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Evaluation of hand eye coordination between sportsmen and nonsportsmen

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Abstract
The purpose of the present study was to find out the hand eye co-ordination between sportsmen and non-sportsmen. Only one-hundred male college students from different physical education training colleges in Ghaziabad District, Uttar Pradesh, offering B.P.Ed. Degree and General College students (50 sportsmen and 50 non-sportsmen) whose age range between 22 to 27 years were randomly assigned to training. Mirror Drawing Test and Finger Dexterity Test were used for the measurement of hand eye co-ordination. The Statistical 't' test was applied to investigate the existence of significant difference between sportsmen and non-sportsmen. In conclusion sportsmen performed better in hand eye co-ordination tests than non-sportsmen and the difference was statistically significant. Exercise not only gives healthy life style but also improve your hand eye co-ordination. So regular exercise is strongly recommended.

Keywords: Hand, eye co-ordination, exercise

Introduction
Hand-eye coordination, or eye-hand coordination, is the ability to do activities that require the simultaneous use of our hands and eyes, like an activity that uses the information our eyes perceive (visual spatial perception) to guide our hands to carry out a movement.

- We use our eyes to direct attention to a stimulus and help the brain understand where the body is located in space (self-perception).
- We use our hands to simultaneously carry out a determined task based on the visual information our eyes receive

Eye-hand coordination is a complex cognitive ability, as it calls for us to unite our visual and motor skills, allowing for the hand to be guided by the visual stimulation our eyes receive. Hand-eye coordination is especially important for normal child development and academic success, but is also an important skill that adults use in countless activities on a daily basis.
Most activities that you do in your day-to-day life use some degree of eye-hand coordination, which is why it's important to ensure that it is as developed as possible. Generally speaking, we use visual information to correct a behaviour that isn't appropriate for a situation, which is one of the reasons why this cognitive skill is so important.
Eye hand co-ordination is the ability of the eyes and hands to work together as a dynamic whole. The process involves sharing information regarding the progress of one sub movement with the centers controlling another sub-movement, ensuring that the second happens in appropriate relation to the first (Haggard, 1997) [11].
Movement in response to stimulus during a game is almost one of the most important features of a good Sportsman. If the athlete is unable to dodge a ball, pass and catch a ball, manoeuvre around a squash court or react to spin ball, then they will not succeed in their sports. Since sports is typically performed under temporal constraints and varying levels of physiological stress/fatigue attempts should be made to examine visual function under more realistic test conditions.
The co-ordination of eye and hand movements to visual targets is fairly well understood. Following the appearance of the peripheral target the saccadic eye movement is typically initiated first and the hand movement second (Biguer *et al*. 1984) [1].

Because of the ballistic nature of saccades the eye fixates on the peripheral target well before the hand movement is completed. As a result, the retinal and extra retinal information derived from the saccade is thought to contribute to the accurate guidance of the hand to the target. The fact that hand movement accuracy is systematically modulated when eye movements are restricted (Bock 1986) [2] or perturbed in some manner (Binsted and Elliott 1999; de Graaf *et al*. 1995; van Donkelaar 1997) [3, 9, 22] is consistent with this idea. Hand eye co-ordination is use of vision to guide movements of the hand for many human activities like eating, sports, using tools etc. (Goyen *et al*., 2006) [10]. To aim at a target location or, reach and perform a task, each sequence of events requires a complex integrated co-ordination of the hand movement and eye. Normal hand eye co-ordination involves synergistic function of several sensor motor systems vision, touch, motor control, attention, and memory all contribute to even the simplest tasks involving, hand eye co-ordination (Crawford, Medendorp, & Marotta, 2004) [7]. The mechanism is dauntingly complex and can potentially involve much of the brain, as well as many recurrent feedback loops (Crawford *et al*., 2004) [7]. However, the brain must implement certain fundamentals transformations in a certain sequence, and it appears to do so in a modular fashion (Crawford *et al*., 2004) [7].

Hand eye co-ordination is one of the more salient and vital human capabilities and can disrupt various aspects of daily life including school, activities of daily living and social interaction (Goyen *et al*., 2006) [10]. Hand eye co-ordination is one of the salient skills that form the basis of perceptual motor functions associated with activities of daily living, sports skills, and various other movement based tasks. Perceptual motor skills can be disrupted in various pathological conditions like stroke, TBI, Parkinson's disease, autism, cerebral palsy, developmental disorders, and many others. For the developing child, disruptions of perceptual motor skills can make everyday tasks more and more difficult. Examples of this impact include school-based tasks like learning to write, functional activities including dressing and using cutlery, and engaging with peers in play (Goyen *et al*., 2006) [10]. Beyond the realm of typical motor development and daily activities, hand eye coordination has its implication on the acquisition of sport skill and coaches need to be aware of the developmental sequences of the children. There is also a need to identify effective training techniques to improve the perceptual motor skills to acquire the required sport skill and to enhance performance of those skills when the occasion arises.

Hand eye co-ordination is use of vision to guide movements of the hand for many human activities like eating, sports, using tools etc. To aim at a target location or, reach and perform a task, each sequence of events requires a complex integrated co-ordination of the hand movement and eye (Rand & Stelmach, 2010) [18]. Normal hand eye co-ordination involves synergistic function of several sensor motor systems vision, touch, motor control, attention, and memory all contribute to even the simplest tasks involving, hand eye coordination (Crawford, medendorp, & Marotta, 2004) [7]. The mechanism is dauntingly complex and can potentially involve much of the brain, as well as many recurrent feedback loops. However, the brain must implement certain fundamentals transformations in a certain sequence, and it appears to do so in a modular fashion (Crawford *et al*., 2004) [7]. Hand eye co-ordination is one of the more salient and vital human capabilities and can disrupt various aspects of daily life including school, activities of daily living and social interaction. Hand eye co-ordination plays a significant role in the process of acquiring sports skills. The rate of the skill development varies for each individual but skills are attained in a sequential manner like other milestones (Stricker, 2002) [21]. For example, the skill of tracking moving objects and judging velocity often has not fully matured until the age of 6 or 7. From ages 10- 12 strategies like selective attention and use of complex memory mature allowing the individuals of this age to participate in sports that require complex hand eye coordination. Vision is one of the several sensory organs which receive information from the external environment and for years it has been recognized that many sports place demands on vision and particular visual skills. The earliest proponent of this concept was Galen, a Roman Physician who in the second century believed that there is a relationship between ball sports, body and visual status. Inspite of this early recognition of visual importance in sports it stood neglected for many years and it was not before the middle of 20th century that new scientific opinions were developed and the thought, “sports being a multi-disciplinary approach” came into picture (Jafarzadehpur and Yarigholi, 2004) [14]. There are evidences which support the claims of vision playing an important role in the perceptual ability of an athlete relating proportionately to his/her motor response. Revien & Gabor (1981) [17] stated that visual abilities affect sports performance and the acquisition of motor skills, which can be improved with training. Supporting the same Quevedo *et al*. (1999); stated that sports vision training is conceived as a group of techniques directed to preserve and improve the visual function, with the goal of incrementing sports performance through a process that involves teaching the visual behaviour required in the practice of different sporting activities.

Definition of terms

Co-ordination

The word co-ordination was first recorded in 1605, it meant "orderly combination" (Barnhart Dictionary of Etymology, 1988). Though the basic meaning of co-ordination has not changed over the centuries, the contemporary meaning of coordination has become increasingly associated with harmonious and skilful movement: To wit, in Webster's New World Dictionary (1988) [23] co-ordination is defined as the "harmonious adjustment of action, as of muscles in producing complex movements. Co-ordination has been defined as the "harmonious movement of independent body parts" (Dictionary of the Sport & Exercise Sciences, 1991) [8]; "the ability to integrate muscle movements into an efficient pattern of movement" (Schurr, 1980) [20], and "the use of muscles in such a manner that they work together smoothly and effectively rather than hinder one another" (Hunter, 1966). Roget's association of coordination and skilful movement was echoed by Schurr: "Coordination makes the difference between good performance and poor performance."

Method and Materials

Subject: One-hundred male college students (50 sportsmen 50 non-sportsmen) were selected randomly for this study, whose age range from 22 to 25 years. These subjects were selected from different places in Ghaziabad District, Uttar Pradesh.

Test/Tool

Finger Dexterity Test: An instrument will be placed before

the subject. The S is to insert pins in its whole, which are to be inserted in two conditions- (1) By Right Hand, (2) By Left Hand. Instructions for Right Hand- keep the pins to the Right Hand side of the S, so that the S may not face any trouble in picking up the pins. The correct condition of insertion of pins is to start insertion from right side of the S if work started by the right Hand; and then from left to right repeating in the same way till the work is finished. Instruction for Left Hand- keeps the pins to the Left Hand side of the S, so that the S may not face any trouble in picking up the pins. Insertion of pins may be started from left Hand side to Right Hand side and then from Right Hand side to left Hand side repeating it till the work is finished. Counting of errors in the Finger Dexterity board is very important. The time is noted by the stop watch. Errors are committed when the pins are not inserted correctly or are slanting or otherwise, or are fallen. Insertion of 100 pins in 100 wholes will count one trail. Here Errors are not counted, only time is considered. Minimum times (Seconds) indicate better result.

Mirror Drawing Test

The experiment will be done by pre-test post test design. This will be done in three conditions. In the first pre test condition the subject will be given three trails in which he will trace the Star Pattern viewing its image in the Mirror with his Left Hand in the Clockwise direction. In the Second Condition the Subject will learn to trace the path with his Right Hand in the Anti clockwise direction. In this practice/ learning condition he will be given as many till reaches the pre set Criterion of three Errorless consecutive trails. Finally in the Third Condition the subject again traces the Star Patterns three times with his Left Hand in the Clockwise direction.

On hearing 'Start' 'S' traces the Star pattern with a Pencil or a Pen viewing its Image in the Mirror. As the 'S' touches or crosses the inner or outer boundaries of the Star Pattern an Error is committed. As the 'S' touches or crosses the inner or outer boundaries of the Star Pattern an Error is committed. The 'S' is advised not to touch or cross the boundaries of the Star Pattern. All the Errors in each trail are marked and Counted by the experimenter manually. And the time taken in each trail is recorded by means of a Stop Watch. The time taken and Errors Committed in each trail are recorded in the data collection table. Alternatively tracing paper is used with the Printed Star Patterns for each trail. Star pattern with tracing paper above it is mounted on the Wooden Base Board and or on elevated aluminium platform with the help of U Pins. All the Errors are marked on the Tracing paper and counted by the experimenter manually. Time taken is recorded as usual employing a Stop Watch. Here Errors are not counted, only time is considered. Minimum times (Seconds) indicate better result.

Statistical procedure

The Statistical 't' test was applied to investigate the existence of significant difference between sportsmen and non-sportsmen of their hand eye co-ordination.

Table 1: Comparison of Mean SD and 'T' Ratio Between Sportsmen and Non-Sportsmen in Finger Dexterity Test

Variables	Gender	Number	Mean	S.D.	't'
Finger Dexterity Test	Sportsmen	50	186	31.06	3.84*
Finger Dexterity Test	Non-Sportsmen	50	207	26.86	

*Significant at 0.05 level

't' value required to be significant at 0.05 level of confidence with 98 degree of freedom was 1.98

Table 2: Comparison of Mean SD and 'T' Ratio Between Sportsmen and Non-Sportsmen in Mirror Drawing Test

Variables	Gender	Number	Mean	S.D.	't'
Mirror Drawing Test	Sportsmen	50	100.94	11.91	6.92*
Mirror Drawing Test	Non-Sportsmen	50	121.08	10.29	

*Significant at 0.05 level

't' value required to be significant at 0.05 level of confidence with 98 degree of freedom was 1.98

Discussion and findings

This study aimed to compare the hand eye co-ordination of sportsmen and non-sportsmen. It was found from the above statistical calculation that sportsmen performed better in hand eye co-ordination than nonsportsmen and the difference was statistically significant. Sedi Akarsu *et al*. (2009) supported the present study. The results show that there was an improvement in the subjects that were exposed to the physical exercise. Christenson *et al*. (1988) [4] expressed Visual performances were found to be significantly better in the athletic population compared to non athletes. Ishigaki H. et. al (1993) [13] reported that the dynamic visual acuity of athletes was superior to that of non-athletic and athletes were faster than non-athletes. Sedi Akarsu *et al*. (2009) proposed that sport activities are beneficial to both eye-hand reaction time and visuospatial intelligence. According to AJPHERD (2010) it can be seen that there was an improvement in the visual skill performance of the players who were exposed to specific physical exercises. Sports vision as such includes specific visual determinants which precisely co-ordinates a player's activity during the game. It has been seen that successful athletes generally have better skill, accuracy and spatio-temporal constraints on visual information acquisition. As such if two similar athletes meet in competition and one has a better trained visual system, the athlete with enhanced visual system will perform better. Sport activities often have a close relationship between perception and action therefore temporally constrained sport tasks require that players extract the most valuable source of visual information and use this information to quickly anticipate the opponent's movement outcome.

Hand-eye co-ordination is the ability of the eyes, hands and body to work together. Co- ordination occurs when the motor system composes complex actions by combining simpler sub-movements. The process involves sharing information about the progress of one sub-movement with the centres controlling another sub-movement, to ensure that the second movement happens in appropriate relation to the first (Haggard, 1997) [11]. The visual system should lead to stronger muscle fibers and more efficient neuronal response. Exercise not only gives healthy life style but also improve your Hand eye coordination. So exercise is strongly recommended.

References

1. Biguer B, Prablanc C, Jeannerod M. The contribution of coordinated eye and head movements in hand pointing accuracy. Exp Brain Res. 1984;55:462-469.
2. Bock O. Contribution of retinal versus extraretinal signals towards visual localization in goaldirected movements. Exp Brain Res. 1986;64:476-482.
3. Binsted G, Elliott D. Ocular perturbations and retinal/extraretinal information: the co-ordination of saccadic and manual movements. Exp Brain Res. 1999;127:193-206.
4. Christenson GN, Winkelstein AM. Visual skills of

athletes versus non-athletic: development of a sports vision testing battery. J Am Optom Assoc. 1988;59:666-675.
5. Cohen AH. The efficacy of optometric vision therapy. Journal of American Optometric Association. 1988;59:95-105.
6. Carnahan H, Marteniuk RG. The temporal organization of hand, eye, and head movements during reaching and pointing. J Motor Behav. 1991;23:109-119.
7. Crawford J, Mendendorp W, Marotta J. Spatial transformation for eye- hand coordination. Journal of Neurophysiology. 2004;92:10-19.
8. Dictionary of the sport and exercise sciences. Champaign, IL: Human Kinetics, 1991.
9. De Graaf JB, Pelisson D, Prablanc C, Goffart L. Modifications in end positions of arm movements following short-term saccadic adaptation. Neuroreport. 1995;6:1733-1736.
10. Goyen T, Todd G, Veddovi M, Wright A, Flaherty M, Kennedy J. Eye- hand coordination skills in very preterm infants <29 weeks gestation at 3 years: effects of preterm birth and retinopathy of prematurity. Early Human Development. 2006;82:739-745.
11. Haggard P. Coordinating actions. Quarterly Journal of Experimental Psychology. 1997;50(4):707725.
12. Hitzemen S, Beckerman S. What the literature says about sports vision. Optometric Clinics. 1993;3:145-169.
13. Ishigaki H, Miyao M. Differences in dynamic visual acuity between athletes and no athletes. Percept Motor Skills. 1993;77:835-839.
14. Jafarzadehpur E, Yarigholi MR. Comparison of visual acuity in reduced lumination and facility of ocular accommodation in table tennis champions and non-players. Journal of Sports Science and Medicine. 2004;3:44-48.
15. Loran D, Griffiths G. Visual performance and soccer skills in young players. Optometry Today. 2001;41:32-34.
16. Maman Paul, Sandeep Kumar Biswas, Jaspal Singh Sandhu Paul, *et al*. Eye hand coordination of table tennis players, 2011.
17. Revien L, Gabor M. Sports Vision: Dr. Revien's Eye Exercises for Athletes. New York: Workman Publishing, 1981.
18. Rand M, Stelmach G. Effects of hand termination and accuracy constraint on eye-hand coordination during sequential two segment movements. Exp Brain Res. 2010;207:197-211.
19. Shim J, Carlton LG, Kwon YH. Perception of kinematic characteristics of tennis strokes for anticipating stroke type and direction. Research Quarterly for Exercise and Sport. 2006;77:326339.
20. Schurr EL. Movement experiences for children: A humanistic approach to elementary school physical education. Englewood Cliffs, NJ: Prentice-Hall, 1980.
21. Stricker P. Sports training issues for the paediatric athlete. Pediatric clinic of North America. 2002;49:793-802.
22. Van Donkelaar P. Eye-hand interactions during goal-directed pointing movements. Neuroreport. 1997;8:2139-2142.
23. Webster's new world dictionary of American English (3rd college ed.). New York: Webster's New World, 1988.
24. Williams JG, Horn RR. Exercise intensity effects on peripheral perception of soccer player movement. International Journal of Sports Vision. 1995;2(1):22-28.