CHAPTER I

INTRODUCTION

The aim of modern sports training strategy, is to achieve a perfect physical state of athlete in perfect timing, acceptable to competitive seasons in professional sports as long as possible. The ideal of a good and perfect life is to have a sound mind in a sound body. This is recognized by all as the best means of performing our duties. Body and mind should work at their best, and they cannot do so unless both are in good order. The body must be supple, active and obedient to the will. The best way to keep the body fit is to exercise them in sports and games of physical skill and strength. Sports and games have been part of human society for thousands of years. The great virtue of sports teaches everybody to acquire the will to win. The century’s heart beat depends on its speed. By virtue of sports it acquires speediness and potentiality. The importance sports should be realized and it should be introduced in every corner of the country in scientific ways. Life is full of struggle that has been started since the creation of the world. However, a constant and prominent tight must help the tighter to overcome every difficulty against any obstacle. Sports and games have now come to stay in our civilization as an essential feature of human activity, and their object is not merely fun, they also instill the spirit of discipline and team-work. The will power of a sportsman must be increased by winning of game.

A true sportsman remembers that failure is the pillar of success. Great effort with strong determination helps him to won any game. Our young man and woman should take active part in sports and games. It is good that our educational institutions and government encourage sports and games by organizing matches and awarding prizes and trophies. The habit of taking part in games and sports is good in several ways. Apart from making us strong, healthy and fit, it teaches us how to use our energy
in the right way. In today’s sporting world player’s coaches and conditioning trainers place an enormous amount of emphasis on winning. Sportsman and women work to be fitter and mentally stronger than their opponents. Coaches try to develop better game play and training strategies than their opponents. Conditioning trainers try to link results from scientific research to the practical implementation of physical conditioning program. Within these efforts to get one “one step ahead” of their opponents, there has been sustained interest in exploring the role of variables associated with perception, especially vision, as critical performance indicator in a variety of different sports performance context (Wilson & Falkal, 2004).

The central role of visual perception and motor skill performance is well established both in terms of players understanding what is happening in the environment as well as for controlling their execution of motor skills (Magill, 2003). The potential of different kind of visual/ perceptual motor control training programs to improve understanding the environment and sports skill performance has grown as a topic of scientific and applied research (Ferreira, 2003). The reports of the success of these programs has be mixed perhaps as a reflection of the wide variety of different kinds of program, different perceptual motor variables different sports and games and different methods that have been involved.

In recent years, there has been a growing acceptance that perceptual skills precedes and determines skillful actions in sports and other contexts (Harris & Jenkin, 1998, William et al., 1999). The visual system plays crucial role in guiding the players search for essential information underlying skillful behavior. According to Zelinsky et al, (1997) eye movement registration system only provides information about the orientation of the fovea and, consequently, visual fixation may not always be indicative
of information extraction. Many circumstances require the effective integration of information from the fovea, para-fovea and periphery (William & Davids, 1998).

Almost 80% of the information that goes to the central nervous system comes from the eyes. So vision is one of the most important factors playing a major role in sport (Hodge et al., 1999). A sportsmen or women outstanding performance depends on successfully using of variable visual information. Now a day there has been a growing acceptance that perceptual skill precedes and determined skillful actions in sports (Harris & Jenkin 1998, Williams et al., 1999). The visual system plays a crucial role in guiding the players search for essential information underlying skillful behavior. According to Abernethy (1996) the role of vision can generally be accepted as a critical of information for the planning and the executing of motor skill.

The role of vision affects sports performance has been under the spotlight in the last few decades. The role of vision in motor skill performance crucial for both understanding what is happening in the environment as well as for controlling the performance of motor skills. The study of vision and visual perception deserve special attention when studying the development of excels in sports performance. Sports that take place in a changing environment, particularly team sports, place huge demands on the athletes’ ability to make decisions in complex situations under huge time pressure. Elite athletic performers must therefore have an elite to ability to process visual data quickly and make accurate predictions about what is about to happen.

Visual performance in sports can be seen as an interaction between two visual systems. Abernethy (1996) introduced the visual system as a computer analogy of information gathering and processing by dividing the “analogy” into the two visual systems, mainly the hardware and the software visual systems. The hardware visual
system (skills) can be seen as the physical difference in the mechanical and the optometric properties of a person’s visual system and the software system (skills) can be seen as the cognitive difference in the analysis, selection, coding and general handling of the visual information during training and or competition. The hardware system consists of six optometric skills, being static and dynamic visual acuity, depth perception, accommodation fusion, color vision and contrast sensitivity (Abernethy, 1987).

There are seven optometric skills that form part of the software system, and they are eye-hand co-ordination, eye-body co-ordination, visual adjustability, visual concentration, central-peripheral awareness, visual reaction time, and visualization (Ferreira, 2002). The visual skills necessary to conduct this accurate decision-making are the software skills.

1.1 EYE & VISION

The human eye is a complex structure designed to gather a significant amount of information about the environment around us. Eye is the organ which gives us the sense of sight, allowing us to observe and learn more about the surrounding world than we do with any of the other senses. We use our eyes in almost every activity we perform, whether reading, working, watching television, writing a letter, driving a car and in countless other ways. Most people probably would agree that sight is the sense they value more than all the rest. The eye allows us to see and interpret the shapes, colors, and dimensions of objects in the world by processing the light they reflect or emit. The eye is able to detect bright light or dim light, but it cannot sense an object when light is absent.
Vision is by far the most used of the five senses and one of the primary means that we use to gather information from our surroundings. More than 75% of the information we receive about the world around us consists of visual information. The eye is often compared to a camera. Each gathers light and then transforms that light into a “picture”. Both also have lenses to focus the incoming light. Just as a camera focuses light on to the film to create a picture, the eye focuses light on to a specialized layer of cells, called the retina, to produce an image.

1.2 ANATOMY OF EYE

The human eye is the organ which gives us the sense of sight, allowing us to observe and learn more about the surrounding world than we do with any of the other four senses. We use our eye in almost every activity we perform. The eye has a number of components. The eye is not shaped like a perfect sphere; rather it is a fused two-piece unit. The smaller frontal unit, more curved, called the cornea is linked to the larger unit called the sclara. The corneal segment is typically about 8 mm in radius. The sclerotic chamber constitutes the remaining five-sixths; its radius is typically about 12mm. the cornea and sclara are connected by a ring called the limbus. The iris the color of the eye- and its black center, the pupil, are seen instead of the cornea due to the cornea’s transparency. To see inside the eye, an ophthalmoscope is needed, since light is not reflected out. The funds shows the characteristics pale optic disk (papilla), where vessels entering the eye pass across and optic nerve fibers depart the globe.
1.2.1 Conjunctiva:

The conjunctiva is a transparent mucous membrane that covers the inner surface of the eyelids and the surface of the eye.

1.2.2 Lacrimal Gland:

The lacrimal gland produces tears that lubricate the eye. It is located under the temporal edge of the eyebrow in the orbit.

1.2.3 Tenon’s Capsule:

Tenon’s capsule is a layer of tissue that lies between the surface of the eye and the conjunctiva.
1.2.4 Sclera:

The sclera is the white outer wall of the eye. It covers nearly the entire surface of the eyeball. It is a strong layer made of collagen fibres. The tendons of the six extraocular muscles attach to the sclera.

1.2.5 Cornea:

The cornea occupies the front centre part of the outer wall of the eye. It is made of collagen fibres in a very special arrangement so that the cornea is clear. One looks through the cornea to see the iris and pupil. The cornea bends light coming into the eye so that it is focused on the retina. The cornea is the part of the eye on which contact lenses are placed.

1.3 INTERNAL (Intraocular) ANATOMY

1.3.1 Anterior chamber:

The anterior chamber is a fluid (aqueous humor) filled space inside the eye. The cornea lies in front of the anterior chamber and the iris and the pupil are behind it.

1.3.2 Iris:

The iris is the coloured part of the eye. It is disc shaped with a hole in the middle (the pupil). Muscles in the iris cause the pupil to constrict in bright light and to dilate in dim light. The change in pupil size regulates the amount of light that reaches the posterior (back) part of the eye.

1.3.3 Lens:

The lens of the eye is located directly behind the pupil. The lens bends light coming into the eye to help focus it on the retina. It changes shape to help the eye focus to see objects clearly at near. The lens is suspended from the wall of the eye by many small fibers (zonules) that attach to its capsule.
1.3.4 Ciliary Body:

The ciliary body is attached to the outer edge of the iris near the wall of the eye. The ciliary body produces the fluid (aqueous humor) that fills the eye and nourishes its structures. It also helps to change the shape of the lens when focusing occurs.

1.3.5 Viteous:

The vitreous cavity lies between the lens and the retina and fills the posterior 4/5 of the space inside the eye. A gelatinous substance known as the vitreous humor fills the cavity. This plays an important role in nourishing the inner structures of the eye. Light comes into the eye through the pupil and passes through the vitreous to be projected on the retina.

1.3.6 Retina:

The retina is a thin, transparent structure that covers the inner wall of the eye. The eye works like a camera and the retina is similar to the film in the camera. It is where images are first projected before they are transmitted through the optic nerve to the brain. It is a very complex structure with 10 layers of specialized cells including the photoreceptor cells (rods and cones).

1.3.7 Photoreceptors:

Photoreceptors are highly specialized cells of the retina that receive light impulses and change them into chemical energy that can be transmitted by nerve cells to the brain. The two types of photoreceptors are rods and cones. Rods perceive black and white and serve night vision primarily. Cones are responsible for color perception and central vision.
1.3.8 Macula:

The macula is a small specialized area of the retina that has very high sensitivity and is responsible for central vision.

1.3.9 Retinal Pigment Epithelium (RPE):

The retinal pigment epithelium is a layer of cells deep in the retina. This single layer of cells helps maintain the function of the photoreceptor cells in the retina by processing vitamin A products, turning over used photoreceptor segments, absorbing light, and transporting nutrients in and out of the photoreceptor cells.

1.3.10 Choroid:

The choroid is a tissue layer that lies between the retina and the sclera. The choroid has a rich supply of blood vessels that nourish the retina.

1.3.11 Uveal Tract:

The uveal tract is a pigmented component of the eye that is comprised of 1) the iris, 2) the ciliary body, and 3) the choroid.

1.3.12 Optic Nerve:

The optic nerve connects each eye to the brain. It is a structure that sends the picture seen by the eye to the brain so that it can be processed. The optic nerves end in a structure called the optic chiasm. In an adult, the optic nerve is about the diameter of a pencil. There are over 1 million individual nerve cells in the optic nerve.

1.3.13 Optic Chiasm:

The optic chiasm is the place in the brain where the two optic nerves meet. The individual nerve fibers from each nerve are sorted in the chiasm. The sorting occurs in such a way that the right side of the brain controls the view of objects in left visual space and the left side of the brain controls the view of objects in right visual space.
1.3.14 Visual Cortex:

This is an area of the brain in the posterior occipital lobe to which the neurons in the retina ultimately give visual information. The visual cortex helps to process information regarding the image such as its colour, composition, and relation in space to other objects. This information is then sent to other parts of the brain that serve higher visual functions.

1.4 EXTRAOCULAR MUSCLES

Six extraocular muscles are attached to each eye to move the eye left and right, up and down, and diagonally, or even around in circles when one wishes. Each eye has six muscles that control its movements: the lateral rectus, the medial rectus, the inferior rectus, the superior rectus, the inferior oblique, and the superior oblique. When the muscles exert different tensions, a torque is exerted on the globe that causes it to turn, in almost pure rotation, with only about one millimeter of translation. Thus, the eye can be considered as undergoing rotations about a single point in the center of the eye. The extra ocular muscles are the six muscles that control movement of the eye (there are four in and one muscle that controls eyelid elevation (levatorpalpebrae). The actions of the six muscles responsible for eye movement depend on the position of the eye at the time of muscle contraction.

Four of the extraocular muscles control the movement of the eye in the four cardinals: up, down, left and right. The remaining two muscles control the adjustments involved in counteracting head movement; for instance this can be observed by looking into one's own eyes in a mirror while moving one's head.
Vision, just like speed and strength, is an important component in how well you play your sport. It is one of the most important special senses and is the primary source of external information. Visual system is an important, special and dynamic sense and is widely involved in the processing of external information from our environment. Vision is in fact the dominant sense that is critical to the planning and execution of response to certain stimuli (The role of vision in our everyday lifestyle is immense and adequate visual skills are needed for simple tasks. Vision does not only entail the ability to see clearly but also the ability of the central nervous system to integrate and plan as well as execute an appropriate motor response.

Vision has been found to be the most complex and the dominant sensory system used to provide feedback (Atkins, 1998). According to Atkins (1998) the vision “must handle such demands as transduction of light into coherent and synchronous neural impulses, binocular and more distant depth perception and motion in the visual field or of the opponent or both in and as near to real time as possible. All of this happens in a wide range of focal lengths and light levels. Motion should not only be perceived but
also tracked by co-ordinate eye, head and body movements as well as lenses – iris accommodation. These pathways will ultimately lead into the realms of memory. This is where the players recognize and understand what is being seen” (Atkins, 1998). The players to perform a skilled motor movement they needs to select the appropriate response from the visual memory.

The term “sight” emphasizes the clarity meaning from what is seen and is the output of visual information processing. The sight plays an important role in image formation in the retina of the two eyes, the complex process comprising of the really of the information as well as its processing by the visual and visual association areas of the brain enables one to achieve better vision. The brain is dedicated more to vision than all the other senses. Improper use of the visual process can affect an individual’s potential.

Vision is the signal that directs the body to respond and provide athletes with the information regarding where and when to perform. If the visual system is not receiving messages accurately or quickly enough, perform may suffer. It is important for visual system to be functioning at advanced levels because athletic performance can be one of the most rigorous activities for the visual system. During an athletic contest visual sensory input may account for up to 85- 90% of the sensory input an athletic is receiving. The eyes can be trained just like other muscle in the body to improve visual skills. Just an exercise and practice increase strength and speed, so can the visual performance are improved to achieve maximum results.

Wilson & 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 reduce to sport specific
performance. Vision is the most important sense in sport to be able to interpret the surroundings and provide feedback over a period of time. According to Rose (1993) “the normal development of the visual system allows all the individual systems to co-ordinate and allows the player to function effectively”.

1.5 PHYSIOLOGY OF VISION

Light waves from an object enter the eye first through the cornea, which is the clear dome at the front of the eye. It is like a window that allows light to enter the eye. The light progresses through the pupil, the circular opening in the center of the colored iris.

Fluctuations in the intensity of incoming light change the size of the eye’s pupil. As the light entering the eye becomes brighter, the pupil will constrict due to the pupillary light response. As the entering light becomes dimmer the pupil will dilate.

Initially, the light waves are bent or converged first by the cornea, and then further by the crystalline lens, located immediately behind the iris and pupil, to a nodal point located immediately behind the back surface of the lens. At that point, the image becomes reversed and inverted.

The light continues through the vitreous humor, the clear gel that makes up about 80% of the eye’s volume, and then, ideally, back to a clear focus on the retina, behind the vitreous. The small central area of the retina is the macula, which provides the best vision of any location in the retina. If the eye is considered to be a type of camera, the retina is equivalent to the film inside of the camera, registering the tiny photons of light interacting with it.
Within the layers of the retina, light impulses are changed into electrical signals. Then they are sent through the optic nerve, along the visual pathway, to the occipital cortex at the posterior of the brain. The electrical signals travel to a part of the brain called the thalamus. The thalamus act as the relay station sending on the information received from the optic nerve to an area of brain visual cortex. The visual cortex is specialized part brain which processes visual information located back of the head; it interprets the electrical signals to get information about the objects color, shape and depth. Other part of the brain put this information together to create the whole picture.

Nerve signals travel from each eye along the corresponding optic nerve and other nerve fibers (called the visual pathway) to the back of the brain, where vision is sensed and interpreted. The two optic nerves meet at the optic chiasm, which is an area behind the eyes immediately in front of the pituitary gland and just below the front portion of the brain (cerebrum). The optic nerve from each eye divides in the optic chiasm. Half of the nerve fibers from each side cross to the other side and continue to the back of the brain. Thus, the right side of the brain receives information through both optic nerves for the left field of vision, and the left side of the brain receives information through both optic nerves for the right field of vision. The middle of these fields of vision overlaps. It is seen by both eyes (called binocular vision).

An object is seen from slightly different angles by each eye, so the information the brain receives from each eye is different, although it overlaps. The brain integrates the information to produce a complete picture. This process is the basis of stereo vision or depth perception.
1.6 SPORTS VISION

In sports, one of the most important keys to performance is the processing of visual information. Porting ability is to a huge extent dependent on quickly and accurately interpreting visual information. Sports vision is not just accurately seeing what is there to be seen, it is using that visual information to make accurate predictions about what will happen in the next few seconds.

Sports vision is an important growing area of optometry that studies the important and repercussion of the visual system during one’s athletic performance. Sports vision is the branch of optometry concerned with vision and perception, evaluating and enhancing visual performance. Like speed strength and endurance vision also important components in sport field. Visual abilities affect sports performance so it can be improved with training. Sports vision is group of techniques directed to preserve and improve the visual function with the goal of increasing the sports performance through a process that involve teaching the visual behavior required
in the practice of different sporting activities. Sports vision s study of visual abilities required on competitive and recreational sports and the development of visual strategies to improve performance, consistency, stamina and accuracy of visual system. The visual skills that are of utmost importance regarding sports vision are: static visual acuity, dynamic visual acuity, eye movement skills, accommodation and vergence, depth perception/ eye teaming, central and peripheral recognition, peripheral vision, eye hand body coordination, visual concentration and visualization.

1.7 BASKETBALL AND VISION

The game basketball was created by Dr. James Naismith in the year 1819 December in Springfield, Massachusetts to condition young athletes during the winter. It consisted of peach baskets and a soccer style ball. He published 13 rules for the new game. He divided his class of 18 into two teams of nine players each and set about to each then the basics of his new game. The first public basketball game was played in Springfield, Massachusetts on March 11, 1892. The game because established quickly, becoming very popular as the 20th century progressed, first in America and then throughout the world.

Basketball (commonly nicknamed "B-ball" or "hoops") is a team sport in which two teams of five players try to score points by throwing or "shooting" a ball through the top of a basketball hoop while following a set of rules. Basketball is one of the world's most popular and widely viewed sports. Basketball is a sport of almost constant motion for both players and the ball. Understanding that the eyes lead the body, a well-developed visual acuity is significant in a player's ability to run, pass, rebound and shoot the ball. Visual training increases the player's ability to react faster, make smarter decisions and enhance overall court vision awareness.
Basketball is a sport that puts many requirement and demands on the athletes that play it. A successful basketball player is one who is fundamentally sound and possesses the ability to dribble, pass, and shoot. These are the three skills that can and should be worked on daily. However, they are not the only parts of the game that equate to success. Successful basketball players are also strong, quick powerful, have good balance, good endurance and have good visual skills. The players spend hours working on their jump shot, set shots, shooting jump after jumps out in the drive away or in a gymnasium.

There is no doubt that basketball is the most complete sports, not only physically but also mentally. So there is no doubt that basketball has the most athletic players in the world. There is no other sport in the world that can match the athletic conditions of basketball players, especially those that play in the NBA.

Visual skills are the key to a basketball player overall performance. When the player trains, he most probably works on his aerobic capacity, endurance, strength, muscle tone and flexibility. The stamina, flexibility and turning of the visual system can sometimes provide the split second timing the player needs to truly excel in his specific sports. Most players train every muscle in the body expert the eye muscle.

Vision is both a learned and a developed skill. All the movement skills required in basketball, vision is the last skill to be fully developed and the first to break down in performance. Successful performance in sports requires skill in perception as well as the efficient and accurate execution of the movement patterns. A player’s ability to use advance postural cues is particularly importance in basketball. Where the speed of play, the drastically changing angle and depth dictate such decisions.
Dr. Howard Baily said “all action or reaction in athletics is a result of a visual cue. How fast and accurately you ‘see’ the situation determines the outcome of the play”. The following is a comprehensive outline of the most important dynamic visual skills for basketball.

- Binocular vision
- Dynamic visual acuity
- Focusing and tracking
- Anticipation timing
- Concentration
- Depth perception
- Eye-hand coordination
- Peripheral vision/awareness
- Visual reaction time
- Color vision

**Typical Symptoms That May Be Related to Poor Dynamic Visual Skills:**

- Difficulty judging the height or the distance of the basket.
- Trouble passing the ball accurately.
- Maintaining an awareness of where you are on the court in relation to teammates and opponents.
- Poor accuracy on free-throws.
- Inconsistent play from game to game, or even shift to shift.
- Trouble judging where the ball is in the air.
- Poor eye-hand coordination.
- Early fatigue is still a problem in spite of increased physical conditioning.
• Slow to react to play development.
• Problems with multi-tasking. Must come to a stop physically in order to process play development and make a reaction decision

1.8 SPORTS VISION TRAINING

Sports Vision (SV) is the branch of optometry concerned with vision and perception, evaluating and enhancing visual performance. Sports vision is one of the strengths of a successful sportsperson that sets him apart from everyone else. "Vision training for sport is the application of specific exercises conducted over a period of time that leads to neural restructuring of cortex and brainstem pathways allowing a person to maximise efficiency while performing visual perceptual tasks leading to enhanced visual motor performance. Vision therapy is not new. Physicians in the mid-1800 originally introduce many of the techniques that are used today. Modern optometric vision therapy was introduced in United States in 1928. Throughout the years, vision therapy has been called various names such as visual training, orthoptics, or eye exercise. The basic premise of sports vision that stressing or loading the visual perceptual, visual motor and visual proprioceptive system during sports-specific training can better prepare the athlete for competition. Sports vision is an area of study that combines vision science, motor learning, biomechanics, sport psychology, and neuro anatomical as they relate to visual/perceptual motor performance.

Sports vision training also known as vision therapy, visual training, behavioral optometry, developmental optometry. It is a kind of physical therapy, or rehabilitative therapy for the brain and eye. It is a progressive program, meaning that the beginning exercise are the easiest, gradually becoming more difficult, so that the flexibility and co-ordination of the eye muscle is improved. Vision training helps to control eye
muscles and able to overcome many kinds of vision impairment which involve the muscle of the eyes. It involves improving visual skills such as eye teaming, depth perception, tracking and eye-hand co-ordination.

Sports Vision Training is about learning how to use your visual system to greater advantage during activities where the vision guides body movement through space and with respect to other stationary and moving objects. It is about learning to absorb and process more information faster, and about anticipating and responding to change at speed in order to move faster and more efficiently through space and arrive at the most appropriate place ahead of time and also it helps to understanding how posture and stability impact upon the ability to use vision effectively and about working visual and body postural feedback mechanisms, both in harmony and in conflict, in order to build in the flexibility to cope with stress and fatigue during play and develop and sustain optimum visual function under fast moving dynamic conditions and extreme postures specific to a particular sport.

A sportsperson trained in sports vision can see the field, team mates, opposition players and the in-field activity better and thus focus better. Sports vision training consists of the learning and training of dynamic visual skills. Cognitive processing and focus are key components of the reactive results that are needed by top athletes to be successful. Sports Vision training concentrates on using tools to train both reactive and cognitive aspects of the athlete to improve cognitive processing, focus, and sensory motor integration. Athletes are always looking for an extra edge to help them perform better at their sport. You’ve probably thought about aerobic capacity, endurance, strength, muscle tone and flexibility. But in a sport where split-second timing can make all the difference, exceptional visual skills are a must. Many studies show that
professional athletes have much better depth perception, hand-eye coordination and other visual skills than non-athletes. Sports vision training can take you from good to exceptional, with a program that actually trains your vision to a point where you can truly excel in your sport. Talent, training and commitment get you far. Sports vision training can get you to the top. Sports vision training helps to improve speed and accuracy of eye movements, dynamic visual acuity, hand-eye coordination, eye tracking and focusing, peripheral vision, fusion flexibility and stamina [the ability to keep both eyes working together under high speed or physically stressful situations], depth perception, reaction time and visualization. These results in a finely-tuned visual system, which helps you, learn to anticipate and respond more quickly to complex situations. Superior visual skills can propel a good athlete to higher levels of performance.

Sports Vision as such includes specific visual determinants which precisely coordinates 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 (Loran & Griffiths, 2001).

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 (Shim et al., 2006).
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. *Reiven & Gabor (1981)* 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. *West & Bresson (1996)* indeed indicated a positive effect on the performance of cricketers to judge the length of ball after specific visual training program. *Salmela & Fiorito (1980)* showed improved performance in hockey players, when accurate pre shot visual clues were obtained. The results of several other studies also assert the claim that visual skills training can improve sports performance (*Kluka et al., 1996*, *Worrell, 1996*) Therefore it should hold true that if a subject’s visual system is at higher level, then the overall performance will be at higher level as well (*Griffiths, 2002*). Vision and reaction to visual stimuli in sport is therefore important in contributing to performance enhancement and can be seen as a limiting factor in the differentiation between elite and recreational sports participation (*Bahill & La Ritz, 1984*) In spite 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 multidisciplinary approach” came into picture (*Jafarzadehpur & Yarigholi, 2004*).
Vision training usually involved with one or more of the following professional activities:

- Prevention and management of sports-related eye injuries.
- Assessment and remediation of functional vision deficiencies that may negatively impact competitive consistency.
- Specialized contact lens services with emphasis on environmental factors in sports, position of gaze factors, emergency care and attainment of maximum visual acuity.
- Performance-based ophthalmic eyewear services that address visual and environmental demands.
- Assessment of specific sports-related visual abilities.
- Enhancement training of specific visual abilities that are considered to be essential for competitive consistency in a specific sport activity.
- Consultation with athletes, coaches, trainers and teams regarding visual factors and strategies related to consistent peak athletic performance.

1.9 OBJECTIVES OF THE STUDY

1. To test the effect of sports vision training on selected visual skills and performance factors of inter-collegiate level basketball players.

2. To determine if visual skills training programmes can beneficial performance result for basketball players.

3. To explore the role and the impact that visual skills have on the skills performance of basketball players.

4. To design the sports vision training exercise and implementing the training for twelve weeks.
1.10 STATEMENT OF THE PROBLEM

The purpose of the study was to determine the effect of sports vision training programme on selected visual skills and performance factors of basketball players.

1.11 HYPOTHESES

1. There would be significant improvement of twelve week period of sports vision training on the selected visual skill of inter-collegiate men basketball players.

2. There would be significant differences of twelve week period of sports vision training on the selected visual skill of inter-collegiate men basketball players.

3. There would be significant improvement of twelve week period of sports vision training on the selected performance factors of inter-collegiate men basketball players.

4. There would be significant differences of twelve week period of sports vision training on the selected performance factors of inter-collegiate men basketball players.

1.12 DELIMITATIONS

- This study is delimited to the inter-collegiate level basketball players.

- The study was delimited to male subjects select are in the age group of 17 to 22 years.

- The study was also delimited to 40 subjects only.

- The selected subjects were divided into two groups namely, sports vision training group and control group. Each group consisted of 20 subjects.

- The visual skills and basketball performance variables such as dynamic visual acuity, depth perception, Arm eye co-ordination, peripheral vision,
Speed Dribble, Dribble and shoot and Passing were selected as dependent variables.

- The duration of the training period was 12 weeks.
- All the selected variables were measured by standardized test.
- The study was conducted in basketball players from St. Berchamans College, Changanassery and sports coaching canter, Thiruvalla, Kerala, India.

1.13 LIMITATIONS

- The study of response given by the subjects is considered as a limitation of the study
- Only male subjects will be taken for the study
- Subjects perception towards own behaviour may be different. It is also considered as another limitation
- Heredity and environment factors which may have influenced the result of this study cannot be controlled
- Subjects included in the study could not be controlled with regard to their life style, diet and habits that might have influenced their performance.
- Subject’s body type and the socio economic status were not considered.
- The previous fitness experiences of the subjects were not considered in this study.
- The other extraneous factors that would have influenced the results of the study were not controlled.
- Motivation and emotional level of the subjects at the time of testing is not controlled.
- Changes due to climatically conditions during the training period are not controlled.
1.14 SIGNIFICANCE OF THE STUDY

The present study would be significant in the following aspects

1. The results of the present study would help the physical education teachers and coaches to understand the concept and importance of sports vision training in improving basketball performance.

2. Having the visual skills a player can easily perceive the things and discern the stimuli during the game situations. By this a player can show their excellence with ample energy and without mental fatigue. Such a valuable effect of sports vision training on visual skills and performance factors of basketball players is the most significant of the present study.

3. The result of the present study helps the player to become a critical thinker and make decision quickly. Also it improves the self-reliance, the speed of play and confidence on the ball. Moreover, the outcome of this, adjacently helping the players in day to day life also.

4. Vision is a psychomotor factor, helps the players to know their progress on performance over a treatment period.

5. The results of the study would help the physical education professionals and coaches in designing the sports vision training programme in basketball players.

6. The results of the study would focus on the sports vision training on improving visual skills and playing ability among basketball players.

7. The result may be used by the coaches and physical education teachers for further development in basketball performance.

8. This study may be useful for physical educationists and coaches to decide the training load during the training period.

9. The study may help the physical educators to conduct further research in this area.
1.15 DEFINITION AND EXPLANATION OF THE TERMINOLOGY

1.15.1 Binocular Vision:

The ability to maintain visual focus on the object with both eyes creating a single visual image.

1.15.2 Visual Acuity:

Visual acuity is acuteness or clearness of vision, which is dependent on the sharpness of the retinal focus within the eye and the sensitivity of the interpretative faculty of the brain. Dynamic visual acuity is the ability of an observer to detect details of an object when either the object and/or the person are moving.

1.15.3 Depth Perception:

Depth perception is the visual ability to perceive the world in three dimensions and distance of an object. It is the ability to move accurately, or to respond consistently, based on the distance of an object in an environment.

1.15.4 Arm Eye Coordination:

Eye-Hand-Body Coordination is how your hands, feet and body and other muscles respond to the information gathered through your eyes. It is an important part of most sports because it affects both timing and body control.

1.15.5 Peripheral Vision:

Peripheral vision is that a part of vision that detects objects outside the direct line of vision. Peripheral vision is being able to look forward and see the sides at the same time.
1.15.6 Eye Tracking

It is following an object with your eyes without much head motion. It is important with any sport that involves a fast-moving ball. Good eye tracking will improve balance and reaction time. You can improve your eye tracking by watching the flight of a ball while keeping a book balanced on your head.

1.15.7 Visual Memory

It is the ability to process and remember a fast moving, complex picture of people and things. It is very important in basketball, hockey, and soccer, where the game quickly moves up the field. Visual memory helps you know where your teammates and opponents are positioned. To improve visual memory, look at a magazine page for a second, and then turn the page. Try to reconstruct the images you just saw. When you've mastered the exercise, allow 5 seconds between seeing the image and reconstructing it.

1.15.8 Visual Reaction Time:

According to *Erickson (2007)* “Visual motor response time refers to the amount of time that elapses between the initiation of a visual stimulus and the completion of motor response to that stimulus”.

1.15.9 Focus Flexibility

It allows a quarterback to quickly focus on his receivers even though they are at varying distances. To improve focus flexibility, post a magazine page on a wall about 15 feet away at eye level in front of you. Hold a similar page in your hand out in front of you, so that it is slightly to one side of your view of the page on the wall. Focus on an object or words on the page on the wall. Then quickly switch focus to the page in your hand.