CHAPTER - I

INTRODUCTION

1.1: Good Posture

Good Posture is Good Health, (Bird, A R. et al., 2009). The position of the body Posture is in which hold the whole body and limbs when a sitting, standing or lying down. To have good body posture means that necessity to be aware of always holding the self in a method that puts the least stress on the back, whatever is doing. (Sung, P. S. et al., 2015)

A good posture, where the muscles and ligaments are at least strained in helping the body, is standing, sitting, and lying to exercise. Proper posture: If the bones and joints are placed in the right direction, the muscles are used properly. The posture is more than hope and expected. Our bodies function properly while sitting or standing in the right position. (Mac Donncha, C. et al., 2000)

Good posture is a way of doing more power, low stress and fatigue things. Without good posture, there really is no physical fit. The importance of good posture standing in the overall exercise program is largely ignored by fitness advisors and fitness seekers.

Good posture helps in the normal functioning of the nervous system. Without good posture, overall health and overall capacity compromises. Long-term effects of poor posture can affect physical settings (such as digestion, elimination, respiration, muscles, joints and ligaments), a person who has poor posture often cannot get tired or efficient or move properly. Even for young people, relaxing or playing can have major consequences. Do you know that reading or typing for fifteen minutes when using wrong positions will exhausts the muscles of the neck, shoulders and upper backs? (Bird, A. R. et al., 2009)

1.2: Bad Posture

Bad posture is not always a symptom of laziness. As for a country, weight problems are becoming more common, and the skeleton and muscles change how they support themselves. People act less, which can lead to increased risk for the disease. Chairs, hunching at work, unsupportive mattresses, and low self-esteem contribute to these problems. Often, the poor posture is caused by accidents or falls. Bad posture can be created from environmental factors or bad habits. Today, posture related to the dispute is increasing. It turns out to be a society that
looks to more television than any previous generation; Became more electronic society, and more people work in the work desks or sit in front of computer terminals; and drive cars with poorly designed seats. In most cases, poor posture the combination of a number of factors. Accidents, injuries, and poor sleep support (mattress) over weight, visual or emotional difficulties. (Penteado, D. C. et al., 2005)

Foot problems or wrong shoes, weak muscles, muscle imbalance, discomfort sitting, standing, sleeping habits, negative self-image, professional stress and poorly designed job location. Poor posture lifetime can begin an improvement on the average adult adult symptoms. More than 80% of the neck and back pain resulted in a bad posture of tight and stroke muscles over the years. Joint stiffness and pain - "wear and tear" is called osteoarthritis, or disintegrating gout. The poor posture and the limited movement are likely to increase in this situation. There are many different factors that can affect the posture and include the biological factors, such as the creative action and the reaction of the energy. Poor posture includes risk factors and psychological factors such as stress and strain. As a result of muscle changes, spine and joint failure can occur. Poor posture may occur in the shortest time but may result in long term pain or damage. (Widhe, T. et al., 2001)

The poor posture is the decay of the muscle in the neck, and the lower and upper back effect. Due to the physical types, the poor posture look differs from the individual to the person. Poor posture there is a lot of risk factors in a number of injuries. Many athlete injuries are the result of bad posture. For example, Journal of Athletic Training; May 2009 subculture says, "Many overhead sportsmen have suffered shoulder pain due to bad posture." The Sigens Medical Dictionary states that soccer players refer to amateur or professional athletes participating in overhead games, causing traumatic or degenerative injuries to the shoulder. Weight and shoulder problems are caused by a number of athletes, which can cause malfunction, if not done correctly. Verne Gambetta, in his literature, refers to perfect posture; "Focusing on the bench of the magazine makes a good impression because it creates a revolving posture

Emotions, physical activities, affect the state of body posture. Further reasons take in constant immovable body posture for lengthy periods of time. Sedentary for longer times is a great interference to good body posture. Poor sitting body posture is tough to correct. Jenny Pynt in the Practice journal &Physio therapy Theory conditions, "In sedentary there is no one perfect
posture, nor should one posture be continued. Proper sitting body posture therefore, is greatest thought of as an active not static phenomenon." (Sung, P. S. et al., 2015)

1.3: Body Deformity

In several cases in which a main abnormality is present at birth, it is the outcome of fundamental disorder severe adequate that the kid does not survive long time. The death of strictly malformed birth may be due to a range of problems containing absent or nonfunctioning important organs, physical weaknesses that prevent eating or breathing and high exposure to wounds, abnormal facial appearance or contagions that cause to death. An abnormality, dysmorphic ordysmorphism feature is a main deformity in the shape of a body part or organ associated to the ordinary shape of that portion. Malformation may rise from many causes: Complications at birth, Injury to the uterus or fetus, Genetic mutation, Reconstructive operation following a severe wound, e.g. burn injury, Arthritis and other rheumatoid syndromes, Abnormality can occur in non-humans, Chronic application of external forces, A growth or hormone disorder e.g. artificial cranial deformation, Chronic paresis, particularly in teenagers, example. due to poliomyelitis or cerebral palsy. Fractured bones left to heal without being properly set, paralysis or muscle imbalance as well.

1.4: Foot Deformity

A foot abnormality is a disorder of the foot that can be present from birth or acquired. Such malformations can contain flat feet, pescavus, hammer toe, club foot, etc. Pediatric feet abnormality is a term that comprises a range of disorders that may affect the tendons, muscles, and bones of the foot. Among those most often treated at Special Hospital for Surgery are accessory navicular, juvenile bunion, clubfoot, cavus foot and tarsal coalition. Treatment of foot abnormalities in teenagers can very meaningfully from that required in adolescence. Luckily, pediatric orthopedists that specialization in this area can carry to bear a range of operative and non-operative procedures specially improved to statement the unique necessities of teenagers, which contain special consideration to preservative the integrity of the development plate, permitting continued development and growth of the feet. (Trieb, K. et al., 2015)

Cavus foot is a disorder in which the kid has an extremely high arch. In several cases, the heel of the foot is twisted inner; this is identified as cavovarus foot. The disorder regularly affects each foot and is frequently advanced. Since the foot is correctly not arranged, participants
experience pain and recover calluses owing to unbalance weight bearing. Ankle stress fractures or even sprains may happen. (Altay, T. et al., 2015)

**Tarsal coalition** develops an abnormal connection between the bones in the posterior part and midsection of the foot. It is generally identified in late juvenile or pre puberty when the coalition initiates to occasionally stiffness, leads pain and less foot movement. Indications may be mostly evident when gait on an irregular ground surface, such as gravel or sand, an action that needs continuous modification of the foot. Normal ankle sprains may also indication the existence of a coalition. Maximum tarsal coalitions may be categorized as one of two kinds: a **calcaneonavicular coalition**, in which the tissue grows between the navicular and the calcaneus or **subtalar coalition** or **talocalcaneal** in which the coalition improves between the talus and the calcaneus. (Nehme, A. H et al., 2015)

**Clubfoot** defines a disorder in which the foot or occasionally both feet are twisted inward and are indicating down. Instantly seeming at birth, club foot is known to grow during intrauterine life, at between nine and fourteen weeks pregnancy. Club foot is statistically seen extra often in male than in female and even though family history may show a portion, many toddlers with club foot have no known relation with the disorder. In the popular of cases, club foot can be effectively treated without operation, using the Ponseti method, which employs mild handling and molding of the foot at weekly breaks. Treatment initiates presently later birth when the baby’s feet, containing joint capsules, bones, ligaments and tendons are greatest responsive. (Malerba, F. et al., 2016)

**Accessory navicular** defines the presence of additional bone development middle on the inside of the navicular and within the posterialtibial tendon that attaches to the navicular. The main symptom from this extra bony importance is tenderness and pain. This hereditary deficiency is thought to happen during growth when the bone is classified. Because this accessory portion of the navicular and the bone not ever quite produce together, it is supposed that, over time, the over motion between the 2 bones outcomes in pain. (Deland, J. T. et al., 2015)

As with bunions in adolescence, in **juvenile bunion**, the joint at the base of the large toe moves out of arrangement in such a way that the large toe positions inward to the second toe. However, unlike adolescence bunion, which generally outcomes from ill suitable footwear or has
a genetic factor, infantile bunion happens most frequently in teenagers who are ligamentous lax or loose connected. The difficulty is more general in female than in male. (Magnan, B. et al., 2016)

**Congenital foot**, ankle and toe disorders have a genetic cause. While many are evident at birth, some may not become noticeable until adolescence. Other lower extremity disorders are symptoms of complex, multisystem disorders. (Park, S. E. et al., 2015)

**Hooked foot also** called metatarsus varus, metatarsus adductovarus, metatarsus adductus and Skew foot, in this disorder the foot is turned inward in relation to the heel.

**Flatfoot**, also called pes valgus, pesplanus and the arch of the foot is absent. There are various types of flat foot: Flexible flatfoot with tight Achilles tendon, Tarsal coalition, Flexible flatfoot, when the joints in the foot or heel fail to correctly form during growth, vertical talus, peroneal spastic flatfoot, a severe type of flat foot.

**Calcaneovalgus foot** the foot is suddenly angled at the heel and pointing rising; in some cases, the top of the foot touches the shinbone.

1.5: Flat Foot

Flat foot (also called fallen arches orpesplanus) is a postural abnormality in which the arch of the feet collapse, with the complete insole of the feet coming into whole or near complete touching base with the floor. Some persons (an estimated 20–30% of the common population) have an arch that just not ever grows in one foot (separately) or both feet (together). There is a practical connection between the arrangement of the arch foot and the bio mechanics of the lower limb. The arch delivers a flexible, elastic association between the hind foot and the fore foot. This relationship safe protector so that a popular of the powers experienced when a weight bearing of the feet can be dissolute previously the power influences the long bones of the thigh and leg. (Mackintosh, S. et al., 2015)

In flat foot, the head of the talus bone is misplaced medially and distal from the navicular. As outcome, the elastic ligament and the tendon of the tibialis posterior muscle are extended, so much so that the people with flatfoot fails the work of the medial longitudinal arch. If the medial longitudinal arch is lacking or non-functional in the standing and seated positions, the person has “rigid” flat foot. If the medial longitudinal arch is functional and present while the persons is
stand-up on their toes or sitting, but this arch not appears when assuming a flatfoot position, the person has “supple” flat foot. This later situation can be correctable with healthy fitting arch supports. Exercise of the foot, particularly by foot gymnastics and going bare foot on changing ground, can ease the construction of arches during infant, with an improved arch happening for maximum by the age of 4 to 6 years. Flat arch in teenagers generally become high arch and correct arch while the kid growths through puberty and into middle age. (Feldman, D. S. et al., 2015)

Teenagers who complain about arch pain, pain of calf muscle, or some other pains around the foot area may be increasing or have flat foot. Discomfort or Pain may also grow in the knee joints. A latest randomized controlled trial establish no sign for the effectiveness of treatment of flatfeet in teenagers either for costly suggested orthoses or a lesser amount of expensive over the counter orthoses. As a sign itself, flat foot generally accompanies hereditary musculoskeletal disorders such as ligamentous laxity, dyspraxiaor hypermobility. (Seo K. et al., 2015)

Going bare foot, mostly over ground such as seashore where muscles are given a good training, is good for everything but the most extremely flat foot, or those with certain associated situations such as plantar fasciitis. Ligament laxity is also amongst the features known to be related with flat foot. One clinical literature in India with a big sample size of teenagers who had grown-up wearing shoes and others going bare foot originate that the medial longitudinal arch of the bare foot were normally highest and strongest as a group, and that flat foot were few common in teenagers who had grown-up wearing slippers or sandals than among those who had wearing closed toe shoes. This conclusion may be outcome of the idea that intrinsic muscle movement of the arch is necessary to avoid sandals and slippers from falling off the kid’s foot. (Rohm, J., et al., 2015)

Flat foot can also improve as a grownup ("acquired adult flat foot") due to injury, sickness, prolonged stress to the foot or unusual, defective biomechanics, or as part of the common aging process. However, if progressive by adult hood, flat foot usually remains flat permanently. If an adolescence or grownup seems flat foot while standing in a complete weight bearing standing position, but an arch looks when the individual plantar flexes, or pull the toe back with the rest of the foot flat on the surface, this state is named flexible flat foot. This is not a correct malformed arch, the medial longitudinal arch is still existing and the wind lass
mechanism still functions; this performance is really due to over pronation of the foot, although the term 'flat feet' is still applicable as it is a somewhat general term. A normal arch makes an upward curve in the middle of the foot. Ligaments and tendons in the leg and foot help arrangement the arch and steady it. Because the feet help support your complete body, having strong arches is significant to the body’s fitness. When those ligaments and tendons weaken, the arch collapses. (Wallden, M. et al., 2015)

A flat feet is common in kids and infants, because the arch foot is has not yet improved. Most individual’s arches grow throughout infant, but some individuals not ever develop arch. This is a usual difference in foot category, and individuals without arch may or may not have difficulties. Some teenagers have flexible flat foot, in which the arch is noticeable when the teenager is standing on tiptoes or sitting, but disappears when the teenager stances. Most youngsters outgrow flexible flat foot without difficulties. Arch can also fall excessive time. Years of wear and tear can weaken the tendon that runs along the inside of the ankle and helps support the arch. (Demetracopoulos, C. A., et al., 2015)

1.6: Causes of Flat Feet

Although it is usually uncommon, flat foot grow unusually in childhood the foot arch never forms. This abnormality may even be present when it comes to birth and is often genetically. Flat feet generally grow as adults with excessive foot pressure. Failure to treat a foot injury (such as ankle sprains) without proper healing time and arch support can lead to flat foot. Some examples of excessive foot pressure: weak muscles in reducing feet, ankles, and aging or low weight. For a long time, especially standing or walking shoes. Wear uncomfortable shoes without formal proper support. Foot injuries like ankle sprain or broken bones in the feet. Flat feet may appear in the birth or grow at an early age, and may be mostly generic. Certain persons, however, improve a symptom of foot abuse that they can improve from any of the following: weak muscles due to acute strain placed on the aging or feet. The high heel is standing or walking for a long time. Wearing shoes that do not give proper arch support. (Frances, J. M. et al., 2014)

However, flat feet can sometimes be interacted with: Pain on the feet, ankles, lower legs, knees, hips or legs is caused by local flow (over pronation). It is possible to get rid of shoes quickly, bones around the feet, muscles or connective tissues.
Female and individual over forty are more probable to grow difficulties with the posterior tibial tendon. Other risk issues contain diabetes, obesity, and hypertension. Having flat foot since infant rises the risk of increasing a tear in the posterior tibial tendon. In addition, individuals who are involved in better impact games, such as football, kabaddi, or basketball, may have tears of the tendon from repetitive use. Arthritis, Injury, pregnancy, tibialis posterior (ruptured tendon), muscle diseases or nervous system - such as muscular dystrophy, cerebral palsy, or spina bifida. Tarsal Coalition the bones of the foot fuse composed in an uncommon way, resultant in stiff and flat foot. (Chadwick, C., et al., 2015)

Flat feet in adults arise from various causes. Here are the most common:

- A deformity that is existing from birth
- Overextended or torn tendons
- Injury or tenderness of the posterior tibial tendon, which attaches from lower leg, along ankle and to the center of the arch
- Damaged or displaced bones
- Some fitness disorders such as rheumatoid arthritis
- Nerve difficulties

1.7: Signs and Symptoms of flat feet

Most flat feet pain or additional difficulties do not occur. Teenagers may have leg pain, ankle pain, or low leg pain. If this occurs, they should be assessed by a health care provider. Indications in adolescence may contain tired or achy feet after prolong periods of standing or playing games. In individuals with flat foot, the in step of the foot comes in connection with the floor during standing. To identify the difficult, the provider will ask to stance on the toes. If an arch is formed, the flat foot is named flexible. If the arch does not form when a standing with toe (named rigid flat feet), or if there is pain, other tests may be required, including: Computer Tomography scan to appearance at the bones in the foot, Magnetic Resonance Imaging scan to appearance at the tendons in the foot, X ray of the foot. (Galli, M., et al., 2015)

Flat foot can lead to ankle sprains, heel spurs, hip and low back pain and contribute to the improvement of arthritis. When this tendon is weakened or overworked, it creates a type of arch
pain that stresses plantar fascia (The connective tissue band that stretches the leg ball from the heel) causes gradual fatigue of the arch, and decreases the amount of support the arch gets from the posterior tibialis tendon. Many persons have flat foot and sign no difficulties and no need treatment. But others may knowledge the following indications: Foot tire easily, Painful or achy feet, particularly in the parts of the heels and arches, The inside bottommost of foot become inflamed, Foot movement, such as standup on the toes, is problematic, leg and Back pain. Most persons have there is no signs or symptoms related with flat foot. But particular persons with flat foot experience foot pain, mostly in the heel or arch part. Pain may be worse with activity. Inflammation inside of the ankle can occur. (Buldt, A. K., et al., 2015)

In the previous stages, indications frequently include tenderness and pain along the posterior tibial tendon behind the inside of the ankle. This abnormality can contain progressive flattening of the arch, heel of the shifting so that it no longer is formed underneath the rest of the foot, rotation and abnormality of the fore foot, tightening of the heel cord, improvement of arthritis, and abnormality of the ankle joint. (Kim, J. A., et al., 2015)

Congenital vertical talus the foot of a baby with hereditary vertical talus normally has a convex rocker foot shape. This is occasionally joined with a real fold in the center of the foot. The rare individual who is identified at a grownup age frequently has a "peg leg" walk, poor balance and heavy calluses on the insoles where the arch would usually be. If a teenager with inherited vertical talus has a hereditary disorder, extra indications frequently are seen in extra parts of the physique. (Benedetti, M. G., et al., 2011)

1.8: Importance of Arches of Foot

The arch is the most important structural component of the feet, which stands at 200,000 to 300,000 lps. Every mile stress to walk. Arches absorb the brunt of the stress of bodies thrust upon the foot with each stride. Arch height may vary significantly from individual to individual. It may also alteration as a person ages, or as the outcome of several health conditions. Appropriately supporting the arch can prevent a variation of musculoskeletal difficulties that can lead to inactivity and even incapacity.

Arches of the foot, formed by the metatarsal and tarsal bones, strengthened by tendons and ligaments, permit the foot to support the weight of the physique in the upright posture with
the minimum weight. They are characterized as transverse and longitudinal arches. (Franco, Abby Herzog, 1987)

**Longitudinal arches**

The longitudinal arches of the foot can be classified into lateral and medial arches.

**Fundamental longitudinal arch**

While these lateral and medial arches may be readily established as the factor antero-posterior arch of the foot, the important longitudinal arch is contributed to by both, and contains of the third cuneiform, cuboid, calcaneus and third metatarsal: All other bones of the foot can be removed without destroying this arch.

**Medial Longitudinal Arch**

The medial longitudinal arch is greater than its lateral counterpart and is noticeable between the heel of the foot proximally and the medial 3 Meta tarso phalangeal joints distally. The arch contains of 2 supports. The anterior support contains of the medial 3 Meta tarsal heads whilst the tuberosity of the calcaneus forms the posterior support. However, the supporting ligaments deliver more steadiness than the bones of the arch.

**The lateral longitudinal arch**

The fewer prominent lateral longitudinal arch is made by cuboid, calcaneus and the 4th and 5th metatarsals. Like its medial counterpart, the lateral arch contains of 2 supports, which help support the arch. The anterior support contains of the 4th and 5th metatarsal heads whilst the calcaneus forms the posterior support. The main provider to stabilization of the arch is the fibularislongus tendon.

**Transverse Arch**

The transverse arch turns in a coronal plane and contains of the 5 metatarsal sources as well as cuneiform and cuboid bones. The lateral and intermediate cuneiforms are wedge molded which aids in maintenance of the arch. The lateral and medial longitudinal arches act as supports for the transverse arch. The deep transverse ligaments, the transverse head of the fibularislongus tendon and adductor longus, also help to stabilize this arch.
Function of the arches

The arch of the foot has a significant part in **weight bearing**. When standing, the body weight is distributed throughout the bones at the foot arches. The weight is transferred from the tibia to the talus earlier being transferred posteriorly to the calcaneus. The lateral longitudinal arch is typically involved in transferring this weight and makes extra contact with the floor than the medial one.

Medial longitudinal arch plays a significant part in shock absorption and motivation during jumping, walking and running. The arch performances like a springboard, as its anterior support is the point of take off during these actions. The process of walking is mentioned to as the **walk cycle** and this contains of 2 stages: swing stage and stance stage. Through the **stance stage**, the fore foot pronates which flattens the transverse arch and the medial longitudinal arch. During the **swing stage**, the hind foot supinates which reasons the medial longitudinal arch to upraise. This high arch performance as a rigid lever for force. *(Esterman A. 2007)*

1.10: Relationship between Arch of Foot and Performance

The prevalence of flexible flat foot is 21 to 57 percentages in teenagers of pre school age and this may cause to extra deformities and pain or adversely impact the performance of walking and physical activity. According to *(Lin 2001 and D’Amico 1984)*, teenagers with flat foot achieve physical activity poorly, and may improve walk illnesses.

Medial longitudinal arch plays a significant role in permitting the foot to transmission absorbs shock and weight during running or walking. According to the height of the medial longitudinal arch, the foot can be categorized into 3 types: normal arch, flat arch and high arch. Medial longitudinal arch category is associated to leg injury. Persons with a high arches may be at a bigger risk of injury, with bone injuries (e.g., stress fractures) and lateral injuries, while low arches persons are at increase risk of soft tissue damages, common knee pain and medial injuries. *(Lin 2001 and D’Amico 1984)*

Plantar force evaluate is broadly used to estimate active foot functions and loading designs. There are several features that contribute to the design of weight under the foot during walking, morphological features and such as gait speed. Some literature has suggested that static arch foot calculate have an important correlation with dynamic capacities, while others have
dissimilar outcomes. For example, (Trisha et al., 2010) recommended that a static calculate of the medial longitudinal arch could not calculate its dynamic motion. The optimistic attitude, such as that of (Cavanagh et al., 1997) has exposed that arch associated assessment and soft tissue thick ness were the strongest analysts of plantar force under the first metatarsal head and the heel when walking.

Several investigators measured dorsal height foot with the paritipants in a comfortable standing position, assuming fifty percentage body weights on both foot. (Franettovich et al., 2014, Vinicombe et al., 2014). Have recommended that performance foot measurements at fifty percentage weight bearing develops measurement reliability by reducing balance associated problems that can happen as participants occasionally modification their foot position while attempting to standing with a limited amount of their body weight on the foot being measured. Furthermore, most studies have not explored the influence of other health-related factors on the relationship between foot posture and functional performance. It is important to consider the relative contribution of foot posture to balance and postural sway after accounting for these potential confounders.

In this literature, the weaker dorsi flexion strength is associated to the extensor hallucislongus, extensor digitorumlongus, and tibialis anterior muscles. These muscles are known to reduce the arch foot, increase the Arch Index (AI). The evertors of the ankle are identified to support the arch foot; they establish a correlation between the Arch Index and eversion strengths in this literature.

1.11: Flat Foot and Performance

Purpose in this literature was to determine if there is a relationship between the degree of foot flat ness and various motor skills that are essential for sport performance. The feet of 218 teenagers’ age between eleven to fifteen years were measured, and the arch index was measured. The assessment of the arch index was modified for the effect of age, and then the whole population was classified into four groups according to the flat ness of their foot. Teenagers with flat and teenagers with “normal” foot were similarly positive at achieving all motor tests; thus, we advise that there is no necessity for treatment of flexible flat foot with the sole objective of developing sports performance, as usually recommended by many. (Abby Herzog et al., 1987)
Flat footness is repeatedly considering an infirmity, the basis of inefficient foot skills and increase injuries. Flat foot has the reputation of affecting painful feet in old age as well as poor sports performance and poor motor skills.

For several years the approach to flat foot in teenagers and adolescences has been to suggested arch supports and specially, high supportive, shoe. But in recent times, such processes have come to be observed as in effective, uncomfortable and embarrassing. They considered a literature to assess the influence of flat foot in eleven to fifteen year olds on a series of skills right associated to sports performance. (Jankowicz-Szymanska, A., 2016)

1.12: Flat Foot Affects the Sports Performance

Many individuals with flat foot experience no difficulties and need no treatment for their disorder, according to the university of maryland health Center. These people can run a usual life complete of sports and physical activity. For others, flat foot can cause pain and can reduce the foot flexibility. Sporting can be very difficult and painful with sore foot. (Mel Cash Feb 1997)

Flat foot is a fairly general condition. For maximum persons, flat foot causes no difficulties and does not inhabit involvement in sports. In athletic those need a lot of running, May sensation pain over the bottom of the foot. This pain can cause discomfort in the legs and knees and can be limping after tougher action. Games like cricket that need standing for a prolong period of time can reason pain with flat foot as well. (Peter Brukner, 2012)

Continuously recommend to the trainers that if they really want to identify whether their player will have balance concerns, check out their foot. Abnormally pronated foot or Flat foot is the main contributing aspect to an imbalanced lower leg. Flat foot can also cause to foot difficulties in athlete such as muscle spasms, plantar fascilitis, lower leg fatigue and not getting the maximum effectiveness out of their lower leg. Several athletes have flat foot and are unknown of how it can disturb their balance when the sports. Arch supports that can fit in the sportsperson’s cleats and sports specific shoes will maintenance the athlete’s foot through all features of the sports. (Nehme, A. H. et al., 2015)

If have flat feet, athlete might be having some pain and wondering what causes it and why it looks different from most other people. We recommend that there is no requirement for treatment of flexible flat foot with the sole determination of developing sports performance, as
usually instructed by many, “the scholars accomplish in their report in the clinical journal pediatrics. (Bauer, K. et al., 2015)

Flat foot is a dropping or collapse medial longitudinal arch. Left untreated, this physical disorder can lead to pronation at the ankle joint. Over pronation can lead stress and pain to various arrangements, including ligaments and musculature (Prentice, 2004). With repetitive pronation when weight bearing activities (running, walking, standing), increase stress will be located along the clinical feature of the ankle.

The arch of the foot helps us to gait, run and jump, stand, balance. This is since they add flexibility and springiness to the foot by permitting the center area of the foot to close and spread. They also assist in distributing the weight of the body equally around the foot as we move. (Van Gestel, et al., 2015)

1.13: Foot Alignment Factors and Sports Performance

One of the feet is most likely flattening more than the other just as one of the leg is somewhat longer than the other. Normal foot flattening is like cholesterol: need a bit but too much can be quite harmful in the long run. Foot and leg imbalances just add up in putting the ankles and knees out-of-alignment as both are forced to roll and twist inward. This is reason why repetitive sports injuries such as ankle sprains, shin splints, knee and hip pain conditions. As the heel turns inward, the calf muscles are forced to twist the heel outward and there: the sprain the ankle once again. Foot and leg alignment is the mere foundation of the performance of all weight bearing sport activities. Sports Medicine often confuses contributing factors with the root-cause of many sports injuries (which are often the result of foot and leg misalignment increased by the various forces imposed on the musculoskeletal system during the course of most physical activities). Improving the foot and leg alignment is key in improving the performance in most sports. (Tudor, A. et al., 2009)

A flat foot is a flimsy and unstable lever to push off from; significantly slowing down athletes. Normal foot-type sprinters take most advantage of the power rigid starting blocks give them at each start. The power of the flattening foot-type push-off and resulting body acceleration will always be lower than the one provided by a more rigid straight foot-type. Weight bearing flat feet reduces the power of a punch and the total weight athletes can lift. A more pronated right foot and makes an athlete slower to move to their left. Sports overuse
syndrome or injury is a misnomer for feet and legs misalignment resulting in musculoskeletal overload magnified by an otherwise healthy sport activity – whenever sufficient foundational misalignment is present. Misalignment increasing torsion, compression, friction and premature wear and tear in all of the weight bearing joints of the human musculoskeletal system appears to be the cause or certainly a major predisposing factor in limiting sports performance and increasing sports injuries. (Tudor, A. et al., 2009)

There is a misapprehension that physical flat foot does not lead foot difficulties or signs. This is incorrect because “physiological” only defines the leads but not the results of the flat foot. Physiological flat foot does affect the bio mechanics of the causes and body different injuries. Physiological flat foot is an appearance of over foot pronation. By calculating the degree of pronation, one could describe the harshness of the “flat foot” irrespective of the soft tissues below the arches. If certain of the muscles become weak, the balance is broken and poor body arrangement may happen. (Hagedorn, T. J. et al., 2013)

Over weight is other risk issue of over foot pronation. Teenagers aged between 2 to 7 generally have noticeable knocked knee (Genu Valgum). It decreases progressively by regular development. However, over weight could obstruct the common decrease of knock knee. This deviated knee arrangement places over loading on the inward side of the foot, and thus directly weight ups the arch foot and leads over foot pronation. It generally occurs on developing children, particularly on active young male. The maximum common painful sites are the protruded bones just below the knees (tibial tuberosity) and the rear area of the heels. The pain could awaken the teenagers as it generally fires at night. It connections with physical exercises. Physiological flat foot shows a role as the muscles attaching to the affected sites are stressed because of the inappropriate bio mechanics induced by the pronation. With the modification by the Bio mechanics insoles, increasing pain could be decrease. (Buldt, A. K. et al., 2015)

Games frequently are played in little bursts of thirty feet (ten yards) or less previously a modification of direction, deceleration and/or acceleration is necessary. Because activities can be started from several body arrangements, sports person require being able to react with strength, quickness and explosiveness from these changed positions. (Arévalo-Mora, J. F. et al., 2016)
1.14: Counteractive Exercises

With the flat foot on the ground, press the toes downwards into the ground. Do not permit them to curl, or the ankle to move whilst performance the activities. Hold for the count of three, repeat ten sets. Execute counter active workout three sets a day if possible. Advancement the exercise by holding the contraction for longer. Place flat feet on the surface. Spread the toes as far as they will go and then return them together. Again this ten repetitions, break and the perform a further two sets of ten repetitions. Purpose to again this work out three sessions a day, as above. Place the back half of a foot on a suitable, and the fore foot on a set of weighing gauges, safeguarding the foot is parallel as far as possible. Press downward with the fore foot onto the gauges to see who much power you produce. Again ten repetitions for each foot. Do these trainings every day. It is an outstanding way of sighted precisely how the strength of the foot is increasing. Place flat feet on the surface and attempt to lift each toe up in turn. Goal to keep the others flat on the surface – its difficult, is it Perform 3 sets of both toe. Try to achieve this workout two times a day at least once. Pencil pick up in the toes. Hold for count of six, ten repetition. Goal to achieve this work out three times a day. An alternate type of this is to frequently scrunch up a towel in the toes. Simple tip toe walk. Do not wear shoes but achieve the workout bare foot. Goal for eight sets of fifteen to twenty seconds with twenty seconds rest between. Complete the workout two times a day. Development by increasing the duration of the gaits. As above but gait on the heels. Complete the workout two times a day. When it comes to workout, most persons over look two of the maximum important parts of their body - their foot. (Kurashige, T., & Suzuki, S. 2015)

A ground like grassland that is yields and soft to the weight will help develop the joint articulation with in the foot, while increasing strength and range of motion in the process. (Wang, J. S. et al., 2016)

The shifting and changing surface of these rocks will help activate all of the proprioceptive nerves that are existent below the foot. (Vulcano, E. et al., 2016)

Maybe the best workout for keeping the arch health is the "towel scrunch." With time and reduced request on the foot, the minor muscles become weaker. (Vulcano, E. et al., 2016)

Another way to develop arch strength is toe rises on a raised board or stair. Stand on a board or step at least 3 to 4 inches off the floor with only the ball of the feet on the board and the rest of the heel and feet hanging slightly under the toes. The massages and stretches the
bottommost of the feet and can be a way to decrease some arch discomfort. (Hatfield, G. L. et al., 2016)

Flat feet can cure with stretching and foot exercises. Following are flat feet exercises to get the arch shaped feet. Wear shoes which have arch support. Do not wear high heels for a prolong period of time. Exercise the feet and toes of the left foot except the heel. Be seated on the ground with knees bend and hands in the back for support. Separate the feet from the ground whilst keeping the heel on the ground. Rest the center of the feet on the other foot and apply slight force. Spread the join and foot the insoles of the heels. Create an arch by cramping the foot and let the toe touch the ground. Combined the feet together and then spread the heels on both the sides with toes combined. Do this flat foot workout in a sitting position for best outcomes. Put the heels on hand balls or tennis and big toes touching the ground. Use these flat foot workouts to heal flat foot, always control tight shoes and avoid wearing a high heel for continuous length. (Tashiro, Y. et al., 2015)

Foot workout stands free, there is not necessity to wear the frequently un sightly inserts and it takes 2 month for outcomes to be felt if approved out for 10 minutes a day. Some workouts are proper for anybody who needs to develop flexibility and foot strength, who elucidates that podiatrists have prolong been recommend foot workout. (Taha, A. M. S. & Feldman, D. S. 2015)

The trainings are intended at developing the foot's strength, coordination and resilience. By performance workouts that stretch the arches of the foot, the deep, intrinsic muscles on the underneath of the foot are tautened and strengthened, Moving both toe independently means that give each part of every muscle the chance to reinforce the arch and bend tone.

1.16: Relationship between Foot Alignment vs Speed

Determine the secrets world best runners have recognized for years they significant to foot speed are plantar and dorsi flexion. These six trainings will absolutely develop foot speed. To develop on the work capability of the peroneus longus, soleus, extensor digitorumlongus, tibialis anterior and gastrocnemius (which do maximum of this work) they all have to be strengthened to produce a better capability to apply power faster. Fundamentally we are trying to decrease the sportsperson's ground contact time and thus help develop on speed. (FabrizioMargheritini, Roberto Rossi, 2011)
Having flat foot does not reduce running speed, or hamper usability of feet, but can lead to pain. When there is no arch in foot various other parts of foot have to compensate, this can carry about pain in the back or leg because of the straining on the calves. Fallen arch can also cause to Plantar Fasciitis, which can occur when the bottommost of the foot expanses too far and creates to inflamed or tear. In certain cases of flat foot, the insole of the feet will develop rigid. Flat foot has also been related to pronation, or the feet rotating too far innermost. The foot obviously makes this movement while walking, but it is measured an ailment when the feet rolls inner too far, throwing foot out arrangement and balance.

1.17: Foot alignment vs Agility

Foot speed trainings are critical to develop agility and speed. More nimble foot straight interpret into faster runners and smoother changes in direction. Being agility and taking good foot work are needed in a variety of games, from basketball to football. Practicing footwork and agility trainings will help elevate athletic performance by permitting to start stop and variation directions rapidly, permitting to get past, or protect against, and the opponents. "Outdo of games specific skills, agility is the main determining aspect for achievement in sports".

Stepladder agility trainings are an outstanding way to develop foot agility, coordination, speed, and complete quickness. They are a vital part of several agility quickness and speed programs and compliment various different events and sports. Speed ladder trainings are about value and form rather than producing over load. (Panichawit, C., et al., 2015)

1.18: Foot alignment vs Coordination

Coordination is significant when performing sport, trainings and moving through day-to-day life. Sportspersons require coordination to influence their potential and develop their skills on the court or field, while regular fitness seekers advantage from coordination in effort responsibilities, hobbies, trainings and complete fitness. By developing leg coordination, can also prevent a variability of injury. Just achieve a few regular trainings and can enjoy the benefits of more balanced, steady movements. One of the best methods to develop the coordination is to do plyometric trainings. Specific of the best plyometric trainings contain squat jumps, high knees, quick feet, rope ladder drills and one leg jumps. The best leg workout for improving coordination is the pistol. These simple, one leg squat trainings not only develop coordination, they also improve leg strength, speed and power by teaching the body to exert power through the
whole range of motion of leg one at a time. Coordination in the lower leg is significant in ordinary life. Running, walking and climbing stairs all need some degree of coordination. Coordination is particularly significant to games participating in sports like kabaddi, football or basketball. There are many examples of trainings that can develop coordination in the lower leg.

1.19: Foot alignment vs Reaction Time

Researchers have related excessively supinated or pronated foot structures with insufficiencies in some features of neuromuscular control compared with neutral foot structure. Constituents of neuromuscular control contain muscle strength, postural control, and proprioception, muscle reaction time. Both (Cote et al 1995 and Tsai et al 2007) originate evidence to recommend that foot structure affects postural control; however, no one has evaluated the effects of supinated or pronated foot structures on muscle reaction time. The assessing of muscle reaction time to a tilt platform perturbation is a well established technique of analyzing neuromuscular control in the lower limb. Therefore, the literature was to regulate whether supinated or pronated foot structures donate to neuromuscular insufficiencies as evaluated by muscle reaction time to a replicated ankle sprain mechanism. Example for, a supinated foot has less surface contact than a neutral foot or pronated, this clarification for the slower muscle reaction time of the supinated feet. The people with supinated or pronated foot structures have slower muscle reaction time than people with neutral foot. Other features of muscle reaction time should control for foot category because variances among subjects may affect outcomes. (Joanna R. Denyer et al., 2013)

1.20: Foot alignment vs Explosive Power

Factors such as explosive power conditions influence in order to have the best performance in these types of activities. Another factor that might be able to affect the performance of these activities and overall performance of the players is the shape and structure of foot, because the foot is the first part of the movement chain that is in contact with the ground and its changes and deformities can affect the entire motion chain and person’s activities performance. In the study of flat foot effect to performance of various activities in children concluded that flat foot does not have effect to selected performances especially explosive activities. In a study that examines the relationship between explosive strength and extent of medial longitudinal arch of the foot have concluded that there is no significant relationship
between the extents of medial longitudinal arch and explosive strength and explosive power. (EsmaeilMozafaripour et al., 2014)

1.21: Foot Alignment vs Balance

When first learn to stand as a child, it was done trial and error. With exercise, learn to balance through the foot and then learn how to move forward with steps. As grownups, they find that their foot pains later standing for prolonged periods of time. Balance is influenced by on the method in which the body is maintained in stable balance. Balance is maximum stable during the supporting forces are transferred along the bones instead of at angles to the bones. Ideal arrangement of the bones, therefore, happens during they line up with the supporting powers. (Kulig, K. et al., 2015)

People with flat foot show a lower balance before corrective exercises but following corrective exercises and their muscular power and motion of lower limb joints improve and it has a positive effect on balance. (MehrnazFarajiShahrivar, et al., 2014)

Optimum alignment and balance of the ankles, knees and arches are greatest capably skilled by becoming conscious of the middle of the feet. The spreading of weight on a foot should be centered on the middle of that foot. (Payehdar, S. et al., 2016)

Which are the intrinsic muscles of the feet important for maintenance of medial longitudinal arch, to help the formation of the arch and the maintenance of the balance of the body? We understood that teenagers with severe flat foot had more problems in balance during they stand on single leg try to uphold their posture. (Lee, H. J., et al., 2015)

Need of Arches Foot

What is damaging the weight-bearing joints the most is it running with abnormal allocation of the body weight within the ailing knee due to foot dysfunction and resulting leg misalignment? Improving the foot and leg alignment is key in improving the performance in most sports. Most talented athletes are not optimally aligned; if this is the case, may have a longer leg and or an over or under pronating foot throwing off the balance. Balance or optimal body weight distribution is impossible if the feet over or under pronate or if have one leg longer than the other. Again, this is something that may very likely have to some degree. (Bishop, C., et al Apr 2016)
Some teenagers have a flexible flat foot, in which the child when sitting or standing on toes arch is visible, but disappears baby when standing. Most youngsters outgrow flexible flat foot without difficulties. Arches fall over time. Flat foot is general in both youngsters and grown-ups. When this abnormality occurs in youngsters, it is mentioned to as “pediatric flat foot.” Although there are several types of flat foot, they all share one characteristic – incomplete or total collapse of the arches. Pediatric flat foot can be categorized as symptomatic or asymptomatic. Symptomatic flat feet exhibit symptoms such as pain and control of activity, while asymptomatic flat feet show no symptoms. These categorizations can assist the ankle and foot specialist in determining a suitable treatment plan. Prachgosin, T., et al (2015)

NEED OF THE STUDY

Foot posture, like most human anthropometric features, differs considerably among teenagers, grownups and the older people. Therefore, there is a necessity for approaches to accurately categorize foot posture and describe normal and potentially 'abnormal' foot categories. Now-a-days, most of the athletes have flat foot or abnormality in arches of foot, the reason because of improper training, improper footwear, injuries, less strengthening in the lower limb etc. These are the reason causes poor performance of athletes. Sometime the flat feet lead to intense pain and injuries, these reason why the athletes’ dropout from the sports.

After observe all these reason, as I am the university Kabaddi player, I have seen many athletes have been struggled with these flat feet. Therefore, I have keen interest to find out the solution for this flat foot. I discuss this matter with the experts and some physiotherapist and also gone through some of the review literatures and finalize that, the flat feet affect the performance of the athletes, and there is need and find the solution for the flat feet problem. This is the reason for selecting this problem.

RESEARCH HYPOTHESES

Hypothesis 1: There would be significant difference on angle of arch foot (flat foot) after the 12 weeks of counteractive exercise programme for experimental group.

Hypothesis 2: There would be significance change in medial longitudinal arch of the foot after 12 weeks counteractive exercise for experimental group.
Hypothesis 3: There would be significance changes in navicular height of the foot after 12 weeks counteractive exercise for experimental group.

Hypothesis 4: There would be significant improvement in skill related physical fitness variables on flat feet athletes after training.

STATEMENT OF THE PROBLEM

The present study is designed to examine efficacy of counteractive exercise among young athletes with flatfeet on foot alignment factors and skill related physical fitness variables.

OBJECTIVES OF THE STUDY

1. To identifying the flat foot athletes on various sports and games.
2. To assess the flat foot of the athletes and analyzing the impact of counteractive exercise on foot alignment factors (flat feet).
3. To find out the effect of counteractive exercise programme on skill related physical fitness components of athletes who has flat feet.
4. Effects of corrective exercise on Arches Index (AI) of flat feet athletes.

DELIMITATIONS

1. To achieve these purpose 550 athletes were tested by foot morphology in Pondicherry region school athletes.
2. The age of the athletes was ranged between 11-15 years.
3. 40 voluntary participations were selected from the total flat feet athletes for this second part of the research. The selected subjects were divided into experimental group (n=20 control group (n=20).
4. Experimental group was undergone training of counteractive exercise (corrective) for five days in a week for total twelve weeks. The control group was doing not participate any specific training to improve foot morphology.
5. The foot alignment factors for this study are angle of arch foot (AAF), medial longitudinal arch (MLA), navicular height (NAV) and arch index (AI).
6. This skill related physical fitness variables selected for the study are speed, agility, coordination, reaction time, explosive power and balance.
LIMITATIONS

1. The height and weight of the athletes were not considered.
2. The injuries on legs and body parts were not considered.
3. The proper foot wears and regular dress coding used by the athletes were not considered as an account.
4. The body postural alignment was not considered.
5. The athletes natural style of walking, running etc. was not considered.
6. Participant’s body types are not taken into consideration for this study.
7. The changes in climatic condition such as temperature, atmospheric pressure, humidity during the training as well as testing periods not controlled and their influence on the result of the study is recognized as a limitation.
8. Participants included in the study not control with regard to their life style, diet and habits which may have influenced their performance.

DEFINITION OF TERMS

Flat Foot

Flat foot is lack of an arch in the insole of the feet that reasons the foot to lie flat during the person is standing. All infant have flat foot because their arch is not yet constructed. This disorder may continue into middle age, or an arch may form as the kid grows. Flat foot can also be acquired, as in jobs that need a great deal of carrying and walking of weighty objects also called pesplanus. (Carr, J. B., 2016)

Arch Foot

The arch of the foot, built by the metatarsal and tarsal bones, strengthening by tendons and ligaments, allow the foot to support the load of the body in the upright posture with the minimum load. They are classified as transvers and longitudinal arches of the foot. (Baxter, J. R., June, 2015)

Bad Posture

Bad posture is the posture that outcomes from convinced muscle shortening or contraction up while others extend and develop weak which frequently happens as outcome of one's day-to-day activity. There are dissimilar aspects which can influence on posture and they
contain work-related activity and bio mechanical aspects such as repetition and force. Risk features for bad posture also contain psychosocial aspects such as strain and work stress. Employees who have greater work stress are more likely to improve shoulder and neck indications. (Paul Ingraham, 2004)

**Angle of Arch Foot**

The angle of the medial longitudinal arch is one of the angles drawn on the weight bearing lateral foot radiograph. The angle is designed between the calcaneal inclination axis and a line drawn along the lower edge of the fifth metatarsal. (Rohm, J., 2015)

**Arch index**

The use of arch index to classify arch height: a digital copy processing approach. In order to avoid these difficulties, digital image processing procedures were used to attain and to calculate the arch index (AI), a parameter which is healthy in its definition. (Christopher Kevin Wong, 2012)

**Navicular Height**

The height of the navicular bone with the sub talar combined in neutral and most of the weight on the contra lateral limb. (Nehme, A. H., 2015)

**Longitudinal Arches**

The longitudinal arch of the foot can be separated into medial and lateral arch. (Prachgosin, T., 2015)

**Medial Arch**

The medial arch is greater than the lateral longitudinal arch. It is made up by talus, navicular, calcaneus, the 3 cuneiforms, and the 1st, 2nd, and 3rd metatarsals. (Prachgosin, T., 2015)

**Lateral Arch**

The lateral arch is formed of cuboid, calcaneus, and the 4th and 5th metatarsals. 2 important structures of this arch are its solidity and its small elevation. 2 strong ligaments, the long plantar and the plantar calcaneo cuboid, composed with the Extensor tendons and the short muscles of the little toe, preserve its truth. (Prachgosin, T., 2015)
Speed

Rapidity with which a movement or successive movements of the same kind may be performed (e.g) 50 mts dash. (Marcus pohl, 2004)

Agility

Speed in changing body position or in changing direction.eg (SENO agility test) (Young W.B., 2007)

Coordination

*Co-ordination is the ability to move two or more body parts under control, smoothly and efficiently.* eg (hexagonal obstacle test) (Brazdziunas D., 1999)

Reaction time

Reaction time is the amount of time it takes to respond to a stimulus. eg (Nelson choice response movement test) (Camron K.L., 2001)

Explosive Power

The amount of power improvement is at the maximum for any category of muscle action is explosive power. In activities needful great acceleration and out put, explosive power exercise is required for maximum improvement.eg (sargent chalk jump) (Dawn A. Skelton, 2000)

Balance

Balance is an ability to uphold the line of gravity (perpendicular line from center of mass) of a body with in the base of support with minimal postural sway.eg (front scale balance on ball of foot test) (Galli, M., 2015)
SIGNIFICANCE OF THE STUDY

1. This study may help to find out the testing procedure of foot alignment factors such as arch index, angle of arch foot, medial longitudinal arch and navicular height.

2. This study may help to find how much percentage of athletes those who affected with abnormal foot alignment.

3. This study may create new set up of therapeutic exercises to promote bad foot posture.

4. This study could help to find out the skill related physical fitness components level for the athletes who have abnormal foot alignment.

5. This study awakens the knowledge on flat foot disability and causative measures. This might have as poor motor skills and poor the source of inefficient foot skills, causes of injuries, causing painful flat in adulthood as well athletic performance.