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EFFECT OF YOGA THERAPY ON COGNITIVE AND AFFECTIVE DOMAINS AMONG SCHOOL GOING CHILDREN: A RANDOMIZED CONTROLLED TRIAL

Meena Thakur*[1], MC Shobhana[2] , Pankaj Kumar[3]

[1] PG Scholar, [2] Professor and Head, Department of Swasthavritta, VPSV Ayurveda College Kottakkal, Kerala, [3]PG Scholar, Department of Kayachikitsa, NIA, Jaipur

ABSTRACT

During the transition of children into adults, many of them get afflicted with behavioural disorders which 'signals' the alterations in affective domain along with disruption of cognitive domain. Yoga is evolving as effective therapy for behavioural modifications which can be used for improving cognitive and affective potentials of the children. **Objectives**: To study the effect of Yoga therapy on cognitive and affective domains among school going children. **Methods:** Sixty school going children aged 13 to 15 years were selected from local schools and randomized into yoga group and wait list control group. Study group practised the given yoga module one hour daily in morning for two months while control group did not receive any intervention during this period. Cognitive domain was assessed on five tests taken from "*NIMHANS neuropsychological battery for children manual*" and Affective domain was assessed by Positive and Negative Affect Scale for Children (PANAS-C).**Results:** Attention, visual memory, comprehension and auditory verbal learning showed significant improvement at $p<0.001$. At PANAS-C, Positive affect and Positivity ratio improved at $p<0.001$ and $p<0.01$ respectively. **Discussion:** Significant difference between two groups on cognitive and affective test indicates the improved awareness and perceptive abilities in cognitive domain along with enhanced mental attitude in overcoming usual stressors and increase in positive attitude of affective domain. **Conclusion:** Yoga therapy is effective in improving cognitive capacities and affective abilities among school going children.

Keywords: School going Children, behaviour, Yoga, Cognitive, Affective

INTRODUCTION

Transformation is a dynamic process which brings marked changes in the nature of an object. In case of humans, the most marked change is transformation of children into adults. Abrupt changes occur at physical, physiological, psychological, psychosocial and cognitive domains. Because of rapid ongoing changes, children are not able to handle many situations which make them vulnerable to psychological and behavioural disorders. It is reported that about 15% of adolescents have depressed mood and by the age of 18, 5% suffers clinical depression[1]. Most of the epidemiological surveys on school going

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children and adolescents have reported a (20-33%) variation in the prevalence of psychological problems with individual studies illustrating between 10-40%[2]. Daily newspapers report many of the abnormal tendencies of adolescents such as committing suicide, drug abusing, stealing, rape, murder etc. which exhibit their mental instability. This hampers their potentials to achieve the academic goals and is the most essential need to be dealt. Yoga can provide students a means to handle stress[3]. Yoga influences the emotional state[4] and improves adjustment among stressed and disadvantaged youth by improving self-regulatory capacities[5]. Emotional stability empowers the abilities of mind and result in productive outcome. A study shows that school children practicing yoga for 10 days improved spatial memory scores[6], strategic planning[7] and the ability to concentrate[8] . In various studies cognitive and affective aspects have been studied in different perspectives among different population. So a broad view of benefits of yoga has been evolved. Through this study we intend to see whether yoga can improve both cognitive and affective domains simultaneously among the most vulnerable and needy population of school going children.

Methods

Selection of participants: The inclusion criteria were (i) those who were interested to practice yoga (ii) those who were willing to give written consent signed up by their parents. Exclusion criteria were (i) having any systemic illness (ii) any physical disability or congenital deformity (iii) having any treatment for psychiatric illness. Two schools from kottakkal panchayat were selected by lottery method from which initially 157 students were registered as per the interest, with 103 satisfying the eligibility criteria and among them 60 were selected and allocated into two equal groups by random number table method (Figure 1).

Study group: Before starting intervention, pre assessment was taken on 0 day. Then study group practised yoga module 5 days at school and 2 days at home per week in the first month (0 – 30 day); all days at home in second month (31 – 60 days) and daily assessment charts were given to their parents to ensure the adherence of practising yoga module. On 61st day, post assessment was taken again.

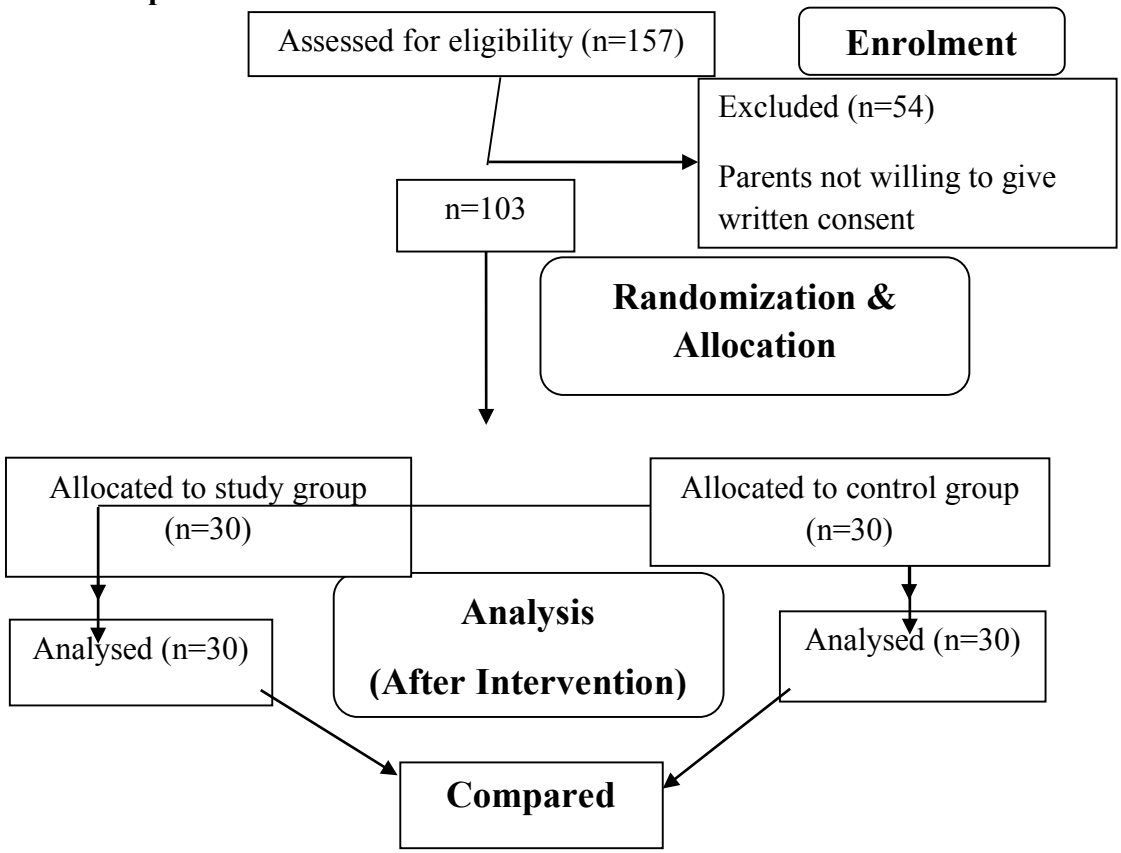
Control group: Other group was kept as wait list control during the study period. After completion of the study, interested and willing participants of control group were also given yoga intervention in order to fulfil their right for receiving intervention.

Drop outs: The criteria of drop outs were discontinuation of practice of yoga module for more than 15 days in the period of total 60 days.

The study was approved by institutional ethics committee of Vaidyaratnam P.S Varier Ayurveda College Kottakkal as Proceedings No: IEC/CI/22/13 dated 22-04-2013.

Assessment Criteria: Cognitive tests were taken from *"NIMHANS Neuropsychological battery for children manual"* (Kar et al., 2004)[9]. Attention was assessed by color cancellation test, color trail test part 'A' & 'B', language by expressive speech test, short term memory by visuo spatial memory span task, comprehension by token test and learning by rey's auditory verbal learning test. Affective domain was assessed by Positive and Negative Affect Scale for Children (PANAS-C) by Laurent & colleagues, 1999[10]

Figure 1 Trail profile for the RCT



Intervention

Table No 1. Selected Yoga Package

Sūkşama vyāyāma (10 minutes)	
Āsanā (20 minutes) 1. *Ardhakaticakra āsanā* 2. *Ardhacakraāsanā* 3. *Vrikşhaāsanā* 4. *Dhanurāsanā* 5. *Suryanamaskāra*	*Prāṇāyāma* (10 minutes) 1. *Kāpālbhati* 2. *Nāđī śhuddhi* 3. *Ujjayī* 4. *Bhrāmari*
Meditation (Transcendental - 10 minutes)	
Relaxation (*Śavāsanā* -10 minutes)	

Data analysis: Data was checked, analysed and presented with the help of tables and graphs. Levene's test was used to check the comparability of two groups. 'Paired t test' was used to assess effect of intervention within the groups. 'Unpaired t test' was used to check the difference between the groups after intervention. Statistical analysis was done by using Microsoft office 2007 Excel.

RESULTS

Table No 2. Baseline characteristics of the subjects

Groups	Yoga	Wait list control
Age in years	13.66 ±0.66	13.86 ±0.77
Age range	13 – 15	13 -15
Gender ratio (B:G)	17:13	15:15
Socio economic status	Lower middle	Lower middle
Average height	148.6 ± 7.04	147.5 ± 9.10
Average weight	42.6 ± 9.26	41.43 ± 6.64
Average BMI (Kg/m^2)	19.14 ± 3.05	19.01 ± 2.45
Average SBP	109 ± 5.03	111.93 ± 4.65
Average DBP	73.73 ± 6.90	74.73 ± 5.90
Sleep disturbance	1	0
Irregular bowels	1	0

B = boys; G = girls; SBP = Systolic blood pressure; DBP = Diastolic blood pressure

Table No. 3 Effect of therapy on Cognitive domain

Tests		Pre	Post	Paired 't'	Unpaired 't'
		Mean (SD)	Mean (SD)		
CCT(time taken in sec)	S	89.03 (12.61)	68.1 (12.59)	8.72***	4.31***
	C	86.2 (13.7)	95.4 (10.8)	-8.03***	
CTTA (time taken in sec)	S	170.73(66.02)	130.56.61)	6.01**	-8.16***
	C	154.33(43.03)	190.76(57.75)	-5.46***	
CTTB (time taken in sec)	S	251.93(90.35)	185.66(70.51)	8.38***	-8.84***
	C	216.36(70.05)	247.94(65.96)	-4.06***	
VSWMS	S	3.9 (0.84)	4.6 (0.71)	-6.18***	4.11***
	C	4.03 (0.66)	3.5 (0.82)	3.56**	
Token test(TT)	S	29.33 (3.58)	33.5 (2.58)	13.75***	8.74***
	C	30.3 (2.29)	29.46 (1.79)	0.86	
RAVLT(total scores)	S	85.8 (16.76)	99.16 (15.87)	-8.22***	7.25***
	C	77.9 (17.01)	73.93 (15.78	2.17*	

Table No. 4 Effect of therapy on Affective domain

PANAS-C		Pre	Post	Paired 't'	Unpaired 't'
		Mean (SD)	Mean (SD)		
Positive affect	S	46.06 (5.28)	50.26 (5.22)	-3.81***	4.93***
	C	50.83 (5.35)	47.7 (6.1)	3.14**	
Positivity ratio	S	1.28 (0.19)	1.59 (0.33)	-5.49***	3.18**
	C	1.58 (0.37)	1.61 (0.41)	-0.43	

Abbreviations: 'S' = Study group, 'C' = Control group, CCT – Color cancellation test, CTTA – Color trail test A, CTTB – Color trail test B, EST – Expressive speech test, VSWMS – Visuo spatial working memory span task, TT – Token test,

RAVLT – Rey's auditory verbal learning test, PANAS-C = Positive and negative affect scale for children

Few components of the cognitive and affective domain did not showed significant difference between two groups. CTTA & CTTB (commissions) on color trail test, object naming and category naming on expressive speech test and negative affect on PANAS-C did not showed significant improvement in study group. Rest all other parameters of the two domains showed significant improvement in study group at varied levels of significance.

DISCUSSION

Discussion on main outcome measures: The scores on **Color cancellation test (CCT)** for number of commissions, omissions and time taken showed a significant improvement in study group as compared to control group which suggests that study group had increased their potentials of sustaining/maintaining attention.

On Color trail test A & B (CTTA & CTTB), scores for number of omissions and time taken for task completion had shown significant improvement in the study group. These results were similar to the study by Galigi Sripad et al. 2006[11], who found that vedic chanting group had significantly reduced the total errors and time taken on cancellation task as compared to non chanting group after yoga practice. Intensive meditation training has also been claimed to improved perceptual discrimination and sustained attention [12], which was one of the component of yoga module. Both the sustained and focused attention had shown significant improvement which is suggestive of increased threshold levels of perception and awareness. This could be explained on the basis of 'load theory of attention' that explains two mechanisms. First is 'Perceptual selection mechanism' according to which when there is high perceptual load then perceptual capacity only receives the relevant stimuli and perception of irrelevant stimuli or distracters is reduced. Second is 'cognitive control mechanism' which says that when perceptual load is low at other times, then all relevant and irrelevant stimuli are perceived but as long as cognitive control mechanisms are available the current priorities are maintained and this reduces interference from perceived distracters. Both these mechanisms explain the same situations that an individual has to overcome during yoga practice.

On **Expressive speech test (EST)** Out of six subcomponents, four had shown significant improvement in mean case difference after intervention. The positive change indicates increased levels of confidence and self esteem which might have helped students for fluent expression of their language and ability to express them. A study by Radhakrishna et al. 2010 [13] shows that after 20 months of yoga practice there was significant improvement on receptive language skills, imitation skills, communication and language on children with autism spectrum disorders. This suggests yoga improve the expression of language by building confidence or by some unknown mechanisms. The scores of study group on the three tests **Visuo spatial working memory span task (VSWMS), Token test (TT), Rey's auditory verbal learning test (RAVLT)** were improved at same level of significance ($p<0.001$). Significant increased scores of these test among study group suggests high alertness, awareness, ability to concentrate and improved short term memory, learning/grasping ability and improved ability to comprehend. These results also substantiate

some findings of previous research works. A study by Manjunath NK[14] shows that yoga practice improves delayed recall of spatial information. Left nostril breathing has also been shown to improve verbal spatial scores in a study by Meesha Joshi and Shirley Telles[15]. Although there are no direct studies on yoga evidencing its effect on comprehension but it is very important aspect to be analysed. Working memory has been directly related to comprehension[16] so any intervention that affects working memory will also affect comprehension which has been reflected in this study also. Another study shows that daily yoga sessions for a period of one month improved immediate and delayed recall on RAVLT scores[17] which has been substantiated in this study also. On the **PANAS-C**, Positive affect and positivity ratio has been improved significantly. These results were similar to a study conducted by Narasimhan L et al. [18] where affective well being have shown beneficial role on positive emotions and in cognitive processing and the harmful role on negative emotions on coping stress and health status. Also, a study by Dubey SN.2011, found improvement in some psychological variables among adolescents after yoga practice [19].

CONCLUSION

The present study shows a significant effect of yoga therapy on cognitive and affective domains of school going children.

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CORRESPONDING AUTHOR
Dr. Meena Thakur
VPSV Ayurveda College Kottakkal, Kerala,
Email- dr.meenuthakur@gmail.com

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