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Evaluation of Visual Skills Between Cricket Players and Sedentary Individuals

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Abstract: Aim: This study aims to evaluate the visual skills between cricket players and sedentary individuals of the same age group and to determine that visual skills are beneficial for both competitive sports performance and daily task activities. Settings and Design: It was a sports vision-based comparative study conducted in the outpatient department of ophthalmology for preliminary ocular examination as well as in the cricket ground for sports vision-based tests. Methods and materials: This study carries 200 subjects out of which 100 cricket players and 100 sedentary individuals (i.e individuals who are not involved in any sports activities) participated between the age group of 18 to 26. Participants underwent preliminary ocular examinations in which all those ocular diseases and binocular vision anomalies are excluded. All subjects were undergone the following sports vision test: stereopsis was measured by Randot stereo acuity chart, accommodative facility with +/- 2.00 flippers, saccadic eye movement was measured by Lang fixation stick and eye-hand coordination was recorded by Alternate hand wall toss test. Result: The cricket players exhibited better accommodative facility (p=0.05) saccadic eye movements (p=0.03) and better eye-hand coordination (p=0.01) stereopsis was good in sedentary individuals (p=0.06) confirming that basic visual skills were high in sedentary individuals. Conclusion: These findings evidence that cricket players exhibit better performance in more visual skills in comparison with a group of individuals without sporting background, suggesting an improvement in visual skills due to routine systematic activity in sports as well as daily tasks.

Keywords: Stereopsis, Accommodative Facility, Saccadic Eye Movements, Eye Hand Coordination, Visual Skills

1. Introduction

Sports vision is tremendously a new field. [1, 19] It encompasses a variety of processes and training methods that help to enhance and embellish the overall performance of athletes. [2] According to the International Sports Vision Association (ISVA), Vision is simply like speed and velocity, and is a crucial element in how well you perform any sport. They delineate sports vision as imaginative, prescient and the science of assisting athletes to attain peak levels of performance via amelioration of visual abilities. [3] sports vision intends to make use of an athlete's visual coordination and to expertise the mandatory motor response. [2-4]

1.1. Visual System in Sports

Vision is the ability to process or elucidate the information which is perceived. Formerly, vision training and visual skills are not considered as crucial in the everyday sports setting, Even though athletes and coaches had done vision-related training techniques unintentionally. Studies have now shown the significance of visual skills in the performance of an athlete. [5]

A visual system is an interaction between hardware and software. [24] In the field of sports, the hardware system can be defined as the non task specific abilities like visual acuity, binocular abilities like accommodation, fusion, depth perception, and colour discrimination as well as peripheral

vision and the software system includes the cognitive aspects like Visualization, visual perception, visual memory & visual reaction time. [6] It is a must to understand that visual skills requirements will vary according to the sports but the basic steps in visual system processing will remain unchanged. [7-18]

1.2. Significance of Visual Skills

Visual skills in sports activities have emerged as relevant variables of athletic performance. [8] According to the American Optometric Association (AOA) there are several visual skills involved in athletics which include Dynamic visual acuity, eye-hand coordination, eye focusing, eye tracking, depth perception, and visual memory. [9] Research has shown that Visual skills can diverge between athletes and non-athletes, experts versus novices, [25] ball Versus non-ball players. In the 1980's Stiene et al confirmed that athletes had superior visual skills than non-athletes. [10-23] Because athletes accumulate an extremely desirable amount of archives quickly from the environment to execute extraordinary motor tasks. It has proven that athletes develop exceptional mechanisms of occipital neural synchronization during visuospatial demands showing higher Visuomotor overall performance in contrast to non-athletes. [11]

The Purpose of vision, Visual skills in Sports have gained a satisfactory amount of attention over the years, however many athletes nevertheless have been restricted from getting appropriate entry to do the big difference of enhancement approach. Competitive athletes are consistently searching for techniques and strategies to enlarge their prevalent standard overall performance in their sports. Most of the focus is on the enhancement of requisite physical abilities like strength, speed, agility and endurance [12] and visual skills have become less significant and uncharted among certain players.

Considering the preceding literature and the component referred to this research tries to determine that visual skills are most sincerely beneficial to aggressive sports performance along with bodily skills like energy and speed also and the same time visual skills are needed in sedentary individuals lifestyles for their routine activity.

Certainly, there is no proof of attempting sports vision testing between cricket players and sedentary individuals of the same age a group among the Indian population. Therefore, the current study examined some parameters associated with sports vision to furnish a greater grasp on visual skills in players have an impact on their peak performance and visual skills can also influence the daily task activities of sedentary lifestyle individuals.

2. Materials and Methods

2.1. Subjects

The participants of this Study Consisted of 200 University students. Out of which 100 belonged to State level cricket players and 100 had no history of sporting activity. Participants under medications against systemic conditions, Ocular diseases binocular vision anomalies, tremors, known neurological or cognitive dysfunctions are excluded from the study. Players with a minimum of 3 years of experience in cricket subjects without any sports background are included and subjects with a refractive error like myopia, hypermetropia, and astigmatism are also included in this study.

2.2. Procedures and Apparatus

All the data are gathered data from the participants of two groups, Initially, monocular and binocular Visual acuity was measured for both distance and near using a Snellen chart and Jaeger' Chart, refraction with best-corrected visual acuity was performed for participants with myopia, hyperopia, astigmatism, pupillary examination Cover, Uncover and alternate cover test with near and distance targets were performed, Broad H test, near point of convergence and near point of accommodation were performed to rule out convergence insufficiency or convergence excess and accommodation insufficiency or accommodation excess.

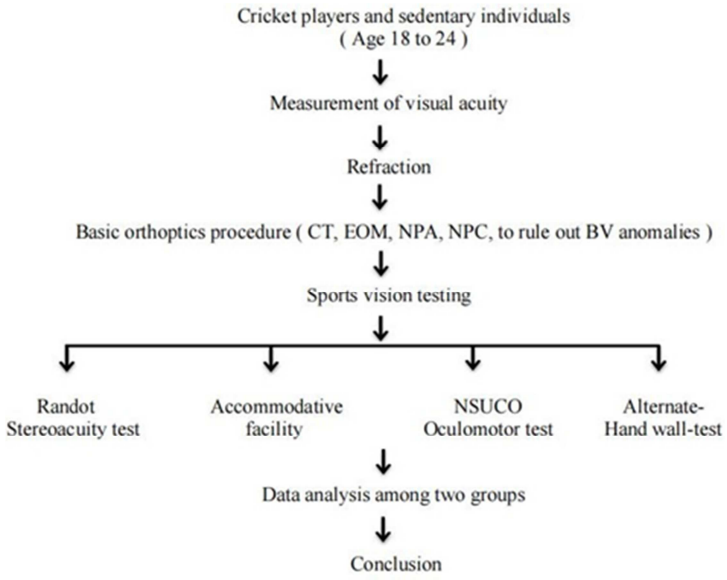

Figure 1. *Flow chart of methodology.*

2.2.1. Stereopsis

Stereopsis or depth perception is measured by a booklet Contains RDS stimuli called the randot stereo acuity test. This test is conducted by holding the test booklet before the subject at 40cm (16 inches) with Polarizing glasses over the BCVA of the Subject. The subject has to go through three targets of the Randot stereo test - geometrical shapes, animals and circles with the disparity range of 500-250, 400-100, 400-20 sec of arc respectively. Measurements are recorded for three targets separately.

2.2.2. Accommodative Facility

This parameter is tested by using a rock chart and +/- 2.00D flipper lens. [16]The Subject holds the rock chart @40cm and focus targets through +2.00 and -2.00 lenses (flippers). A flip from positive to negative was recorded as one cycle. The accommodative facility was measured by counting the number of cycles per minute.

2.2.3. Saccades

Saccades was performed by the NSUCO (Northeastern state University college of optometry oculomotor) test, which is a standardized procedure with scoring criteria. The test subjectively assesses saccades by considering four performance areas - Ability, accuracy, Head movement and body movement.

The test was conducted at 40 cm binocularly, with patient sitting in front of examiner. Saccades was performed by using lang fixation sticks. The examiner holds the two test stimuli with 20cm of Separation horizontally. Saccades was evaluated by asking the participant to alternatively fixate on the two stimuli followed by instruction by the examiner. According to the examiner observation the scoring was determined according to criteria are given below,

Table 1. *Scoring procedures used in NSUCO test [15-20].*

Performance Area	Evaluation procedure	Scoring system
Ability	Patients ability of performing 5 cycles of change of fixation presented.	Completes less than two round trips. Completes two round trips. Completes three round trips. Completes four round trips. Completes five round trips.
Accuracy	Patients ability of performing 5 cycles of change of fixation without correcting refixations.	Large over or under shooting is noted one or more times. Moderate over or under shooting noted one or more times. Constant slight over or undershooting noted. Intermittent slight over or undershooting noted. No over or undershooting noted.
Head and body movement	Patients ability of performing 5 cycles of change of fixation without head or body movements.	Large movement of the head / body at any time. Moderate movement of the head /body at anytime. Consistent slight movement of the head / body (greater than 50% of the time). Intermittent slight movement of the head / body (less then 50% of the time). No. movement the head/ body.

2.2.4. Eye-Hand Co-ordination

Alternate hand- Wall Toss test was used to measure eye-hand coordination. This test was conducted by asking the participant to stand 3 feet away from the wall. The ball is tossed against the wall with an underarm motion and caught in the left hand. It is thrown with the left hand and caught with the right hand. This is repeated for 30 seconds. The number of successful catches in 30 seconds was recorded, scoring was given according to the criteria given below.

Table 2. *Scoring criteria for Alternate hand - wall toss test [21].*

Performance	Score in (30 seconds)
Excellent	> 35
Good	30 -35
Average	20-29
Fair	15-19
Poor	< 15

2.3. Statistical Analysis

The ANOVA 1-way test was made to compare the sports vision test viz. Randot stereo acuity test, Accommodative facility and NSUCO oculomotor test for both groups. The Mann-Whitney U test was used to compare sports vision tests called Alternate hand wall toss test for both cricket players and sedentary individuals. shown in (Figures 6 and 7).

3. Results

3.1. Demographics

A total of 200 participants had been analyzed in this study. Out of which 100 had been cricket players and 100 had been sedentary individuals. Of cricket players, all had been male and in sedentary individuals 31 were male and 69 had been female ranging between 18 to 26 years with a mean age of 20.36 in cricket players and 20.68 in sedentary individuals.

Before undergoing sports vision test basic ocular examinations were undergone by all participants and the frequency distribution of ocular assessment is listed in (Table 3).

3.2. Descriptive Analysis

Descriptive statistics (mean and standard deviation) of cricket players and sedentary individuals for preliminary test (NPC and NPA) are shown in (Table 4) and for sport vision

test like Randot stereo acuity, accommodative facility, NSUCO oculomotor test and Alternate hand wall toss test the descriptive analysis was presented in (Table 5).

3.2.1. Stereopsis

(Figure 2) shows the descriptive data of the stereopsis parameters of cricket players and sedentary individuals. Analyses showed that depth perception (i.e) stereopsis was good in both groups. There is no significant difference (p =0.06) was found between cricket players and sedentary individuals.

3.2.2. Accommodative Facility

(Figure 3) shows the mean and standard deviation of accommodative facility for each right eye, left eye and both eye of both groups. Here, the accommodative facility was good and equal for players as well as sedentary individuals. Accommodative facility was statistically significant between the two groups (p = 0.05).

3.2.3. Saccadic Eye Movements

(Figure 4) shows the descriptive data of NSUCO oculomotor test for saccadic eye movements. Saccadic eye movement was significantly better in cricket players and sedentary individuals. Hence, a statistically significant difference was found between cricket players in sedentary individuals (p= 0.03).

3.2.4. Eye Hand Coordination

(Figure 5) represents the descriptive analysis of Alternate hand wall toss test for eye-hand coordination. Here, eye-hand coordination was found to be better in cricket players. There is a great significant difference found between cricket players and sedentary individuals (p= 0.01).

Table 3. *Frequency distribution of preliminary.*

Variables	Categories	Cricket Players (n)	Sedentary Individuals (n)
Pupillary evaluation	Briskly acting	100	100
Board H test	Full free painless	100	100
Cover test	Distance:		
	Orthophoria	99	97
	Esophoria	01	03
	Near:		
	Orthophoria	69	71
	Esophoria	06	02
	Exophoria	25	27

Table 4. *Descriptive statistics for NPC and NPA.*

Variables	Categories	Cricket Players (n)		Sedentary Individuals (n)	
		Mean ($\bar{x}$)	S.D	Mean ($\bar{x}$)	S.D
NPC	Subjective	7.94	1.470	7.73	1.758
	Objective	8.34	1.667	7.73	1.833
NPA	OD	8.5	1.842	8.22	2.196
	OS	8.93	1.805	8.38	1.806
	OU	8.6	1.780	8.03	1.912

Table 5. *Descriptive analysis for Sports vision test.*

Test	Variables	Cricket Players				Sedentary Individuals			
		Maxscore	Minscore	Mean ($\bar{x}$)	S.D	Maxscore	Minscore	Mean ($\bar{x}$)	S.D
Randot	Shapes	250	250	250	0	250	250	250	0
	Forms	500	500	500	0	500	100	496	39.799
	Circles	200	30	68.2	20.754	400	30	80.1	60.506
	Animal	100	100	100	0	500	100	107	49.507
	Total	1050	880	918.2	20.755	1250	880	930.1	60.506
Accommodative Facility	OD	19	09	14.91	1.744	19	09	14.35	2.026
	OS	18	10	15.06	1.629	19	10	14.39	2.024
	OU	16	08	12.84	1.787	19	08	12.64	2.124
Saccades	Ability	05	0	3.59	1.149	05	0	3.45	1.161
	Accuracy	05	01	4.72	0.749	05	02	4.64	0.728
	Head moment	05	0	3.39	1.476	05	0	2.89	1.599
	Body moment	05	03	4.93	0.324	05	03	4.86	0.447
	Total	20	09	16.62	2.469	20	10	15.87	2.448
Eye-Hand Coordination	Successful catches@ 30 seconds	37	18	146.83	3.345	37	01	54.17	6.542

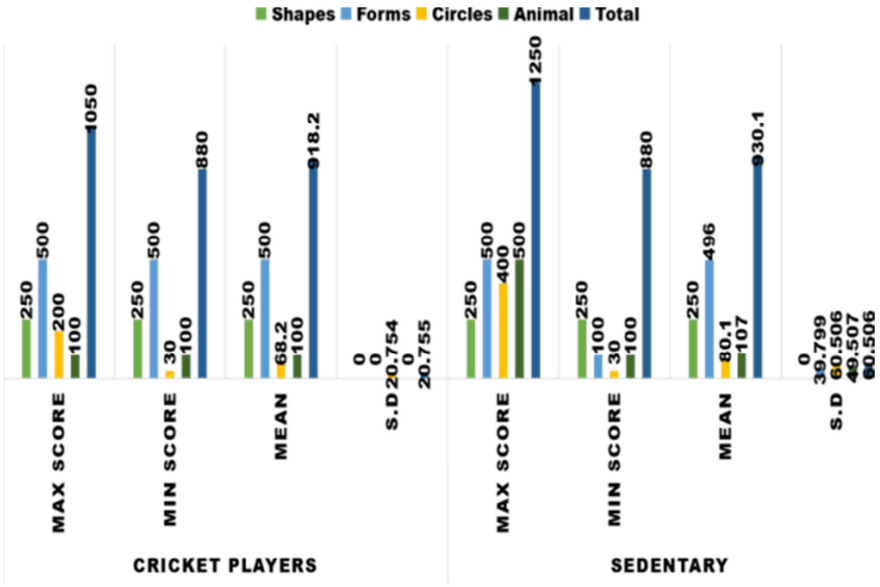

Figure 2. *Descriptive analysis for Randot stereo acuity.*

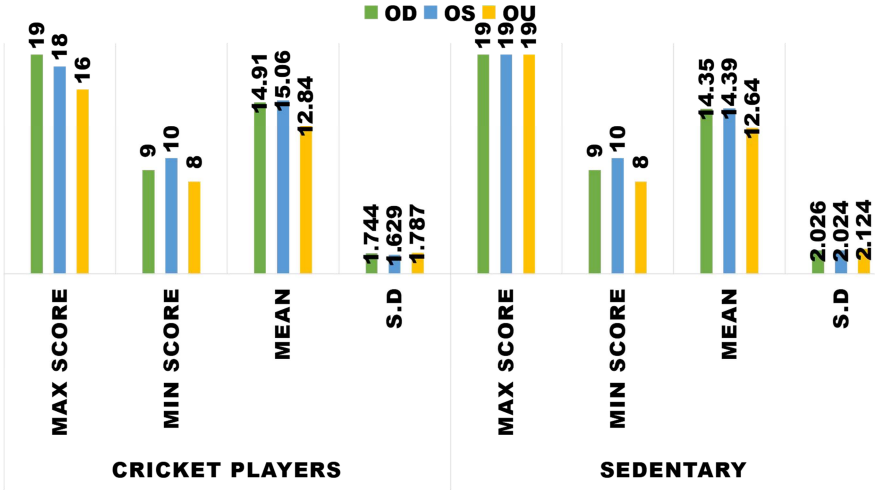

Figure 3. *Descriptive analysis forAccommodative facility.*

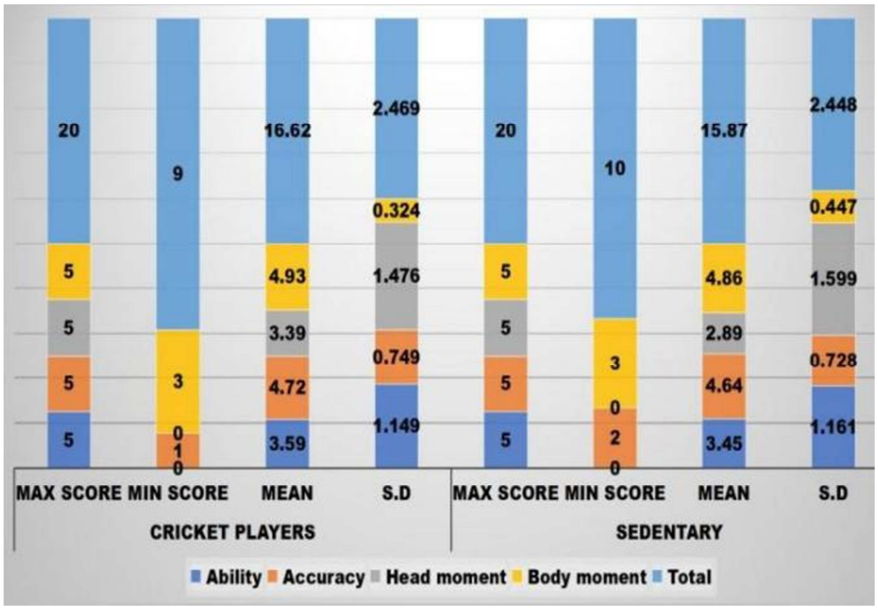

Figure 4. *Descriptive analysis for for NSUCO oculomotor test.*

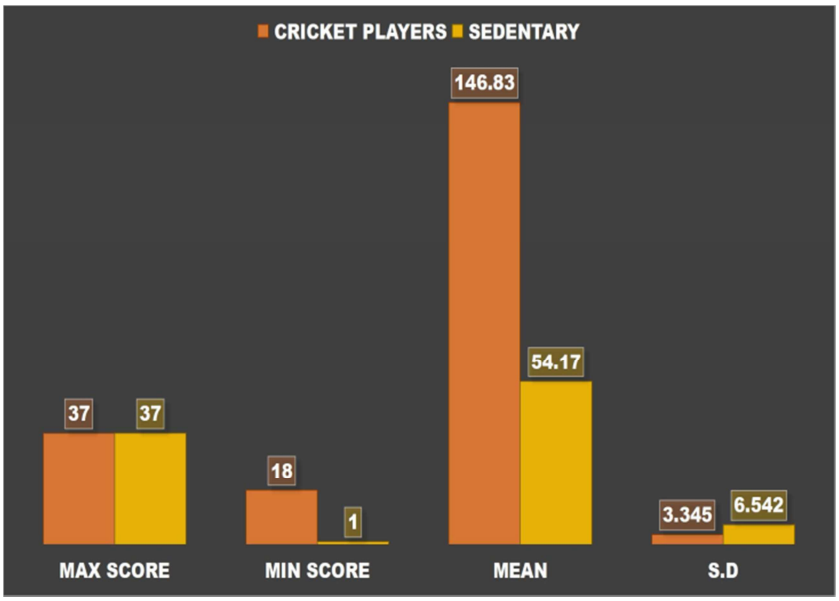

Figure 5. *Descriptive analysis for AHWTT.*

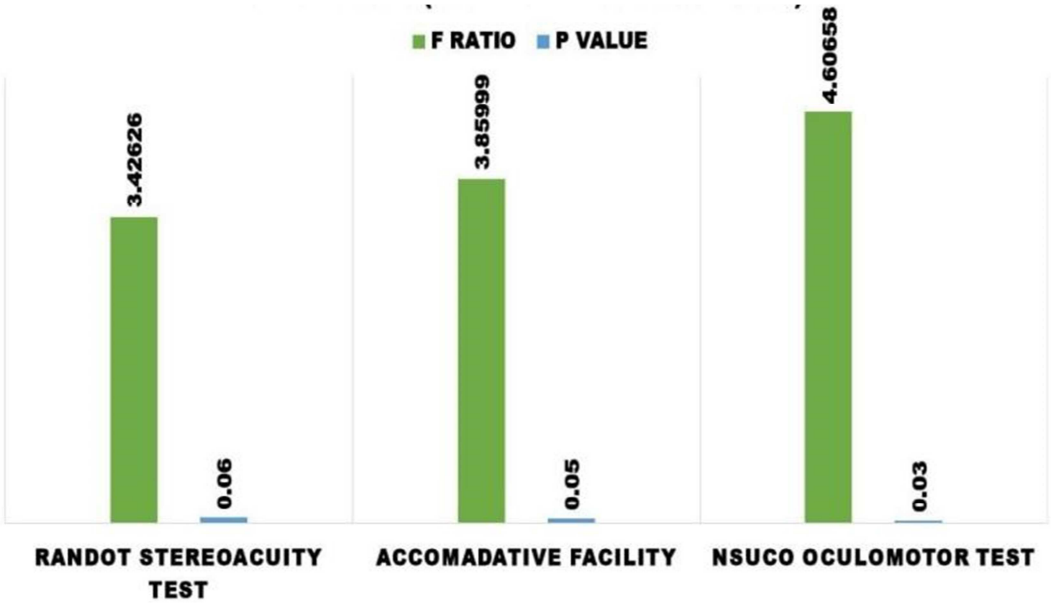

Figure 6. *Results of ANOVA 1 way analysis test.*

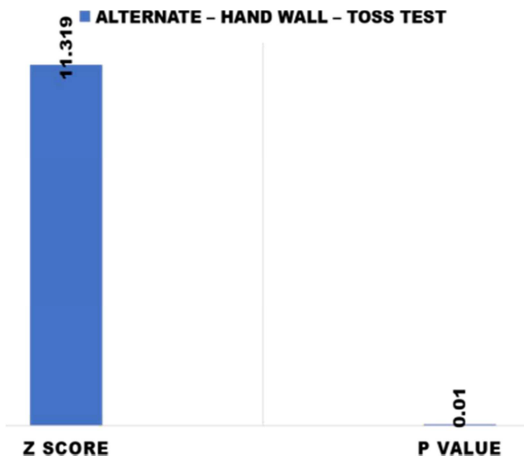

Figure 7. *Results of MANN WHITNEY U test.*

4. Discussion

This study investigated how visual skills are beneficial for cricket players. It is also investigated that visual skills are also beneficial to daily task activities. The noteworthy findings are summarized as follows:

4.1. Accommodative Facility and Steropsis

Cricket is a dynamic sport in which the target should be focused on by the players from different distances. Therefore, accommodative facility has been compared between cricket players and sedentary individuals. The accommodative system is controlled by the autonomic nervous system and is greater steady and efficient in athletes. [22, 13] Therefore, a higher accommodative response from cricket players. Here,

the hypothesis used to be quick as proper and this study found a statistically significant difference (p = 0.05) between both groups. But in 2017 Jesus vera et al [13] located no significant variation in accommodative facility between basketball players and sedentary individuals.

No statistical differences were found for stereopsis (p =0.06) in this study. These results agree with Jesus Vera et al [13] who made a comparison of near-static stereopsis in basketball players and sedentary individuals. But Boden et al found significant differences between softball players and non-ball players. Stereopsis is a cortical function. So, systematic cricket practice does not involve substantial stereopsis improvements which are also indicated by Paulus et al. [27]

4.2. Saccades

Saccadic eye movements exhibit a statistically massive difference (P=0.03) between the two groups. This outcome concurs with A. Piras et al [26] determined comparable results in subjects of Italian volleyball players and non-volleyball players. The only distinction is that they recorded saccadic eye movements with the help of a video-based eye-tracking system but the current study used a subjectively evaluating test (NSUCO Oculomotor test). The results of this study suggest that cricket enthusiasts have the most appropriate saccadic movements as they are doing activities like tracking the motion of a ball in their routine practice.

4.3. Eye-Hand Coordination

Eye-hand coordination is essential expertise in cricket and some sports with admire for their standard performance on the field. Cricket players exhibit exceeding eye-hand coordination and higher scores in the Alternate hand-wall toss test. Thus, intimating that a statistically good-sized difference (P = 0.01) was discovered between the two groups. Similarly, Irem. S Mohammad contrasted eye-hand coordination among volleyball and non-volleyball university students in Delhi. [14] These consequences revealed that coordination between eye and hand is magnificent in cricket players only due to the effect of everyday practice.

The current findings indicated that visual skills are greater and more efficient in cricket players than sedentary individuals. Thus, the speculation that was set for this research has been partially established correctly. Statistics indicated that eye-hand coordination, saccades and accommodative facility had been recorded in higher rankings in players. Because these skills are mainly involved in dynamic activities. For stereopsis, both the groups had shown more or less equal ranking and a drastic difference was not found between them. This indicates that both the player and sedentary individuals were having good binocular vision and this skill is specifically useful for individuals having a sedentary lifestyle like drivers, hairdressers and photographers.

By analysing this, cricket players had been recorded higher ranking in three main sports vision tests due to their superior visual skills. Moreover, the players in no way have gone through any sports vision training programs or exercise implies that normal cricket practice itself would possibly be responsible for the variations between cricket players and sedentary individuals.

5. Conclusion

In sports, numerous visual skills are wanted for extraordinary performance in players. The key factors involved in most excellent sports activities of a player are precise vision and more suitable visual skills. This study does not elucidate whether the prominent visual skills in cricketers are because of their innate or developed abilities. The findings of this study suggest that standardized cricket practice might also be the motive for visual skill improvement. In the beginning, the cricket fielder learns to target the ball and finds the exact location. This task will become more frequent as the player achieves the next level. Here, the skill which has been practised, determine their performance. so, this study determine visual skills are not only beneficial for cricket players it is also useful for individuals having a sedentary lifestyle. The results of this current study showed that stereopsis is equal for both groups. This shows stereopsis is also an important skill that is also useful and good in sedentary people like drivers and photographers. At the same time, accommodative flexibility is also useful and good in teachers and students and eye-hand coordination are also useful and good in surgeons.

Finally, this study concluded that visual skills are prominent not only because of an individual in sports it's because of their routine systematic activity. For cricket players it is 'practice' and for sedentary individuals, it is a 'daily task'.

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