1.1 Introduction

As a result of many forms of scientific advancements and their application in the sphere of sports in particular, the world of games and sports has achieved numerous milestones. Athletes are subjected to workouts and training methods that have been helpful for obtaining greater standards in the present scientific era as they are trained using extremely complex ways for better performance in their particular sports.

Every person has the right to the privilege of receiving physical education and participation in sports, both of which are necessary for the entire development of the individual. Both within the academic framework and in other facets of social life, the freedom to develop one's physical, intellectual, and ethical fortitude through physical education and recreation must be guaranteed. Everyone should have the opportunity to succeed in sport at a level that is commensurate with their abilities, regardless of the level of national trust they have in physical education, sport, or both.

Good health is essential for success in school or in life in general, and it cannot be attained in youth if growth and development do not take place in an appropriate manner. Unless the child is able to grow his physical and physical condition to attain the aforementioned goals, a healthy body is required for him to fulfill his full potential.

More than any previous time in human history, sports have become very popular and prominent in the twenty-first century. Finding the right abilities for the right jobs has now become an important necessity.

A sport is an essential component of schooling. According to research, children who participate in regular sports will benefit from improved learning and memory, increased concentration, and improved problem-solving abilities. A healthy learning environment is vital for fostering a positive attitude toward oneself and others, which is fostered through regular physical activity. Students get the ability to incorporate physical activity into their daily lives through physical education when they comprehend how leading an active lifestyle encourages personal development and equips them to take on the problems of society.

In today's society, sport is significant. It is crucial for every person, every organization, every nation, and for the entire globe. Sport is an institutionalized

competitive activity that requires intense physical effort or the application of relatively complex physical skills by participants who are motivated to participate both by the intrinsic rewards of the activity itself and by the external rewards attained through participation. The dedication to achieving a set objective through competition is the fundamental element of sport. Standardized rules and circumstances must apply to this competition **(Howell et al. 1994).**

Sport is a lifestyle choice where the pursuit of improving neuromuscular coordination is performed through a variety of actions. Every single person in the modern day is directly or indirectly involved in sports. Nowadays, physical education is frequently associated with the sports that publicly create the physical, biological, and social sciences as a desire for discipline.

Sport has existed since the beginning of human society and today has a widespread following. It has more appeal than any other type of social interaction right now. It is now an essential component of the learning process. Numerous sporting events are followed by millions of people worldwide with fervor bordering on devotion. Many people play sports for enjoyment or to improve their strength, fitness, and health. For individuals with high skill levels, it is taking the shape of a profession with significant financial rewards associated with widespread popularity **(Remirez, 1976).**

A context for frequent and structured physical activity involvement is provided through physical education. Due to its positive effects on children's health and fitness, physical education is frequently justified as having a place in the school curriculum **(Physical Education Association of the United Kingdom, 2004).**

Physical education is defined as a teaching strategy that makes use of physical activity to help students develop the information, attitudes, and abilities necessary for their most effective physical and mental growth. "The time period training" refers to the constant learning process that occurs throughout our lifetime. Physical education is no longer limited to a specific age range and can take place anywhere in a number of settings. Some of the more prestigious settings for education and physical education programs include homeschooling, distance learning, workplace fitness advertising programs, and preschools.

Physical education is that type of education that starts with physical improvement and progresses to optimal development of the individual, with the ultimate goals of achieving an active and solid physique, mental alertness, achieving sound wellbeing, and maintaining social and emotional balance **(Kales, 1988).**

Gandhi and Tagore both believed that a child's holistic growth must be based on the genuine education that is given to us. The child's overall growth, including their mental, moral, social, and physical health, must come before their education. A person's personality changes as a result of their education. Sports are essential to building a robust and healthy physique that will enable people to withstand all physical, physiological, psychological, and sociological issues. A person's mind is refreshed after playing for a time. The player feels more energised and enthusiastic as a result. In general, education is incomplete without physical activity.

Performances in physical education are fundamental components of lifetime training in the general educational system. As an essential component of education and civilization, physical education and sport should develop each person's ability, willpower, and self-discipline as a fully integrated member of society. Through the ability of a worldwide lifespan and democratized education, the everlasting nature of physical activity and the rise of sports must be ensured over life.

Every person has the right to the privilege of receiving physical education and participation in sports, both of which are necessary for the entire development of the individual. Both within the academic framework and in other facets of social life, the freedom to develop one's physical, intellectual, and ethical fortitude through physical education and recreation must be guaranteed. Everyone should have the opportunity to succeed in sport at a level that is commensurate with their abilities, regardless of the level of national trust they have in physical education, sport, or both. Performances in physical education are fundamental components of lifetime training in the general educational system. As an essential component of education and civilization, physical education and sport should develop each person's ability, willpower, and self-discipline as a fully integrated member of society. Through the ability of a worldwide lifespan and democratized education, the everlasting nature of physical activity and the rise of sports must be ensured over life.

It is well accepted that regular physical activity enables a person to maintain physical fitness and to continue with his daily exercises. In any case, everyone who aspires to be a hero or to reach the highest level in sports or entertainment should go beyond the fundamental requirements of regular exercise. He should engage in extreme physical activity and go through rigging to develop the physical traits that are most important for success, especially in game endeavor.

Everyone agrees that regular exercise keeps one physically fit and helps the ordinary person function normally during the course of a day. The simple guideline of regular exercise, however, is not enough for everyone who wants to compete successfully in games and sports, desires to be a champion, or wants to reach the highest level. He has to put in a lot of effort and practice becoming physically fit, working on the physical attributes that are most important for success in a certain activity **(Ghosh, 1980).**

Throughout the world, nations compete in international sporting events to display their accomplishments. Every nation creates its own unique innovations, methods, and plans for displaying elite performance in order to win and become the sports champion.

Sports and games in the modern era are becoming harder and faster every day. The game is now mesmerized by agility, endurance, enormous strength, flexibility, and action-packed encounters in addition to the complexity of the tools, surroundings, and attire. There is constant incentive to get better through fresh setups and even generally shifting method approaches. Due in great part to a scientific training regimen, the fundamental level of fitness at the international and even the national levels is improving.

Currently, the intricacy of hardware, offices, and fabrics, together with speed, endurance, outstanding quality, suppleness, and control-filled experiences, are what make the game exciting. There is overall comfort in the ability to improve with new setups, despite general changes in styles or systems. Due in large part to a logical preparation strategy, both the fundamental well-being on a global and even a national scale is significantly improving.

The Mahabharata and the Ramayana, two of the world's greatest epics, were written on the Indian subcontinent. The Ramayana serves as the foundation for the idea of Ram Rajya, which is meant to benefit all of humanity. Like many other kinds of international entertainment, popular sports have their roots in India's cultural history. There are numerous games and sports mentioned in the ancient Indian treatises that we have access to. Kho-Kho is essentially a card game from India. Both metropolitan streets and suburban neighborhoods like playing Kho Kho. And it's not just in California; word of this game's success has traveled across the entire nation.

Apart from kabaddi, the most popular game in rural India is Kho-Kho, a simple game with a lengthy history. Currently, it is the most well-liked Indian native team game. Competitions are held at all levels, including national.

Indian Kho-Kho is a sport that is frequently practised in schools and institutions across the nation. Every Indian is aware of the game's long history and the fact that it has been played ever from the beginning of time. Two teams of twelve players each compete on a rectangular court; nine players take the field while the remaining three serve as reserves. Kho-Kho is a fantastic way to gauge a player's stamina, speed, strength, and dodging skills. Although many historians claim that Kho-Kho is essentially a modified version of "Run Chase," no one is certain of the game's origins or when it was originally played.

Although just nine players take the field for a match, each of the competing sides is required to have twelve members by the Kho-Kho game's rules. One team sits in a row in the middle of the court after winning the coin toss, with alternate players facing in different directions. The chasers are them. A member of the opposing team enters the court as a dodger.

There are 2 main types of skills in Kho-Kho they are offensive skills (chase) and Defensive skills (Dodge).

Kho-Kho is a game that is based on the laws of physical development. It is ferocious and cultivates healthy competitiveness in young people. In addition to moving quickly, CHASE is a natural instinct to overtake and follow an opponent in order to get a kill. Speed is the heart, without a doubt, and it takes strength and stamina to maintain a relentless pursuit for several minutes at a time (turn). A young person who

is physically active appreciates it, and those watching enjoy a thrilling sport to their satisfaction. There are two innings in the game. A team has fifteen players. However, only one participant actually enters the game at first out of the 12 individuals who are nominated for the match. In a game that consists of two innings, each team must chase and defend for a minute each twice. A "Turn" of the specific act is when a player pursues or defends once during an inning.

Between two innings, there is a minute of rest, and between two turns, there are five minutes. Controlled sprinting, dodging, and dividing are a few of the abilities displayed throughout the contest, which is won by the team scoring the most points (one point is given for each away defender who is ejected). Any surface that is appropriate for open field sports can be used to play the game. As of right now, it is played on fields made of turf or even dirt. It goes without saying that playing indoors and on artificial turf are unacceptable.

The physical parameters of Kho-Kho are based on nature. It is engaging and cultivates a healthy competitive spirit in children, encouraging not only fast walking but also a natural instinct to overtake, pursue, and score a kill. Speed is without a doubt the focus of this game, and it takes strength and endurance to endure a relentless pursuit for nine minutes at a time. Some of the competencies displayed during the course of the game include controlled sprinting, dogging, and diving. The public enjoyed it and watched exciting sports to their satisfaction, especially the physically fit children **(Sharma 2004).**

The Kho-Kho players should be able to ramp up speed as quickly as possible and execute the action quickly. The necessities of the sport dictate it. Speed, according to **Neilson (1970),** is the quickness with which a person can transfer his bodily structure from one place to another.

Kho-Kho players because the game's nature necessitates rapid running to get away from opponents and change opponents. To shrug off the competition as well as to flee, a change of course is required. A participant in Kho-Kho needs a lot of patience because they must run at different speeds for extended periods of time **(Robert 1973).**

Kho-Kho seeks out physical attributes including quickness, stamina, strength, agility, and coordination. Sports like Kho-Kho adhere to the rules of physical fitness. Kho-

Kho sport encourages young athletes to be healthy and active. Its goal is to develop a skill, not just speed, but also to obey natural rules of overtaking to develop a particular competence. There is no denying that speed is crucial to Kho-Kho and provides us the endurance to chase and catch the opponent during a battle. The amount of stamina required for this process is substantial. Although a physically fit player likes the game, a good and exciting match also appeals to the viewers.

Speed is essential for both the active chaser and the dodger in order to meet the demands of the sporting position. Occasionally, when the runner is in the middle of the field, the active chaser must spin quickly around the summit in order to attack the dodger. It is well known that Kho-Kho is a form of fast recreation. Speed is essential for both the active chaser and the dodger in order to meet the demands of the sporting position. Speed is necessary to club the runner, shock attack to take pole dive, provide judgment kho, etc. The defender must run quickly, play ring to take, provide pulpit, and execute each and every fundamental skill of speed in one way or another in order to escape the speedy energetic pursuer.

A crucial aspect of bio-motor ability is flexibility, which is the capacity of a joint or muscle to move through its full range of motion. It is an essential component of both Kho-Kho and many other sports. The Kho-Kho, pole dive, heel tap, and other crucial skills can be seen. For instance, a chaser must be able to quickly stretch his hand and leg forward to make touch with and offer aid to his team members; this needs a great level of flexibility, which would otherwise hinder him from doing so. Additionally, flexibility reduces the risk of sports-related injuries.

A player who has considerable strength and explosive leg power may not necessarily be an effective Kho-Kho player; instead, he needs to have a reasonable amount of muscular and cardiovascular stamina. Every step, the runner throws his entire body weight into the air, fighting against inertia and perhaps having to sprint in "restricted" fashion, exhausting himself too rapidly. The next requirement for the game is therefore endurance.

All of the skills and characteristics of runners stated above should be had by a chaser. In addition to these, they require unique qualities that enable their squad to score more goals quickly and effectively. To dismiss a runner in the smallest amount of time

possible, all chasers should cooperate with one another. To accomplish this goal, every chaser should contribute to the game's increased speed and refrain from giving a runner a break that can wear him out or put him in an awkward situation.

Kho-Kho needs a high degree of physical fitness since it involves sprinting, twisting, and turning. Playing this sport regularly can assist in enhancing cardiovascular health, agility, and general fitness. It is one of the best benefits of playing the Kho-Kho game.

Physical, physiological and mental fitness are crucial components of a game like Kho-Kho. A player can only play the game effectively if they are both physically and physiologically. Sports training plays an important role in improving both these factors. By performing repetitive exercises, training is a methodical procedure for enhancing your gaming skills. Training is the sum of regular exercise under the supervision of professionals. Players claim that training gives them greater tolerance for similar types of stress. The training program, which aids in the improvement of each player's specific sporting abilities, involves straining the players and teaching them how to respond to stress.

Exercise, healthy eating, and adequate rest are typically required to achieve physical fitness. It is a crucial aspect of existence. Physical fitness is now viewed as a gauge of the body's capacity to do tasks quickly and effectively, to stay healthy, to fend off hypokinetic disorders, and to respond to emergencies. It has only been about 30 years since the science of sports training emerged as a distinct field of sports science. Before this, there were various sports-related ideas and training methods. The primary sources from which the science of sports training evolved as a scientific discipline are physical education and the philosophy and methods of various prominent sports like track and field, soccer, boxing, swimming, etc.

The goal of a training program should be to increase players' athletic ability and stamina in preparation for a certain event. Different things in different professions are meant by training. In general, physical education training entails prescribed physical activity. Training aims to increase one's physical fitness. Different types of games are designed for various forms of exercise. To get the intended outcome in a training regimen, physical activity must be performed under the guidance of a professional. Initially, winning a game depended mostly on one's competence in the game, but

nowadays, both skill and physical fitness are necessary. Players are currently attending training camps to increase their physical fitness.

“Training is a complex process. Through which the player is prepared for high performance."**(Sharma, 2000).**

The ratio of each of these items will change as the construction plan moves forward. Compression conditioning for endurance will gradually change as a training season progresses, shifting from an emphasis on volume to one on power and substituting intensity for volume when calculating the total load **(Singh, 1991).**

Sports training's instructional component is brought into stark relief. When we take into account that practically all sports in performance sports require organized training to begin in childhood. Therefore, it becomes even more crucial to teach children and young people while also enhancing their athletic performance. Periodic evaluations of the athlete's performance are part of training. The difficulty of the task performance during training typically increases gradually. Training implies some kind of sustained, incremental improvement in some of the initial motions' performance output. Any training will inevitably require work. Health should be connected to training. Training is an activity plan created to help athletes develop their abilities and boost their energy levels in preparation for a certain competition **(Edward, 1984).**

Circuit Training

R. E. Morgan and G. T. Anderson created the circuit training exercise program in 1953 at the University of Leeds in England. It has been around ever since. Circuit training was created to enable individuals to exercise with others while simultaneously working out at their own intensity. A circuit would have 9 to 12 stations in the original format. Moving quickly from one station to the next while executing an exercise for a predetermined amount of time or repetitions. All of the energy systems interact during the circuit training session to allow for the performance of activities of varying intensities. As a result, during some exercises, the aerobic energy system will be more prominent, and during other exercises, the anaerobic energy system will be more prominent.

We refer to exercising in a circle as "circuit training." It is a unique form of training in which exercises are performed with or without equipment. The well-organized type of

physical exercise training is called circuit training. The number of repetitions, learner effort, time interval, etc. are all planned in advance. Circuit training's primary goal is to concurrently build muscle strength, tolerance, and proficiency. The necessary exercises are provided in a circle in accordance with the need for thorough preparation. These workouts include sprints, hops, and rolls, carrying loads over hurdles, pulling, pushing, and more. In it, the player must finish this circle in a set amount of time. These circles must be done in a higher number, either by getting more activity or by lengthening their duration.

In order to allow for appropriate recuperation, circuit training stations are typically organized so that they alternate between different muscle groups. Between stations, there should be a 30-90 second rest period, and between circuits, one to three minutes. A typical gym features a variety of workstations and strength training equipment, allowing for the formation of numerous circuits. This advantage of diversity keeps participants engaged from session to session by testing their skills.

For sports that aim to improve as many facets of physical fitness as possible, especially endurance, circuit training is a crucial form of exercise. There are typically six to twelve stations. The circuit's selection and variety of activities take into account the entire operation's continuous character. At each station, the player spends two minutes **(Matthews, 1971).**

Circuit training includes numerous stations. With the time allotted for each station, the player advances from one station to the next, typically in the set order, finishing the fitness objective at each one. Excellent for improving physical fitness (strength, power, endurance, agility, and flexibility) is the training provided by Morgan and Anderson.

In circuit training, various exercises are carried out in succession on various body regions with little break in between. The horizontal and vertical forms of circuit training are the two most fundamental. Prior to performing the subsequent exercise in a horizontal training session, one must complete all sets of the previous exercise. Prior to performing an activity a second time in vertical training, each type of exercise receives one set.

Resistance Circuit Training

The development of strength, self-efficacy, lean body mass, and the potential reduction of coronary artery syndrome risk factors have all been linked to circuit resistance training. For patients with cardio respiratory damage, circuit resistance training appears to provide a large benefit and minimal danger. These exercises may help players carry out daily tasks with stamina, efficiency, and confidence. One can greatly improve fitness level by participating in circuit resistance training activities, which depended on the balance and structure of the session.

With a little creativity, circuit training may be applied in a number of various ways. It is a method of interval training that cuts down on rest periods in between sets and workouts. It may consist solely of weight training or may alternate between short bursts of intense cardio exercise. Each exercise in a circuit-style weight-training program is performed after the other with little to no break in between. An exercise can be performed repeatedly before switching back to the initial exercise to start over, as opposed to resting in between sets. This enables optimizing workout time while decreasing rest time. In an interval circuit, a quick cardio interval is performed following each set of a weight-training activity.

Circuit weight training has been suggested and has been shown to improve strength, lean body mass, self-efficacy, and may decrease risk factors for coronary artery disease, according to **Verill et al. (1992).** By working out in brief spurts of about 60 seconds apiece, one can considerably raise their level of cardiovascular fitness. One will maintain a raised heart rate and achieve the best results if they combine an aerobic work-station with a high repetition and strength station. It saves time and improves physical attributes like strength and endurance by working both the upper and lower bodies. The advantages of circuit training can be summarized up in the phrase "maximum results in the least amount of time"*. It offers exceptional overall fitness, tone, and strength, making it arguably one of the best exercise strategies.

For patients with cardiovascular dysfunction, resistive exercise training appears to have a significant benefit and low risk. Patients may be able to execute daily strengthrelated tasks more effectively, confidently, and safely thanks to this type of training. According to studies, participating in circuit training activities can

significantly increase fitness level, depending on the structure and balance of the session.

A high-attainable result can be obtained by using an aerobic workstation with a strength station, high repetition, and individual motivation. The advantages of taking part in resistance training circuits may be summed up in a few phrases: best outcomes in the shortest amount of time. As a result, one of the best circuit resistance training exercise routines since it offers exceptional all-around strength and **fitness (Verill et al. 1992).**

A variation of the circuit known as a super circuit uses aerobic stations that may include exercises like stationary cycling, jogging in place, rope skipping, stair climbing, bench stepping, and rowing. Circuit resistance training typically consists of several circuits of resistance training with little rest in between the exercise stations.

During a circuit training session, the amount of weight that a person lifts can change between sets. A person can either begin with modest weights or progress to heavier ones (increasing pyramid) or they can begin with big weights and go back to lighter ones (decreasing pyramid). The key to circuit training is to alternate sets of the same or different exercises with short rest periods in between.

Adults can build their muscle mass and reduce their overall body fat by using resistance circuit training. Adults who engage in resistance circuit-based training simultaneously enhance their cardiorespiratory fitness and strength performance. A stronger impact on changes in body composition and strength is feasible if training load is effectively handled.

Resistance circuit training is made to produce strength training's advantages but in a much shorter amount of time. Reduced rest intervals are used in this time-saving technique to boost the metabolic, hormonal, and cardiovascular effects of resistance training. Resistance circuit training involves lifting large weights in a circuit arrangement, as the name would imply. Each session consists of three "mini-circuits" that each target a different body component.

According to a few studies, circuit-based resistance training is effective for increasing the highest levels of oxygen consumption, greatest lung ventilation, functional ability, and strength while also enhancing body composition. Circuit training is a time-

effective training method that can lead to significant improvements in physical and mental well-being. Similar recommendations have been made for high-resistance circuit training to increase strength, muscular mass, and bone mineral density in healthy, more youthful, more established individuals. The purpose of the current study is to determine the impact of circuit-based resistance training on adolescent boys' mental and physical health.

Benefits of Circuit Resistance Training

Circuit training sessions include a ton of benefits, including the ability to design a whole program using only body weight exercises, improving body composition, increasing muscular endurance, and much more. We could go on and on. However, based on our observations, the advantages of a circuit training program are those we've stated below. Resistance exercises that target several different muscle groups are included in circuit training, which also serves to increase overall strength and muscular endurance. Circuit training can assist to test your muscles and encourage growth by requiring you to execute a range of activities with short respite.

Your body continues to burn calories after strength training as it returns to its more rested condition (in terms of energy expended) with both aerobic activity and strength training. The American Council on Exercise (ACE) refers to it as "excess postexercise oxygen consumption." For adding muscle mass, resistance exercise is a fantastic alternative. Studies show that concentrating on mechanical tension and metabolic stress is the greatest method to build muscle. To see results from this kind of training program, persistence is crucial.

Your muscles can stay strong and functional with resistance training. Your muscles can assist you with simple tasks like lifting objects, opening containers, or even staying active for longer periods of time. One study found that your level of resistance training directly correlates with your level of muscle strength and endurance. Increase the amount of resistance training you undertake, either by lengthening the time you spend doing it or by doing it more frequently, if you want to develop your strength or endurance.

Hypertrophy is the term used to describe the growth in muscle size. Transient hypertrophy is the term used to describe the 'pump' one experiences after a single

exercise session. The fluid buildup from blood plasma in the intracellular and interstitial regions of the muscle is responsible for this momentary impact. Chronic hypertrophy, on the other hand, describes the growth in muscle size resulting from continuous resistance training. In the majority of training trials, increases in the cross-sectional area of muscle fibers vary from 20% to 45% **(Staron, et al., 1991).**

According to a 2017 review, performing at least one resistance training session per week, whether alone or as part of a program with a variety of workouts, can increase muscle strength by up to 37 percent, muscle mass by up to 7.5 percent, and functional capacity by up to 58 percent in frail, elderly adults. Functional capacity is linked to fall risk.

Interval Training

Interval training is a very hard form of exercise that is comparable to Sisyphus' incredibly arduous labor. Greek mythology describes Sisyphus as the king of Corinth and a cunning character. When the death god Hades came to collect him, Sisyphus fooled him and bound him. After eventually making his way out, Hades punished Sisyphus for his deception. The punishment was to push a heavy stone up a hill for all of eternity as Sisyphus. The stone would roll back down every time Sisyphus reached the top, making him have to resume his labor all over again. Anyone interested in interval training would do well to keep in mind Sisyphus' labors.

Activities that are more intermittent are a part of interval training. Alternating intervals of rather arduous work and active recovery make up this process. As opposed to working continuously, it enables the completion of more work with a heavy workload over an extended period of time **(Douga, 1987).**

"In interval training, the work should be done with sufficient speed and duration so that heart rate increases to 180 beats per minute," according to **Singh (1991).** After speaking, there should be a recovery interval, and work should resume when the heart rate drops to 120–130 beats per minute."

Exercises in interval training are performed at a high level of intensity with periods of incomplete recovery. Interval training is dependent on a number of principles, including the rate of work, the length of work and recuperation, the number of repetitions, and the type of recovery. Work should be done at a pace and for a length

of time that causes the heart rate to rise to 180 beats per minute. After this, there should be a recovery period, and work should resume when the heart rate drops to 120 beats per minute. The training load in the interval approach can be managed by repeatedly monitoring the heart rate. The key to success in interval training, according to Fox and Mathews, is using the right intensity of exercise, followed by a rest period **(Fox, et. al. 1974).**

The foundation of interval training is the idea that by breaking up intensive effort with rest breaks, more may be accomplished. A prescribed amount of work is done in a predetermined length of time for a predetermined number of repetitions during an interval training program. The athlete gets physiologically stressed and becomes fatigued numerous times during a single training session because the challenging periods of exercise are interspersed with recuperation periods. As a result, by placing an increasing amount of stress on their cardio-respiratory system, exercisers gradually build their endurance **(Novich and Taylor, 1993).**

In the continuous approach, an exercise is performed continuously over an extended period of time. In the continuous running approach, volume is high and intensity is low to medium. **Dick (2006)** states that the "continuous method" refers to a steady speed or intensity with a heart rate between 130 and 160 beats per minute and a running time of more than 30 minutes for young athletes. When using the interval training approach, the work is done comparatively quickly and with intermittent incomplete rest.

Intensive Interval Training

Intensive Interval training is a type of interval training exercise. It consists of a number of rounds that alternate between long stretches of high-intensity exercise to markedly raise heart rate to at least 80% of one's maximal heart rate and short bursts of lower-intensity exercise. Intensity Interval Training (HIIT) is a style of exercise that alternates between short bursts of high and low intensity activity. The physical components can be improved very effectively and efficiently with this kind of training.

Elite athletes have employed high-intensity interval training (HIIT) for decades. Nevertheless, it is still a training approach that has not received much attention.

Training during brief periods of time at an intensity that is close to the maximal or supramaximal is known as high intensity interval training. When an athlete reaches their VO2max, their intensity is measured as a percentage of their maximal speed.

The intensive interval method involves three to six sets of each exercise and somewhat higher resistance (50 to 60 percent) for shorter intervals (on average 30 seconds). The authors don't specify a goal heart rate for this technique but do say that the set performance needs to be explosive for each repetition. With this approach, we put less emphasis on reps and instead use time as a measuring stick **(Hartmann & Tunnemann 1995).**

High-intensity intermittent training is a type of interval training that consists of quick bursts of all-out effort followed by rest intervals that last anywhere from 20 seconds to five minutes. It is a low-volume approach for achieving improvements in aerobic power and endurance that are often linked to longer training sessions. In the lead-up to tournaments, endurance athletes should gradually introduce periods of highintensity intermittent training. Maximum oxygen uptake (Vo2max) of at least 70 ml.kg1.min-1 is a minimum criterion for an athlete to compete successfully in an endurance event **(Hawley et al., 1997).**

A form of cardiac training called high intensity interval training (HIIT) involves alternating short, highly intense intervals with longer, slower intervals to recover. Athletes have employed this kind of training to enhance performance, but research has also shown that it offers advantages for regular exercisers. HIIT training enhances the muscles' capacity to burn fat while also enhancing performance. A normal HIIT workout contains a 2:1 ratio, which means your recovery intervals are twice as long as the work intervals, and lasts 20 to 30 minutes on average. A set of five to ten highintensity sprints lasting 30 to 60 seconds and working at Level 8 to 9 on this scale of perceived exertion might serve as an example **(Waehner, 2010).**

Elite athletes have employed high-intensity interval training (HIIT) for decades. Nevertheless, it is still a training approach that has not received much attention. Training during brief periods of time at an intensity that is close to the maximal or supramaximal is known as high intensity interval training. As a proportion of the

speed at which the athlete reaches maximum aerobic power (vVO2max), intensity is calculated.

When compared to conventional endurance-based training methods, the available evidence demonstrates that HIIT is an effective and time-efficient training paradigm for the development of aerobic power. As a result of the numerous physical, tactical, and technical issues that need to be addressed in a short amount of time during open-loop team sports, training time is frequently constrained. This is especially true in a youth development program where learning and progress for the future are prioritized over a strong focus on results. Any training methodology used at the performance development level must be effective, time-efficient, and have a favorable influence on performance. Elite adult athletes who frequently participate in endurance sports are frequently favored in research in these areas. Therefore, additional research into the application of HIIT training with developing athletes to increase workload and aerobic power in team sports matches is necessary **(Morgan & Williams, 2009).**

Benefits of Intensive Interval Training

Although HIIT can aid in reducing body fat, boosting strength and endurance, and improving health outcomes, it is not always superior to other workout types. Its key value is that it incorporates rest periods and can produce comparable fitness and health benefits in a shorter amount of time.

Neranoch, et al. (2023) draw the conclusion that high-intensity interval training had some favorable effects on cardiopulmonary function and propose using short-term high-intensity interval training to enhance football players' forced vital capacity performance. This discovery can be used in the future to strengthen the respiratory muscles. The High Intensity Interval Training (HIIT) workout developed by **Fajrin et al. (2018)** is meticulously planned and executed. Increased explosive power, speed, and agility as a result of high-intensity interval training (HIIT). **Stankovic and others (2022)** conclusion that the athletes who participate in team sports benefit from HIIT programs, independent of the kind, in terms of VO2max, RSA, change of direction speed, speed, explosive strength of the lower limbs, and body composition. HIIT has benefits in both the preparation period, when physical performance is elevated to a higher level, and in the competing period, where it may be maintained, regardless of

the level of training or competitive experience. Additionally, it is crucial that coaches use HIIT techniques to prepare their teams and modify the type of HIIT performed based on the season. **Ruo-chin Lin (2020),** investigated "the cardio-respiratory fitness and agility in badminton players after two weeks of high-intensity foot work interval training." This study came to the conclusion that a 2-week HFIT program had similar advantages for VO2 Max. Researchers recently conducted the first direct comparison of intervals based on heart rate (HR) versus intervals based on power **(Swart et al., 2009)**. In that study, Swart et al. discovered that both kinds of interval training were effective in raising physiological fitness levels and performance in experienced cyclists. They did not, however, demonstrate the superiority of any approach. The relative efficacy of HR versus power-based interval training in recreational cyclists has not yet been studied.

Need of the Study

All Kho-Kho players today are faced with multiple challenges to develop the necessary speed, stamina and technical skills of the game. Techniques and skills of every player depend entirely on speed, aerobic and anaerobic endurance, abdominal strength and stride length. Although there are a variety of training techniques that might help Kho-Kho players increase their speed and endurance levels.

The skills in the game, such as sitting, chasing, turning, and diving, require more strength, endurance, and speed. Numerous studies' findings indicate that circuit training and interval training significantly enhance Kho-Kho players' physical and physiological characteristics. More studies have been done on Kho-Kho players to determine the effects of interval training, weight training, speed training, and endurance training; however, no studies have been done employing circuit-based resistance training and intense interval training. As a result, the researcher decided to focus on that research.

1.2 Statement of the Problem

The purpose of the study was to find out the effect of resistance circuit training and intensive interval training on selected physical and physiological variables of Veer Narmad South Gujarat University Kho-Kho players.

1.3 Objectives of the proposed study:

Following objective for the proposed study:

1. To assess the level of physical variables (speed, endurance, agility, flexibility and explosive power) and physiological variables (resting pulse rate, vital capacity and blood pressure) in Kho-Kho players.
2. To identify the outcome of resistance circuit training and intensive interval training on selected physical variables of Kho-Kho players.
3. To determine the comparative effect of resistance circuit training and intensive interval training on selected physiological variables of Kho-Kho players.
4. To find out which experimental training were more effective in improving the selected physical and physiological variables of Kho-Kho players.

1.4 Delimitation

1. Ninety (N=90) male Kho-Kho players from different colleges of Veer Narmad South Gujarat University, Surat were selected at random for this study.
2. Subjects were between the ages of 18 and 25 years.
3. The subjects were divided at random into three groups of thearty each (n=30). Group I underwent resistance circuit training, Group II underwent Intensive Interval training and Group III acted as Control.
4. The following dependent variables were delimited in the study.
   - **Physical Variables:**
     - Speed
     - Endurance
     - Agility
     - Flexibility
     - Explosive Power
   - **Physiological Variables:**
     - Resting Pulse Rate
     - Vital Capacity
     - Blood Pressor
5. The training period was delimited to ten weeks.

1.5 Limitation

1. The student had diverse socioeconomic backgrounds, nutrient preferences, behaviors, and disparities in how they interacted with their hearing peers. Which the researcher was unable to control and which might have had an impact on the performance was regarded as one of the limitations.
2. No special motivation technique was used while collection of pre and post test data which might affect the performance of the basketball players is another limitation of this study

1.6 Hypothesis

- There would be significant improvement on selected physical variables due to the effect of resistance circuit training and intensive interval training on KhoKho players.
- There would be significant improvement on selected physiological variables due to the effect of resistance circuit training and intensive interval training on Kho-Kho players.
- There would be significant differences on selected physical and psychological variables due to the effect of resistance circuit training and intensive interval training.

1.7 Definition and Explanation of the Terms Training

Training is a unique method of preparing athletes based on scientific principles with the goal of enhancing and sustaining higher performance capacity in a variety of sports.

Circuit Training

It is a series of exercises that are performed a progressive manner, doing a prescribed allocation of work at each station.

Resistance Circuit Training

It's a combination of six or more exercises performed with short rest periods between them for either a set number of repetitions or a prescribed amount of time with resistance.

Interval Training

A form of exercise known as interval training involves a sequence of high intensity sessions separated by rest or relaxation periods.

Intensity Interval Training

Intensity interval training involves alternating short bursts of intense or explosive anaerobic exercise with quick rest periods until tiredness sets in.

Speed

It is the competence to carry out motor functions under predetermined conditions in the shortest amount of time.

Endurance

Endurance is the capacity to carry out tasks in a sport quickly and satisfactorily under conditions of fatigue.

Agility

The ability to change directions swiftly and successfully while travelling at almost full speed is known as agility.

Flexibility

Flexibility is the capacity to move one's body and its components over a wide range of motion without causing damage to the joints and muscle attachments.

Explosive Power

Explosive Power can be characterized as a person's ability to engage maximum muscle contraction at the swiftest rate of speed.

Resting Pulse Rate

Resting pulse rate is the phrase for the measurement of heart rate when an organism is in complete physical and mental rest.

Vital Capacity

The amount of air expelled from the lungs after a deep inspiration.

Systolic Blood Pressure

The greatest arterial pressure that may be felt at the blood vessel walls during a cardiac cycle is called the systolic blood pressure.

Diastolic Blood Pressure

The lowest arterial blood pressure, known as diastolic blood pressure, is experienced at the blood vessel walls during the cardiac cycle.

1.8 Significance of the Study

- The findings of this study could be used to determine the impact of resistance circuit training and intense interval training on particular physical and physiological characteristics of kho-kho players.
- The results of this study may generally help physical education teacher, coaches, and experts evaluate the athletes' performance level.
- The study's findings would useful in identifying talent and choosing students for advanced Kho-Kho training.
- This study provides a blueprint for game coaches to create a group training program that could improve players' technical and physical skills.
- This study might aid future researchers in selecting a relevant problem.