CHAPTER-I
INTRODUCTION

Today’s world is a world of computers and spaceships. As civilization advances man’s desire to compete with counterpart also increases. He wants to excel in his chosen field. The result of such desire is due to scientific inventions/discoveries and their applications for excellence.

The technical and technological advancements have made man to be more inquisitive than ever before. His endeavor to tap every nook and corner of knowledge to achieve for excellence, knows no bounds. In the course of his run for knowledge he has discovered that man is a bundle of potentials rich and varied.

Technological advancement has lead to more sedentary life style when compared to the past when a fair amount of physical activity was common. Walking and cycling are the past as people travel in cars and buses. Microwave oven and mixers have replaced manual cooking and grinding. People are addicted to the television and Internet rather than socializing. They meet friends, over the telephone or through E-mail. Hence one should make an effort to find ways to move one’s body. Anything that moves ones limb is not only a fitness tool. It is also great stress buster.
The most important thing in life is to keep oneself in shape and fit, to enjoy things in life. Keeping fit means capturing the days of youth and all the fun of those days alive. Man can give up everything for the sake of keeping himself young. In spite of all the kinds of treatments that have been flourishing the market, the people have not been crazy, they still trust the basic natural way of keeping in shape, i.e., by exercising regularly and maintaining a routine working. It is very necessary to go for a complete fitness training, which takes care of all the aspects of making a fit body, beginning to make note about the right kind of diet and right kind of exercise, which suit to the physical conditions of the body.

Clinical and epidemiological studies have demonstrated that the regular exercise help to prevent and control diseases, aids in reducing weight, risk of colon cancers; strengthen bones, muscles and joints; enhance the immune system; increase stamina; lower blood pressure, aid digestion, reduces serum lipid levels; improve blood circulation; provide the skin a healthy glow and may add a few years of life.

There are also psychological benefits and most studies suggest a positive relationship between physical fitness and mental achievement. Exercise reduces stress, the level of anxiety, alleviates depression, enhances quality of sleep and improves a person’s quality of life.
Fitness

Fitness is a broad term denoting dynamic qualities that allow a person to satisfy his or her own needs such as mental emotional stability, social consciousness and adaptability, spiritual and moral figures and organic health consistent with person heredity.

Fitness is a state which often characterizes the degree to which a person is able to function. Ability to function depends upon the physical, mental, emotional, social and spiritual components of fitness, all of which are related to total fitness. While fitness is the maximal, economical and efficient functioning of the body, health is referred to as optimal homeostatic functioning of the body.

Fitness is perhaps one of the most controversial aspects in the field of measurement in physical education. It is most elusive quality and has been frequently defined in rather abstract terms. In the dictionary 'Fitness' is defined as having the necessary qualities or a readiness or preparedness. Fitness is operationalized in present day by Western Societies with a focus on two goals; i.e., performance and health. Performance related fitness refers to those components of fitness that are necessary for optional work to work performance. (Bouchard, 1994).

It is self-evident that the fit citizens are a nation’s best assets and weak ones are its liabilities. It is therefore the responsibility of every country to promote physical fitness of its citizens because physical
fitness is basic requirement for most of the tasks to be undertaken by an individual in his daily life. If a person's body is under developed or grows soft or inactive and if he fails to develop physical prowess, he is undermining his capacity for thought and for work, which are of vital importance to one's own life and society in a welfare state. *(Uppal, 1994).*

**Physical Fitness**

Physical fitness is a term used to the functional capacity of and individual to perform certain kinds of tasks requiring muscular activity. Physical fitness is the ability of the body to adopt and recover from strenuous exercises. It is the relation of one's ability to work and play with vigor and pleasure without under fatigue and with sufficient energy for unforeseen emergencies.

Now a day's people are more aware of physical fitness and the importance of physical education. When a person is fit, the various systems of the body are well conditioned so that each system can play its part towards effective performance. Fitness serves as a general base for excellence in performance, but it does not include all the essentials. An excellent performance in a particular activity must possess in addition to motor fitness, the specific skills that are part of activity *(Bucher and Willest, 1964).*
Conditioning activities are one of the known ways for improving physical fitness. Neiman defines physical fitness as "a dynamic state of energy and vitality that enables one not only to carry out daily tasks, active leisure time pursuits, and to meet unforeseen emergencies without undue fatigue", but also to avoid hypokinetic diseases, while functioning at an optimal level of intellectual capacity and experiencing the joy of life (Camaione, 1993).

**Training**

The word 'Training' has been a part of human language since ancient times. It denotes the process of preparation for some task. This process invariably extends to a number of days and even months and years. The term 'Training' is widely used in sports. There is, however, some disagreement among sports coaches and also among sports scientists regarding the exact meaning of this word. Some experts, especially belonging to sports medicine, understand sports training as basically doing physical exercises.

The term training refers to the acquisition of knowledge, skills, and competencies as a result of the teaching of vocational or practical skills and knowledge that relate to specific useful competencies.

Training induces physiological changes in almost every system of the body, particularly within the skeletal muscles and the cardiorespiratory system. The changes resulting from training are influenced
by the frequency, direction and particularly, by the intensity of the training program, and heredity. The effects of training are specific to the type of exercise performed, the muscles groups involved and to the type of training program used. The specificity of training and exercise has two broad physiological bases – metabolic and neuromuscular. Training effects can be maintained with programs consisting of one or two days of exercise per week. Previous training does not significantly influence the magnitude or rate of gain of training effects induced by subsequent training program.

**Sports Training**

Sports' training is done for improving sports performance. The sports performance, as any other type of human performance, is not the product of any single system or aspect of human personality. On the contrary, it is the product of the total personality of the sports person. The personality of a person has several dimensions e.g., physical, physiological, social and psychic. In order to improve sports performance the social and psychic capacities of the sports person have to be improved in addition to the physical and physiological ones. In other words the total personality of a sportsman has to be improved in order to improve his performance. Sports' training, therefore, directly and indirectly aims at improving the personality of the sportsman. No wonder, therefore, sports training is an educational (i.e., pedagogical) process.
"Sports training is a scientifically based and pedagogically organized process which through planned and systematic, effect on performance ability and performance readiness aims at sports perfection and performance improvement as well as at the contest in sports competition".

"Sports training, based on scientific knowledge, is a pedagogical process of sports perfection which through systematic effect on psycho-physical performance ability and performance readiness aims at leading the sportsman to high and the highest performance. Through active and conscious interaction with the given demands in sports training, the sportsman's personality develops according to the norms and standards of socialist society".

**Circuit Training**

“A method of physical conditioning in which one moves from one exercise to another, usually in a series of different stations or pieces of equipment”.

In circuit Training each of several stations has a designated task. The student moves from station to station, generally in a prescribed order, completing the designated fitness task at each station. Activities should contribute to various components of physical fitness (strength, power, endurance, Agility and flexibility) ([Morgan and Anderson (1953)).
Circuit training is an efficient and challenging form of conditioning. It works well for developing strength, endurance (both aerobic and anaerobic), flexibility and coordination. Its versatility has made it popular with the general public right through to elite athletes. For sports men and women, it can be used during the closed season and early pre-season to help develop a solid base of fitness and prepare the body for more stressful subsequent training.

A well–designed circuit can help to correct the imbalances that occur in any sports player to a high level. It can also be one of the best types of training for improving strength endurance be it for a sport such as field hockey, soccer or a classic endurance event like the triathlon.

Circuit training is an excellent way to improve mobility, Strength and stamina. The circuit-training format utilizes a group of 6 to 10 Strength exercises that are completed by doing one exercise after another. Each exercise is performed for a specified number of repetitions or for a prescribed time before moving on to the next exercise. The exercises within each circuit are separated by brief, timed rest intervals, and each circuit is separate by a longer rest period. The total number of circuits performed during training session may vary from two to six depending on your training level (beginner, intermediate, or advanced), your period of training (Preparation or competition) and your training objective.
Identify a circuit of 8 exercises so that you work out each body part as follows. Total – body, upper-body, lower, body, Core & Trunk. Complete the circuit training session twice a week with at least 48 hours between each session. If you are carrying out other training on the same day, then the circuit session should follow, with a suitable recovery period, the other session.

**History and Fundamentals of Circuit Training**

Circuit training is an enduring and evolving training exercise format that was developed by R.E. Morgan and G.T. Anderson in 1953 at the University of Leeds in England. The term “circuit” refers to a ‘number of carefully selected exercises arranged consecutively’. In the original format, 9–12 stations are comprised in the circuit; this number may vary according to the circuit’s design. Each circuit training participant moves from one station to the next with little (15–30 seconds) or no rest, performing a 15- to 45-second work-out of 8–20 repetitions at each station (using a resistance of about 40%–60% of one-repetition maximum [1RM]). The circuit training workout program may be performed with exercise machines, hand-held weights, elastic resistance, calisthenics or any combination of these.

When a 30-second to 3-minute (or longer) aerobics station is added between stations, creating what’s known as aerobic circuit training, the method attempts to improve cardio respiratory endurance
as well (although this has not been conclusively supported in experimental research) \textit{(Gotshalk et al, 2004)}.

**Circuit Training Concepts**

Circuit training is a continuous series of exercises attempting to improve as many components of physical fitness as possible especially endurance. Generally, six to twelve stations are up. Selection and sequence of the activities within a lap of circuit is made with consideration given to the continuous nature of the performance. A group of individuals spends two minutes at each station \textit{(Mathews, 1971)}.

According to \textit{Singh (1984)} circuit training, usually consists of 5 to 15 exercises, which are carefully selected according to their effect on the performance capacity. Normally, the sequence of exercise is such that different muscle groups are exercised in rotation, the stations, at which exercise are done are arranged in circle. The person does one set of each exercise for a definite time period or defined number of repetitions and then moves to the next station for doing the next exercise. In this manner, he does a set of each exercise till the circuit is over. This is called one round. In a circuit training session, normally three or more rounds of the circuit have to be done.

**Circuit Training Basics**

Circuit training is a series of multiple exercises on multiple body parts in a row with little rest in between exertions. The two most basic types of circuit training are horizontal training and vertical training. In horizontal training, all sets of one exercise are performed before a
person moves on to the next exercise. In vertical training, one set of every different type of exercise is performed before returning to an exercise for the second time.

The amount of weight that a person lifts during a circuit training session can vary between sets. A person can start with light weights and work up to heavier weights (increasing pyramid) or can start with heavy weights and regress to lighter weights (decreasing pyramid). The most important component of circuit training is to take little rest in between sets, whether of the same or different exercises.

**Benefits of Circuit Training**

The combination of weight training and increased cardiovascular effort makes circuit training a beneficial type of cross training. The exerciser gains muscle through the resistance training and increases his/her cardiovascular endurance during the slightly elevated heart rate that is maintained in between sets and throughout the overall program. The exerciser also burns high amounts of calories during the high exertion periods of his/her sets.

Circuit training is also a convenient way to exercise. It maximizes the total exercise volume (number of sets, repetitions, and amount of weight) completed in a period of time. Exercises are completed in a row, and therefore, the time spent exercising is condensed. Separate cardiovascular training is not necessary. All body parts are trained in one session, and therefore, exercisers do not need to work out every day.
Circuit training is a type of exercise program where one does a series of timed exercises at a fairly rapid pace, with a brief period of rest in between each exercise. Circuit training workouts may target the entire body or just one specific area, such as the arms, legs, or chest. In addition, circuit training workouts may focus on strength training, aerobics, or a combination of the two; the possibilities are virtually limitless. In general, there are four types of circuit training workouts, and these include a timed circuit, a competition circuit, a repetition circuit, and a sport specific/running circuit.

**Skill**

A Skill is the learnt capacity or talent to carry out pre-determined results often with the minimum outplay of time energy or both.

Exploring one’s own capabilities games encourage the player to look at, understand, and experience things.

A movement depends upon practice and experience for its execution, as opposed to being genetically defined. It is a learned movement and is an essential component of sport. Skill enables athletes to produce predetermined results with maximum certainty, often with the minimum expenditure of energy. Three important components of skill are effectiveness, consistency (the ability to reproduce the skill), and efficiency.

**Fundamental Skills and Importance in General**

Fundamental skills are the key to success. It is the elegance and beauty of the skill that is the center point in the pursuit of sport. In any sports discipline the mastery over the fundamental skill is essential to
the eventual success. This means the correct technique for each stroke, grip, body position and basic movement and patterns should be learnt practiced and mastered which ultimately enable one to achieve success. The mastery of skills is not only the consolidation of the essential techniques but also the ability to improvise so as to be flexible to meet the demands of the occasion. The highly skilled persons in any sports discipline are noted for their consistency and stability in the execution of the skills. The individual style of execution arises from the manner in which the task is executed in a unique way. A player will have a feeling of confidence when he masters over the skill.

There are number of fundamental skills in the game of hockey such as, Dribbling, Hitting, pushing, trapping, scooping, flicking, tackling and dodging. Skill of the game plays a very vital role in the success of modern hockey. Each skill is having its own Importance and application to different situations. A hockey player must masterise over skills to prove his proficiency. The perfection of these skills has a direct impact on the total performance of the game.

**Introduction of Hockey**

The typical field Hockey player must train for many years to refine technique and to develop the physical fitness factors especially strength, Endurance and speed to reach his individual potential. There are many types of training by which an athlete can improve the above said bio-motor qualities.

Field Hockey is considered to be an endurance event. Various skill in Field Hockey demands display of specific strength and
endurance. A definite degree of strength of arm muscle is required to do the basic skills like hitting, pushing, and scooping. Hockey requires a higher degree of running ability. Since the extension of the Hockey field is so large, the players should be able to run on the whole field without fatigue and compete with their opponents and hence the quality of muscular endurance and cardio respiratory endurance is highly required for a Hockey player to improve his performance. There are trainings like circuit and weight training to develop and improve strength and interval and resistance training to improve the speed. Circuit training had been proved to be a very effective method for improving strength endurance (Seaton et al, 1983).

Origin of Hockey

The game of Hockey has been around from the time of early civilization. Some of the reports find the earliest origin of the game 4000 years back. Field hockey was reportedly played even before the birth of Christ. Basically known as the “ball and stick” game, it was played since ancient times in places diverse as Rome, Scotland, Egypt and South America. The game was referred to in different names but the basic idea of playing the game was the same. The most apt term used was “Hockie” by the Irish. Though the term was coined centuries ago, the word found its way through to the present generation.

The roots of hockey are buried deep in antiquity. Historical records show that a crude form of hockey was played in Egypt 4,000
years ago, and in Ethiopia around 1,000 BC. Various museums offer evidence that a form of the game was played by Romans and Greeks, and by the Aztec Indians in South America several centuries before Columbus landed in the New World.

In the 17th and the early 18th century in England, the game acquired a fiercely competitive and chaotic form. Villages would compete against their neighboring hamlets and there were nearly 100 players in one team. The game was a matter of pride and manhood; so the game acquired a dangerous form. The game would last for half a month and many players would have got injured and grievously hurt. The umpires were there but they were more of mute spectators, who would make a call only if a team asked them to.

After some years, common sense and a logical and organized approach to the game came into play with the introduction of revision of rules. The game was limited to 30 players for each team. The Eton College of England drafted some rules to bring sanity to the game. The Hockey Association was formed in the year 1875 and some of the rules chalked out were implemented. The results were quite positive and more rules like giving the umpire enough authority were soon drafted to improve the quality of the game.

The modern game of hockey evolved in England in the mid-18th century, primarily around schools. The first Olympic Hockey Competition for men was held in London in 1908 with England, Ireland
and Scotland competing separately. After having made its first appearance in the 1908 Games, hockey was subsequently dropped from the 1912 Stockholm Games, and reappeared in 1920 in Antwerp before being omitted again in Paris in 1924. The Paris organisers refused to include hockey on the basis that the sport had no International Federation (http://www.fih.ch/en/fih/history).

Hockey had made its first step towards an International Federation when in 1909 the Hockey Association in England and the Belgium Hockey Association agreed to mutually recognize each other to regulate international hockey regulations. The French Association followed soon after, but this was not considered sufficient.

**Origin and Development of Hockey in World**

Nobody can say with certainty as to when and where this game was played first, about 5000 years ago the Persians are known to have played from the horse backs a game like polo. The young one’s imitated the game with Short sticks and stones or pebbles.

A bas-relief unearthed (514-449BC) shows some Athenians at play, two of who were actually engaged in a Hockey Bully.

There is a theory that the game of Hockey originated in ‘PERSIA’ in500BC. Then it travelled to GREECE’ from where ‘ROMANS’ picked it up. But according to another theory the game of Hockey was played in ‘EGYPT’, It travelled to ‘GREECE’ and then to other European countries.
The oldest English club of Hockey was ‘Black health club, which was started in 1608 in London. This club was in fact a ‘Golf Club’, started in 1608 a new section exclusively for Hockey. The name given to this game at that time was ‘HAWKIC’ or ‘HOCKIE’. Up to that time its rules were not framed. The first association to control and regulate this game in England was formed in 1875. ‘British Hockey Association’ was formed in1988. It framed standard rules for the game of Hockey. The game was standardized by the Wimbledon Hockey club in 1883. The first international match was played in 1895 between England and Ireland.

**Origin and Development of Hockey in India**

Modern Hockey was imported to India by English, the ruler of India. In the early years of the 15th century. The credit of starting Hockey in India first goes to Calcutta (1885). The Bengal Hockey was the first Hockey association in India founded in 1908. The second was formed in 1920, in, Karachi by the name ‘Sind Hockey Association’. With the popularity of the game, Associations were formed in different states like Bombay, Bihar, Orissa, Delhi etc.

The people there played a leading role in popularizing the game in India. In India the game takes the pride at place and it is considered as our national game. It became popular in other countries and its popularity of the world can be judged in terms of Federation International Hockey (FIH) which now comprises of more than 125 National federations as its member.
‘Brighton cup Hockey tournament’ was started in 1895 at Calcutta and ‘Alaskan Hockey tournament’ was started in 1896 at Bombay (Mumbai). Later on, Punjab took up this game in a big way and it was first included in ‘Punjab university sports tournament’ in 1903. The ‘Indian Hockey federation’ (IHF) was formed in 1925. India participated for the first time in Olympic Games in the year 1928 at ‘Amsterdam’ and won the gold medal.

**Birth of Modern Hockey**

A central organization to control the game and to lay down a definite rule was established in Britain on January 18, 1886, which marked the birth of modern Hockey. King ‘Edward’ III (1365) then ‘Prince of Wales’ was elected.

As president of the ‘Britain Hockey Association’ and hundreds of clubs got themselves affiliated to this body. Divisional Association was formed and affiliated. England defeated Ireland in the first international Hockey match by five goals to nil. The ‘Irish Hockey Association’ was formed in 1894, and the ‘Wales Hockey Association’ was formed in 1897.

In 1900 the international Hockey Rule board was formed with two representatives each from Ireland and Wales.

International matches were played between other countries such as Belgium, Denmark, Holland, Spain and Austria. The game then spread to Australia, New Zealand, South Africa, Japan and other parts of the world. But a great future is awaited in India where in the present form it was first played in the game, early goals.
Performance variables chosen for study

Performance outcomes are more likely to be achieved when what is done prior to and during a competition is to be planned; practiced and tuned to be successful. In contests, an athlete should never use new approaches, techniques, or strategies, without being previously tested or refined. An athlete should compete with only what is known or has been practiced.

Sports performance whether achieved in a competition or in training is a valuable indicator of the direction in which the performance capacity is improving.

Performance is the execution of skills. Sports performance is possible only through sports motor actions or movements. The performance of sportsman is significantly influenced by the skill with which he executes these actions or movements. Therefore, for the acquisition of sports technical skill is important. In all sports, one or more skills have to be acquired by doing technical training.

High level of performance of hockey player depends upon fundamental skills. It is recognized that among the fundamentals, ability to dribble the ball, ability to hit, ability to push, ability to scoop, and ability to trap are of the primary importance for high level of performance. Hence, from the fundamental skills, a few selected skills namely; dribbling, hitting and trapping (stopping) were selected for this study.
**Dribbling**

“To proceed forward within time, having full control over the ball and to move according to the aim to be achieved”. Dribbling is a essential factor in man-to-man marking in attack and in defense in hockey. Effective use of dribbling is actually the fine expression of individuality. The significant of dribbling becomes clear when the attacker beats an opponent and takes a shot at goal. Dribbling can be realized positively and is emphasized in the process of technique training as a strongest weapon in the principles of penetration.

Dribbling is one of the most important skills in the game of hockey. It is an art, which will draw the attention of the spectators. During the game, when the defender is in dangerous zone, completely covered by the opponents, the defender has to clear the situation, dribbling is so useful. It helps the forward at the time of scoring when there is no chance to give straight hit and thus dribbling is most useful for the forwards.

**Hitting**

Hitting is the most valuable technical asset of a player. He can make use of hitting in almost every phase of the game. Hitting is the most valuable weapon in defense and in the preparation and execution of attack.

**Mathews (1973)** stated that the importance of hitting is to cover maximum distance so that the ball will reach nearer to the opponent’s goals and also help to score goal.
- Hitting covers the maximum distance in a minimum time.
  To take 16 yards hit and free hit, hit is one of the most important ways to gain an advantage.
- Hit is of great value at the time of taking corners and penalty corners.
- Hit is one of the main sources to adopt technique to long clearances by the defender when the team is hardly pressed.
- For quick change of play from one flank to another, hit is the most appropriate skill to be used.
- The effectiveness of the crosses by the wingers depends upon their ability and quality of hitting.
- For scoring, hit is most useful when the opponent goalkeeper is weak in skills and also when attacking player does not want to give to defenders to cover.
- The goalkeeper applies the hit whenever he wants to make hard clearances.

**Trapping (Stopping)**

Trapping is used to restrict the movement of oncoming ball and bring it complete control in such way that the ball comes to a place from where the next possible pass can be executed without wasting time.
Trapping is one of the most important skills in the game of hockey. Players can make use of this trapping ability in almost every phase of the game. Trapping is the most valuable weapon in defense to avoid more goal scoring and to stop the penetration by the opponents. Because of the above qualities, trapping is called the Mother of Fundamental Skills.

The skill of stopping is most necessary to block or to check the opponents attack and in this case, the defender blocks the opponents attack and also brings the ball under control to rebuild his own attack or to change the opponent’s attack into defense.

Success of each pass or a movement between two or more players depends upon the ability and quality of the stopping skill. This skill has its own importance in taking the corner and penalty corner effectively.

**Physical variables chosen for the study**

High level of performance of hockey player may depend upon the physical ability or motor ability.

The term physical ability is used synonymously with general ability. There are many factors that contribute to successful performance in athletic skill. A totally fit individual must have physical ability also. Physical ability is also one of the important aspects of physical activities. The components of physical ability are Speed, Power, Agility, Endurance, Strength, Flexibility, and Coordination etcetera.
Among the various Physical abilities the investigator selected Speed, Power and Endurance for the investigation.

**Speed and importance of speed in Hockey**

Speed is one of the main requisites, which enables for higher performance in certain motor tasks speed may vary from individual to individuals. Speed is the capacity of an individual to perform successive movements of the same pattern at a faster rate. Speed is one of the most important physical fitness components, which is highly essential for many physical activities. Speed is a valuable factor in the game of hockey. “It is the performance prerequisite to do motor actions under given conditions (movement task, external factors, individual prerequisites) in minimum of time”.

Speed is one of the most important physical qualities required for successful performance in jumps, especially in the horizontal jump and in the pole vault. The amount of speed required is slightly different in the events due to differing emphasis in the take off. It is said that sprinters are born not made but it is certainly true that natural ability always plays a major role in sports events.

Speed plays a significant role in hockey performance. Generally, in team events like hockey, soccer, basketball, the team with higher speed and strength wins because they can creatively influence the progress of the game by being in the better position and he keep up the ball position in favourable conditions.
Hockey is the game, which demands running with and without ball in various directions. A speedy player is always an asset to every team in match winning performance. Speed in hockey refers to often to one’s ability to accelerate over short distance. Penetration into the opponent’s territory can be achieved more easily and an attack can be launched at speed. Players also run faster, to fall back to defend the goal, being scored by the opponent’s.

**Power and importance of power in Hockey**

“Power is the capacity of an individual to bring into play maximum muscle contraction at fastest rate of speed”.

Power is the measure of total amount of work that the muscle performs in unit of times. The power of muscle contraction is different from muscular strength. Power is determined not only by the strength of muscle contraction but also on its distance of contraction and the number of times that it contracts each minute; Muscle power is generally measured in kilogram meters per minute.

Muscular power and muscular strength are two different things. Muscular strength refers to how much force can be applied (The ability to lift a heavier weight as opposed to a lighter one). As per common knowledge, strength alone is not indicative of speed. Although muscle strength is correlated to sprint performance, research has shown that combining both resistance training and plyometric training will have better effects on training. While plyometric’s assists in rapid force
development (power), weight training assists in maximal force output (speed). Power refers to the combined factors of speed and strength (force). Performance in many sports is based on different types of power. In American Football, a lineman and a receiver may have the same power, but they have different limitations in how their power is delivered. The lineman would be speed limited, whereas the receiver would be strength limited.

Power plays a major role in all the competitive sports. In hockey power has been considered as more important variable equally with other physical variables.

During the game, players run fast to receive the ball in the gap and sometimes to create space. To speed up the game players must have good power with speed. Modern hockey requires highly speedy player with sufficient power. To score goal, players must have very good power so the players can play the ball in the goal with more speed. For a long clearance, to take free hit, hit in or 16 yards free hit players should have optimum power to achieve their ultimate aim. In modern hockey the result depends upon the penalty corner conversion. Most of the European countries use to score goal through penalty corner much more easily. European countries use to train specialist to score through penalty corner by executing push scoop technique. European countries hockey players have more power than the Asian countries hockey players. Hence power is playing major role for the hockey players to achieve high level of performance.
Endurance and importance of endurance in Hockey

Endurance is a conditional ability. Energy liberation processes primarily determine it. The ability of the human body to maintain a certain level of energy production forms the physiological basis of endurance. Endurance is directly or indirectly involved in sports.

- It relates to doing work for a long time or period.
- It relates to working under fatigue conditions.
- It involves a large number of muscles.
- It involves working efficiency.

Endurance is a very important ability in sports. It is the product of all psychic and physics organics and systems. No other motor ability depends so much on working capacity of complete of psychophysical apparatus of human as endurance. All other performance factor depends upon one or more parts of this psychophysical apparatus and results are directly or indirectly affected by endurance.

In sports, endurance ensures optimum speed of motor actions. The ability to maintain pace or tempo of exercises or during a competition is impossible without the requisite endurance. Good endurance also ensures high quality skill of movement execution, which finds expression in accuracy, precision, rhythm, and consistency etcetera. Under conditions of fatigue the sportsman tends to lose motor coordination, concentration, mental alertness etcetera. This clearly points out the importance of endurance for tactical efficiency.
Psychological variables chosen for the Study

Sports psychology within a short plan of time is to take giant strides in the field of competitive game like hockey. Training of an athlete is incomplete without psychological training of the player. At present the psychological aspects have been emphasized and become increasingly vital in the study of psychological characteristics that limit the performance of an individual in a game situation at high level of competition. Psychologically stable players will react according to the situation arising during the playing situation as a result of which timely and fruitfully positive results can be expected from the players.

Among the many psychological variables, Anxiety, Aggression and Self-confidence were chosen for the study.

Anxiety

Anxiety is manifested in a variety of ways, sometimes the individual experiences it as merely a sense of harmless dread, without being able to identify why or of what he is fearful. Psychiatrists call this, as “Free Floating Anxiety” to indicate that it is not attached to any specific object. Psychiatrists diagnose this condition as “Anxiety State” (Neil, 1987).

Anxiety is a disorder within the personality, arising when there is clash between incompatible or conflicting tendencies as and when a person is torn out by conformity and rebellion, resolution and temptation or troubled by reminders of gap between what he is and what he pretends to be (Allport, 1961).
Lewellyn and Bluker (1974), States that Anxiety selected for the study is one of the psychological factors. "Nervousness" is often used synonymously with anxiety. "Tension" is another term used to describe the chronic, low level of anxiety. "Fear" is another term used to describe to still higher level of anxiety. "Panic," indicates the most serious level anxiety.

Anxiety refers to diffuse unfocused emotional status in which the person cannot accurately specify the source of the threat he feels. Anxiety is one of the greatest problems of modern trends in scientific knowledge. Cultural conflicts, economics and industrialization add to the problem of man thus increasing the anxiety level. Anxiety refers to that emotional state of mind where a fear of danger or loss or suffering is a prominent future. It generally arises as a result of fear for something unknown which creates tension and disturbance.

Singh (1983) states that, laboratory field and clinical evidence demonstrates that athletic and motor skill performance can suffer if anxiety became too high and many youngsters report that various worries prevent them from playing their best when the competitive anxiety can affect youngster’s health by disturbing normal sleeping and creating gastrointestinal problems. Cognitive approach and environmental approaches are widely used in reducing anxiety.
Aggression

Silva and Weinberg (1984) states that, the word Aggression, which is also a psychological factor comes from the Latin word “aggredi” “add” mean towards and gradior means walk. Literally the word means to walk toward to approach, to “more against” or to move with intent to “Hurt” or Harm. The major problem when studying aggression in sports of any other environment is in finding an acceptable universal definition. Most psychologists describe aggression in terms of behavior.

Aggression, the institution of direct physical contact accompanied by the intent of bodily harm to another, is not confined to the human species. The findings of recent studies have important implications for the study of aggression among younger animals is often of preparation for adult food-gathering rules.

Aggression in sports has been found to be helpful at times if expressed by defensive players whose expression of skill need not be practice. But, excessive aggression, aside from its moral implication may be less than useful when high levels of skills are required. Aggression in sports is molded by the acquisitions of rewards winning and / or money as well as by social norms that condone aggression in various sports and sports situations.

Gill (1986) States that, Aggression behavior is quite in sport. To observe aggressive sport behavior, we could attend a team game and watch players “Fight for the ball”.


**Self-Confidence**

Self-confidence is a quality, which is formed as a result of one’s experience and reaction to the environment. The Hockey and football players with high level of self-confidence will protect themselves in game situations by effectively utilizing the skills acquired at right time for the right purpose.

There has been growing realization of importance of self-confidence in recent years for understanding human behavior, which plays an important role in hockey and football performance. This is a general acceptance that children and adult with poor self-confidence are more anxious, tense and less adjusted than those who have greater level of self-confidence.

**STATEMENT OF THE PROBLEM**

The purpose of the study is intended to find out the effects of circuit training, skill training and the combined effects of circuit training and skill training on performance variables, physical variables and psychological variables.

**HYPOTHESES**

1) There would be significant improvement on selected Hockey performance variables due to the effect of circuit training, skill training and combined circuit and skill training.
2) There would be significant differences on selected Hockey performance variables due to the effect of circuit training, skill training and combined circuit and skill training.

3) There would be significant improvement on selected physical variables due to the effect of circuit training, skill training and combined circuit and skill training.

4) There would be significant differences on selected physical variables due to the effect of circuit training, skill training and combined circuit and skill training.

5) There would be significant improvement on selected psychological variables due to the effect of circuit training, skill training and combined circuit and skill training.

6) There would be significant differences on selected psychological variables due to the effect of circuit training, skill training and combined circuit and skill training.

**DELIMITATIONS**

1) For this study, sixty (N=60) school higher secondary girls hockey players who were studying in various schools in Tamilnadu and who have been participating in inter school hockey tournaments during the year 2011-2012 were randomly selected as subjects.

2) The age of the subjects are ranging from 15 to 18 years.

3) The subjects were divided at random into four groups of fifteen each (n=15). Group I underwent Circuit training,
Group II underwent Skill training, Group III underwent Combined Circuit and skill training and Group IV acted as Control.

4) The duration of the training period was restricted to twelve weeks and the number of sessions per week was confined to three. Combined Circuit and skill training group underwent first six weeks of Circuit training and next six weeks of skill training.

5) The study was delimited to the following dependent variables

**Performance variables**

- Dribbling
- Hitting
- Trapping

**Physical variables**

- Speed
- Power
- Endurance

**Psychological variables**

- Anxiety
- Aggression
- Self confidence
6) The selected criterion variables for the study were assessed by the following standardized test items: Dribbling, Hitting and Trapping were assessed by subjective rating of performance ability, Speed was assessed by 50 meters run test, Power was assessed by Standing Broad Jump, Endurance was assessed by Cooper’s 12 Minutes Run/walk Test, Anxiety was assessed by SCAT Questionnaire, Aggression was assessed by Smith’s Aggressive Questionnaire and Self Confidence was assessed by Agnihotri’s Self Confidence Inventory (ASCI).

7) The data were collected prior to and immediately after the training period of twelve weeks.

LIMITATIONS

1) No attempt is made to relate to the subjects, habits, behaviors and other training in this investigation.

2) The humidity, altitude and such other factors are not taken into consideration.

3) There is no control made on their diet.

4) The subjects responsible to the statements on the questioner may vary depending upon the various factors such as understanding of the statements and sincerity of the subjects. This difference is considered as limitation.
DEFINITION OF THE TERMS

Hockey

Hockey is a field game played by both men and women. Each team consists of eleven players who use curved stick to hit the ball along the ground. The object of the game is to send the ball into the opponent’s goal, and the team to score their greater number of goals (Wein, 1981).

Circuit Training

Circuit training is a type of interval training in which strength exercises are combined with endurance/aerobic exercises, combining the benefits of both a cardiovascular and strength training workout. “Circuit” means a group of activities and refers to a number of selected ‘stations’ positioned around the facility that are to be visited in rapid succession (Len, 1996).

Skill Training

A skill is the learned capacity or talent to carry out the pre-determined results often with the minimum outplay of time energy or both.

Dribbling

Dribbling is to proceed further, having full control over the ball in a required speed towards the desired directions preferably towards the opponent’s goal (Wein, 1981).
**Hitting**

*Wein (1981)* stated that, hitting is to strike the stationary or the moving ball with the flat side of the stick to a determined destination at a certain speed and also abiding by the rules of the game of hockey. i.e., flat side or face of the stick is only used for playing the ball.

**Trapping**

*Bames and Kentwell (1979)* stated that, trapping is a technique used to stop the ball coming from one place by the flat side of the stick or the reverse stick abiding the rules of the game of the hockey.

**Speed**

Speed is the ability of an individual to make successive movement of the same kind in the shortest period of the time *(Singh, 1996).*

**Power**

The ability to exert the maximum muscular contraction instantly in an explosive burst of movements. The two components of power are strength and speed.

**Endurance**

*Pjorsiu (1983)* stated that, endurance is the ability to do sports movements with desired quality and speed under conditions of fatigue.
Anxiety

Competition anxiety is the anxiety generated in a sport competition situation. It is a specific form of anxiety that occurs as a function of the competition situation.

Aggression

Cratty (1989) stated that, aggression is behaviour and actions that usually seek to inflict psychological and or physical harm, either on person or on persons or dear ones.

Self-Confidence

Herre and Lamp (1983) stated that, self-confidence is an accumulation of the athlete’s unique experiences in achieving many different things, which results in the specific expectations he or she is about achieving success in a future activity.

SIGNIFICANCE OF THE STUDY

1. Study may help to explore the levels of speed, power, Endurance, Anxiety, Aggression and Self-confidence among women hockey players.

2. The results may be helpful to compare the Performance, Physical and Psychological variables of Dribbling, Hitting, Trapping, Speed, Power, Endurance, Anxiety, Aggression among women hockey players.

3. The results of study may add to the quantum of knowledge in the area of Hockey.
4. The Study may be helpful to the future research scholars to select new problems relating to this study.

5. The findings of the study may provide useful information and guidelines to Physical education administrators, teachers, coaches and players for better physical and psychological parameters in sports activities and to enhance the total performance.

6. Based on the results of this study, similar training program may be scheduled to develop speed, power, endurance, anxiety, aggression and self-confidence for various team games.

7. Since large number of schools, colleges, clubs are not giving much importance to our national game hockey; this study may create awareness to these people.

8. This study would open a new channel for future studies by combining these activities in various proportions and with some modifications.