

## **The role of visual skills and its impact on skill performance of cricket players**

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### **Abstract**

The aim of this study was to determine the role and the impact of a visual skills training programme on the skills performance of cricket players, and whether visual training programmes are beneficial to competitive sports performance. Highly skilled cricket players (n=13) who were actively participating at a provincial level of competition, served as participants. Since the sample was relatively small non-parametric statistics, i.e. Wilcoxon test was used to analyze data. After initial testing the cricket players participated in an eight-week visual skill and performance skills programme for 60 minutes a day, once a week. The programme included sports vision activities, speed and agility activities and ball skills activities. The pre-training and post-training values of the cricket players were recorded and significance of difference was determined by using the Wilcoxon signed-ranks test. Data revealed that the visual skills programme had a significant influence on most of the tested variables (ball handling skills, co-ordination, visual awareness, eye tracking skills, accuracy, peripheral awareness, pro-action – reaction skills and visual concentration). For some variables that were tested on the experimental group improvements were found, which indicates that the improvements can be ascribed to the visual skills programme. More than half of the variables tested improved in the experimental group as well. It can thus be concluded that there was an increase in most of the variables tested (ball handling skills, co-ordination, visual awareness, eye tracking skills, accuracy, peripheral awareness, pro-action – reaction skills and visual concentration). Visual skills training, utilizing the conditions in this investigation, can result in an increase in the players' visual fields. Visual skills training programmes can be beneficial to competitive sports performance.

**Key words:** *Cricketers, visual, perceptual, and motor skills, speed, agility, and visual performance.*

### **Introduction**

In recent years, there has been a growing acceptance that perceptual skills precedes and determines skilful actions in sport and other contexts (Harris & Jenkin, 1998; Williams, Davids & Williams, 1999). In particular, the visual system plays a crucial role in guiding the player's search (visual search strategies) for essential information underlying skilful behaviour. Visual search strategies refer to the way that the eyes move around the field in an attempt to direct visual attention towards relevant sources of information. Since almost 80% of the entire input that goes to the brain, comes from the eyes, it can be said that vision is one of the most important factors playing a role in sport performance (Hodge, Atkinson, Gill, Crelier, Marret & Pike, 1999). For a player

to excel, attention should be given to all these aspects of skills enhancement (Hodge *et al.*, 1999).

Extraordinary sport performance depends on successfully using all available visual information. As such, there has been a growing acceptance that perceptual skill precedes and determined skilful actions in sport (Harris & Jenkin, 1998; Williams *et al.*, 1999). The visual system plays a crucial role in guiding the player's search for essential information underlying skilful behaviour. According to Abernethy (1996) the role of vision can generally be accepted as a critical source of information for the planning and the executing of motor skills.

Accurate decision-making in sport depends largely upon the level of attention, scanning for opportunities and then acting upon them, in a specific situation (Greenwood, 1993). The emphasis of coaching or training players in cricket has been heavily reliant upon repetition of motor skills, conditioning and weight training. Although strength and endurance are beneficial to the sport and can still be conducted without guidance by a coaching authority, repetition of motor skills is the key to any individual or team success and it should always be monitored to ensure that the skill is being repeated correctly. Kindal and Winkin (2000) stated that "practice makes permanent", which suggests that any action constantly repeated, whether correct or incorrect, will be engrained into an automatic response.

Hopfinger, Buonocore and Mangun (2000) explained that dynamic interplay between the attentional control system and the sensory brain structures correlates to selective visual attention. The superior frontal, inferior parietal and superior temporal cortex are selectively activated by cues, indicating that these structures are part of a network for voluntary attentional control, resulting in selective sensory processing of relevant visual targets. Visual information is critical for performing a variety of motor skills that are used in cricket. This visual information is critical when the players' movements must coincide with a changing environment, such as hitting the ball and catching the ball, or in motor activities requiring precise movements of the limbs towards a target. The study of these movement activities, such as pointing at a target, relocating a body segment in space, or reaching for an object, has been directly linked to vision and movement control since the pioneering work of Woodworth in 1899 (Hopfinger *et al.*, 2000).

During the initial stages of performing a skill, players carry out visual search patterns to select from the playing environment certain clues that can be relevant

for the performance demands of specific situations. Two literature reviews have suggested that successful performance in sport requires skill in perception as well as efficient and accurate execution of movement patterns (Abernethy, 1987; Williams & Davids, 1994). When focusing on cricket, it is argued that the ability to quickly and accurately perceive events in complex sport settings is an essential requirement of skilled performance. For example, in cricket, players are confronted with a rapidly changing, information-rich environment involving the cricket ball, other cricketers, the field of play, and spectators in the stands.

According to Bard and Fleury (1976) from a cognitive perspective, the cricket player has very little time in which to interpret all available data. This is due to the player's limited information processing capacity and the constrained circumstances from the sport demands; therefore, only the most pertinent information is selected and acted upon.

The process of selecting relevant information, whilst disregarding less informative pieces of information is not conducted in an arbitrary manner. It is based on deliberate visual search strategies. These visual search strategies enable the skilled cricket player to make more efficient use of the time available for skill analysis (Bard & Fleury, 1976).

It has been argued that visual skills training exercises allow athletes to improve their visual skills and thus improve performance skills. Wilson and Falkel (2004) stated that the improvements from visual skills training exercises in eye movement skills, focusing skills, peripheral visual awareness, and visual perceptual skills can carry over onto the field of play. To participate in a competitive sport, such as cricket, one of the main aspects any coach should keep in mind is that it is vital to achieve the best possible performance from the whole body – including the visual system. In cricket it is possible that success is achieved by accurately made decisions, based on the information obtained by visual input. Effectiveness of the player's ability to act quickly and accurately depends upon how efficiently the visual system can process the information.

Vision involves many subtle and sophisticated links between the brain, eyes and muscles. Vision has been found to be the most complex and the dominant sensory system used to provide feedback (Atkins, 1998). Good vision requires exceptional visual and/or perceptual skills, which involves the eyes feeding information to the brain. The brain then interprets the information and sets the

body, feet, hands and leg's balance system in motion. It therefore instigates the appropriate physical action the player needs to play cricket.

Visual skills are the key to a cricket player's timing, co-ordination and overall performance. Motor skills, which bridges the gap between fitness and technical ability is vital in training for cricket excellence. The body must be trained to respond to what the eyes sees. The eyes cannot be trained in isolation, the body must be taught to work as a unit. The long hours most cricket players spend in the gymnasium and on the field working to improve their physical ability is important. However, they also need to concentrate on their visual skills, as visual skills are the key to timing, co-ordination, overall performance, stamina and agility, flexibility, concentration, balance and fine-tuning of specific skills (Barnes & Attaway, 1996). Vision is both a learned and a developed skill. Of all the movement skills required in cricket, vision is the last skill to be fully developed and the first to break down in performance (Campher, 2008). As the eyes lead, the body will follow. The eyes can be trained just like any other muscle in the body to improve reaction to what is seen. Just as exercise and practice increase strength and speed, so can the visual performance be improved to achieve maximum results (Smythies, 1996).

Wilson and Falkel (2004) explained that vision involves two basic categories of function: visual motor and visual perceptual skills. These authors further stated that visual motor skill is probably the easiest category to relate to sport-specific performance. If a player cannot move the eyes quickly and effectively, then they cannot optimally perform sport-specific tasks. However, the above mentioned skill does not apply to visually impaired athletes, as they rely solely on their hearing abilities. It differs from athletes that are sight impaired but have acute hearing abilities. It has been found that one of the primary differences between good and elite-level cricket and soccer players, other than their physical skills being equal, is that elite cricket and soccer players can move their eyes more effectively and efficiently than non-elite players for the duration of the game (Wilson & Falkel, 2004).

According to Thomas, Lee and Thomas (1988), Abernethy (1991) and Rowland (1996) normal motor development forms the platform for all skill acquisition including motor –and visual skills. According to Williams and Davids (1997) visual concentration is not only dependent on good visual abilities. There are other factors that also contribute to optimal visual performance, e.g. confidence, the amount of practice the player puts in and being aware of the situation that he

is in. Attentional selectivity and the ability to perform two or more skills concurrently play an important role in sports performance (Williams & Davids, 1997).

From a sport science point of view, one can see that cricket is a game where the players and the ball are almost constantly in motion, with the ball changing direction at acute angles very often. Because cricket is an anaerobically based sport, the length and intensity of focus on the ball will change constantly. It is postulated that over 90% of the time a cricket player uses vision to put all of these skills into action (Morris, 2000). Researchers have proven that visual motor skills can be improved through visual skills training to allow for optimal visual motor performance during sports (Stine, Arterbrun & Stern, 1982). The visual system actually performs much better after it has been loaded, or stressed (Wilson & Falkel, 2004). The goal of visual skills training programmes is to improve ocular motor skills and to enhance not only visual performance but also sports performance. Wilson and Falkel (2004) argued that when you improve the ocular motor skills (vergence, focusing, and tracking) you improve athletic performance. They stated that it is important for the eyes to be able to converge (or cross) as the ball comes towards the player or diverge (or uncross) as the ball goes away. It is also necessary for the player to be able to focus on the target where he wants to place the ball (either with the bat, or with his foot as to where to kick the ball) and then to be able to track the specific target smoothly through space. Therefore, visual skills training exercises, like any other component of the player's training regime, are necessary for optimal preparation for competition (Ferreira, 2001; Wilson & Falkel, 2004).

The purpose of this study was to determine the role and the impact of a visual skills training programme on visual skill tests and potentially, on the performance of cricket players. It was hypothesised that due to a high correlation between laboratory tests and field performance (taking into account that the test battery includes the physiological parameters that are paramount for performance in that particular sport), visual skills training will result in enhanced visual skills in cricket players on and off the field.

## **Methods and Procedures**

### *Subjects*

The participants for this study consisted of 13 (n=13) under-19 cricket players who were actively competing at provincial level. They underwent pre-training and post-training assessment. After the pre-training assessment, the under-19

cricket players underwent an eight week visual skills training programme. They attended these training sessions twice a week.

### *Study design*

An experimental dependent pretest-posttest randomised group design was used. For this design, the groups are randomly formed and were given the pre-training assessment as well as the post-training assessment. Ethical clearance was provided by the Research Proposal and Ethics Committee of the Faculty of Humanities. The following visual skill tests (Campher, 2008) were performed before and after the intervention programme:

**1. Accommodative Flexibility** – The player needs to focus his eyes by using a small chart, focusing 35 reduced Snellen letters through +2.00 and –2.00 lenses (flippers). Accommodative flexibility is measured by counting the cycles per minute that the player completes in accommodating to alternating presentation seen through the lenses. The player can only flip the flipper over (change lenses) if the given line on the chart was in focus. The rotation from positive to negative was recorded as one cycle.

**2. Depth Perception** –Depth perception (or Stereopsis) is measured by a booklet containing polarized test stimuli for use at 40 cm and requires cross-polarized lenses, namely the Randot Stereo test. The time it takes the player to complete the test is recorded. What the player needs to do is to indicate as quickly as possible the circle that appears to be 3-D. Measurements are scored out of nine because there are nine blocks with four circles inside each block.

**3. Eye tracking (Pursuits)** –The Rotator pegboard is used for this assessment. A wooden disc, with 26 holes, is placed on a turntable and rotated at 33, 3 rotations per minute (rpm). Each hole is identified by a letter of the alphabet placed in random sequence on the wooden disc. The player is ordered to find the letter in alphabetical sequence while the disk rotates at 33rpm on a turntable at arm's length. The player is not allowed to stop the board in an attempt to insert the golf peg into the hole next to the alphabetical letter. The time it takes the player to complete the test (to be able to put ten golf pegs into the board in alphabetical order) is recorded and if any, the number of errors made. The player has three minutes in which to place a golf peg into each hole and this must be done in alphabetical order. The letter reached is recorded, or if the letter Z is reached within the time limit, the time is recorded.

**4. Eye jumps (Saccades)** –A wall chart, “X-chart”, is being used to test the rapid movements of the eyes (saccades). The player is asked to stand an arm-

length away from the chart, and the chart is placed at eye-level. The player needs to keep his head still for the entire duration of this test, and needs to read one letter to the next horizontally (from left to right to left to right) all the way down to the bottom of the chart. The time it takes the player to complete the test is recorded and if any, the number of errors made

**5. Peripheral Awareness and response** –The ability of the player to respond rapidly and successively to peripherally present stimuli is assessed using the Wayne Membrane Saccadic Fixator. The player stands facing the apparatus, with the centre of the apparatus at eye height and within half a meter away from this apparatus. The 35 lights on the apparatus are programmed to illuminate in random order and the task of the player is to depress the 35 lights when they appear as quickly as possible. The number of lights the player touched in thirty seconds was recorded. The player was instructed to react as quickly as possible in order to get better results

**6. Eye-hand Co-ordination and Eye-foot Co-ordination** –The player stands facing the wall behind a 1meter restraining line, with a ball held in the right hand. On the starting signal the ball is tossed against the wall with an under-arm motion and caught in the left hand. It is then thrown with the left hand and caught with the right hand. This movement is repeated as often as possible in 30 seconds. The number of successful catches in 30 seconds is recorded.

**7. Crucifix ball drop – Advanced modification** – This tests a player's peripheral awareness and response and foot speed. The player is instructed to bend his knees; feet approximately shoulder width apart and hands on his knees. He must try and catch the ball with soft hands; and to bring the ball toward his body. The player must catch the ball with wrist supinated, and when the ball drops, the player must drop into a squat position as quickly as possible and is not allowed to snatch the ball. The number of correct catches the player makes out of 20 drops is recorded.

**8. Visual recognition (Visual memory)** –The player sits in front of the computer; a programme testing visual memory is selected. The player is instructed to concentrate on the four blocks on the screen. The computer will flash different colours inside of the four blocks and the player must try and remember the sequence that the computer flashed and then click with the computer mouse inside the four blocks the sequence that he can remember. The computer will complete 10 screens and then determine the player's visual memory ability, regarding the number of blocks that the player could remember the sequence of correctly.

**9. Visual anticipation** - The player sits in front of the computer; a programme testing visual anticipation is selected. The player is instructed to follow the ball on the screen and try to prevent the ball to touch his side by moving a paddle on the screen up and down using the arrow keys on the computer's key board. Every time the ball touches the player's side then the computer gets one point and every time that the ball touches the computer's side, then the player gets one point. At the end of this programme, the player's score and the computer's score is recorded.

**10. Accuracy** – This test measures the player's accuracy skills. The player sits in front of the computer; a programme testing accuracy is selected. The player is instructed to click with the computer's mouse on all the red balls that will come up on the screen as quickly as possible. The duration of this test is for 30 seconds, and the amount of red balls that the player clicks on is recorded.

**11. Colour vision** – The colour vision testing made easy booklet was used to test the player's colour vision sensitivity. This test will detect red-green deficiencies. The player sat 70 cm away and was instructed to focus on the nine cards that will be shown and he has three seconds to look at the picture and then he must draw what he sees. He must draw the three elements in the correct order as well. On the nine cards there are three elements, a star, a circle and a square. The player must draw what he sees. At the end the player will get a score out of nine.

#### *Intervention*

The under-19 cricket players underwent an 8-week visual skills training programme. They attended these training sessions twice a week. All training programmes were designed with these criteria in mind, even though the player's body will only respond to what it can see (McCarthy, 1996). This is why repetitions in this form of sports vision fitness training programmes are short in duration. The visual skills fitness training programme for cricket was predominantly carried out in this manner, short in duration and much higher in intensity. A battery of fielding drills was devised by the authors that are qualified sport scientists. These drills were combined with explosive, running drills in order to elevate pulse rates with an associated increase in physiological fatigue. The objectives of the drills were to enhance visual performance under stress – seeing how the visual system works under conditions of fatigue or elevated pulse rate. Secondly, it was to improve visual concentration, reaction time, speed off the mark, ability to track a moving ball, and accuracy and reflexes, all visual attributes appropriate to cricket



The sessions lasted approximately one hour, warm-up and cool down included. Initially, a fair amount of running (15 to 20 minutes) was included to enhance explosive fitness, in various forms. All the running stations (drills) that formed part of the running training programmes, were done over a total distance of 20 m

#### *Data analysis*

The information obtained from the sample was captured onto a computer and analysed by means of the Statistical Product and Service Solutions (SPC for Excel 2003) package. All statistically significant differences have been reported at the 5% level of significance.

#### **Results**

The results of the analyses to determine whether significant differences existed between pre- and post-training assessment measurements for the cricket players are presented in Figures 1 to 3. There was a statistically significant difference between flexibility pre and post-training measurements. In nine of the 13 cases the post-training measurement was significantly higher than the pre-training measurement. This difference was significant at the 5% level of significance ( $p < 0.05$ ). No statistically significant difference ( $p > 0.05$ ) was found between pre and post-training measurements for Depth Perception. A statistically significant difference ( $p < 0.05$ ) was found between pre and post-training assessment measurements on Co-ordination, where post-training scores were higher than pre-training scores.

Peripheral Awareness also showed significant changes from pre to post-training with post-training scores higher than pre-training scores. There was also a statistically significant difference ( $p < 0.05$ ) in advanced ball skill scores from pre to post-training assessment. In all 13 cases the advanced ball skills scores were higher in the post-training than in the pre-training (Figure 1).

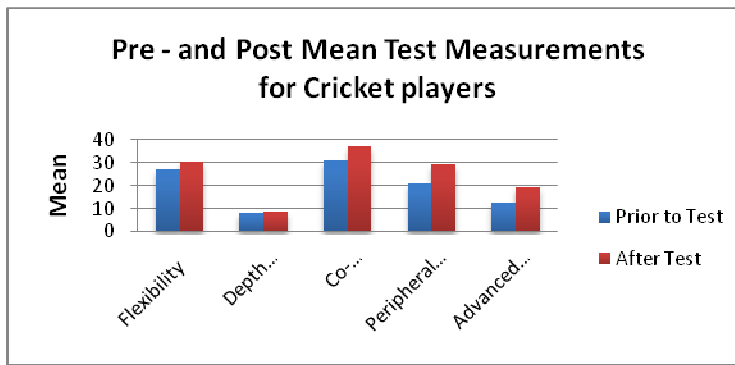


Figure 1: Pre- and post-mean test measurements

Figure 2 indicates that there was a definite improvement in the cricket players' eye movement skills. There was no statistically significant difference ( $p > 0.05$ ) in the cricket players' saccadic eye movements from pre to post-training. After the eight-week visual skills training sessions, the cricket players' pursuit eye movements were also tested and showed a statistically significant difference. The post-training assessment average indicates a statistically significant difference ( $p < 0.05$ ) due to the fact that the players' average for the eye tracking test was 58 seconds. Eye tracking showed a statistically significant difference between pre and post-training measurements with all 13 cases having pre-training scores higher than post-training scores. Saccadic eye movement test (eye jumps test) did not show any statistically significant difference ( $p > 0.05$ ) from pre to post-training assessment measurement. The post-training assessment average did not indicate a statistically significant difference ( $p > 0.05$ ) because the players' average for the eye jump test was 23 seconds.

The results in Figure 3 indicate that visual memory measurements showed no significant change from pre to post-training assessment measurement. Visual Anticipation scores increased significantly during the post-training assessment, with seven of the 13 players having higher post-training assessment scores. This difference was significant at the 5% level of significance ( $p > 0.05$ ). Post-training assessment scores on Accuracy also improved significantly when compared to pre-training assessment scores ( $p < 0.05$ ). Colour vision scores also showed a significant improvement from pre to post-training assessment ( $p < 0.05$ ).

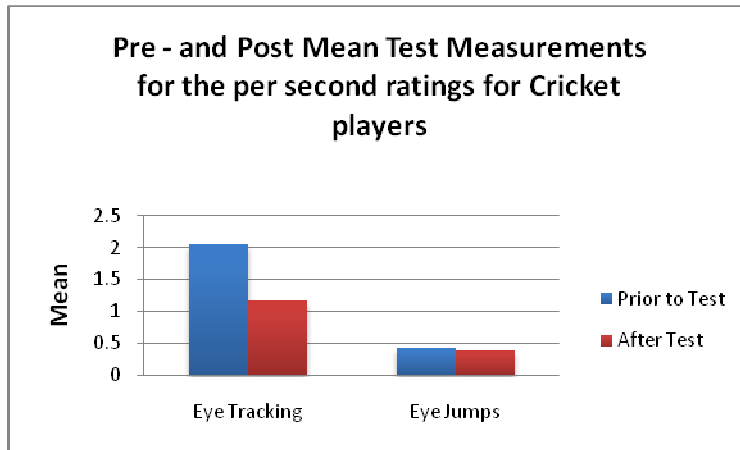


Figure 2: Pre- and post-mean test measurements for per second ratings

**Discussion**

This study investigated whether visual skills training programmes can produce beneficial performance results for cricket players. It also investigated whether visual training programmes are beneficial to competitive sports performance. Abernethy (1996: 90) said that “...visual defects can indeed limit sports performance, and performance can be enhanced if such defects are corrected”.

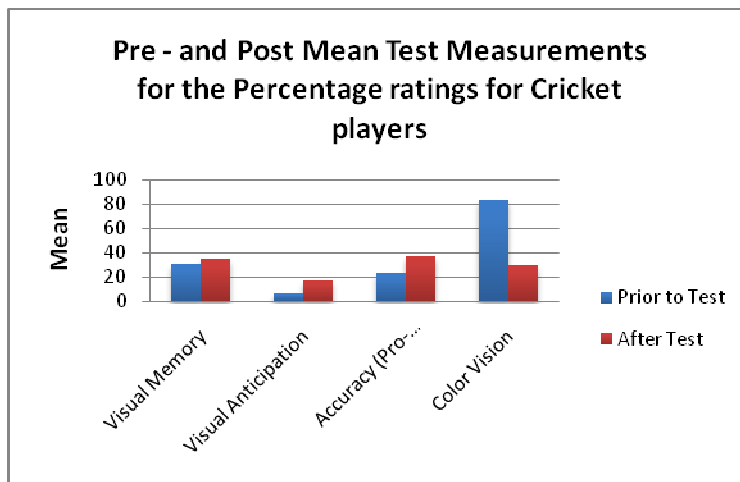


Figure 3: Pre- and post-mean test measurements for the percentage ratings

The post-training tests indicated that the visual skills training sessions did have an effect on the players’ visual skills. The reason why cricket players performed

better during the post-training assessments could be due to the fact that they were subjected to training of general and specific skills for a time period. The present study revealed that the visual skills programme had a significant influence on most of the tested variables (visual skills). For some variables in the experimental group, improvements were found, thus indicating that improvements can be ascribed to the visual skills programme. Coffey and Reichow (1995) explained that “...a visual skills programme is designed to enable players to perform and achieve their maximum potential on the field”. Just as practice and physical exercise increase players’ strength and speed, can players’ visual performance also be improved to achieve maximum results? The issue surrounding the extent to which visual performance of various kinds can be modified by experience and/or specific visual enhancement training has attracted significant interest from all sports vision specialists. Similar results were found by Kluka (1991), Kluka, Love, Kuhlman, Hammach and Wesson (1996) and Wood and Abernethy (1997). Paas and Adam (1991) explain that while it is difficult to improve eye muscle strength, exercise can improve agility and flexibility. The eyes feed information to the brain; if the information is inaccurate, performance may suffer and factors e.g. the eyes’ ability to focus clearly; the eyes’ ability to quickly and accurately change focus; the eyes’ ability to rapidly process visual information and thereby improving reaction time and general eye health, may be affected., The results of the analyses between pre and post-training assessment scores of the cricket players can be summarised as follows:

**Focus flexibility and Depth perception (Stereopsis) skills:** Table 1 indicates that there was a statistically significant difference between focus flexibility pre and post-training measurements of the cricket players, where the cricket players’ ability to maintain steady focus, whilst quickly changing focus between objects at various distances improved. In nine of the 13 cases the post-training measurement was significantly higher than the pre-training measurement. This difference was significant at the 5% level of significance. No statistically significant difference was found between pre and post-training assessment measurements for depth perception.

**Co-ordination skills:** The cricket players’ co-ordination skills seem to have improved with higher scores at the post-training assessments (Table 1), thus indicating that a statistically significant difference exists between pre and post-training assessment measurements, where post-training scores were higher than pre-training scores. The cricket players’ combination of agility, flexibility and balance thus seem to have improved.

Table 1: Descriptive statistics for Cricket players (sample size of 13)

Test Description	Prior to Training				After Training			
	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation
<b>Flexibility</b>	12	38	27.23	7.650	20	42	30.23	7.350
<b>Depth Perception</b>	3	9	8.15	1.908	5	9	8.54	1.127
<b>Co-ordination</b>	27	35	31.15	2.512	32	44	37.23	3.745
<b>Peripheral Awareness</b>	9	30	20.92	4.890	23	35	29.54	4.294
<b>Advanced Ball Skills</b>	8	16	12.69	2.869	17	20	19.08	.954

**Peripheral awareness skills:** The results from Table 1 regarding the peripheral awareness tests shows significant changes from pre to post-training with post-training scores being higher than the pre-training scores. The cricket players’ ability to be able to keep focused while being aware of essential information around them seemed to have improved.

**Advanced ball skills:** Table 1 which indicates the pre and post-training measurements of the cricket players, shows that there was a statistically significant difference in advanced ball skill scores from pre to post-training. In all the 13 cases, the advanced ball skills scores were higher in the post-training assessment than in the pre-training assessment. Peripheral vision, concentration, ball handling and foot speed thus seemed to have improved.

**Eye tracking (Pursuits) skills:** The player’s eye movement skills are vital to the recognition, analyses, and interpretation of visual information, such as the field placing of the opponents and the potential open area. Eye movement skills are the key to good decision making and anticipation, and are defined as perceptual skills. Table 2 indicates that there was a definite improvement (when comparing the minimum time averages that the players completed the test in) in the cricket players’ eye movement skills when comparing the pre and post-training assessment scores. After the eight week visual skills training session the cricket players’ pursuit eye movement skills were tested and showed a statistically significant difference. Eye tracking scores on pre-tests were quicker in all the 13 cases. The post training assessment average indicates a statistically significant difference due to the fact that the players’ average for the eye tracking test was 58 seconds.

Table 2: Descriptive statistics for Cricket players (sample size of 13)

Test Description	Prior to Training				After Training			
	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation
Eye Tracking	1.29	3.00	2.0462	0.57653	0.58	1.43	1.1669	0.21669
Eye Jumps	0.25	1.07	0.4331	0.21926	0.23	0.50	0.3808	0.08995

**Eye jumps (Saccadic) skills:** Saccadic eye movement test (eye jumps test) did not show any statistically significant difference from pre to post-training assessment measurement (Table 2). With the pre-training assessment the minimum average time for the test was 25 seconds. The expected time that the players should be able to complete the test in is 30 seconds. The post-training assessment average did not indicate any statistically significant difference due to the fact that the players' average for the eye jumps test was 23 seconds. If the players' post-training assessment average was a quicker time, then a statistically significant difference would have been documented. The post-training assessment average time is still an improvement from the pre-training assessment average time, although it was not statistically significant.

**Visual memory skills:** Table 3 shows that the visual memory measurements of the cricket players showed no significant change from pre to post-training assessment measurement. Thus, it can be postulated that the visual memory post-training assessment scores remained stable, which means that the players' ability to take in and process information in a short space of time remained the same.

**Visual anticipation skills:** Referring to Table 3, the cricket players' visual anticipation scores increased significantly during the post-training assessment, with seven of the 13 players having higher post-training assessment scores and the remaining six players' scores remained the same. This suggests that the cricket players' visual anticipation abilities improved.

**Accuracy skills:** The cricket players' accuracy scores improved significantly ( $p < 0.05$ ) from pre to post-training assessment, indicating that players' peripheral awareness, pro-action, reaction and visual concentration improved (Table 3).

Table 3: Descriptive statistics for Cricket players (sample size of 13)

Test Description	Prior to Training				After Training			
	Minimum	Maximum	Mean	Standard Deviation	Minimum	Maximum	Mean	Standard Deviation
Visual Memory	8.00	54.00	30.63	14.761	17.00	48.00	34.78	8.465
Visual Anticipation	0	20.00	6.15	6.176	0	70.00	17.31	21.853
Accuracy (Pro-action/ Reaction)	15.00	32.00	23.00	4.933	20.00	44	37.23	3.745
Colour Vision	0	100.00	83.85	26.683	0	100.00	29.54	4.294

**Colour vision skills:** The Colour Vision Testing made Easy ® booklet was used to test the player's colour vision sensitivity. To draw a conclusion regarding colour vision, Presented in Table 3 are the cricket players' colour vision scores which show a significant increase from pre to post-training, thus indicating an improvement of scores from pre to post-training assessment. Visual performance in sport is an interaction between two visual systems, the hardware and the software visual systems. The *hardware system* (skills) can be seen as the physical differences in the mechanical and the optometric properties of a person's visual system and the *software system* (skills) can be seen as the cognitive differences in the analysis, the selection, coding and general handling of the visual information during training or competition (Abernethy, 1987).

Ferreira (2001) explained that the hardware system consists of six optometric skills, being static and dynamic visual acuity, depth perception, accommodation, fusion, colour vision, and contrast sensitivity. Through training exercises, the player can teach his eyes to focus, locate and centre properly to reduce fatigue (Table 4). The performance of the cricket player is based on the ability of the visual system to respond quickly and effectively to visual cues in many skilled motor performances (www.cricketfitness.com, 2007). The reason for this significant increase in colour vision scores is not clear, but it may be attributed to an increase in the sensitivity of the cone and rod cells that are the photoreceptor cells in the eye (Ferreira, 2001).

The present findings indicated that more than half of the variables tested did improve. It can thus be concluded that the hypothesis that was set for this paper has been proven correct. Statistics indicated that there was an increase in most of the variables tested, which prove then that visual skills training will result in an increase in the players' visual fields resulting in an increase in the visual skills on and off the cricket field. Visual skills training programmes are beneficial to competitive sports performance. The cricket players also performed significantly better on eye movement skills, visual anticipation, accuracy, peripheral awareness, pro-action, reaction and colour vision. The results indicated that more than half of the variables tested did improve. Through training exercises, the player can guide his eyes to focus, locate and centre properly to reduce fatigue. The performance of the cricket and soccer player is based on the ability of the visual system to respond quickly and effectively to visual cues in many skilled motor performances ([www.cricketfitness.com](http://www.cricketfitness.com), 2007).

### **Conclusion**

One of the factors involved in sport performance is based on a player's ability of the visual system to respond quickly and effectively to visual cues in many skilled motor performances.

Cricket has entered a modern and scientific era where visual performance plays an important role in training programmes. Given the physical demands in cricket, it would seem reasonable to assume that with the onset of physiological fatigue, deterioration in response time to visual cues will occur. Although physiological fatigue was not measured, a training programme of high intensity and duration (60 minutes) will lead to an increase in heart rate and consequently in physiological fatigue. Thus, nervous aspects like perceptual motor co-ordination, reaction time, anticipation abilities and the reaction time required for cricket should also be measured to get an indication of an individual player's performance ability.

Effectiveness of the player's ability to act quickly and accurately depends upon how efficient the visual system can process the information. Visual information is therefore of critical importance for successfully performing a variety of motor skills that are used in cricket.



Table 4: Four components of visual-physical-fitness training (www.cricketfitness.com)

Component	Explanation
<b>1. High Intensity</b>	<ul style="list-style-type: none"> <li>➤ High intensity is how the players need to carry out the visual-physical-fitness drills</li> <li>➤ Fitness activity must be carried out at high exertion levels</li> <li>➤ This means that the players almost need to be flat out sprinting at the running stations to gain the exertion levels needed</li> </ul>
<b>2. Short Duration</b>	<ul style="list-style-type: none"> <li>➤ If the duration of the repetitions of the exercise is too long then the cricket player's body starts to stress more than normal</li> <li>➤ With short duration, the cricket player will be using his anaerobic fitness energy system</li> </ul>
<b>3. Adequate Recovery</b>	<ul style="list-style-type: none"> <li>➤ The cricket players need enough time to gain their breath and get back to a near fully recovered state</li> <li>➤ If this is not done properly, they will again stress their body and start producing the unwanted muscle wasting stress hormone</li> </ul>
<b>4. Lactic Acid</b>	<ul style="list-style-type: none"> <li>➤ Lactic acid will take care of itself if the player train at high exertion levels</li> <li>➤ If the exertion level isn't high enough then lactic acid will not be produced</li> <li>➤ Lactic acid will produce a burning feeling but it will not harm the player's muscles</li> </ul>

However, the results from this study confirm the possibility that improvements from visual skills training exercises in eye movement skills, focusing skills, peripheral visual awareness, and visual perceptual skills will carry over onto the field of play (Wilson & Falkel, 2004). Visual skills training can result in an increase in the players' visual fields. Visual skills training programmes can be beneficial to competitive sports performance.

Vision and reaction to visual stimuli in sport is important for contributing to performance enhancement. Visual performance is an important factor for excellence in sport. It is possible that the test protocol that was followed in this study may play an important role in influencing the players' concentration levels, performance on and off the fields and motivation. By including the visual skills training programme in each training session (whether training on his own or with the team), the player and the coach will find that the player can perform better because he can "see" what he/she should have "been seeing" all the time. In planning daily training sessions, these visual perceptual skill exercises that were used in this study can easily be incorporated into regular practice activities. It is then concluded that visual abilities can be improved with visual skills training sessions. Accurate decision-making depends on the level of attention, scanning

for opportunities and acting upon them, in a specific situation. The player's eyes give him the information that he needs to perform these actions. This study clearly showed that there are many varied visual skills that play a role in sport. Acute vision plays an important role in all sports, and improving a player's visual skills could very well make all the difference to his enjoyment of the game. From the present findings it can be postulated that the eyes lead the body, and after training the visual system under fatigue and pressure, it is much easier for a player to get "in the zone" because the visual system guides the motor system. Specific visual training programmes can potentially enhance visual and motor skills in sports performance by improving certain visual skills.

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