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Visual callisthenic exercises– A study on eye-hand coordination among athletes

V Satyanarayana
Professor, Department of Physical Education, Osmania University, Hyderabad, Telangana, India

Abstract
The study was conducted to know the impact of visual callisthenics on the sports related visual skills i.e., eye-hand coordination among the athletes at various levels of competition. The visual callisthenics exercises as suggested by sports ophthalmologist were considered for the study and it is limited to the athletes at A.P. Sports school academics and other sports organisations. The study concluded that the eye-hand coordination has shown greater improvement for sub-junior group (experimental group III) after 12 week direct visual callisthenic training. Further, it also stated that it has improved better for junior group (experimental group III) after 12 week direct visual callisthenic training and better improvement for senior group at experimental group I after 12 weeks continuous visual callisthenic training.

Keywords: visual callisthenic, eye-hand coordination, junior, sub-junior and senior

Introduction
Accurate assessment of visual acuity is of utmost importance for various fields of sports persons. The assessment mainly depends on static, dynamic and contrast sensitivity. The sports related visual skills were measured for athletes are: Coordination, Eye-Hand Coordination Assessment, Eye-Foot Coordination Assessment, Depth Perception Assessment, Eye/Body Coordination Assessment, Reaction Speed Measurement, Visual Concentration Assessment, Special Ocular Risks in Sports, treatment options for Athletes with Vision Problems and Contact Lenses.

Callisthenics refer to those group activities which involve free hand exercises either done to the rhythm of a drum or without it. Vision is the basic need of the Athlete for improvisation of visual performance. It certainly provides utmost perfection of any sports activity. Visual callisthenics are the most proliferic functions of Athletes in physical activity. Visual callisthenics develop the beauty or grace and visual strength of the body. Visual callisthenics are healthy exercise in developing good vision

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Based on the importance of the visual callisthenic exercise among athletes, the research interested to conduct a study on the effect of visual callisthenics on the sports related visual skills i.e., eye-hand coordination among the athletes at various levels of competition.

Significance of the Study
Visualization is the primary necessity of an athlete to show the better performance in and out of sports field. A good vision will certainly better the al-round performance of the athlete in various competitions. Keeping in view the importance of sports vision among athletes an attempt was made by the investigator to know whether or not the visual callisthenics exercises, i.e., eye-hand coordination improve the sports related visual skills.

Objectives of the Study
To find out the existing impact of visual callisthenics on the sports related visual skills i.e., eye-hand coordination among the athletes at various levels of competition.

Hypotheses
1. There may not be any significant effect of visual callisthenic exercises in developing the sports related visual skill that is eye-hand coordination among athletes (sub-junior athlete group): Control group, (ii) Experimental Group I (6, 8, 12 weeks), (iii) Experimental Group II (direct 8 weeks) and (iv) Experimental Group III (direct 12 weeks)
2. There may not be any significant effect of visual callisthenic exercises in developing the sports related visual skill that is eye-hand coordination among athletes (junior athlete group): Control group, (ii) Experimental Group I (6, 8, 12 weeks), (iii) Experimental Group II (direct 8 weeks) and (iv) Experimental Group III (direct 12 weeks).
3. There may not be any significant effect of visual callisthenic exercises in developing the sports related visual skill that is eye-hand coordination among athletes (senior athlete group): Control group, (ii) Experimental Group I (6, 8, 12 weeks), (iii) Experimental Group II (direct 8 weeks) and (iv) Experimental Group III (direct 12 weeks)

Limitations
The present investigation was limited to: (a) the visual callisthenics exercises as suggested by sports ophthalmologist were considered for the study and (ii) the study was limited to the athletes at A.P. Sports school academics and other sports organisations.

Review of Literature
Sillero Quintana M., Refoyo Román I., Lorenzo Calvo A., Sampedro Molinuevo J. (2007) [1] designed to evaluate visual abilities such as distance visual acuity. When scores were compared by sex and age, significant differences on certain visual measures were observed. Many layers showed

crossed eye-hand dominance. Visual screening programs may help promote visual health among junior basketball players and could be used for performance training. Block S.S., Beckerman S.A. and Berman P.E. (1997) [2] conducted a vision screening test on 905 special athletes at the 1995 Special Olympic World Summer games to identify the prevalence of visual anomalies. More than 65% of the participants had not received eye care for more than 3 years. The most commonly reported symptom was difficulty in seeing. Other ocular health problems included refractive errors, poor distance monocular acuity, and strabismus. The results of the study indicate that special Olympians have a high prevalence of vision anomalies that may go undetected. Duane Knudson and Darlene A. Kluka (1997) [3] summarized important vision information related to performance in sport, shows how teachers can easily use vision training to improve performance, and provided practical examples of applying this knowledge in teaching. Juodzbaliene V. and Muckus K. (1997) [4] observed the change in such human motor performance processes as stability maintenance, production of a response to the environment if loss of vision impairment appears. Harris RW, Cole BL[5] reported that abnormal colour vision is under-represented among cricketers, presumably because cricketers with abnormal colour vision have difficulty seeing the red ball against the green grass of the cricket field and the green foliage around it.

Methodology

For the present study, 25 athletes from among three groups: sub-junior, junior and senior levels were taken. To measure the sports related visual skills Lafayette eye-hand coordination tester tool was used.

The experimental design was framed for interval training method and continuous training method. The subjects were treated with visual callisthenic exercises for six weeks, eight weeks and twelve weeks according their respective groups. Finally, the post-tests were conducted for all the selected groups.

Ophthalmologist at Sarojini Devi Eye Hospital, Hyderabad was consulted in finalising the visual callisthenic exercises. The experimental groups were treated with visual callisthenics exercises.

The purpose of the test is to measure the two eye hand coordination among the players in various games and sports for administrating the test the subject will be asked to sit in a chair comfortably and the eye hand coordination tester will be kept on a table. The experiment conducted by making the subject to stand before the apparatus. The experimenter gave the signal 'ready', 'go' then the subject holding the identical bars with two hands started scrolling the pointer in a clockwise direction on the diamond.

To find out the difference among athletes of the selected variables the means, standard deviations and finally 't' test was computed.

Results and Discussion

The results of the study on visual callisthenic training exercises are presented in the following paras.

Table 1: Showing the Mean, SD, df and 't' values of eye-hand coordination among athletes (Sub-Juniors)

Sl. No.	Group	Variable	N	Mean	S.D.	't' ratio	P value
1.	Control group	Pre-test	25	29.40	3.36	2.02	0.05
		Post-test	25	28.08	3.89		

From the above table, it is known that the mean value of Pre-test was 29.4000, standard deviation was 3.3665 and the mean value of Post-test was 28.0800 and standard deviation was 3.8936. The degree of freedom is 48 and 't' ratio was 2.023 which was found to be significant at 0.054 level.

Table 2: Showing the Mean, SD and 't' values of eye-hand coordination among athletes (Sub-juniors) for Experimental Group I

Sl. No.	Variable	6 weeks		8 weeks		12 weeks	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1.	Mean	28.52	26.44	28.52	24.88	28.52	23.28
2.	S.D.	2.91	2.59	2.91	2.16	2.91	1.81
3.	't'-ratio	12.80		14.51		12.09	
4.	p-value	0.00		0.00		0.00	

The mean value of sub-junior athletes (Experimental Group-I) Pre-test was 28.52, standard deviation was 2.91 and the mean value of Post-test (6 weeks) was 26.40, (8 weeks) was 24.88, Post-test was (12 weeks) 23.28 and standard deviation (6 weeks) was 2.59, (8 weeks) was 2.16 (12 weeks) was 1.81. The degree of freedom is 48 and 't' ratio was 12.80 for 6 weeks, 14.51 for 8 weeks and 12.09 for 12 weeks which were found to be significant at 0.000 level.

Table 3: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at sub-junior level for Experimental Group II (Pre-test and Post-Test)

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	27.36	2.51	13.80	0.00
2.	Post-test	25	24.24	1.94		

The mean value of sub-junior athletes (Expermental Group-II) Pre-test was 27.36, standard deviation was 2.51 and the mean value of Post-test was 24.24 and standard deviation was 1.94. The degree of freedom is 48 and 't' ratio was 13.80 which was found to be significant at 0.000 level.

Table 4: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at sub-junior level for Experimental Group III (Pre-test and Post-Test)

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	27.36	1.80	14.73	0.00
2.	Post-test	25	23.68	1.37		

The mean value of sub-junior athletes (Experimental Group-III) Pre-test was 27.36, standard deviation was 1.80 and the mean value of Post-test was 23.68 and standard deviation was 1.37. The degree of freedom is 48 and 't' ratio was 14.73 which was found to be significant at 0.00 level.

Table 5: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at junior level for Control Group (Pre-test and Post-Test)

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	29.16	3.56	1.04	0.30
2.	Post-test	25	28.88	3.03		

The mean value of junior athletes (control group) Pre-test was 29.16, standard deviation was 3.56 and the mean value of Post-test was 28.88 and standard deviation was 3.03. The degree of freedom is 48 and 't' ratio was 1.04 which was found to be significant at 0.30 level.

Table 6: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at junior level for Experimental Group-I

Sl. No.	Variable	6 weeks		8 weeks		12 weeks	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1.	Mean	28.08	26.32	28.08	24.60	28.08	22.80
2.	S.D.	3.92	3.52	3.92	3.16	3.92	2.84
3.	't'-ratio	6.45		10.02		11.47	
4.	p-value	0.00		0.00		0.00	

The mean value of junior athletes (Experimental Group I) Pre-test was 28.08, standard deviation was 3.92 and the mean value of Post-test (6 weeks) was 26.32, (8 weeks) was 24.60, (12 weeks) was 22.80 and standard deviation (6 weeks) was 3.52, (8 weeks) was 3.16 (12 weeks) was 2.84. The degree of freedom is 48 and 't' ratio was 6.45 for 6 weeks, 10.02 for 8 weeks and 11.47 for 12 weeks which were found to be significant at 0.00 level.

Table 7: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at junior level for Experimental Group II

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	27.68	3.31	12.73	0.00
2.	Post-test	25	24.32	3.06		

The mean value of junior athletes (Experimental Group II) Pre-test was 27.68, standard deviation was 3.31 and the mean value of Post-test was 24.32 and standard deviation was 3.06. The degree of freedom is 48 and 't' ratio was 12.73 which was found to be significant at 0.00 level.

Table 8: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at junior level for Experimental Group III

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	26.68	3.31	13.22	0.00
2.	Post-test	25	22.52	2.43		

The mean value of junior athletes (Experimental Group III) Pre-test was 26.68, standard deviation was 3.31 and the mean value of Post-test was 22.52 and standard deviation was 2.43. The degree of freedom is 48 and 't' ratio was 13.22 which was found to be significant at 0.00 level.

Table 9: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at Senior level for Control Group

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	29.04	2.73	0.61	0.54
2.	Post-test	25	29.32	3.72		

The mean value of senior athletes Pre-test was 29.04, standard deviation was 2.73 and the mean value of Post-test was 29.32 and standard deviation was 3.72. The degree of freedom is 48 and 't' ratio was -0.61 which was found to be significant at 0.54 level.

Table 10: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at senior level for Experimental Group-I

Sl. No.	Variable	6 weeks		8 weeks		12 weeks	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1.	Mean	28.32	26.32	28.32	24.48	28.32	23.12
2.	S.D.	2.82	2.77	2.82	2.55	2.82	2.18
3.	't'-ratio	10.95		14.28		16.72	
4.	p-value	0.09		0.00		0.00	

The mean value of senior athletes (Experimental Group I) Pre-test was 28.32, standard deviation was 2.82 and the mean value of Post-test (6 weeks) was 26.32, (8 weeks) was 24.48, (12 weeks) was 23.12 and standard deviation (6 weeks) was 2.77, (8 weeks) was 2.55 (12 weeks) was 2.18. The degree of freedom is 48 and 't' ratio was 10.95 for 6 weeks, 14.28 for 8 weeks and 16.72 for 12 weeks which were found to be significant at 0.00 level respectively.

Table 11: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at Senior level for Experimental Group II

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	28.48	2.66	13.29	0.00
2.	Post-test	25	25.04	3.12		

The mean value of senior athletes (Experimental Group II) Pre-test was 28.48, standard deviation was 2.66 and the mean value of Post-test was 25.04 and standard deviation was 3.12. The degree of freedom is 48 and 't' ratio was 13.29 which was found to be significant at 0.00 level.

Table 12: Showing the Mean, SD and 't' values of eye-hand coordination among athletes at senior level for Experimental Group III

Sl. No.	Variable	N	Mean	S.D.	't' ratio	P value
1.	Pre-test	25	28.04	2.47	13.91	0.00
2.	Post-test	25	24.16	2.73		

The mean value of senior athletes (Experimental Group III) Pre-test was 28.04, standard deviation was 2.47 and the mean value of Post-test was 24.16 and standard deviation was 2.73. The degree of freedom is 48 and 't' ratio was 13.91 which was found to be significant at 0.00 level.

Findings

1. It is found that at sub-junior level for control group a marginal difference was found with regard to eye hand co-ordination. The athletes of sub-junior group have developed the eye hand coordination due to their regular participation in sports training and coaching camps. However without any specific training, the sports related visual skills will not improve. The results subscribe for the same.
2. It is found that eye hand coordination has improved better for sub junior athletic group after 8 weeks continuous visual callisthenic training rather than 6 weeks and 12 weeks training. The visual calisthenics exercises have shown substantial improvement on eye hand co-ordination in continuous interval training method adopted for 8 weeks.
3. It is found that the visual calisthenics exercises have improved the eye hand coordination even for the experimental group-II lasting for 8 weeks which had regular intervals after 6 weeks and 8 weeks. A significant difference was found after 8 weeks continuous training for sub junior group, with regards the sports related visual skill, i.e., eye hand coordination.
4. It is found that a significant impact shown for sub-junior athletic (experimental III group) after 12 weeks continuous visual callisthenic training. Thus for improving eye-hand co-ordination 12 week visual

callisthenic training was proved to be the best training module for sub-junior athletes.
5. It is found that eye-hand coordination for junior athletic group (control group) did not show any improvement in pretest and post test results as they were not treated with visual callisthenic training.
6. It is found that the Eye-hand coordination for the junior athletes has shown a greater improvement after 6, 8, 12 week continuous visual calisthenics training. The 12 week training has sounded good results.
7. It is found that the experimental group II for junior Athletes have shown a greater improvement on eye-hand coordination even at 8weeks direct training.
8. It is found that the experimental group III which belongs to junior athletic group has shown a greater impact on eye-hand coordination after 12 week direct a visual calisthenics training.
9. It is found that a senior athletic control group did not yield any improvement on eye-hand coordination as they were not exposed to visual calisthenics.
10. It is found that the experimental group-I i.e., a senior athletic group at 6, 8 and 12 continuous visual calisthenics training has shown better results on eye-hand coordination. The 12 week training has shown high scores with regard to the development of the sports related visual skills i.e., eye-hand coordination for senor group.
11. It is found the experimental group II for seniors has shown significant impact on eye-hand coordination after 8 weeks direct training which was found to be lesser than 8 weeks continuous training.
12. It is found that the experimental group III for senior group has also shown significant impact ever eye-hand coordination after 12 weeks direct visual calisthenics training. The obtained average was compared to be lower than the 12 weeks continuous training.

Conclusions

1. The eye-hand coordination has shown greater improvement for sub-junior group (experimental group III) after 12 week direct visual callisthenic training.
2. The eye-hand coordination has improved better for junior group (experimental group III) after 12 week direct visual callisthenic training.
3. The eye-hand coordination has shown better improvement for senior group at experimental group I after 12 weeks continuous visual callisthenic training.

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