



Assess the Effectiveness of Integrated Yoga on Learning ability, Academic Stress, Biomarker and Anxiety among the School Children

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Abstract

Human is prepared to engage with his/her skills to the outside world through the learning process. Learning is the process of acquiring various skills and gaining them in a methodological and systematic way. The aim of the study was to determine the effectiveness of yoga on reduction of academic stress, to improve the learning ability among the school children. **Design:** Quantitative Research design was used. **Method:** One hundred and forty school children who fulfilled the inclusion criteria were selected and assigned into control (n=70) and experimental (n=70) groups with simple random sampling technique. The children's performance was assessed by based on the Cumulative Record Card, Opinion about the parents and learning ability of children IQ level by using revens coloured progressive matrix. Academic stress scale was used before and after the intervention. Experimental group received integrated yoga for 8 weeks with 1 hour session held each day. Whereas the control group received routine care. Parametric and nonparametric statistical methods were used

compare the results. **Findings:** The mean and standard error of Raven Coloured Progressive Matrix of Control Pre-test, Post-test 1 and Post-test 2 are 44.9, 44.9 and 44.9, respectively. The mean Raven Coloured Progressive Matrix score of Experimental Pre-test, Post-test 1 and Post-test 2 are 44.9, 47.5 and 50.1, respectively. The experimental group showed significant change in Pre-test and Post-test 1 (within group), Pre-test and Post-test 2, and Post-test 1 and Post-test ($P < 0.001$, < 0.001 and < 0.001 , respectively). In the Control group from Pre-test to Post-test 2, no improvement was seen, while in the Experimental group 5.2 score increases was observed. The mean and standard error of academic stress of Control Pre-test, Post-test 1 and Post-test 2 are 66.2, 66.2 and 66.2, respectively. The mean academic stress score of Experimental Pre-test, Post-test 1 and Post-test 2 are 75.2, 57.6 and 43.5, respectively. The experimental group showed significant change in Pre-test and Post-test 1 (within group), Pre-test and Post-test 2, and Post-test 1 and Post-test ($P < 0.001$, < 0.001 and < 0.001 , respectively). In the Control group from Pre-test to Post-test 2, no improvement was seen, while in the Experimental group 31.7 score decrease was observed, showing the effectiveness of the intervention. **Conclusion:** Yoga for the school children may be a beneficial intervention for reducing academic stress, improving the learning ability and academic performance.

Keywords: Effectiveness, bio marker, integrated yoga, learning ability, academic stress, and anxiety, school children

Introduction

The process of learning starts when the child or the infant learns to cry for their basic needs like food and elimination¹. In the later stages the child acquires his/her milestones and learns to talk, interpret the languages, and write etc. the 21st century learning skills are often called the 4 C's: critical thinking, creative thinking, communicating, and collaborating. These skills help students learn, and so they are vital to success in school and beyond. One of the best places to start is by assessing students, both formally and informally a classroom may be filled with students of the same age, but their learning abilities will most likely vary over a broad spectrum. Conducting assessments help teachers identify a student's individual academic skills, learning styles and interests in mixed-ability classrooms². The study was conducted by Justine James. et al. (April 2018) to assess the percentage of learning disability students in India it was found that 1%-19% of the students was suffering from learning disability. Today's education is competitive, stressful, and hectic to the students. Most parents expect exceptionally good academic results from their children. Such a pressure of parents makes students very busy in self-study, tuition classes, and completing home works. Indian school education system is textbook-oriented that focuses on rote memorization of lessons and demands long hours of systematic study.³ Academic stress has extended during the last few years, there are examinations, assignments and lots of different activities that a pupil has to shuffle through. Not only the instructors and parents additionally burden the scholars with numerous stress of having good grades. These expectations cause the students to work tirelessly and increase their stress levels.⁴ The parents, as well as the institutions, need the students to participate in extracurricular activities in addition to their academics because the modern expectation of the student is to be well-rounded.

According to medical professionals, 90%–95% of illnesses in modern era can be attributed to psychological reasons. Stress also manifests itself into many other physical ailments. Meditation practice and yoga enables a students to overcome stress and makes him/her capable of attaining good performance and improve learning ability in school and also helps face other life-related problems.⁵ School dropout rates have also been attributed to learning difficulty and poor academic performance. Specific clinical features of depression such as reduced attention span, lethargy, poor concentration and memory, as well as abridged task perseverance are all factors that have emerged as obstacles to effective learning⁶. Academic achievement is an attained ability of competence in school task, usually measured by standardized tests and expressed in grades or units based on norms derived from a wide sampling of pupils' performance⁷. Indian education system resembles colonial legacy: educational structure, curriculum design and pattern of examination. But too much stress cause a lot of discomfort and get in the way of being able to focus and achieve. The processes of attention, concentration, and memory are the main factor in learning. Yoga is an ancient technique which is claimed to enhance physical and mental well-being and designed to bring balance and health to the physical, mental, emotional, and spiritual dimensions of the individual. "Yoga" means union of our individual consciousness with the Universal Divine Consciousness in a super-conscious state known as Samadhi. It was also found that brief yoga-based relaxation training normalizes the function of the autonomic nervous system by deviating both sympathetic and parasympathetic indices toward more "normal" middle region of the reference values. Yoga significantly decreases heart rate and systolic and diastolic blood pressures⁸. It has been hypothesized that some yoga exercises cause a shift toward parasympathetic nervous system dominance, possibly via direct vagal stimulation. Shapiro et al has demonstrated the effectiveness of yogic techniques in the management of anxiety and reported increased attention/concentration. Yoga keeps body healthy but also increases brain power, memory power and concentration. A brain, a mass of soft tissues that weighs less than 1.5 kg, controls everything including ability to talk, think, feel and even breathe⁹ Yoga techniques are helpful in management of anxiety and improvement in concentration. Other researchers found that Transcendental Meditation improves academic performance and enhances problem-solving ability Results shows that the students with high stress performed better in the subjects of Social Studies and Science¹⁰. Further the findings reveal that excessive stress affects overall academic performance negatively, and this result is in tune with the earlier studies, which conclude that excessive stress is harmful to academic performance and may lead to dropping out.¹¹

Effects of a Yoga Program on Health, Behaviour and Learning Ability in School Children: A Single Arm Observational Study. Learning difficulties, Stress and behavioural problems are widely prevalent in school children that contribute to dropouts and poor performance¹². Yoga as a mind body intervention has been shown to improve performance and learning ability. Iron deficiency (ID) is the most common nutrient deficiency, affecting 2 billion people and 30% of pregnant women and their offspring. Early life ID affects at least 3 major neurobehavioral domains, including speed of processing, affect the learning and memory, the latter being particularly prominent. The learning and memory deficits occur while the infants are iron deficient and persist despite iron repletion.¹³ The impact of anaemia is best understood by looking at school dropout rates. India Spend reported in September 2016, in children, iron deficiency anaemia severely affects cognitive performance. It also

impacts language skills, motor skills and coordination among infants and young children, and a deficit of five to 10 points in intelligence quotient (IQ). The 2011 estimates suggest anaemia affects around 800 million children.

Thyroid hormones affect many important processes in the body, including metabolism, brain development, heart and nervous system functions, body temperature, and weight. In children, hypothyroidism can also stunt growth and affect intellectual development. Dr. Cooper (2013) said that key signs of hypothyroidism in children may include not growing normally, lagging behind behaviorally, having an enlarged goiter (swelling in the neck), experiencing learning disabilities, falling asleep during the day, and having low mood, or depression. This review covers recent findings on the main categories of thyroid hormone–disrupting chemicals and their effects on brain development. Further, we emphasize recent data showing how maternal thyroid hormone signalling during early pregnancy affects not only offspring IQ, but also neuro developmental disease risk. These recent findings add to established knowledge on the crucial importance of iodine and thyroid hormone for optimal brain development. We propose that prenatal exposure to mixtures of thyroid hormone–disrupting chemicals provides a plausible biological mechanism contributing to current increases in the incidence of neuro developmental disease and IQ loss.¹⁴ Research has demonstrated that high levels of stress can lead to hyper vigilance as arriving at a solution too quickly (premature closure). Higher levels of stress reduced grade point average (GPA) among 146 college men and led to increased psychological and somatic symptom logy.¹⁵ It may be concluded from the finding of the study that with the intervention of yoga, academic performance improves by optimizing the stress levels. So it is suggested that yoga module should become a regular feature in the schools.¹⁶

Materials and Methods

Study design

This pilot study was done to assess the feasibility and initial efficacy. The present study is a prospective, nonrandomized design with pre-test and post-test assessment. The study was approved by the Institutional Ethics Committee of Saveetha Medical College and Hospital on 003/09/2021. An information sheet was provided about the study in English and Tamil to the children, and signed consent for participation in the study was obtained. Confidentiality was maintained.

Intervention and Study Material

The effectiveness of integrated yoga in reduction of academic anxiety and stress was analysed in this study. The study was conducted in kuthambakkam village under Kancheepuram district situated in Tamil Nadu state, with a population 5047. The size of the area is about 8.33 square kilometer. Out of this, 2567 are males whereas the females count 2480 here. This village has 547 children in the age of 6-12 years. Out of this 287 are boys and 260 are girls. Biomarkers such as Haemoglobin, T3, T4, TSH level was measured. Using convenient sampling technique Children who fulfilled the inclusion criteria were selected and assigned into control (n=70) and experimental (n=70) groups. Members of the experimental group provided informed consent for the study after being fully informed about it. The children's performance was assessed by based on the Cumulative Record Card, Opinion about the parents and learning ability of children IQ level by using Revens coloured progressive matrix, Academic stress scale was used before and after the intervention. Experimental group received

integrated yoga such as asana for 8 weeks with 1 hour session held each day. Yoga improving the learning ability, concentration, academic performance and reducing academic stress and anxiety among the school children. It includes Surya Namaskar, Bakasana, Padmasana, Paschimottanasana, Sukhasana, Vajrasana, Padahasthasana, Sarvangasana, Halasana, Tadasana, Savasana. Whereas the control group received routine care. Parametric and nonparametric statistical methods were used to compare the results.

Statistical Analysis

The data are represented as mean \pm SEM and analysed by two-way repeated measures analysis of variance (RM ANOVA) for one factor repetition, and Bonferroni 't' test for post hoc multiple comparisons. Factor A, was groups (between group comparison – Control and Experimental), Factor B, was tests (within group comparison i.e., repetition factor – Pre-test, Post-test 1 and Post-test 2) and the group X test interaction. A probability of 0.05 and less was considered as statistically significant. SigmaPlot 14.5 version (Systat Software Inc., San Jose, USA) was used for statistical analysis.

Results

The Raven Coloured Progressive Matrix mean and standard error of Control Pre-test, Post-test 1 and Post-test 2 are 44.9, 44.9 and 44.9, respectively. The mean Raven Coloured Progressive Matrix score of Experimental Pre-test, Post-test 1 and Post-test 2 are 44.9, 47.5 and 50.1, respectively. Two-way RM ANOVA revealed significant difference in the groups (Control and Experimental) ($P = 0.002$). The tests (Pre-test, Post-test 1 and Post-test 2) and the interactions (group X test) also showed significant difference ($P < 0.001$ and < 0.002 , respectively). Multiple comparisons revealed significant difference between Control and Experimental Pre-tests (between group) ($P = 0.002$), The Post-test 1 and Post-test 2 also showed statistical significance ($P = 0.001$ and < 0.001 , respectively). No significant change was observed among Control Pre-Test and Post-test 1 (within group), Pre-test and Post-test 2, and Post-test 1 and Post-test 2 ($P = 1.0, 1.0, 1.0$ and respectively). The experimental group showed significant change in Pre-test and Post-test 1 (within group), Pre-test and Post-test 2, and Post-test 1 and Post-test 2 ($P < 0.001, < 0.001$ and < 0.001 , respectively). In the Control group from Pre-test to Post-test 2, no improvement was seen, while in the Experimental group 5.2 score increases was observed, showing the effectiveness of the intervention.

The academic stress scale mean and standard error of Control Pre-test, Post-test 1 and Post-test 2 are 66.2, 66.2 and 66.2, respectively. The mean academic stress score of Experimental Pre-test, Post-test 1 and Post-test 2 are 75.2, 57.6 and 43.5, respectively. Two-way RM ANOVA revealed significant difference in the groups (Control and Experimental) ($P = 0.008$). The tests (Pre-test, Post-test 1 and Post-test 2) and the interactions (group X test) also showed significant difference ($P < 0.001$ and < 0.001 , respectively). Multiple comparisons revealed significant difference between Control and Experimental Pre-tests (between group) ($P = 0.002$), The Post-test 1 and Post-test 2 also showed statistical significance ($P = 0.002$ and < 0.001 , respectively). No significant change was observed among Control Pre-Test and Post-test 1 (within group), Pre-test and Post-test 2, and Post-test 1 and

Post-test 2 ($P = 1.0, 1.0, 1.0$ and respectively). The experimental group showed significant change in Pre-test and Post-test 1 (within group), Pre-test and Post-test 2, and Post-test 1 and Post-test ($P < 0.001, < 0.001$ and < 0.001 , respectively). In the Control group from Pre-test to Post-test 2, no improvement was seen, while in the Experimental group 31.7 score decrease was observed, showing the effectiveness of the intervention.

DISCUSSION

The aim of the study was to determine the effectiveness of yoga on reduction of academic stress, to improve the learning ability among the school children. The research shows that yoga is a useful method for reducing a range of psychological issues in school-aged children and enhancing focus, memory, and learning capacity¹⁷. The present study was supported by Christal Jeba N (2018) a study on effects of yoga and academic achievement of high school students. Sample consists of 300 IX standard students from Kaniya Kumari district using random sampling technique. The study concluded that daily yoga participation assists in maintaining high levels of engagement and academic achievement in students.¹⁸

National Council of Educational and Research Training 2015: (NCERT) introduced the book entitled "Yoga: A Healthy Way of Living" meant for school children while celebrating International Yoga Day on 21 June. Yoga is an integral part of 'Health and Physical Education' which is a compulsory subject up to secondary stage. Yoga contributes to the physical, social, emotional and mental development of a child. Yoga has been considered to be introduced from Class VI onwards, though yogic activities may begin in an informal way from primary level onwards.¹⁹ Amit Kauts and Neelam Sharma (2009) Effect of yoga on academic performance in relation to stress. The study started with 800 adolescent students; 159 high-stress students and 142 low-stress students were selected on the basis of scores obtained through Stress Battery. Experimental group and control group were given pre-test in three subjects, i.e., Mathematics, Science, and Social Studies. A yoga module consisting of yoga asanas, pranayama, meditation, and a value orientation program was administered on experimental group for 7 weeks. The results show that the students, who practiced yoga performed better in academics. The study further shows that low-stress students performed better than high-stress students, meaning thereby that stress affects the students' performance.²⁰ Yoga helps students to assist their attention in a variety of tasks. Stress can be controlled by certain yogic techniques. Yoga reduces stress and brings self-control. Regular yoga practices develop healthy life style habits for healthy and happy life forever.²¹ Yoga practices also improve performance of children in special memory task. It also helps to increase in memory level.²²

Conclusion

The current study provides evidence that Yoga for the school children may be a beneficial intervention for reducing academic stress, improving the learning ability and academic performance. Finding suggests that yoga practices help children to develop a greater awareness of their body mind and emotions.

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Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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Reference

1. Ager K, Albrecht NJ, Cohen M. Mindfulness in Schools Research Project: Exploring Students Perspectives of Mindfulness. *Psychology*. 2015; 6:896-914.
2. Yuwei Deng, Jacob Cherian, Noor Un Nisa Khan, Kalpina Kumari, Muhammad Safdar Sial, Ubaldo Comite, Beata Gavurova, and József Popp Family and Academic Stress and Their Impact on Students' Depression Level and Academic Performance. *Front Psychiatry*. 2022; Doi: 10.3389/fpsy.2022.869337.
3. Bihari, Saket. (2023). Academic Anxiety among Secondary School Students with reference to Gender, Habitat and Types of School.
4. Hotkar, J.M. Significance of Shahaj Yoga Meditation in reducing academic stress, *Yoga-Mimamsa*, 2017; 49(1), 17-19.
5. Dr. Kalidas Karak, Abhijit Ghoshal and SK Rasid Mahammad, Effect of yogasana on academic performance of school going students, *International Journal of Physical Education, Sports and Health* 2016; 3(4): 194-197
6. Dr. Shanti Swaroop Dr. Madhu Mahor. Effect of Yoga Exercise on Memory and Academic Achievement, *international journal of creative research thought* ,2021: 9(4) 2569-2571
7. Seema, Dr.Suman Dalal, Effect of Yoga on Academic Performance of secondary School Students, *International Journal of Research in Economics and Social Sciences* ,2019; 9 (1) :352-364
8. Dubey, S. N. (2011). Impact of yogic practices on some psychological variables among adolescents. *Indian Journal of Community Psychology*, 7(1), 1-7.
9. Zilli, A. S. & Charli. Mental health among yogic and non-yogic practitioners. *Indian Journal of Health and Well-being*, 2012; 3(1), 295-297
10. Songsak Phusee-orn et.al. A Study of Intelligence Quotient for Primary School Students in Maharakham Province, *Journal of Education and Training Studies*;2019 . 7(2)206-211.

11. Lakshmi Prabhur, Ruckmani A, Venkatesan D, Madhusudhanan N, Pavithra R. Anxiolytic effect of homeopathic preparation of Pulsatilla nigricans in Swiss albino mice. *Homeopathy*. 2012;101(3):171-174.
12. K Anupama, D Sarada, Academic stress and levels of life skills among high school children, *IP Indian Journal of Neurosciences* 2020;6(4):241–246.
13. Stephanie J. B. Fretham, Erik S. Carlson, Michael K. Georgieff The Role of Iron in Learning and Memory Advances in Nutrition, 2011;2(1),112–121, <https://doi.org/10.3945/an.110.000190>
14. Fanni Päckilä, Tuija Männistö, Anna-Liisa Hartikainen, Aimo Ruokonen, Heljä-Marja Surcel, Aini Bloigu, Marja Vääräsmäki Marjo-Riitta Järvelin, Irma Moilanen, and Eila Suvanto. Maternal and Child's Thyroid Function and Child's Intellect and Scholastic Performance. *Thyroid*. 2015 Dec 1; 25(12): 1363–1374. doi: 10.1089/thy.2015.0197
15. Jaysing Malhari Hotka, Significance of Sahaja Yoga meditation in reducing academic stress. *Yoga Mīmāṃsā*; 2017, 49(1) 17-19.
16. A.O. Busari, Academic Stress among Undergraduate Students: Measuring the Effects of Stress Inoculation Techniques, *Mediterranean Journal of Social Sciences*. 2014;5(27),599-609
17. Vhavle S, Rao MR, Manjunath NK, Ram AR, Effects of a Yoga Program on Health, Behaviour and Learning Ability in School Children: A Single Arm Observational Study. *Int J Complement Alt Med* 2017; 5(1): 00138. DOI: 10.15406/ijcam.2017.05.00138
18. Christal Jeba N. A study on effects of yoga and academic achievement of high school students. *International Journal of Research-Granthaalayah*, 2018;6(7), 23-27.
19. Ranjna Devi and Dr. Mudit Rathore, Effect of yoga practices on educational achievement: A short summary of reviews *International Journal of Yogic, Human Movement and Sports Sciences* 2018; 3(2): 369-373.
20. Amit Kauts and Neelam Sharma, Effect of yoga on academic performance in relation to stress, *International Journal Of Yoga*, 2009; 2(1): 39–43.
21. Manasi Bera et.al. Role of yoga in psychological correlates of learning ability in school children, *Yoga Mīmāṃsā*; 2017, 49:13-16.
22. Devi, R. & Rathor, M. . Effect of yoga practices on educational achievement: A short summary of reviews. *International Journal of Yogic, Human Movement and Sports Sciences*, 2018. 3(2), 369-373

Table 1: Comparison of control and experimental groups on Raven Coloured Progressive Matrix by two-way RM ANOVA with Bonferroni ‘t’ test.

S.No.	Group comparisons	Test comparisons	Mean ± SE
1	Control	Pre-test	44.9 ± 0.5
	Control	Post-test 1	44.9 ± 0.5
	Control	Post-test 2	44.9 ± 0.5
	Experimental	Pre-test	44.9 ± 0.6

	Experimental	Post-test 1	47.5 ± 0.6
	Experimental	Post-test 2	50.1 ± 0.6
2	Significance among groups (Control and Experimental)		F = 10.189 P = 0.002
	Significance among tests (Pre-test, Post-test 1 and Post-test 2)		F = 729.347 P < 0.001
	Significance in the interaction (groups X tests)		F = 729.347 P < 0.001
3	Significance between Pre-test (Control and Experimental)		t = 0.000 P = 1.000
	Significance between Post-test 1 (Control and Experimental)		t = 3.154 P < 0.002
	Significance between Post-test 2 (Control and Experimental)		t = 6.378 P < 0.001
4	Significance within Control (Pre-test and Post-test 1)		t = 0 P = 1.0
	Significance within Control (Pre-test and Post-test 2)		t = 0 P = 1.0
	Significance within Control (Post-test 1 and Post-test 2)		t = 0 P = 1.0
5	Significance within Experimental (Pre-test and Post-test 1)		t = 26.706 P < 0.001
	Significance within Experimental (Pre-test and Post-test 2)		t = 54.012 P < 0.001
	Significance within Experimental (Post-test 1 and Post-test 2)		t = 27.306 P < 0.001
n = 70 each in control and experimental groups			

Table2: Comparison of control and experimental groups on academic stress by two-way RM ANOVA with Bonferroni ‘t’ test

S.No.	Group comparisons	Test comparisons	Mean ± SE
1	Control	Pre-test	66.2 ± 2.3
	Control	Post-test 1	66.2 ± 2.3
	Control	Post-test 2	66.2 ± 2.3

	Experimental	Pre-test	75.2 ± 1.5
	Experimental	Post-test 1	57.6 ± 1.7
	Experimental	Post-test 2	43.5 ± 1.5
2	Significance among groups (Control and Experimental)		F = 7.278 P = 0.008
	Significance among tests (Pre-test, Post-test 1 and Post-test 2)		F = 889.277 P < 0.001
	Significance in the interaction (groups X tests)		F = 889.277 P < 0.001
3	Significance between Pre-test (Control and Experimental)		t = 3.223 P = 0.002
	Significance between Post-test 1 (Control and Experimental)		t = 3.080 P = 0.002
	Significance between Post-test 2 (Control and Experimental)		t = 8.138 P < 0.001
4	Significance within Control (Pre-test and Post-test 1)		t = 0 P = 1.0
	Significance within Control (Pre-test and Post-test 2)		t = 0 P = 1.0
	Significance within Control (Post-test 1 and Post-test 2)		t = 0 P = 1.0
5	Significance within Experimental (Pre-test and Post-test 1)		t = 33.023 P < 0.001
	Significance within Experimental (Pre-test and Post-test 2)		t = 59.522 P < 0.001
	Significance within Experimental (Post-test 1 and Post-test 2)		t = 26.499 P < 0.001
n = 70 each in control and experimental groups			

Table 3: Comparison of control and experimental groups on biological variables by Students‘t’ test

S.No.	Variable	Groups	Mean	SD	SEM	Statistics
1	Hb	Con	8.996	0.908	0.109	t = 21.597

	(g/dL)	Exp	11.811	0.601	0.072	P < 0.001
2	TSH	Con	0.482	0.133	0.016	t = 12.665
	(mU/L)	Exp	1.936	0.945	0.113	P < 0.001
3	T3	Con	96.043	4.539	0.546	t = 21.512
	(ng/dL)	Exp	124.329	9.949	1.189	P < 0.001
4	T4	Con	6.232	1.395	0.168	t = 19.684
	(ng/dL)	Exp	16.057	3.908	0.467	P < 0.001
<p>Con = Control</p> <p>Exp = Experimental</p> <p>n = 70 each</p> <p>Hb = Haemoglobin</p> <p>TSH = Thyroid stimulating hormone</p> <p>T3 = Thyroxin</p> <p>T4 = Triiodothyronine</p> <p>The 't' and 'P' values are by Student's 't' test.</p>						

Table 4: Comparison of control and experimental groups on demographic variables by chi-square test for homogeneity

S.No.	Variable	Category	Con	Exp	Statistics
1	Gender	Male	35	34	$\chi^2 = 0$ P = 1.0
		Female	35	36	
2	Age (years)	< 8	29	28	$\chi^2 = 0.0432$ P = 0.979
		8 – 10	22	22	
		> 10	19	20	
3	Type of family	Joint	27	25	$\chi^2 = 0.531$ P = 0.767
		Nuclear	20	24	
		Extended	23	21	
4	Father's Education	School	38	37	$\chi^2 = 0$ P = 1.0
		Graduate	32	33	
5	Mother's Education	School	42	42	$\chi^2 = 0$ P = 1.0
		Graduate	28	28	
6	Types of syllabuses	State Board	21	20	$\chi^2 = 0.123$ P = 0.941
		Central Board	25	27	
		Matriculation	24	23	
n = 70 each					

Figure 1: Effect of control (Con) and experimental (Exp) groups on ravens coloured progressive score in pre-test (Pre), post-test 1 (Post 1) and post-test 2 (Post 2).

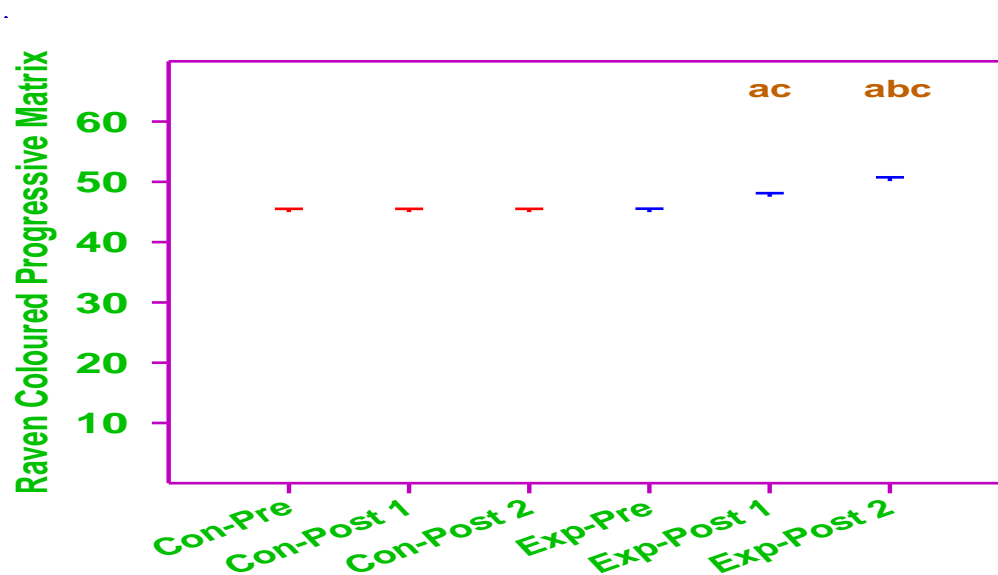
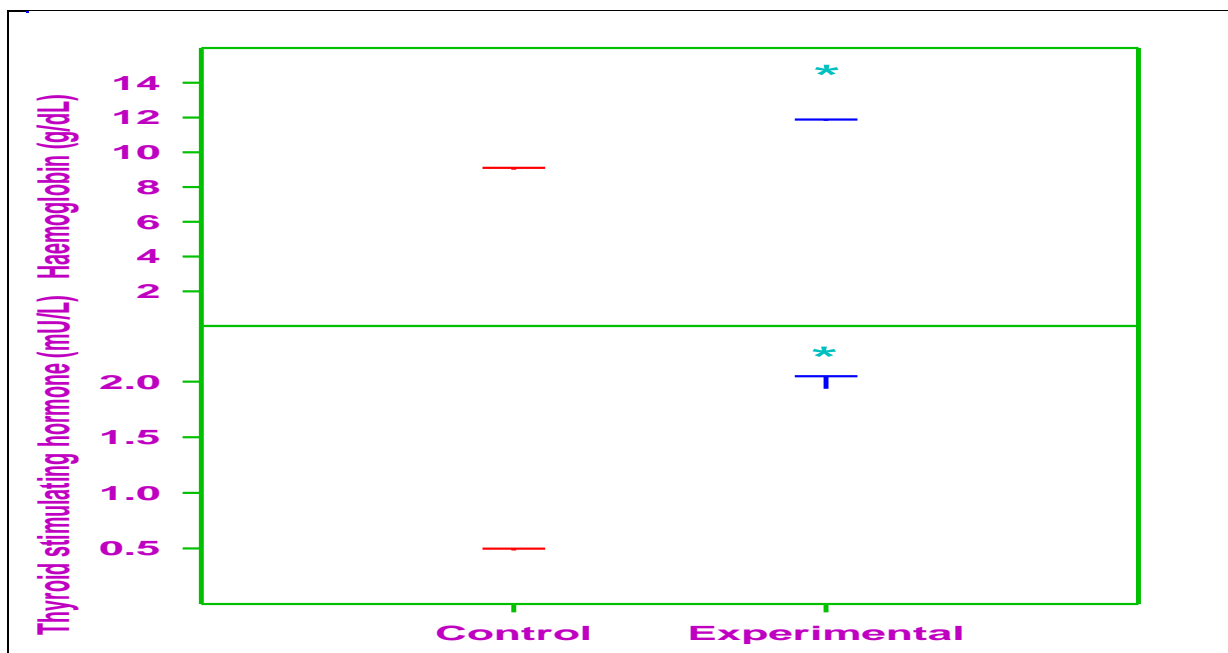


Figure 2: Effect of control (Con) and experimental (Exp) groups on academic stress score in



pre-test (Pre), post-test 1 (Post 1) and post-test 2 (Post 2).

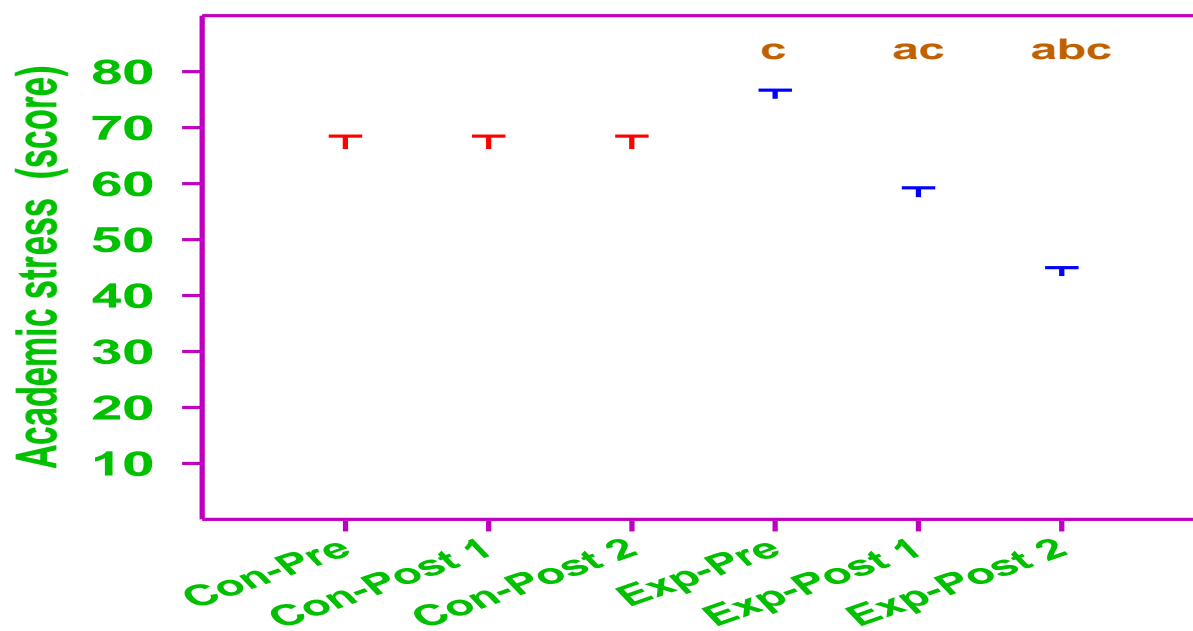


Figure 3: Effect of intervention in control and experimental groups on haemoglobin and thyroid stimulating hormone.

