Research Paper | *International Journal of Physical Education,* Vol. 4 No. 2 (October, 2011) : 93-100

Yoga: A better prospect for improving learning ability

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Received : *April, 2011;* **Revised :** *June, 2011;* **Accepted :** *July, 2011*

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ABSTRACT

Sixty adolescent boys within the age group of 13 to 18 were the subject for 12 weeks long study to measure the effect of a yoga programme on learning ability. Pre-test and post-test of both experimental and control groups were compared using ANOVA and found a positive effect of yoga on learning ability on adolescent school going boys.

Mishra, Sakti Ranjan, Rout, Puspa and Patra, Bipin Kumar (2011). Yoga: A better prospect for improving learning ability. *Internat. J. Phy. Edu.*, **4** (2) : 94-100.

Key words : Yoga, Learning ability, Adolescent

The process of yoga is an ascent into the purity of the absolute perfection that is essential for all human beings. This goal requires the removal of our enveloping personal impurities, the stilling of our lower feelings and thoughts and the establishment of a state of inner balance and harmony. Its methods are based on the perfection of our personalities that help to create a new world order. The adolescent period exhibits tremendous changes on physical, physiological and psychological aspects of the individual and continues to transform a young person to reach the adulthood. Therefore, adolescent stage is a phase of life where the youths require maintaining physical and mental fitness to facilitate proper growth. Inclusion of yogic activities programme in school physical education programmes may lead the young boys and girls towards their fullest growth as well as their desired level of academic achievements.

Craik and Tulving's (1975) study was conducted to test a theory of memory called the depth of processing (or levels of processing) framework. The participants in Craik and Tulving's study were first exposed to a list of words, and shortly afterwards were tested to see how well they remembered those words. Hermann Ebbinghaus (1885) was the first person to apply the scientific method to the study the learning and memory. Two of Ebbinghaus's major discoveries are the total time hypothesis and the principle of distributed practice.

METHODOLOGY

The present study was a self assumed assignment to investigate the effect of yoga on learning in adolescent school going boys. Sixty (n= 60) adolescent students of Delhi Public School, Anugul were taken as subjects of the study. They were the students of classes VIII, IX, and X belonging to the age group of 13 to 18 years. On the basis of random sampling conducted in classes, only 60 students were selected for the study. They were assigned into two (2) equal groups numbering 30 in each, categorized as 1. Experimental (Yoga) group and 2 Control group.

The following variables were selected to measure the learning ability of students:

1. Passage comprehension test, 2. Word series test, 3. Digit span test, 4. Number detection test, 5. Listening comprehension test

Measurements of the above variables were taken during pre- and post-test and standard methods were followed to procure the data. Training stimuli, adopted for a 12 weeks period, was considered here as independent variables.

Instrumentations and administration of dependant variables:

Tests were conducted to examine different psychological (cognitive) skills or ability of a person. Some tests test the attention or concentration power, some test the memory whereas others test the vocabulary capacity. These tests are used just before and after the training yoga to find out how training influences ones mental skills.

Passage comprehension test:

Reading introduces familiar experiences and stimulates questions and discussions. The researcher conducted on the Passage comprehension test that

measures the subject's ability to comprehend a short reading passage and identify a key word missing from it. For each blank, the subject is to supply a word that would be appropriate in the context of the passage within approximately 30 seconds. The task requires the subject to exercise a variety of comprehension and vocabulary skills.

Scoring:

A single-word response was only accepted. If the subjects respond with more than one word, they were asked for single word answer.

Word series test:

The word series subtest consists of 9 single–syllables, high frequency words: Book, Car, Cow, Dog, Girl, Key, Man, Shoe, and Wall. The subtest has 27 items that the administrator reads aloud to the subject. Each series ranges from length of 2 to 9 words read at the rate of one word per second. The subject was asked to repeat the words in the same order as stated by the examiner. The voice of the author must drop when the last word of the series was spoken in order to show the subject that the series is over.

Scoring:

Each item was scored either correct or incorrect (1, 0). The response of each item was considered as correct, when all the words were reproduced by the subject by maintaining the same sequence/order. Items were administered until the child repeats the series wrongly four times.

Digit span test:

There are many ways to test one's memory and concentration. One such way is the digit span test. In the digit span test, the subjects were required to repeat a series of digits as called out by their instructor. They were given scores on the basis of number of series they repeat orderly. It has two parts –Digit forward and Digit backward. Administer digit backward to the subject even if he obtains a score of zero in digit forward.

Scoring:

At first, the investigators asked the subjects to listen carefully. Then they called out a series of numbers at the rate of one per second. The applicants listen to them carefully and repeat after the instructor. Each applicant had to face two trials. For every item he was given a chance to attempt the second trial even if he failed in the first trial. But if he failed in both the trails of an item then the test came to an end for him. Two points were awarded if the child passed both the trials, one point if he passed in one trial and zero for failure in both the trials. The maximum score one can obtain was 28 points-14 for digit forward and 14 for digit backward.

Number detection test:

Number detection is a test designed to measure selectivity, ability to shift attention and resistance to distraction. The subjects were presented a page of numbers and were asked to underline specific numbers that appear at the top of each page within 2 mins and 30 secs. In item 1 they were asked to underline the numbers 1, 2 and 3 printed in an outlined typeface (hollow number). In item 2 they were asked to underline the numbers 1, 2 and 3 that appeared in regular typeface (single line), and 4, 5 and 6 appeared in an outlined type face (hollow number). There were 15 rows of 12 numbers with a total of 45 targets (25% targets) in each item. The subjects were instructed to complete each page working from left to right and top to bottom and not to go back to check the page after completion.

Scoring:

The raw score for Number Detection is the ratio of the accuracy score (total number correct minus the number of false detections) and the total time taken for each item, summed across the items. The more accurate the subject is at detecting the target stimuli and avoiding the distracting stimuli.

Listening comprehension test:

Before the test, the researchers instructed the subjects to pay full attention and listen carefully to what the investigators say and remember the important points. A few questions based on an unseen passage were distributed to the subjects. The researchers played the cassette thrice and instructed to start writing until the tape recorder stopped playing.

Scoring:

First of all, the tape recorder was played and the subjects were asked to listen to the passage very minutely and carefully, so that they could answer a ten marks question paper based on that extract being played. The subjects were given a piece of paper in which some questions were stated and the subjects were asked to read those questions. The researchers played the cassette related to the questions and then they were given time to answer the questions. In the first time they may or may not remember all the points. So they were given three

chances to correct the mistakes. The researchers played the tape recorder again and the subjects answered the questions that they left. This way the test was conducted. The cassette was played for three times and within that time, subjects were asked to listen, complete and check their writing.

Administration of tests:

After conducting a pre-test on learning ability, the students were divided homogenously into two groups *viz.,* (1) Yogic exercise group (Experimental group) and (2) Non–practitioner group (Control group). The first group was told to participate on the specified activities, prescribed for them, according to the nature of their group. The second one, the non-practitioner group was instructed not to participate in any of the activities of the other groups and to function as usual during the periods of treatment.

Description of experimental group activities:

Yoga:

The following yogic activities were given as treatment to the subjects for 12 weeks. Three classes in week with duration of 40 minutes each were the timing schedule for the yoga group. The yogic activities included Asanas and Pranayama.

Asana:

1. Vrikhsasana, 2. Tadasana, 3. Natarajasana, 4. Padmasana, 5. Ardha-matsyendrasana, 6.Ustrasana, 7.Bhujangasana,8.Dhanurasana,9.Ardha-shalbhasana, 10.Sarvangasana, 11. Sputa-vajrasana, 12. Shavasana.

Students were instructed to maintain each Yogasana at least for a period of 30 seconds.

Pranayama:

1. Bhastrika Pranayama, 2. Anuloma-viloma Pranayama, 3. Kapalabhati Pranayama 4. Bhramari Pranayama

OBSERVATIONS AND DISCUSSION

The descriptive statistics employed were mean and standard deviation of the subject's scores in the learning variables. The measures of mean and standard deviation of both the experimental and control groups have been presented in Table 1. The results of descriptive as well as inferential statistics have been presented as follows:

Results on Yoga for learning ability:

The statistical model for this investigation has been presented in Table 1. This experiment included two groups (*viz.*, Gr.A: Experimental *i.e.* Yoga group and Gr.B: Control group), who participated in five test items of learning ability tests which were tested two times (*i.e.*, during pre-and post-tests). Thus, the statistical design as 2 x 2 x 5 Factorial ANOVA.

Table 1: Model of factorial design for learning ability (2 x 2 x 5 Factorial ANOVA)

Factor	Levels	Design
Variables (5)	Passage comprehension (A1)	2 x 2 x 5 Factorial ANOVA
	Word series (A2)	
	Digit span (A3)	
	Number detection (A4)	
	Listening comprehension (A5)	
Groups (2)	Yoga Gr. (B1), Control Gr. (B2)	
No. of testing (2)	Pre-test (C1)	
	Post test (C2)	

Analysis of descriptive data:

The result of mean and SD has been presented in Table 2.

Thus, the result on the measures of mean and standard deviation as presented in Table 2 revealed that the training intervention *i.e.*, "Yoga training" may have better treatment effect than the "Control" in improving learning ability of the subjects. However, it was not clearly evident statistically that the treatment stimulus helped to influence the variables. Therefore, inferential statistics (*i.e.*, 2 x 2 x 5 Factorial ANOVA) have been employed followed by Scheffe's post hoc test.

Factorial analysis of data on learning ability:

In case of inferential statistics applied on learning variables, the result of 2 x 2 x 5 Factorial ANOVA (Table 3) revealed that all most all the variables got remarkably significant changes ($F=62.49$, $p<0.01$). Further, statistically significant changes were also evident in case of the experimental and control groups ($F=35.70$, $p<0.01$) and even in interactions ($F=40.27$, $p<0.01$). It seems that the training intervention had statistically significant effects. These changes, therefore, have been discriminated further by using Scheffe's post hoc test.

Results on Scheffe's post hoc analysis for learning:

Result on Yoga for passage comprehension test (PCT) In passage comprehension test (Pts.), the ordered means of "Yoga training group" (Pre: 1 and post: 2) and "Control group" (Pre: 3 and post: 4) as presented in Table 4 were 34.04, 43.12, 34.46 and 33.78, respectively (where, 1 = Pre-test of Yoga training group, 2 = Post-test of Yoga training group, 3 = Pre-test of Control group, and 4 = Post-test of Control group).

Table 2 : Mean and standard deviation of the groups in learning ability test

Variables (A) in pts.	Group	Pre-test		Post-test	
		Mean S.D.	S.D.	Mean	S.D.
Passage comprehension (Pts.) (A1)	Experimental group	34.25	5.57	42.35	4.49
	Control group	35.46	5.32	33.40	4.67
Word series (pts.) (A2)	Experimental group	12.42	2.04	11.65	1.84
	Control group	12.34	0.40	11.87	0.49
Digit span (A3)	Experimental group	17.35	1.55	19.95	1.53
	Control group	18.59	1.50	17.65	1.47
Number detection (A4)	Experimental group	73.21	8.27	79.44	8.45
Score in pts.	Control group	75.23	7.38	76.22	8.53
Score in Secs.	Experimental group	236.34	27.26	231.37	26.52
	Control group	233.46	26.34	241.27	25.56
Listening comprehension (A5)	Experimental group	9.40	1.08	9.44	1.11
	Control group	9.29	1.20	9.05	1.14

Table 3: Result of analysis of variance (ANOVA) of learning abilities

Source of variation	S.S.	d.f.	M.S.	F
Total	7140.43	160	-	-
Yoga group (A)	2792.00	5	558.40	35.70**
Control group (B)	629.88	1	629.88	40.27**
Interaction	1482.03	11	134.73	08.60*
Error	2236.52	143	15.64	

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 4 : Ordered treatment means of passage comprehension (Yoga training group Vs Control group)

	O rder			
	1	2	3	4
Means	34.04	43.12	34.46	33.78

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

The statistical significance of Scheffe's Post Hoc test presented in Table 5 revealed that-

– Control group did not show significant improvement in "Passage comprehension" (CD=0.18, p>0.05).

Table 5 : Scheffe's Post Hoc test for difference between pairs of ordered means in Passage comprehension (Yoga training group Vs Control group)

Steps	3	2	1
4	0.18	0.34*	0.13
3		0.19	0.11
2		-	0.44**
1			-

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

* and ** indicate significance of values at P=0.05 and 0.01, respectively

– Yoga training group had higher score that showed significant improvement (CD=0.44, p<0.05) in "Passage comprehension".

– "Yoga training" helped to increase high score which was significantly superior to the "Control" in improving "Passage comprehension". (CD=0.34, p<0.05) (Fig. 1).

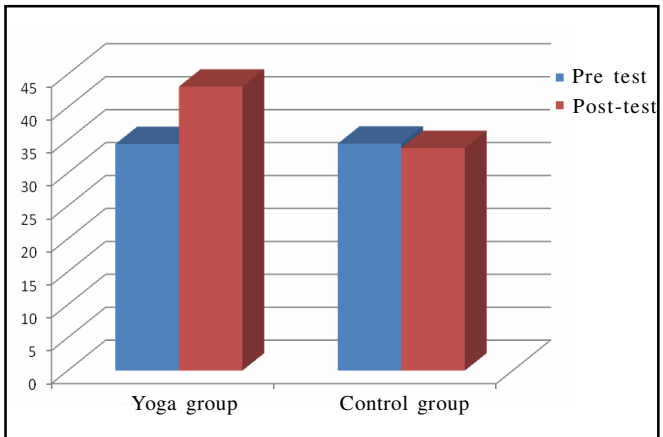

Fig. 1: Yoga for improvement in passage comprehension test

The result revealed that the yoga training has positive effect towards improvement in passage comprehension test which in turn improves the learning ability.

Table 6 : Ordered treatment means of word series (Yoga training group Vs Control group)

	Order			
	1	2	3	4
Means	11.6	12.88	11.04	11.19

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

Result on Yoga for word series test:

In Word Series (Pts.), the Ordered Means of "Yoga training group" (Pre:1 and post: 2) and "Control group" (Pre:3 and post: 4) as presented in Table 6 were 11.16, 12.88, 11.04 and 11.19, respectively (where, 1 = Pre-test of Yoga training group, 2 = Post-test of Yoga training group, 3 = Pre-test of Control group, and 4 = Post-test of Control group).

The statistical significance of Scheffe's Post Hoc test presented in Table 7 revealed that-

Table 7: Scheffe's Post Hoc Test for difference between pairs of ordered means in word series (Yoga training group Vs Control group)

Steps	3	2	1
4	0.11	0.35*	0.13
3		0.19	0.11
2		-	0.43*
1			-

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."
* and ** indicate significance of values at P=0.05 and 0.01, respectively

- Control group did not show significant improvement in Word Series (CD=0.11, p>0.05).
- Yoga training group had higher score that showed significant improvement (CD=0.43, p<0.05) in Word Series.
- "Yoga training" helped to increase high score which was significantly superior to the "Control" in improving Word Series (CD=0.35, p<0.05) (Fig. 2).

The result revealed that the yoga training has positive effect towards improvement in passage comprehension test which in turn improves learning ability.

Result on Yoga for digit span test (DST):

In Digit Span (Pts.), the Ordered Means of "Yoga training group" (Pre:1 and post: 2) and "Control group" (Pre:3 and post:4) as presented in Table 8 were 17.31, 19.99, 17.46 and 17.40, respectively (where, 1 = Pre-test of Yoga training Group, 2 = Post-test of Yoga training group, 3 = Pre-test of Control group, and 4 = Post-test of Control group).

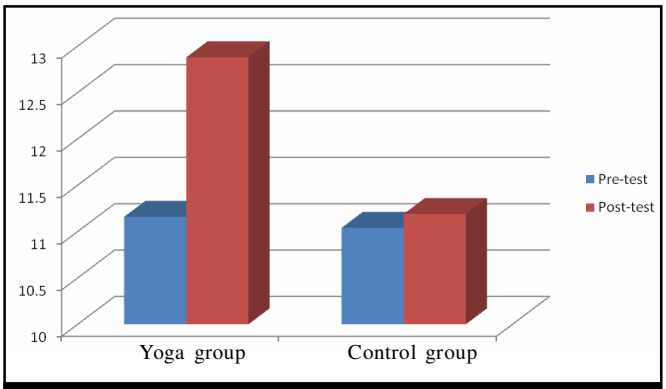

Fig. 2: Yoga for improvement in word series test

Table 8: Ordered treatment means of digit span (Yoga training group Vs Control group)

	Order			
	1	2	3	4
Means	17.31	19.99	17.46	17.40

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

The statistical significance of Scheffe's Post Hoc test is presented in Table 9 revealed that-

Table 9: Scheffe's Post Hoc Test for difference between pairs of ordered means in digit span (Yoga training group Vs Control group)

Steps	3	2	1
4	0.15	0.32*	0.13
3		0.19	0.11
2		-	0.37*
1			-

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."
* and ** indicate significance of values at P=0.05 and 0.01, respectively

- Control group did not show significant improvement in Digit Span (CD=0.15, p>0.05).
- Yoga training group had higher score, which showed significant improvement (CD=0.37, p<0.05) in Digit Span.
- "Yoga training" helped to increase high score which was significantly superior to the "Control" in improving Digit Span (CD=0.32, p<0.05) (Fig. 3).

The result revealed that the, yoga training has positive effect towards improvement in passage comprehension test which in turn improves the learning ability.

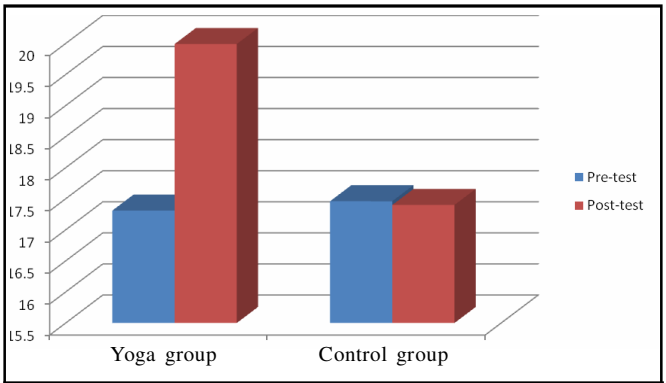

Fig. 3: Yoga for improvement in Digit Span test

Result on Yoga for number detection test:

Number detection test (Pts.): the Ordered Means of "Yoga training group" (Pre: 1 and post: 2) and Control group" (Pre: 3 and post: 4) as presented in Table 10 were 73.34, 79.86, 73.54 and 74.06, respectively (where, 1 = Pre-test of Yoga training group, 2 = Post-test of Yoga training group, 3 = Pre-test of Control group, and 4 = Post-test of Control group).

Table 10: Number detection scores expressed in points (Yoga training group Vs Control group)

	Order			
	1	2	3	4
Means	73.34	79.86	73.54	74.06

Where,
1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

The statistical significance of Scheffe's Post Hoc test presented in Table 11 revealed that-

– Control group did not show significant increase in Number Detection scores expressed in points (CD=0.13, p>0.05).

Table 11 : Scheffe's Post Hoc Test for difference between pairs of ordered means in number detection scores expressed in points (Yoga training group Vs Control group)

Steps	3	2	1
4	0.13	0.46*	0.13
3		0.19	0.11
2		-	0.55**
1			-

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

* and ** indicate significance of values at P=0.05 and 0.01, respectively

– Yoga training group showed significant improvement (CD=0.55, p<0.01) in Number Detection scores expressed in points.
– "Yoga training" could show high score in Number Detection scores expressed in points than the control group (CD=0.46, p<0.05) (Fig. 4).

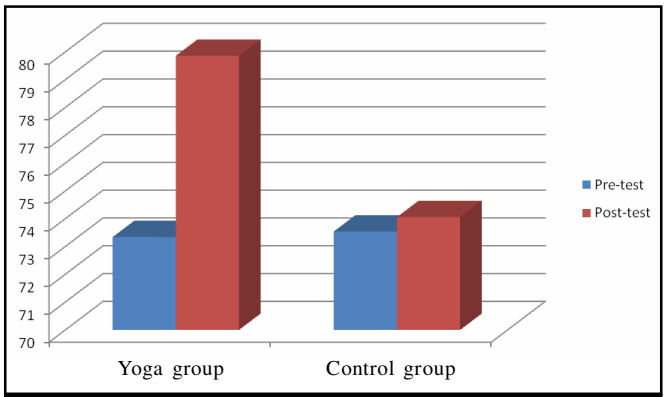

Fig. 4: Yoga for improvement in number detection test

Number detection test expressed in terms of time (Sec.):

Number detection test (Sec.), Ordered means of "Yoga training group" (Pre: 1 and post: 2) and "Control group" (Pre: 3 and post: 4) as presented in Table 12 were 237.58, 230.29, 236.44 and 241.68, respectively (where, 1 = Pretest of Yoga training group, 2 = Post-test of Yoga training group, 3 = Pre-test of Control group, and 4 = Post-test of Control group).

Table 12: Ordered treatment means of number detection scores expressed in sec. (Yoga training group Vs Control group)

	Order			
	1	2	3	4
Means	237.58	230.29	236.44	241.68

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

The statistical significance of Scheffe's Post Hoc test presented in Table 13 revealed that-

– Control group showed significant increase in Number Detection scores expressed in time (CD=0.33, p<0.05).
– Yoga training group showed significant reduction (CD=0.55, p<0.01) in Number Detection scores expressed in time.
– "Yoga training" could show higher reduction in Number Detection scores expressed in time than the control group (CD=0.46, p<0.05) (Fig. 5).

Table 13: Scheffe's Post Hoc Test for difference between pairs of ordered means in number detection scores expressed in secs (Yoga training group Vs Control group)

Steps	3	2	1
4	0.33	0.46*	0.13
3		0.19	0.11
2		-	0.55**
1			-

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."
* and ** indicate significance of values at P=0.05 and 0.01, respectively

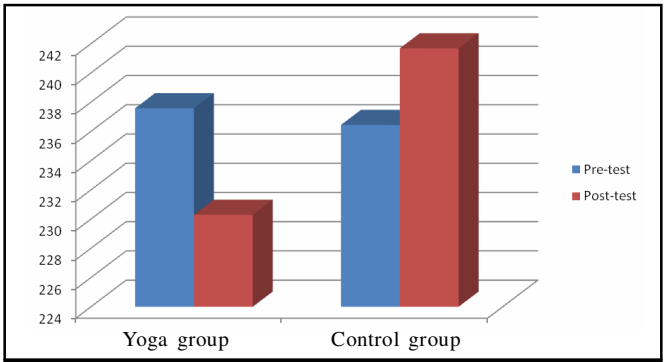

Fig. 5: Yoga for reduction in time in number detection test

Result on Yoga for listening comprehension test: In listening comprehension test (Pts.), the Ordered Means of "Yoga training Group" (Pre: 1 and post: 2) and "Control Group" (Pre: 3 and post: 4) as presented in Table 14 were 9.30, 9.45, 9.29, and 9.17, respectively (where, 1 =Pre-test of Yoga training Group, 2 = Post-test of Yoga training group, 3 = Pre-test of control group, and 4 = Post-test of control group).

Table 14: Ordered treatment means of listening comprehension scores (Yoga training group Vs Control group)

	Order			
	1	2	3	4
Means	9.30	9.45	9.29	9.17

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."

The statistical significance of Scheffe's Post Hoc test presented in Table 15 revealed that-

– Control group showed significant reduction in Listening Comprehension scores (CD=0.35, p<0.05).
– Yoga training group showed significant improvement (CD=0.39, p<0.05) in Listening Comprehension scores.

Table 15: Scheffe's Post Hoc Test for difference between pairs of ordered means in listening comprehension scores (Yoga training group Vs Control group)

Steps	3	2	1
4	0.35*	0.30*	0.10
3		0.13	0.12
2		-	0.39*
1			-

where, 1 = Pre-test Score of "Yoga training Gr."
2 = Post-test Score of "Yoga training Gr."
3 = Pre-test Score of "Control Gr."
4 = Post-test Score of "Control Gr."
* and ** indicate significance of values at P=0.05 and 0.01, respectively

– "Yoga training" could show high score in Listening Comprehension scores than the control group (CD=0.30, p<0.05) (Fig. 6).

The result revealed that the yoga training has positive effect towards improvement in Listening Comprehension test which in turn improves the learning ability.

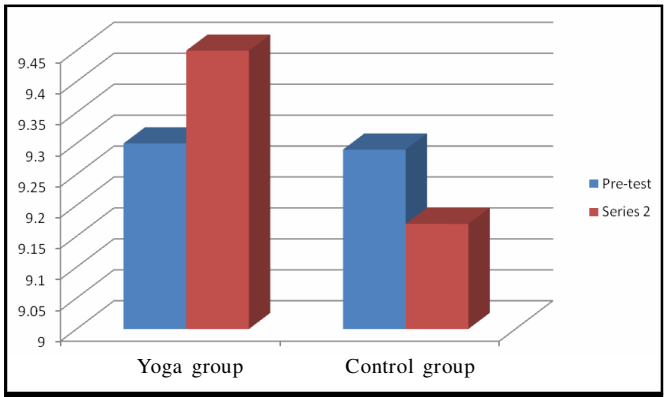

Fig. 6: Yoga for improvement in listening comprehension test

Conclusion:

The ability to concentrate is ability to learn. Often, those with learning disabilities have an impaired ability to concentrate. Yoga, however, facilitates concentration. Balance postures work to enhance concentration and focus, learning how to clear the mind from outside influences for a moment, helping children to learn more easily. The present study had given emphasis on promoting learning on school going adolescent boys through programmes on yoga training. "Yoga training" helped the subjects to increase high score. It was significantly superior to the "Control" group in improving Passage comprehension, Word Series, Digit Span, Number Detection, and Listening Comprehension.

– It is recommended to have further researches on the improvement of learning in different ethnic groups.

- The study may be conducted on different variables other than learning ability.
- Similar studies may be under taken with different age groups and sex other than those employed in this study.
- A study of this nature need to adopt a longer duration of activity in order to find out achievements or the impact to establish more significance and to establish the conclusion.

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