



Research article

Relationship between handedness and ocular dominance in healthy young adults – A study

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ABSTRACT

The present study aims to determine the relation between handedness and ocular dominance in healthy young adults. The study included 100 healthy subjects of age group 18 to 25 years. By questionnaire method hand preference and eye preference was determined, and then ocular dominance was confirmed by Miles test. By questionnaire method, 97% were right handed and 84% were right eye dominant, 16% left eye dominant. The calculated Chi –Square value is 0.224 & is less than the table value (3.84) at 5% level of significance for one degree of freedom. No significant association was found between hand and ocular dominance. By Miles test, 75% were right eye dominant and 25% left eye dominant and Miles test was more significant for confirmation of ocular dominance than questionnaire method. 74% showed uncrossed hand ocular dominance and 26% showed crossed dominance. The calculated Chi –Square value is 0.115 & is less than the table value (3.84) at 5% level of significance for one degree of freedom. In conclusion, in the present study there is no significant relation between dominant eye and dominant hand. Eye hand dominance could serve as a factor in athletes or guiding young players on whether to hit left or right hand or to switch hit. Although the role of ocular preference in sports is inconclusive, evaluation of preferred eye, hand has been included in many sports vision evaluations. It may also be used in assessment of learning disabilities.

Key words: Hand dominance, Miles test, Ocular dominance

1. INTRODUCTION

Functional lateralization occurs in the paired organs of the body, such as hands, legs and cerebral hemispheres [1]. Handedness is defined as the preferred hand used for a motor activity or the hand most skillful at performing a task. Approximately 90-95% is right handed. Left handedness has been reported to vary with culture. There is higher incidence of left handedness in variety of groups including epilepsy, mental retardation, autism and dyslexia. The dominant hand is expected to perform better than non dominant hand [2].

Ocular dominance was first described in 1953 by Giovanni Battista Porta. Ocular dominance, sometimes called eye dominance or eyedness was the tendency to prefer visual input from one eye to the other [3]. The eye is a sensory organ and has no conscious proprioception and vision in each

eye is represented bilaterally and equally in the occipital lobes. People have no consciousness of using right or left eye, as one is conscious of having left or right hand. One does not see the world from left or right eye but from a single so called cyclopean eye, which combines information from both. Dominance wise eyes work as ones hand. They grab the image with one eye and pass on to other a start to analyze the object by refining like using their fingertips or balancing objects with two hands [4].

Approximately two-thirds of the population is right eye dominant, however neither eye is dominant in a small portion of the population [5, 6]. Dominance does appear to change depending upon direction of gaze due to image size changes on the retinas [7]. Furthermore, the eye preferred for sighting does not indicate handedness. This is not surprising since each eye projects to both cerebral hemispheres whereas each hand is represented mainly in the opposite hemisphere.

The present study aims to determine the relation between handedness and ocular dominance in healthy young adults.

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2. MATERIALS AND METHODS

The study was conducted at Sri Devaraj Urs Medical College. Ethical clearance was obtained. The study included 100 healthy subjects, age ranging between 18-25 years. Informed consent was taken. By questionnaire method hand preference and eye preference were determined and ocular dominance was again determined by Miles test (Fig.1).



Fig.1. Miles test (Reproduced with permission from www.archeryweb.org)

Hand dominance was ascertained by questionnaire method, where each subject was asked, which hand he/she prefers to write, draw, throw a ball, hold a tennis racket, tooth brush, knife to cut things, match light it, eraser to erase, remove the top card when one deals from a deck, holds the thread when one threads a needle and holds a fly swatter. The responses were left, right or either and number of right responses were multiplied by 3; number of either response were multiplied by 2 ; number of left responses were added to these answers and interpretation was, 33-36 as strongly right handed, 29-32 as moderately right handed , 25-28 as weakly right handed and 24 as ambidextrous [15].

Eye preference questionnaire included which he/she uses to look through a key hole, dark bottle, telescope and a rifle. The scores were 1 for left, 2 for either, 3 for right in each question and final score was graded as 11-12 as strongly right eyed, 9-10 as mixed right eyed, 8 as ambi dexterous, 6-7 as mixed left eyed and 4-5 as strongly left eyed [15].

Ocular dominance was also determined by using Miles test, where the subject is asked to extend both arms, and to bring both hands together in front of the face to create a small opening. Then with both eyes open, is asked to view a distant object through the opening. The observer is asked to see the object alternately closing the eyes or slowly to draw the opening back to the head to determine which eye is viewing the object. i.e., the dominant eye [16]. The results thus obtained were statistically analyzed by Chi Square test and tabulated.

3. RESULTS

By questionnaire method, 97% were right handed and 84% were right eye dominant, 16% left eye dominant. By Miles test, 75% were right eye dominant and 25% left eye

dominant and Miles test was more significant for confirmation of ocular dominance than questionnaire method.

The calculated Chi –Square value is 0.224 & is less than the table value (3.84) at 5% level of significance for one degree of freedom. No significant association was found between hand and ocular dominance (Table 1). 74% showed uncrossed hand ocular dominance and 26% showed crossed dominance. The calculated Chi –Square value is 0.115 & is less than the table value (3.84) at 5% level of significance for one degree of freedom. No significant association was found between hand and ocular dominance (Table 2).

Table 1
Ocular and hand dominance by questionnaire method

Dominant eye	Dominant hand			Total
	Right handed	Left handed		
Right eye	84	2		86
Left eye	16	1		14
Total	100	3		100

The calculated Chi –Square value is 0.224 and is less than the table value (3.84) at 5% level of significance for one degree of freedom. No significant association was found between hand and ocular dominance.

Table 2
Hand dominance and Ocular dominance by Miles test

Dominant eye	Dominant hand			Total
	Right handed	Left handed		
Right eye	75	2		75
Left eye	25	1		25
Total	100	3		100

The calculated Chi –Square value is 0.115 & is less than the table value (3.84) at 5% level of significance for one degree of freedom. No significant association was found between hand and ocular dominance.

Eye dominance by questionnaire method & Miles test was compared as represented in Table 3. The calculated Chi –Square value is 2.46 & is less than the table value (3.84) at 5% level of significance for one degree of freedom. No significant association was found between hand and ocular dominance. The pattern of hand ocular dominance was classified as uncrossed dominance (that is right eye & right hand or left eye & left hand dominance) or crossed dominance (left eye & right hand or right eye & left hand).

Table 3
Comparison of eye dominance by questionnaire method & Miles test

Eye dominance	Right eye	Left eye	Total
Questionnaire	86	14	100
Miles test	75	25	100
Total	159	41	200

The calculated Chi –Square value is 2.46 & is less than the table value (3.84) at 5% level of significance for one degree of freedom.

4. DISCUSSION

Dominance is mainly influenced by genetics (8), and is defined as physiological priority or preference by one member of any bilateral pair of structures in the body when

performing various tasks. Handedness depends on neurological inhibiting of the recessive hand so that the dominant hand can develop the precise, corrective, rapid movement without competition from the non-dominant hand. People with right hand dominance use their right hand primarily as the Worker Hand.

Few studies have investigated the relation between hand and eye preference. About 10% of the general population has left hand dominance. Ocular dominance was thought to be related with hand dominance. Right eye dominance is much more common than left eye dominance. Approximately 2/3 of the population is right eye dominant. The preferred eye does not always correspond to the preferred hand and when they are different the condition is referred as cross dominance. Many theories have been proposed advantages of having crossed eye and hand dominance in sports performance. Miles test is more significant than Questionnaire method for eye dominance. In the present study there is no significant relation between dominant eye and dominant hand. By Miles method 24% right hand dominant people are left eye dominant, 66% left hand dominant are right eye dominant, that is 26% show crossed dominance. In questionnaire method 13% right hand people are left eye dominant, 66% are left hand dominant are right eye dominant, and 15% showed cross dominance.

The present study indicates that it is definitely far from one to one relationship. In the present study, it is clear that there are a significant number of people who have a dominant right hand has dominant left eye. Dr Jonathan S in his study on kart racing drivers has found similar results [9].

Portal JM, Romano PE, reported that pitchers in baseball who were uncrossed eye hand dominance were slightly more successful than crossed. While batters who were crossed eye hand dominance were slightly more successful than uncrossed. The pattern of eye hand dominance appears to be related to athletic proficiency for base ball [10]. As knowledge grows concerning the relations between ocular dominance and patterns of eye hand dominance in sports like cricket, golf, baseball, and one can guide an athlete to which sport to concentrate on.

Dane S, Balci N has reported that the rates of left handedness and left eyedness were higher in children with autism compared to normal populations. Autism and early language impairment may be associated with left handedness, eyedness and nasal dominance [11].

In another study they have indicated that, it is possible that the crossed preference may be partially the reason for visual-spatial and constructive disturbances observed in obsessive compulsive disorder [12]. Barbara H Connolly has

reported that mixed foot dominance and crossed eye dominance are more common in children with learning disabilities than in normal children [13]. In one more study, they have shown that persons with mental handicaps have prevalence rates of crossed dominance [14].

5. CONCLUSIONS

In conclusion, in the present study there is no significant relation between dominant eye and dominant hand. Eye hand dominance could serve as a factor in athletes or guiding young players on whether to hit left or right hand or to switch hit. Although the role of ocular preference in sports is inconclusive, evaluation of preferred eye, hand has been included in many sports vision evaluations. It may also be used in assessment of learning disabilities.

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