

7.0 THE EFFECT OF A SHORT DURATION INTEGRATED CLASSROOM YOGA MODULE ON PHYSICAL FITNESS, COGNITIVE PERFORMANCE, EMOTIONAL WELL-BEING AND PERSONALITY CHARACTERISTIC MEASURES OF SCHOOL CHILDREN: A RANDOMIZED CONTROLLED TRIAL DESIGN

7.1 METHODS

7.1.1 PARTICIPANTS

The participants for the study were selected from two urban campuses of the multi-campus Samsidh Mount Litera Zee School group in Bangalore, India. The Yoga intervention group was drawn from one campus and the Control group from the other campus. All students from grades 7-10 who met the inclusion criteria participated in the study. The randomization was unequal because two different campuses were involved in the study.

Sample Size:

Since the physical fitness variables required significantly more time and resources to measure, the sample size for physical fitness tests was restricted to 98. For cognitive performance, emotional well-being and personality characteristic variables, the sample sizes were larger. There was some variation in the sample sizes achieved for cognitive performance, emotional well-being and personality characteristic tests because of unequal availability of students on the days each test was administered. This was due to absenteeism or non-availability of students due to participation in other activities.

For the physical fitness tests the sample size was $N = 98$ (Yoga Group = 48, Control Group = 50). The age of participants was $mean = 13.46$ (1.105), $range = 11-16$ years. The ratio of boys to girls was $B:G = 49:49$.

For the cognitive performance test the sample size was $N = 253$ (Yoga Group = 143, Control Group = 110). The age of participants was $mean = 13.15$ (1.195), $range = 11-16$ years. The ratio of boys to girls was $B:G = 127:126$.

For the emotional well-being tests the sample size was $N = 244$ (Yoga Group = 137, Control Group = 107). The age of the participants was $mean = 13.06$ (1.243), $range = 11-16$ years. The ratio of boys to girls was $B:G = 126:118$.

For the personality characteristic test the sample size was $N = 254$ (Yoga Group = 148, Control Group = 106). The age of the participants was $mean = 13.16$ (1.215), $range = 11-16$ years. The ratio of boys to girls was $B:G = 129:125$. The age and gender characteristics of participants are given in Table 12.

Table 12: Age and Gender of Participants in RCT Study

	Total	Yoga Group	Control Group
EUROFIT Physical Fitness Tests			
• Sample size	98	48	50
• Age in years	13.46 (1.105)	13.65 (1.021)	13.28 (1.161)
• Age range	11-16	12-16	11-16
• Gender ratio (B:G)	49:49	23:25	26:24
Stroop Color-Word Task			
• Sample size	253	143	110
• Age in years	13.15 (1.195)	13.42 (1.128)	12.79 (1.189)
• Age range	11-16	11-16	11-15
• Gender ratio (B:G)	127:126	70:73	57:53
Rosenberg Self-Esteem Scale & WHO-5 Well-Being Index			
• Sample size	244	137	107
• Age in years	13.06 (1.243)	13.34 (1.202)	12.70 (1.207)
• Age range	11-16	11-16	11-15
• Gender ratio (B:G)	126:118	75:73	54:52
Sushruta Child Personality Inventory			
• Sample size	254	148	106
• Age in years	13.16 (1.215)	13.45 (1.139)	12.75 (1.210)
• Age range	11-16	11-16	11-15
• Gender ratio (B:G)	129:125	75:73	54:52

Age in years, values are group means (Standard deviation).

7.1.2 INCLUSION AND EXCLUSION CRITERIA

The inclusion criteria were: (i) participants must be from grades 7-10 and (ii) of both genders. The exclusion criteria were: (i) any history of major physical illness or surgery in the last two months, (ii) any mental illness and (iii) any condition where physical activity was contraindicated.

7.1.3 ETHICAL CONSIDERATIONS

A signed informed consent was obtained from the school principal (dated 10.07.2019). The study was approved by the Institutional Ethics Committee of S-VYASA University (Reference: RES/IEC-SVYASA/145/2019).

7.1.4 DESIGN

The design of the study was randomized controlled trial with unequal randomization. For cognitive performance, emotional well-being and personality characteristic tests, all available

students from grades 7-10, who fulfilled the inclusion criteria, participated in the study. For physical fitness variables the sample size was smaller ($N=98$). For this purpose, grade-wise quotas were pre-decided and 1:1 gender ratio fixed. Hence, the age, academic status and gender ratio were matched for Yoga and Control groups. The selection was done blindly and randomly by drawing from paper slips. The intervention period was 5 days a week of *yoga* practice for two months. The pre-assessment was done in the middle of July 2019 and the post assessment in the middle of September 2019. At the end of the intervention, a qualitative assessment was undertaken involving focus group discussions in the yoga group. The design profile is given in Figure12.

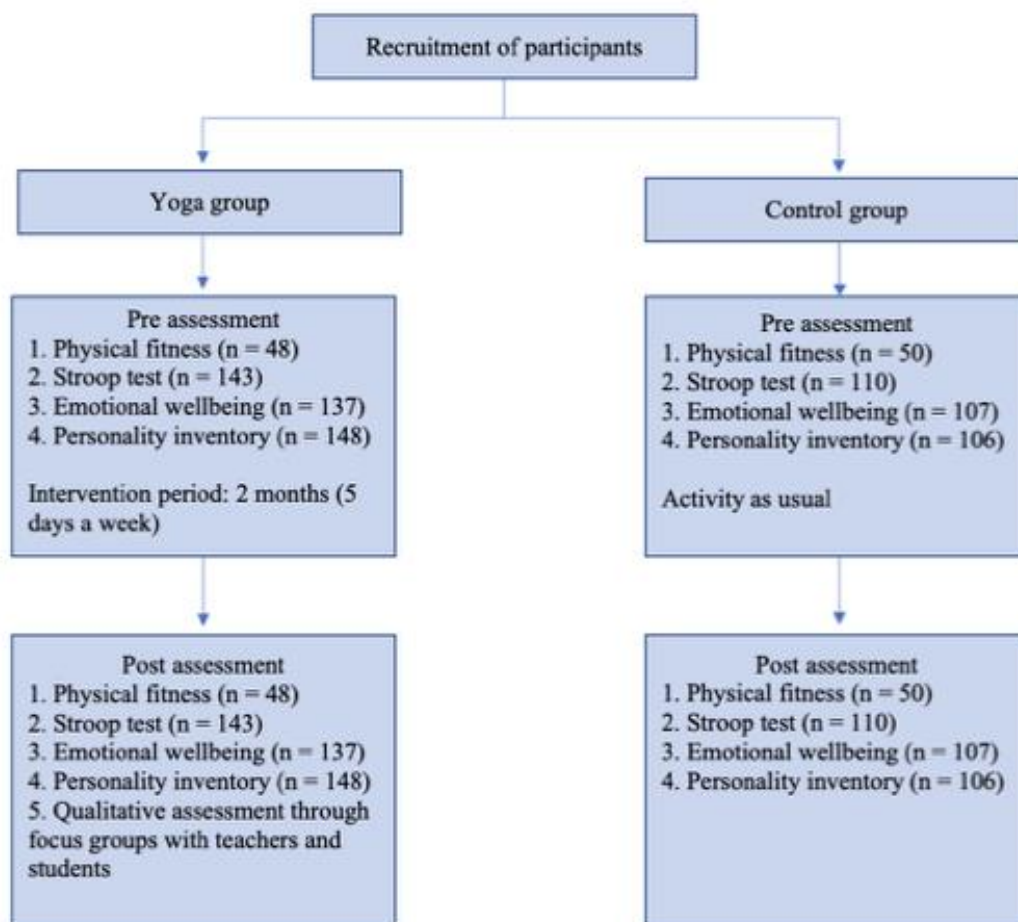


Figure 12 - Design Profile of RCT Study

7.1.5 INTERVENTION

A short duration ICYM was used as the intervention *yoga* module. The module was validated in the earlier study (Sinha, Kumari and Ganguly, 2021). The same study included an uncontrolled pre-post pilot design to confirm the module's feasibility and efficacy. The module was found feasible and efficacious in delivering benefits related to physical fitness, cognitive performance and self-esteem. The duration of ICYM was 12-minutes. It comprised 1 minute of *dhyāna* (meditative silence) followed by 4 minutes of *āsana*s (physical postures), 4 minutes of *prānāyama* (breathing exercises), 1 minute of *mantrā* chanting, 1 minute of *dhyāna* (meditative silence), 0.5 minute of a positive affirmation and 0.5 minute of closing. The physical postures combined sideways bending or twisting, forward & backward bending, stretching and balancing poses. The module was designed for practice in the limited spaces of a classroom environment.

Class teachers instructed the students in the *yoga* practice. They were trained by qualified *yoga* instructors with daily one-hour sessions spread over 7 days. The training included an overview of the discipline of *yoga*. The benefits of each *yoga* practice were conveyed to them. Each *yoga* exercise was demonstrated and practiced. Teachers were required to lead mock sessions. A video of the module was also given to the teachers. The instructors met them once every two weeks for a top up session. Two sets were practiced alternately for variety and to maximize the benefits. Set 1 was practiced in the first week, Set 2 was practiced in the second week. The unbroken practice for a week each helped the participants become familiar with each set. Thereafter, for the following six weeks, the sets were alternated on a daily basis. The intervention period was two months with five sessions per week. The detailed module is given in Table 13.

Table 13: ICYM: Set 1 and Set 2 Practiced on Alternate days

Sl. No.	Set 1			Set 2		
	Yoga Practice	Time	Description	Yoga Practice	Time	Description
1.	Dhyāna (Meditative silence)	1 min	Sit straight with eyes closed. Attention on breathing. Watch your thoughts flowing	Dhyāna (Meditative silence)	1 min	Sit straight with eyes closed. Attention on breathing. Watch your thoughts flowing

2.	Āsanā			Āsanā		
	Katichakrasana	1 min	20 rounds	Ardhakatichakrasana	1 min	Hold for 7 counts on each side
	Hastauthanasana/ Padahastasana	1 min	3 rounds backward-forward bending. On 4 th round hold for 7 counts on backward bend and then on forward bend	Ardhachakrasana/ Padahastasana	1 min	3 rounds of backward-forward bending. On 4 th round hold for 7 counts on back bend and then on forward bend
	Tadasana	1 min	3 rounds of up and down followed by 1 round of holding for 10 counts	Gaumukhasana (standing)	1 min	Hold on each side to the count of 10
	Vrkhsasana	1 min	Hold on each side for 10 counts	Garudasana	1 min	Hold on each side for 10 counts
3.	Prānāyama			Prānāyama		
	Yogic breathing (Abdominal)	1 min	10 rounds	Yogic breathing (Abdominal)	1 min	10 rounds
	Nadi Shudhi	2 min	6 rounds	Nadi Shudhi	2 min	6 rounds
	Bhramari	1 min	6 rounds	Bhramari	1 min	6 rounds
4.	OM chanting	1 min	6 rounds	OM chanting	1 min	6 rounds
5.	Dhyāna	1 min	Mentally recap the practices. Attention on breathing	Dhyāna	1 min	Mentally recap the practices. Attention on breathing
6.	Affirmation			Affirmation		
	I am a powerful soul	.5 min	3 rounds	I am a loveful soul	.5 min	3 rounds
7.	Closing	.5 min	Rub palms, massage eyes, face, neck. With a few blinks open eyes.	Closing	.5 min	Rub palms, massage eyes, face, neck. With a few blinks open eyes.
	TOTAL TIME	12 MIN		TOTAL TIME	12 MIN	

7.1.6 ASSESSMENT

The aim of this study was to assess the impact of ICYM on physical fitness, cognitive performance, self-esteem, emotional well-being and personality characteristic. The primary outcome measures comprised (i) four tests from the EUROFIT physical fitness testing battery, (ii) Stroop color-word naming task to evaluate effect on cognitive performance, (iii) Rosenberg self-esteem scale, (iv) WHO-5 well-being index and (vi) Sushruta Child Personality Inventory to assess impact on *triguna*. The secondary outcome measure was a qualitative assessment of the quality of experience, benefits reported and feasibility of continuation of the practice. This was assessed through focus group discussions with participants and teachers.

The specific measures have been covered in detail in the previous section pertaining to the pilot study on the development, validation and feasibility of a school-based short duration ICYM. Hence, it is not repeated here.

7.1.7 DATA ANALYSIS

The study aimed to test the hypothesis that a short duration Integrated Classroom Yoga Intervention (ICYM) is associated with significant differences in post-intervention means compared to pre-intervention means of physical fitness, cognitive performance, self-esteem, emotional well-being and personality characteristic measures. At the first level, pre-intervention and post-intervention means of the Yoga group and Control group were compared separately using paired sample *t*-test. This was done individually for each variable. The analysis revealed if the difference in means of pre-intervention and post-intervention were significant. The effect size was calculated using Cohen's *d* formula. At the next level, repeated measure analysis of variance (RM-ANOVA) was carried out for each variable. The Within-subjects factor was Time (pre-intervention and post-intervention). The Between-subjects factor was Groups (yoga and control). The alpha level was set at $p < .05$. The assumptions of sphericity measured by Mauchly's test and homogeneity of variance measured by Levene's test were satisfied. The raw data was analyzed using Statistical Package for Social Science (SPSS) version 26.

7.2 RESULTS

7.2.1 EUROFIT PHYSICAL FITNESS TESTING BATTERY

In the Yoga group, the paired sample *t*-test was associated with statistically significant differences in post-intervention means, compared to pre-intervention means in all the four tests. The effect size for flexibility and strength tests were large and for balance and agility tests were medium. In the Control group, the difference in means was statistically significant in balance and flexibility tests only. The effect size in flexibility test was small and for the balance test it was medium (Table 14).

Flamingo Balance Test: Yoga Group $p = .001$, Cohen's $d = 0.53$; Control Group $p = .001$, Cohen's $d = 0.56$

Sit & Reach Flexibility Test: Yoga Group $p = .001$, Cohen's $d = 0.78$; Control Group $p = .007$, Cohen's $d = 0.40$

Sit Ups Trunk Strength Test: Yoga Group $p = .001$, Cohen's $d = 0.91$; Control Group $p = .233$, Cohen's $d = 0.17$

10x5 meters Shuttle Run Agility Test: Yoga Group $p = .001$, Cohen's $d = 0.53$; Control Group $p = .218$, Cohen's $d = 0.18$

In the RM-ANOVA test, there was sufficient evidence to reject the intervention effect null hypothesis for Sit & Reach Flexibility Test and Sit Ups Trunk Strength Test. The effect size for flexibility test was large and for strength test medium. There was insufficient evidence to reject the intervention effect null hypotheses for Flamingo Balance Test and 10x5 meters Shuttle Run Agility Test (Table 15).

Flamingo Balance Test: $F(1, 96) = 0.538, p = .465, \eta^2_p = .006$

Sit & Reach Flexibility Test: $F(1, 96) = 30.777, p = .001, \eta^2_p = .243$

Sit Ups Trunk Strength Test: $F(1, 96) = 21.739, p = .001, \eta^2_p = .185$

10x5 meters Shuttle Run Agility Test: $F(1, 96) = 2.301, p = .133, \eta^2_p = .023$

Table 14: Variables of EUROFIT Physical Fitness Testing Battery: Paired Sample *t*-test- Means, Standard Deviation, Effect Size

N = 98

Variable	Yoga (n = 48)				Control (n = 50)			
	Pre	Post	<i>P</i>	Cohen's <i>d</i>	Pre	Post	<i>P</i>	Cohen's <i>d</i>
Flamingo Balance Test	7.50 (6.36)	4.75 (4.72)	.001	0.53	11.98 (7.33)	8.36 (7.37)	.001	0.56
Sit & Reach Flexibility Test	17.98 (6.64)	20.94 (7.40)	.001	0.78	16.44 (5.48)	14.46 (6.49)	.007	0.40
Sit Ups Trunk Strength Test	19.29 (4.77)	23.19 (4.93)	.001	0.91	9.82 (6.72)	8.80 (6.44)	.233	0.17
10x5 meters Shuttle Run Agility Test	15.77 (1.98)	15.13 (1.68)	.001	0.53	17.51 (2.04)	17.26 (2.16)	.218	0.18

Table 15: RM-ANOVA Table for Variables of EUROFIT Physical Fitness Testing Battery

Factor	Variable	F	df	Huyhn Feldt ϵ	P	Partial eta squared
Within-Subjects (Time)	Flamingo Balance Test	28.832	1	1	.001	.231
	Sit & Reach Flexibility Test	1.208	1	1	.274	.012
	Sit Ups Trunk Strength Test	7.44	1	1	.008	.072
	10x5 meters Shuttle Run Agility Test	11.36	1	1	.001	.106
Group x Time	Flamingo Balance Test	0.538	1	-	.465	.006
	Sit & Reach Flexibility Test	30.777	1	-	.001	.243
	Sit Ups Trunk Strength Test	21.739	1	-	.001	.185
	10x5 meters Shuttle Run Agility Test	2.301	1	-	.133	.023

7.2.2 STROOP COLOR-WORD NAMING TASK

In the Yoga group, the paired sample *t*-test was associated with statistically significant differences in post-intervention means compared to pre-intervention means on all three scores. The effect size for word and color scores were medium and for color-word score, large. In the Control group, the difference in means was statistically significant in all the three Stroop scores. The effect size was small for word and color scores and medium for color-word score (Table 16).

Stroop Word Score: Yoga Group $p = .001$, Cohen's $d = 0.62$; Control Group $p = .001$, Cohen's $d = 0.35$

Stroop Color Score: Yoga Group $p = .001$, Cohen's $d = 0.63$; Control Group $p = .001$, Cohen's $d = 0.47$

Stroop Color-Word Score: Yoga Group $p = .001$, Cohen's $d = 0.99$; Control Group $p = .001$, Cohen's $d = 0.55$

In the RM-ANOVA test there was sufficient evidence to reject the intervention effect null hypothesis for Stroop color-word score. The effect size was small. There was insufficient

evidence to reject the intervention effect null hypotheses for Stroop word score and Stroop color score (Table 17).

Stroop Word Score: $F(1, 251) = 3.304, p = .070, \eta^2_p = .013$

Stroop Color Score: $F(1, 251) = 3.229, p = .074, \eta^2_p = .013$

Stroop Color-Word Score: $F(1, 251) = 16.079, p = .001, \eta^2_p = .060$

Table 16: Variables of Stroop Color-Word Naming Task: Paired Sample *t*-test-Means, Standard Deviation, Effect Size

N = 253

Variable	Yoga (n = 143)				Control (n = 110)			
	Pre	Post	<i>P</i>	Cohen's <i>d</i>	Pre	Post	<i>P</i>	Cohen's <i>d</i>
Word Score	87.87 (16.793)	93.64 (18.044)	.001	0.62	90.64 (14.71)	94.17 (12.985)	.001	0.35
Color Score	59.22 (11.776)	65.43 (11.337)	.001	0.63	59.95 (11.64)	64.04 (10.795)	.001	0.47
Color-Word Score	30.33 (10.039)	38.62 (8.478)	.001	0.99	33.07 (8.493)	37.27 (8.964)	.001	0.55

Pre and Post are Group means (SD).

Table 17: RM-ANOVA Table for Variables of Stroop Color-Word Naming Task

Factor	Variable	F	df	Huyhn Feldt ϵ	<i>P</i>	Partial eta squared
Within - Subjects (Time)	Word Score	57.109	1	1	.001	.185
	Color Score	73.985	1	1	.001	.228
	Color-Word Score	149.763	1	1	.001	.060
Group x Time	Word Score	3.304	1	-	.070	.013
	Color Score	3.229	1	-	.074	.013
	Color-Word Score	16.079	1	-	.001	.060

7.2.3 ROSENBERG SELF-ESTEEM SCALE

In the Yoga group, the paired sample *t*-test was associated with statistically insignificant difference in post-intervention mean compared to pre-intervention mean. In the Control group the difference in means too was statistically insignificant (Table 18).

Rosenberg Self-Esteem Scale: Yoga Group $p = .702$, Cohen's $d = 0.03$; Control Group $p = .068$, Cohen's $d = 0.18$

In the RM-ANOVA test, there was insufficient evidence to reject the intervention effect null hypothesis for Rosenberg self-esteem scale (Table 19).

Rosenberg Self-Esteem Scale: $F(1, 242) = 3.203, p = .057, \eta^2_p = .013$

7.2.4 WHO-5 WELL-BEING INDEX

In the Yoga group, the paired sample t -test was associated with statistically significant difference in post-intervention mean compared to pre-intervention mean with small effect size.

In the Control group the difference in means was statistically insignificant (Table 18).

WHO-5 Well-Being Index: Yoga Group $p = .001$, Cohen's $d = 0.33$; Control Group $p = .097$, Cohen's $d = 0.16$

In the RM-ANOVA test, there was sufficient evidence to reject the intervention effect null hypothesis for WHO-5 well-being index. The effect size was small (Table 19).

WHO-5 Well-Being Index: $F(1, 242) = 14.166, p = .001, \eta^2_p = 0.055$

Table 18: Rosenberg Self-Esteem Scale & WHO-5 Emotional Well-Being Index: Paired Sample t -test-Means, Standard Deviation, Effect Size

N = 224

Variable	Yoga (n = 137)				Control (n = 107)			
	Pre	Post	<i>P</i>	Cohen's <i>d</i>	Pre	Post	<i>P</i>	Cohen's <i>d</i>
Rosenberg Self-Esteem Scale	28.55 (3.42)	28.66 (3.51)	.702	0.03	28.66 (4.03)	27.90 (4.45)	.068	0.18
WHO-5 Emotional Well-Being Index	17.21 (4.04)	18.57 (3.17)	.001	0.33	16.39 (4.68)	15.66 (4.85)	.097	0.16

Pre and Post are Group means (SD)

Table 19: RM-ANOVA Table for Rosenberg Self-Esteem Scale & WHO-5 Emotional Well-Being Index

Factor	Variable	F	df	Huyhn Feldt ϵ	<i>P</i>	Partial eta squared
Within Subjects (Time)	Rosenberg Self-Esteem Scale	1.801	1	1	.181	.007
	WHO-5 Emotional Well-Being Index	1.286	1	1	.258	.005
Group x Time	Rosenberg Self-Esteem Scale	3.203	1	-	.057	.013
	WHO-5 Emotional Well-Being Index	14.166	1	-	.001	.055

7.2.5 SUSHRUTA CHILD PERSONALITY INVENTORY

In the Yoga group, the paired sample *t*-test was associated with statistically significant differences in post-intervention means compared to pre-intervention means of *rajas* and *tamas* scores with small effect sizes and insignificant difference in mean of *sattvā* score. In the Control group, the difference in means was statistically significant in *sattvā* and *tamas* scores with small effect sizes and statistically insignificant in *rajas* score (Table 20).

Sattvā Score: Yoga Group $p = .516$, Cohen's $d = 0.05$; Control Group $p = .044$, Cohen's $d = 0.020$

Rajas Score: Yoga Group $p = .011$, Cohen's $d = 0.21$; Control Group $p = .647$, Cohen's $d = 0.04$

Tamas Score: Yoga Group $p = .004$, Cohen's $d = 0.24$; Control Group $p = .020$, Cohen's $d = 0.23$

In the RM-ANOVA test there was insufficient evidence to reject the intervention effect null hypotheses for *Sattvā* score, *Rajas* score and *Tamas* score (Table 21).

Sattvā Score: $F(1, 252) = 0.791, p = .375, \eta^2_p = .003$

Rajas Score: $F(1, 252) = 2.053, p = .153, \eta^2_p = .008$

Tamas Score: $F(1, 252) = 0.044, p = .835, \eta^2_p = .001$

Table 20: Variables of Sushruta Child Personality Inventory: Paired sample *t*-test-Means, Standard Deviation, Effect Size

N = 254

Variable	Yoga (n = 148)				Control (n = 106)			
	Pre	Post	<i>P</i>	Cohen's <i>d</i>	Pre	Post	<i>P</i>	Cohen's <i>d</i>
Sattvā Score	13.62(2.06)	13.74(2.17)	.516	0.05	12.75(2.17)	13.10(2.40)	.044	0.20
Rajas Score	8.93(2.22)	8.42(2.64)	.011	0.21	7.57(2.31)	7.47(2.06)	.647	0.04
Tamas Score	6.95(2.13)	6.39(2.49)	.004	0.24	6.68(2.59)	6.18(2.05)	.020	0.23

Pre and Post are Group means (SD).

Table 21: RM ANOVA Table for variables of Sushruta Child Personality Inventory

Factor	Variable	F	df	Huyhn Feldt ξ	P	Partial eta squared
Within Subjects (Time)	Sattvä Score	3.249	1	1	.073	.013
	Rajas Score	4.317	1	1	.039	.017
	Tamas Score	13.300	1	1	.001	.050
Group Time	Sattvä Score	0.791	1	-	.375	.003
	Rajas Score	2.053	1	-	.153	.008
	Tamas Score	0.044	1	-	.835	.001

7.2.6 QUALITATIVE ASSESSMENT

The main findings of the qualitative assessment were:

Experience of ICYM:

The physical activity at the beginning of the day was felt to be enjoyable. The mix of physical activity, breathing exercises and meditation lent variety and added to the enjoyment. Some students, however, found the routine boring at times. They also felt that, on certain days, the class teacher would rush through the practice in his or her anxiety to begin the lessons planned for the day.

Perceived Benefits of ICYM:

Physical:

Students reported that they enjoyed the physical activity. The practice made them feel less sleepy and lethargic. They felt there was an improvement in their fitness and stamina. As a result, their participation in sports and physical training had increased.

Cognitive:

Both, students and teachers were most enthusiastic in reporting cognitive benefits compared to all other benefits. Students spontaneously reported that their power to concentrate had improved along with their capacity to grasp, retain and recall lessons. They reported that their understanding of concepts and questions had become clearer. They noticed that their interest in the subjects being taught had increased. Teachers felt that the students had developed a more positive attitude towards academic learning. Like the students, they too felt that the concentration and memory of the cohort had improved.

Academic Performance:

Students reported performing better in class tests and assignments. Teachers corroborated this observation.

Emotional:

Students reported feeling refreshed and recharged, physically and mentally, as a result of the practice. The meditative practice and chanting were credited with instilling calmness. Better emotional regulation and control was reported. They felt less irritated, experienced fewer agitations and noticed an increase in patience. The anxiety over tests, examinations and assignments had reduced and they experienced lower levels of stress. The teachers were very pleased with the emotional regulation they observed. They felt that the discipline in the class had improved. The hyperactive children had become calmer and had begun to display more consistent behavior.

Social:

Many students reported feeling more confident which, in turn, resulted in greater class participation. The feeling of positivity seems to have had a favorable effect on friendships. Students reported that they felt friendlier, kinder and more helpful towards others. Teachers noticed a positive outlook towards friends and greater social cohesion.

Feasibility of ICYM:

The students were unanimous that the 12-minute duration of ICYM was just right. A longer module would impinge on their study time which was not acceptable. They also found no difficulty in practicing ICYM in the limited spaces of the classroom environment. There was no difficulty in following the instructions or in performing the practices. The teachers agreed that the duration of ICYM was just right. They felt it would be difficult to sustain the attention of students for a longer period. They found no difficulty in leading the practice and giving instructions. However, they noticed that some students were distracted and it was difficult for the teachers to get them to take the practice more seriously. The advantages of ICYM were: (i) the acceptability of its duration, (ii) variety in the mix of practices, (iii) the experience of enjoyment, (iv) no difficulties encountered in practicing the module in the limited spaces of the classroom environment, (v) the module was simple to instruct and (vi) it was perceived to have a range of important benefits. On the negative side, both students and teachers felt pressured by a surfeit of activities packed into the daily school schedule. Hence, the attitude

towards addition of *yoga* was some amount of exasperation at the addition of one more activity. However, it was more to do with activity fatigue than with the practice of *yoga* itself.

7.3 DISCUSSION

In this randomized controlled study, the Yoga group showed significant differences compared to Control group in EUROFIT tests of flexibility and strength, Stroop color-word score and WHO-5 emotional well-being. There were no significant differences in EUROFIT tests of balance and agility, self-esteem and *triguna*. The effect size in the RM ANOVA analysis was large for EUROFIT test of flexibility and medium for the test for strength. For the Stroop color-word test and WHO-5 test for emotional well-being, the effect sizes were small. It can be concluded that the short duration ICYM has a positive impact physical fitness, cognitive performance and emotional well-being. While the effect size in physical fitness tests were medium to large, those on cognitive performance and emotional well-being were small. It can be argued that small effect size should not be dismissed since every little improvement in school children's well-being is encouraging.

The within-subject comparison needs interpretation for drawing a balanced conclusion. In the EUROFIT physical fitness tests, the Yoga group showed significant improvements in all four measures of physical fitness. The effect sizes were medium to large. The Control group showed significant improvement in two of the four measures namely, balance and flexibility. The effect sizes were small to medium. It can be concluded that the Yoga group performed better than Control group on tests for physical fitness, with significant differences in all four measures and larger effect sizes. It is possible that participation in physical exercise and sport activities in the intervening period, between pre and post assessment, could have led to improvements in some measures of physical fitness in the Control group. An earlier research shows that physical exercise does impact physical fitness (Telles, Bharadwaj, Kumar and Balakrishna, 2013). In the Stroop test, the Yoga group showed a significant improvement in the color-word score with large effect size. The Control group showed a significant improvement with medium effect size. The most likely reason for the improvement in the Control group could be that practice improved performance. The same forms were used in both pre and post assessments. The review of the Stroop test by Jensen and Rohwer Jr (1966) states "it is not known that how much of improvement with practice is due to the improvement in ability to...overcome the interference on CW card and how much is due to learning the specific sequence of responses". The effect size was, however, larger in the Yoga group. In the Sushruta Child Personality

Inventory test, the Yoga group showed significant reduction in *rajas* and *tamas* with large effect sizes. The Control group showed significant reduction in *tamas* and increase in *sattvā* with large effect sizes. The assessment in the Yoga group was done a week prior to the term examinations while that in the Control group was done a week after the term examinations. It is possible that the resulting relaxed state of mind might have contributed to the improvements seen in the Control group.

It may, further, be noted that only one study by Patil and Nagendra (2014) has reported a change in *triguna* as a result of a short term *yoga* intervention. The general impression is that *triguna* changes require long term practice. This is supported by a study which compared the *triguna* composition of long term *yoga* practicing adults with that of non-practicing adults. The study found that the *yoga* practitioners had a significantly higher *sattvā* score and lower *rajas* and *tamas* scores compared to non-practitioners (Gopal, Mandal and Parimala, 2011).

We now compare the results with longer duration *yoga* interventions. A study by Purohit, Pradhan and Nagendra (2016) found significant differences in nine out of eleven EUROFIT variables in the Yoga group compared to the Control group. Hence, the impact of short duration *yoga* intervention is in conformity with earlier research with longer duration intervention. An earlier study assessed executive function using the Stroop test between a Yoga group and physical exercise group. The study did not find any significant difference between Yoga and PE groups. However, in the within-subject comparison, the Yoga group reported a significant improvement with small effect size (Telles, Bhardwaj, Kumar and Balkrishna, 2013). Another study reported a significant improvement in the Yoga group compared to control with a moderate effect size (Purohit and Pradhan, 2017). The result of the short duration module is in line with the results obtained in studies using longer duration *yoga* modules. Regarding emotional well-being variables, studies using longer duration *yoga* interventions have reported improvements in self-confidence, self-concept, mood disturbance, tension-anxiety, negative affects with medium effect sizes (Noggle, Steiner, Minami and Khalsa, 2012; Bhardwaj, Mookherjee and Bhardwaj, 2015; Benson et al, 1994). The result of the present study that used a short duration *yoga* module is consistent with results of the studies that used longer duration *yoga* modules, albeit with a small effect size.

The qualitative assessment buttressed the benefits shown in the quantitative results of the study. Students and teachers found the duration of the ICYM just right. Further, no problems were experienced with its implementation and students found the practice enjoyable. This augers well for the inclusion of the short duration ICYM in the daily school schedule. The present qualitative findings are in consonance with a previous qualitative research that reported the perceived benefits as kinesthetic awareness, improved self-image, stress reduction, self-regulation of emotions and social cohesion (Conboy, Noggle, Frey, Kudesia and Khalsa, 2013).

The question arises as to why the short duration ICYM positively impacted physical, cognitive and emotional measures. One possible reason could be that the module itself had been developed methodically. It is an integrated practice incorporating *āsana*s (physical postures), *prānāyama* (breathing practice), *dhyāna* (meditation) and *mantrā* (chanting). The practices have been specifically selected for their impact on physical well-being, mental calmness, stress reduction and impact on concentration. They have been sequenced in a manner that the physical postures involve full body movement namely, sideways bending, forward-backward bending, stretching and balancing. The breathing exercises too include full breathing, balancing breathing and inward focusing practice. Chanting and meditation promotes calmness, stress reduction and concentration. The module had been validated by subject matter experts (Sinha, Kumari and Ganguly, 2021). The second possible reason was that the convenience of the module made it possible to practice daily. The daily practice may have contributed to its efficacy. The third reason is that we know from modern research that *yoga* is connected with physical, cognitive and emotional benefits. This module is a shorter version of a practice known to work.

The present study shows that the school-based short duration ICYM had equivalent effect on physical fitness compared to the longer duration module. On cognitive performance and emotional well-being variables, the ICYM was effective, albeit, with small effect sizes. It may be concluded that the short duration ICYM can be considered for inclusion in the daily school schedule when it is not feasible for the longer duration module to be included. The importance of the present study, thus, is that it paves the way for inclusion of *yoga* in the daily school schedule by addressing the problems of time and resources.

7.4 STRENGTHS OF THE STUDY

The study has substantial strengths: (i) The ICYM intervention used was a methodically developed and validated module with its feasibility and efficacy confirmed in a pilot study (Sinha, Kumari and Ganguly, 2021). (ii) The research design was randomized control trial with a large sample size. (iii) The test variables covered multiple domains of personality, like physical fitness, cognitive performance, self-esteem, emotional well-being and personality characteristic which are all components of the development of the whole child. (iv) The quantitative study was supplemented with a qualitative assessment to build an in-depth understanding of the experience, benefits and feasibility of the practice.

7.5 LIMITATIONS OF THE STUDY

The limitations of the study were: (i) the randomization was unequal since the control and Yoga groups were drawn from two different campuses of an urban school group and (ii) the study lacked follow up assessments to ascertain sustenance of benefits. Future studies could specialize on studying in depth, multiple variables within each personality domain. Longitudinal studies could strengthen the findings of this study. Classroom *yoga* modules for different age groups could be developed and tested to ascertain its effectiveness across age groups.

If there arises any doubt regarding your conduct in life, act exactly like the wise, who are thoughtful, religious, gentle and devoted to Dharma.

The Convocation Address
Taittiriya Upanishad