22 items on 5-point, focusing on areas of CGs' health, psychosocial well-being, finances, social life, and the relationship between the caregiver and children with NDDs. This tool uses the subscale on four aspects, such as personal strain, privacy conflict, guilt, and uncertain attitude. The total score ranges from 0 to 88. The higher the ZBI scores indicate, the greater burden. No burden at scores of less than 21, mild at 21-40, moderate at 41-60, and severe at 61-88.[20]

Depression, anxiety and stress was measured with the depression anxiety stress scale (DASS-21). The scale is in a self-report format consisting of statements referring to the past week, and reporting time to administering time shall be less than 10 minutes. It is a 4 points scale (0-did not apply to me at all to 3-applied very much or most of the time). A high score indicated a greater level of distress. Cronbach's alpha for depression was 0.94, anxiety 0.87, and stress 0.91.[21]

Secondary outcome measures such as caregiving appraisal were assessed using 24 items revised caregiver's appraisal scale (RCAS) that measures subjective caregiving burden, perceived environmental impact, caregiving mastery, and caregiving satisfaction.[22] Higher scores indicate more burden, negative impact, satisfaction, or mastery, respectively. Cronbach's alpha was calculated as 0.89 for the wholescale and subscales include Caregivers' burden α=0.89, Caregiving satisfaction α=0.84, Caregiving impact α=0.71, Caregiving mastery α=0.55, and Caregiving demand α=0.61.

Quality of life was measured by the world health organization quality of life scale (Bref), which is an integrated instrument of 26 items addressing physical health, psychological health, social relationship, and environmental conditions with a higher score indicating higher QOL.[23]

Data analysis

The statistical analysis was done using SPSS 21.0 (IBM Corp., Armonk, NY). The data were tested for normality that showed no significant difference in all primary and secondary scales. Repeated measures of ANOVA were carried out separately, followed with Bonferroni correction for each assessment. The statistically significant was considered at $p<0.05$.

Ethical clearance

The study was approved by the Institutional Ethics Committee of University and registered in the Clinical Trials Registry - India (CTRI) CTRI/2018/08/015256.

RESULTS

The adherence to interventions was 75% (18 out of 24 classes) for dance and 83% (20 out of 24 classes) yoga sessions.

The data analysis was done using repeated-measures Anova with two factors: factor 1: state (pre, mid, and post) and factor 2: groups (dance, yoga, and control). Significant main effects of levels x groups and their interaction of assessments are given in (Table 2). The mean and standard deviation of the outcome measures at pre (1st day), mid (4th week), and post (8th week) are given in (Table 3).

Primary outcomes

The repeated measure analysis of Anova for ZBS showed there was a significant difference at the mid and post scores of dances $p<0.01$, and mid and post scores of yoga ($p<0.01$) compared to the control group. There were significant reductions in ZBS scores at mid-38%, and post 64% $p<0.001$ of dance and mid 28% and post scores 61% $p<0.001$ of yoga group compared to pre (Figure 2). Among the DASS-21 subscales, dance groups showed a significant difference in depression at mid ($p<0.01$), and post-scores ($p<0.001$); anxiety and stress scores at mid and post ($p<0.001$) compared to the control group. Besides, the yoga group also showed a significant difference in depression, anxiety, and stress scores at mid and post ($p<0.001$) independently compared to the control

group. The within-group analysis showed significant reductions in all three subscale scores. Dance group showed a significant difference in depression at mid (34%), and post -scores (64%) ($p<0.001$); anxiety scores at mid (32%), and post (62%) ($p<0.001$); stress scores at mid (26%) and post-scores (49%) ($p<0.001$) compared to pre. Additionally, yoga group also showed a significant difference in depression at mid (28%) ($p<0.01$)and post scores (58%) ($p<0.001$); anxiety scores at mid (30%) and post (58%) ($p<0.001$); stress at mid (19%) and post scores (43%)($p<0.001$) compared to pre. On the other hand, the control group showed a significantly increased depression ($p<0.05$), at the post; anxiety at mid ($p<0.05$), and post ($p<0.001$) and stress score at the post scores ($p<0.001$) compared to pre.

Secondary outcomes

The between-group difference in the subscales compared to the control group of RCAS are given in (Table 5). Regarding the CGs burden, scores of dance group showed a significant difference at mid and post ($p<0.001$) and yoga group at mid and post ($p<0.05$) compared to the control group. Concerning CGs demand, there was a significant difference in the dance and yoga groups at mid scores ($p<0.05$) and post (0.001) compared to the control group. Furthermore, dance group showed a significant improvement relating to caregiver's satisfaction at mid ($p<0.01$) and post ($p<0.001$); mastery at mid ($p<0.05$) and post ($p<0.001$); and impact scores at mid and post ($p<0.001$) compared to the control group.

Table 2: Summary of analysis of variance (Anova) of variables.

Variables	F	df	P value	Partial Eta (η^2)
Levels (pre-mid-post)				
ZBS	288.95	1.77, 164.49	0.001	0.76
DASS-21				
Depression	310.33	1.63, 151.59	0.001	0.77
Anxiety	157.02	1.47, 137	0.001	0.63
Stress	3.9.49	1.36, 126.12	0.001	0.77
WHOQOL (BREF)				
Physical	212.57	1.84, 170.97	0.001	0.70
Psychological	95.37	1.78, 165.42	0.001	0.51
Social	90.64	1.82, 168.96	0.001	0.49
Environmental	120.87	2, 186	0.001	0.57
RCAS				
CB	121.33	1.63, 151.87	0.001	0.57
CS	160.54	1.86, 172.81	0.001	0.63
CM	285.80	1.80, 166.94	0.001	0.75
CD	185.63	2, 186	0.001	0.63
CI	332.59	1.81, 168.22	0.001	0.78
Levels X groups				
ZBS	66.14,	3.54, 164.49	0.001	0.59
DASS-21				
Depression	118.10	3.26, 151.59	0.001	0.72
Anxiety	115.25	2.95, 137	0.001	0.71
Stress	140.06	2.71, 126.12	0.001	0.75
WHOQOL (BREF)				
Physical	69.34	3.68, 170.97	0.001	0.60
Psychological	27.26	3.56, 165.42	0.001	0.37
Social	14.47	3.63, 168.96	0.001	0.24
Environmental	29.43	4, 186	0.001	0.39
RCAS				
CB	46.12	3.27, 151.87	0.001	0.50
CS	40.81	3.72, 172.81	0.001	0.47
CM	43.36	3.59, 166.94	0.001	0.48
CD	53.91	4, 186	0.001	0.54
CI	99.55	3.62, 168.22	0.001	0.68

Note: ZBS - Zarit Burden Scale; DASS - 21-depression anxiety stress scale; WHO-QOL - world health organization quality of life, RCAS - revised Caregivers Appraisal scale: CB = Caregiving Burden, CS = Caregiver satisfaction, CM = Caregiver mastery, CD = Caregiver demand, CI = Caregiver impact.

On the other hand, the yoga group showed a significant improvement relating to CGs satisfaction, master, and impact both at mid and post scores (p<0.001) compared to the control group.

Within-group comparisons showed a significant reduction of CGs burden at mid (25%) and post (40%) (p<0.001) scores of the dance group and mid (26%) and post scores (42%) (p<0.001) of yoga compared to pre. Reduction in CGs demand was also significant in the dance group at mid (22%) and post (45%) (p<0.001), and mid scores of yoga (23%) and post (37%) (p<0.001) compared to pre. Among the dance and yoga intervention group, a significant difference was found in the scores of CGB (p<0.01) at the post and physical domain of WHO-QOL(BREF) (p<0.001) at mid scores.

Concerning WHOQOL (BREF), between-group analysis of both the intervention groups showed a significant difference at both mid and post scores (p<0.001) in the physical, psychological, and environmental domains. The social domain score of dance and yoga also showed a significant difference (p<0.01) over the control group.

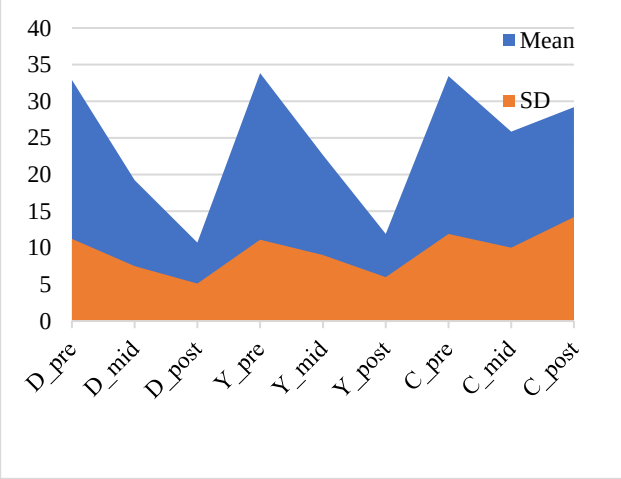

Figure 2: Graphical presentation of ZBS scores.

Within-group analysis showed that, the dance group showed a significant improvement in the physical domain at mid (40%) and post (46%) (p<0.001)and yoga group at mid (31%) and post (61%) (p<0.001); psychological domain of dance mid (17%) (p<0.001) and post (35%) and yoga at mid (19%) and post (32%) (p<0.001); social group of dance at mid (24%) and post (48%) and yoga mid (18%) and mid (36%) (p<0.001); environment group of dance at mid (17%) and post (29%) (p<0.001) and yoga at mid (16%) and post (33%) (p<0.001) compared to pre.

In contrast, the control group showed a significant reduction of scores in CGs mastery at mid (p<0.001) and post (0.05) and caregivers demand at mid (p<0.01) of WHO-QOL(BREF) but the magnitude of change is more in intervention groups (Figure 3).

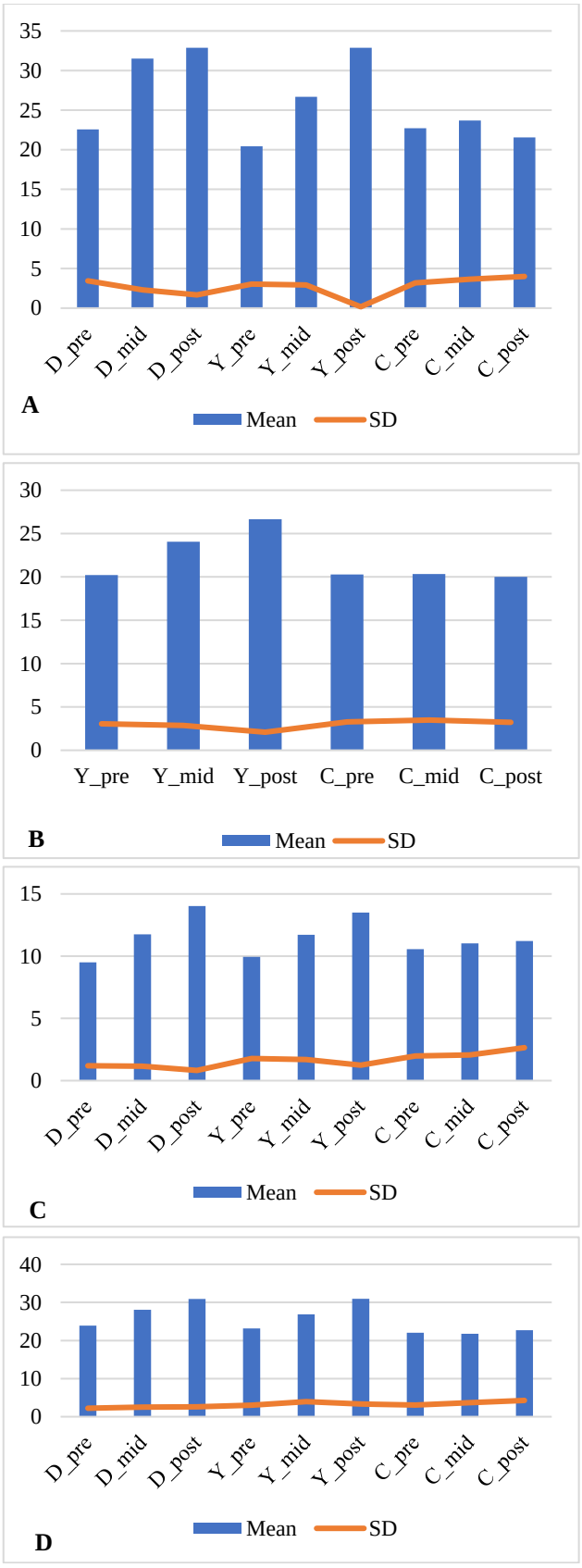

Figure 3: Graphical presentation of subscales of WHOQOL (BREF) (A) physical domain, (B) psychological domain, (C) social domain, and (D) environmental domain.

Table 3: Results of outcome measures at pre, mid and post of dance, yoga and control groups; values are given in mean and SD.

Variables	Dance			Yoga			Control		
	Pre	Mid	Post	Pre	Mid	Post	Pre	Mid	Post
	n=32			n=32			n=32		
ZBS	28.81 (6.20)	17.97 (5.39) ***$$$	10.25 (4.02) ***$$$	28.88(5.97)	20.72 (6.09) ***$$	11.31 (3.72) ***$$$	27.06 (5.59)	25.66 (6.31)	26.47 (6.51)
DASS -21									
Depression	9.31 (1.62)	6.16 (1.92) ***$$$	3.38 (1.50) ***$$$	9.56 (2.56)	6.88 (2.08) ***$$	4.03 (1.69) ***$$$	9.34 (3.85)	9.13 (3.70)	10.16 (3.58) *
Anxiety	9.91 (2.70)	6.78 (2.21) ***$$$	3.81 (1.69) ***$$$	10.09 (2.45)	7.03 (1.80) ***$$$	4.19 (1.20) ***$$$	9.94 (2.82)	10.59 (2.27) *	12.25 (2.89) ***
Stress	15.69 (2.44)	11.59 (1.59) ***$$$	7.94 (1.59) ***$$$	15.19 (3.02)	12.34 (2.54) ***$$$	8.63 (2.08) ***$$$	15.19 (3.02)	15.88 (2.39)	16.72 (2.20) ***
WHOQOL (Bref)									
Physical	22.56 (3.45)	31.50 (2.31) ***$$$	32.88 (1.67) ***$$$	20.44 (3.03)	26.69 (2.92) ***$$$	32.88 (0.17) ***$$$	22.72 (3.19)	23.69 (3.66)	21.56 (4.0)
Psychological	20.13 (2.95)	23.59 (2.41) ***$$$	27.16 (1.99) ***$$$	20.22 (3.06)	24.06 (2.87) ***$$$	26.66 (2.09) ***$$$	20.28 (3.27)	20.34 (3.49)	20.00 (3.23)
Social	9.50 (1.19)	11.75 (1.16) ***	14.03 (0.82) ***$$$	9.94 (1.78)	11.72 (1.69) ***	13.50 (1.24) ***$$$	10.56 (1.98)	11.03 (2.07)	11.22 (2.65)
Environmental	23.91 (2.23) $$	28.09 (2.51) ***$$$	30.91 (2.61) ***$$$	23.19 (3.01)	26.88 (3.97) ***$$$	30.94 (3.34) ***$$$	22.05 (3.08) *	21.78 (3.69)	22.69 (4.27)
RCAS subscales									
CGB	20.00 (5.32)	15.06 (3.92) ***$$$	12.00 (2.95) ***$$$	23.78 (5.59)	17.72 (4.25) ***$	13.75 (3.37) ***$	19.25 (5.19)	20.63 (5.69)	20.34 (5.0)
CGS	18.44 (3.93)	24.00 (2.98) ***$$	27.63 (1.83) ***$$$	20.84 (1.55)	24.91 (2.36) ***$$$	28.59 (1.5) ***$$$	21.25 (3.13)	21.03 (3.33)	21.31 (3.82)
CGM	16.88 (2.21)	20.69 (2.40) ***$	24.66 (1.91) ***$$$	17.31 (1.67)	21.47 (1.59) *** $$$	25.00 (1.30) ***$$$	17.66 (2.48)	19.31 (2.13) ***	18.94 (2.53) *
CGD	10.59 (1.24)	8.28 (1.17) ***$	5.84 (1.73) ***$$$	10.75 (1.30)	8.31 (1.45) ***$	6.81 (1.89) ***$$$	10.22 (1.48)	9.41 (1.85) * *	10.63 (0.98)
CGI	11.91 (1.25)	5.22 (1.54) ***$$$	4.25 (1.27) ***$$$	11.94 (1.22)	5.34 (2.50) ***$$$	4.91 (2.53) ***$$$	11.97 (1.12)	11.25 (1.34)	13.09 (1.03) *

Note: SD - Standard Deviation; ZBS - Zarit Burden Scale; DASS (21) - Depression Anxiety Stress Scale; WHOQOL: World Health Organization Quality of Life Scale; RCAS - Revised Caregiving Appraisal Scale: CB = Caregiving Burden, CS = Caregiving Satisfaction, CM = Caregiving Mastery, CD = Caregiving Demand, and CI = Caregiver Impact.

Note: *represents mean change within groups when compared to Week 0 (baseline) i.e. *=p<0.05; **= p<0.01; ***=p<0.001. $=significant difference in dance group and yoga over control group ($ <0.05; $$ < 0.01; $$$<0.001, significant levels of all variables are after Bonferroni correction.

DISCUSSION

In the present study, we investigated the effect of 8 weeks of practice of dance and yoga on mental health-related issues in caregivers of children with NDDs. Caregivers of such children showed a high level of psychological burden, stress, anxiety, depression with poor quality of life, and low caregiver's appraisal at pre-intervention.

Previous studies reported that the dance and yoga interventions being therapeutic exercise involves various forms of physical movements and has been using as therapy across the world and also on positive health promotion in CGs.[24-26]

Further, yoga practices embedded with physical movements and regulated breathing that may help to direct mindful awareness self and improved coordination in different parts of the body.[27] Yoga is also one of the mind-body interventions help to slow down repetitive negative emotion by mindful on slow movements during physical postures (*asana*). During the practice of yoga, CGs instructed to observe the physical movements and coordinate with breathing.[28] It might have helped them to reduce perseverative thinking about the current circumstances and improve the positive state of mind. Concurrent to it, with few sessions of intervention sessions, CGs started expressing delight for their reduced fatigue, and long-settled pain in the limbs, which encouraged them to look forward to further sessions.

Reduction in stress scores of the DASS-21 scale of this study indicates that dance and yoga practice may develop effective coping abilities in the caregivers of children with NDDs with stress, which could help them to manage their feelings effectively without being stressed.[30] This result matches with a pilot study conducted on Salsa dance intervention on informal Mexican CGs, which showed a marked reduction of perceived stress.[26] It could be the effect of the physical movements in dance and yoga associated with upgrading in mental functioning by enhancing the coordination in different parts of the body and mind.[26,25] In this regard, dance sessions of our study involved constant learning of the movements and expressions, to train the CGs with enhanced attention and memory. Concerning to this, the previous study mentions that working memory is associated with anterior cingulate cortex and the medial frontal gyri, the training of which found to be associated with the increased grey matter volume in the brain after constant dance practices.[31]

Further, a significant reduction in anxiety and depression scores of DASS-21 affirms the results of earlier studies on CGs on reduction in self-reported psychological problems such as stress, anxiety, depression, fatigue following dance[10,] and yoga interventions.[27,32] It is noted that physiological changes happen with the practice of dance and yoga, resulting in muscle relaxation and changes in the concentration of stress hormones.[33,34] Previous studies have noted that hormones, namely, serotonin and dopamine concentration, are directly and indirectly related to stress, fatigue, and psychological symptoms.[35] The decreased scores of anxiety and depression in the intervention groups are concurrent to the previous study findings which suggests that consistent IAD and yoga interventions might have helped balancing those hormones in CGs.[36,37]

To outburst frozen negative emotions without speech, the sessions of IAD included the miming of their adverse incidents relating to their disabled children. Whenever each caregiver mimed the incident, others also flashed back to similar experiences from the bottom of their heart as if they are sailing in the same boat.

Additionally, with an intimate relationship with music, dance stimulates aesthetic and creative experiences. Additionally, lyrics (words placed to the melody) play a crucial role in the communication of positive emotions and develop positive psychology through meaning, as lyrics have originated since the origin of language. Previous studies have tested the effect of mood, lyrics, and melody on various disorders separately in earlier studies.[38,39,40] As IAD is a pack of mood/state of mind, melody, rhythm, and lyrics altogether, it might have made the dance effective to culture the emotion in CGs to understand and manage self in stressful conditions.

Besides, the scores of subscales of CGs appraisal scale have shown lessened burden and demand, better satisfaction, mastery, and impact in connection with their disabled dependents. The overall result of the study shows that with twenty-four sessions of IAD and yoga, CGs could able to learn and memorize the mechanism of a positive way of managing their emotions. The consistent learning and practice of expression and remembering might have given immersing nature of the experience.[12] In learning and memory, the circuitry of adult hippocampal neurogenesis plays a vital role in the integration of adult-born neurons. The Central nervous system neurons tend to grow new-born neurons spontaneously, which might be involved in the hippocampal functions that are dependent on the dentate gyrus such as pattern separation.[41] So, a new process is initiated with different maturation stages, and new-born neurons make a distinct contribution to learning and memory.[41] Now it is accepted widely that, throughout adultlike species including humans, new neurons are spontaneously generated in a discrete region of the brain.[42] This inherent "plastic" anatomical recovery process guided by consistent practices may guide the brain towards an optimal functional outcome and tend to re-establish connection even without ongoing therapies.[24]

Limitations

Only 24 sessions of intervention were designed due to the uncertainty of health issues among CGs' children with NDDs hampering their participation in the study, and we

did not stratify them based on the symptoms of children and associated abnormal behavior.

Further, the control group did not receive any intervention. Further study warranted a bigger population, including both genders, with objective assessments such as cognitive and executive functions using different neuroimaging techniques. The feasibility of dance and yoga modules needs to experimented on both caregivers and dependent.

CONCLUSION

In conclusion, the mind-body intervention such as IAD and yoga for caregivers of NDDs was potentially useful. The practice of dance and yoga may help to regulate emotions by reducing the symptoms of psychological burden, stress, depression, and anxiety. The positive emotional state of the caregiver can be strengthened through behavioural interventions and negate the therapies of treating the mind and body separately. IAD and yoga practice can be a promising intervention for emotion regulation and psychological well-being among caregivers.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Moritz DJ, Fox PJ, Luscombe FA, Kraemer HC. Neurological and psychiatric predictors of mortality in patients with Alzheimer disease in California. Arch Neurol. 1997;54(7):878-85.
2. Arora NK, Nair MKC, Gulati S. Neurodevelopmental disorders in children aged 2-9 years: Population-based burden estimates across five regions in India. Persson LA, ed. PLOS Med. 2018;15(7):1002615.
3. Abbeduto L, Seltzer MM, Shattuck P, Krauss MW, Orsmond G, Murphy MM. Psychological Well-Being and Coping in Mothers of Youths with Autism, Down Syndrome, or Fragile X Syndrome. Am J Ment Retard. 2004;109(3):237.
4. Peckham A, Spalding K, Watkins J, Barrett BC, Grasic M, Williams AP. Caring for Caregivers of High-Needs Children. Healthc Q. 2014;17(3):30-5.
5. Pinquart M, Sorensen S. Differences between caregivers and non-caregivers in psychological health and physical health: A meta-analysis. Psychol Aging. 2003;18(2):250-67.
6. Levallois S. The health and well-being of caregivers of children with cerebral palsy. In: Orthopedic Management of Children with Cerebral Palsy: A Comprehensive Approach. 2015:611-8.
7. Ambikile JS, Outwater A. Challenges of caring for children with mental disorders: Experiences and views of caregivers attending the outpatient clinic at Muhimbili National Hospital, Dar es Salaam-Tanzania. Child Adolesc Psychiatry Ment Health. 2012;6:16.
8. Gillick MR. The Critical Role of Caregivers in Achieving Patient-Centered Care. JAMA. 2013;310(6):575.
9. Baruch E, Pistrang N, Barker C. Psychological interventions for caregivers of people with bipolar disorder: A systematic review and meta-analysis. J Affect Disord. 2018;236:187-98.
10. Aithal S, Karkou V, Kuppusamy G, Mariswamy P. Backing the backbones - A feasibility study on the effectiveness of dance movement psychotherapy on parenting stress in caregivers of children with Autism Spectrum Disorder. Arts Psychother. 2019;64:69-76.
11. Manmohan Ghosh. Natya Shastra Ascribed to Bharat Muni. Vol II. The Asiatic Society, Culcutta, India; 1961.
12. Rasa. Abhinavagupta on the Purpose (s) of Art. Natyasastra Anthol New York McFarland. 1994:72-88.
13. Paranjpe AC. In Defence of an Indian Approach to the Psychology of Emotion. Psychol Stud (Mysore). 2009;54(3):22.
14. Chakravorty P. Dance, Pleasure and Indian Women as Multisensorial Subjects. Vis Anthropol. 2004;17(1):1-17.
15. Milbury K, Liao Z, Shannon V. Dyadic yoga program for patients undergoing thoracic radiotherapy and their family caregivers: Results of a pilot randomized controlled trial. Psychooncology. 2019;28(3):615-21.
16. Milbury K, Mallaiah S, Mahajan A. Yoga Program for High-Grade Glioma Patients Undergoing Radiotherapy and Their Family Caregivers. Integr Cancer Ther. 2018;17(2):332-6.
17. Khalsa SBS. Treatment of Chronic Insomnia with Yoga: A Preliminary Study with Sleep? Wake Diaries. Appl Psychophysiol Biofeedback. 2004;29(4):269-78.
18. Lima CD, Brown LE, Wong MA. Acute Effects of Static vs. Ballistic Stretching on Strength and Muscular Fatigue Between Ballet Dancers and Resistance-Trained Women. J Strength Cond Res. 2016;30(11):3220-7.
19. Subrahmanyam P. Karanas. 1st ed. Nrithyodaya, Chennai, India; 2003.
20. Limpawattana P, Theeranut A, Chindaprasirt J, Sawanyawisuth K, Pimporm J. Caregivers Burden of Older Adults with Chronic Illnesses in the Community: A Cross-Sectional Study. J Community Health. 2013;38(1):40-5.
21. Cox BJ, Antony MM, Enns MW, Swinson RP, Bieling PJ. Psychometric properties of the 42-item and 21 items versions of the Depression Anxiety Stress Scales in clinical groups and a community sample. Psychol Assess. 2005;10(2):176-81.
22. Farhadi A, Foroughan M, Mohammadi F. Validity and reliability of the Persian version of the revised

caregiving appraisal scale in Iranian family caregivers of older adults with dementia. Iran Red Crescent Med J. 2017;19(1):1-9.
23. Lingjiang L, Derson Y, Shuiyuan X, Xiao Z, Liang Z. Psychometric properties of the WHO Quality of Life questionnaire (WHOQOL-100) in patients with chronic diseases and their caregivers in China. Bull World Health Organ. 2004;82(7):493-502.
24. FAH Facilitation Techniques in Therapeutic Exercise; 1978:110-178.
25. Puymbroeck VM, Payne LL, Hsieh PC. A phase I feasibility study of yoga on the physical health and coping of informal caregivers. Evid Based Complement Alternat Med. 2007;4(4):519-29.
26. Sanchez FH, Hernandez CBE, Sidani S, Osorio CH, Contreras EC, Mendoza JS. Dance Intervention for Mexican Family Caregivers of Children with Developmental Disability: A Pilot Study. J Transcult Nurs. 2020;31(1):38-44.
27. Collins C. Yoga: Intuition Preventive Medicine Treatment. J Obstet Gynecol Neonatal Nurs. 1998;27(5):563-8.
28. Bernardi MLD, Amorim MHC, Salaroli LB, Zandonade E. Effects of Hatha Yoga on caregivers of children and adolescents with cancer: a randomized controlled trial. Esc Anna Nery. 2020;24(1).
29. Li AW, Goldsmith CAW. The effects of yoga on anxiety and stress. Altern Med Rev. 2012;17(1):21-35.
30. Sibia A, Misra G. Understanding Emotion. In: Handbook of Psychology in India; 2011:286-298.
31. Rehfeld K, Luders A, Hokelmann A. Dance training is superior to repetitive physical exercise in inducing brain plasticity in the elderly. PLoS One. 2018;13(7).
32. Lopez G, Chaoul A, James PC. Group Yoga Effects on Cancer Patient and Caregiver Symptom Distress: Assessment of Self-reported Symptoms at a Comprehensive Cancer Center. Integr Cancer Ther. 2018;17(4):1087-94.
33. Horwitz EB, Theorell T, Anderberg UM. Fibromyalgia patients' own experiences of video self-interpretation: A phenomenological-hermeneutic study. Scand J Caring Sci. 2003;17(3):257-64.
34. Evans S, Cousins L, Tsao JCI, Sternlieb B, Zeltzer LK. Protocol for a randomized controlled study of Iyengar yoga for youth with irritable bowel syndrome. Trials. 2011;12(1):15.
35. Meeusen R, Roeykens J, Magnus L, Keizer H, Meirleir DK. Endurance Performance in Humans: The Effect of a Dopamine Precursor or a Specific Serotonin (5-HT 2A/2C) Antagonist. Int J Sports Med. 1997;18(08):571-7.
36. Jeong YJ, Hong SC, Myeong SL, Park MC, Kim YK, Suh CM. Dance movement therapy improves emotional responses and modulates neurohormones in adolescents with mild depression. Int J Neurosci. 2005;115(12):1711-20.
37. Manincor DM, Bensoussan A, Smith CA. Individualized Yoga for Reducing Depression and Anxiety, and Improving Well-Being: A Randomized Controlled Trial. Depress Anxiety. 2016;33(9):816-28.
38. Lewis C, Annett LE, Davenport S, Hall AA, Lovatt P. Mood changes following social dance sessions in people with Parkinson's disease. J Health Psychol. 2014;21(4):483-92.
39. Hackney ME, Earhart GM. Effects of dance on movement control in Parkinson's disease: A comparison of Argentine tango and American ballroom. J Rehabil Med. 2009;41(6):475-81.
40. Valla JM, Alappatt JA, Mathur A, Singh NC. Music and Emotion: A Case for North Indian Classical Music. 2017;8:1-9.
41. Deng W, Aimone JB, Gage FH. New neurons and new memories: How do adult hippocampal neurogenesis affect learning and memory. Nat Rev Neurosci. 2010;11(5):339-50.
42. Gage FH. Mammalian Neural Stem Cells. Science. 2000;287(5457):1433-8.

Cite this article as: Hegde JR, Melukote SK, Srinivasan TM, Singh D. Indian aesthetic dance and yoga improves mental health among caregivers of children with neurodevelopmental disorders: a randomized trial. Int J Community Med Public Health 2020;7:2532-41.