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Cross Dominance in Cricketers.

Vinodha R*, Indumathi D, Precilla Catherine A, and Shanmugapriya C.

Department of Physiology, Thanjavur Medical College, Thanjavur - 613004, Tamil Nadu, India.

Research Article

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*For Correspondence

Department of Physiology,
Thanjavur Medical College,
Thanjavur - 613004, Tamil
Nadu, India.

Mobile: +91 9944164435

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ABSTRACT

Ocular dominance sometimes called eye dominance or eyedness may be particularly important for certain sports which require accurate aim (eg: Cricket). It has been proved that cross dominance (in which the dominant eye is on one side and the dominant hand is on the other) is beneficial in sports requiring side-on stances (baseball, cricket, golf etc.). However, certain studies found that cricketers were not more likely to have cross-dominance. The present study was therefore conducted to determine whether the cricketers have cross dominance. This study was done at Physiology Research laboratory, Thanjavur Medical College, Thanjavur. 23 medical students were participated. 21 were batsmen and 2 bowlers. Subjects with corneal opacity, squint, colour blindness, those on miotics or mydriatics and those with other neuromuscular disorders were excluded. Ocular dominance was first tested by Miles test and then VEPs (Visual Evoked Potentials) were performed by checkerboard pattern reversal stimuli system. In this study, out of the 23 cricketers, 5 cricketers showed cross dominance (Right handed with left eye dominant) & 18 cricketers showed non-cross dominance (Right handed with right eye dominant). Cross dominance cricketers did not show significant difference with non-cross dominance cricketers in relation to amplitude. However, significant differences were observed in P₁₀₀ latency. We found that cross dominance, exists in very few percentage of cricketers. In future, we hope to extend this work on larger data set to determine the cross dominance. Further studies can also be carried out to determine whether performance difference exists between cross dominant and non-cross dominant cricketers.

INTRODUCTION

Most people have a dominant eye, or one eye that works a little bit harder than the other. Although we use both eyes to look at an object, we use our dominant eye more.

Ocular dominance was first described by Giovanni Battista Porta in 1593^[1,2]. It is the tendency to prefer visual input from one eye to the other^[3]. It is also called 'eyedness' similar to the usage of "handedness". About two-thirds of the general population has right eye dominance, while the remaining one-third has left eye dominance. Some people neither have left nor right ocular dominance^[4,5,6].

In sports that require precision, such as archery & in cricket, a person relies primarily on the dominant eye for the correct aim. Cross dominance, a phenomenon wherein the dominant hand is on the opposite of the dominant eye, is a factor that improves the performance in sports such as golf, baseball or cricket^[7].

In cricket, eye dominance is linked with the stance. Dominant eye faces and the dominant hand controls the swing. However, certain studies found that cricketers were not more likely to have cross dominance [7,8].

Therefore the present study was done to evaluate whether cross dominance exists in cricketers.

MATERIALS AND METHODS

This study was done at Research laboratory of Physiology Department, Thanjavur Medical College, Thanjavur from March 2010 to October 2011.

Twenty three medical students were participated in the study. Detailed history like Handedness, Cricket information (batsman/bowler), medical history and drug history were obtained by interview using a questionnaire.

Ocular dominance was first tested by Miles test and then VEPs were performed by Checkerboard pattern reversal stimuli system. Subjects with corneal opacity, squint, colour blindness, those on miotics or mydriatics and those with other neuromuscular disorders were excluded. Informed written consent was obtained from all the participants and experimental protocol was approved by College ethical committee.

Procedure

Miles test

In 1928, W.R.Miles established the basis for how eye dominance is determined [9,10,11]. It is easy to determine which eye is the dominant or sighting eye by doing the simple test called Miles test. The following method is simple and accurate way to check eye dominance for both adults and children.

- Extend both arms forward of your body and place the hands together making a small triangle (approximately 1/2" to 3/4" per side) between your thumbs and the first knuckle.
- With both eyes open look through the triangle and center something such as doorknob or the bull's eye of a target in the triangle.
- Close your left eye- If the object remains in view, you are right eye dominant. If your hands appear to move off the object and move to the left, then you are left eye dominant.
- To validate the first test, look through the triangle and centre the object again with both eyes open.
- Close your right eye- If the object remains in view, you are left eye dominant. If your hands appear to move off the object and move to the right, then you are right eye dominant.

VEP

VEPs are Visually evoked electrophysiological signals recorded from human scalp. It depends on the functional integrity of central vision at any level of visual pathway including retina, optic nerve, optic chiasma & occipital cortex [12,13].

Pre-test Instructions [14,15]

- About the procedure of the test and got informed consent.
- To avoid hair spray or oil after the last hair wash.
- The room parameters should be maintained constant throughout the experiment.
- Not to use any eye drops(miotic/ mydriatics) 12 hrs before the test.

The study was done with 4 channels Digital Polygraph. Digital intex colour monitor, 17 ½ model-no: IT-173SB.

VEP- Experimental Design and Recording

VEPs were performed by checkerboard pattern reversal displayed on a TV monitor subtending 15°×12° at a viewing distance of 90cm and individual squares in the checkerboard pattern subtended a visual angle of 60°. The stimuli reversal rate was 2 per second. Electrode scalp placement and recording

parameters were carried out according to the standard of the International Society For Clinical Electrophysiology Of Vision (ISCEV) [13]. Standard disc EEG electrodes were placed at the Oz position (active electrode) and reference electrode was placed at Fz position & ground electrode on the patient's vertex (Cz). The subject was instructed to fix his gaze at the center of the screen. The latency of P₁₀₀ and amplitude were measured.

Statistical Analysis

Results were analysed to assess the existence of cross dominance in cricketers by student's 't' test. p value < 0.05 was taken as significant.

RESULTS

In this study, Mean & Standard Deviation of right and left eye amplitude and latency were compared in cross dominant and in non-cross dominant cricketers and also between dominant eye of cross and non-cross cricketers.

Table 1: Summarises the studies showing the number of cricketers who use right or left for batting, the numbers using their right or left for bowling and also results of Miles test.

Handedness	Batsman/Bowler	Dominance	Miles test
Righthanded	Batsman	Right eye	16
		Left eye	5
	Bowler	Right eye	1
		Left eye	
Lefthanded	Batsman	Right eye	
		Left eye	
	Bowler	Right eye	
		Left eye	1

In this study, out of 23 cricketers, 21 were right handed batsmen, 1 was a right handed bowler & 1 was a left handed bowler.

Table 2

Parameters	Mean	SD	p value
P100 Latency(ms)			
RE	102.8000	5.03240	.010
LE	96.7000	7.14668	
P100 Amplitude(μv)			
RE	7.2000	4.52681	.021
LE	9.1880	3.63654	

Cross dominant cricketers (n=5) Paired 't' test

Table 3

Parameters	Mean	SD	p value
P100 Latency(ms)			
RE	100.1389	3.87604	.007
LE	102.1944	4.21530	
P100 Amplitude(μv)			
RE	9.9206	3.76764	.225
LE	9.2656	3.60651	

Non cross dominant cricketers (n=18) Paired 't' test

Table 4

Parameters	Mean	SD	p value
P100 Latency(ms)			
Cross	96.7	7.14668	0.038
Non cross	100.1389	3.87604	
P100 Amplitude(μv)			
Cross	9.1880	3.63654	0.185
Non cross	9.9206	3.76764	

Cross Vs Non cross dominant cricketers Unpaired 't' test

According to Miles test, 5 cricketers showed cross dominance (Right handed with left eye dominant), their P₁₀₀ latency and amplitude were analysed by VEP (Table. 2)

P₁₀₀ latency (p=0.010) & amplitude (p= 0.021) were statistically significant.

18 cricketers showed non-cross dominance (Right handed with right eye dominant) as per Miles test. Their P₁₀₀ latency and amplitude were analysed by VEP. P₁₀₀ latency was significant (p=0.007) and amplitude was not significant (p=0.225) (Table 3).

Cross dominant cricketers did not show significant difference with non-cross dominant cricketers in relation to amplitude (p= 0.067). However, significant difference was observed in P₁₀₀ latency ie. P₁₀₀latency was shorter in cross dominance cricketers than non-cross dominance cricketers (p= 0.000) (Table 4).

DISCUSSION

Ocular dominance can be broadly defined as the preference for one eye over the other. It refers to the inclination to prefer one eye's visual input compared to that of the other eye. The preferred eye is known as the dominant eye. The concept of handedness, to some extent offer a clue on what ocular dominance is. Ocular dominance is somewhat analogous to the laterality of right or left handedness. This is attributed to the neuroanatomic asymmetry in human visual cortex [15].

In handedness, the right cerebral hemisphere controls the left hand and the left controls the right hand. Most people have right hand with left brain dominance. The laterality of the dominant hand and the laterality of the dominant eye do not always coincide because each eye projects to both cerebral hemispheres whereas each hand is represented mainly in the opposite hemisphere [3].

In some sports like cricket, the objects move at very high speed and it is very important that the cricketer co-ordinates the eye, hands and body to hit the ball at the appropriate point in space.

In cricket with a right eye dominant, right handed batsman requires a more open stance to align the ball with right eye [16]. Coaches should be aware of eye dominance and the role it plays in sports. It is an important factor in how a coach approaches and working with players [18].

Unfortunately this stance is often coached to players without checking their eye dominance. Notable cross dominant sport persons are also known for good hand-eye co-ordination.

Kinds of Ocular dominance [17]

The various types of ocular dominance tasks may be divided in to three sub-categories

- Sensory dominance
- Oculomotor dominance
- Directional dominance

Sensory dominance: Occurs when there is a difference in the two retinal images that might lead to rivalry or some binocular interaction. For e.g. there may differences in image clarity, brightness or colour saturation.

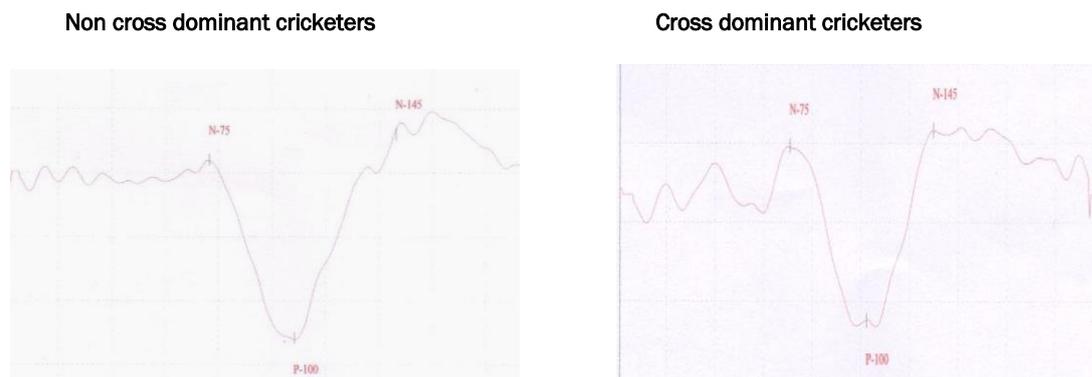
Oculomotor dominance: refers to the eye that fixes an object under binocular condition.

Directional dominance: is the most familiar, sometimes referred as sighting dominance. It can be tested in various ways. Miles test is an important one.

In the present study, both Miles test and VEP analysis confirmed that only 21.7% were cross dominant & 78.3% were non-cross dominant cricketers. Lady DM, Kirschen, Rosenbaum, Mellman studied the effect of hand-ocular dominance on the performance of professional baseball players and did not show an effect on batting average [7].

Similarly, Thomas NG, Harden, Rogers found that cricketers were not more likely to have cross dominance than normal persons [8].

Figure 1: Shows the comparison of different latency & amplitude of cross & non cross dominant cricketers:



In the present study, cross dominant cricketers have faster latency than non-cross dominant cricketers and it was statistically significant (Fig 1). However, in relation to amplitude, it was not statistically significant. Similar conclusions were drawn by Thomas NG, Harden, Rogers between cricketers and control.

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