Assessment of Anaerobic Power and Balance among Elite Indian Under-19 Football Players

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Abstract: ***Objective:*** ***To assess anaerobic power and balance among elite indian under-19 football players. Method:22 Elite Indian under-19 players Football players were tested for Anaerobic power and Balance on Monark Cycle Ergometry and Neurocom Balance Master respectively. Result:Anaerobic Peak Power (W) for professional Indian under-19 football players was 498.70, while the mean for the Anaerobic Capacity (W/Kg) was 7.75. On Balance assessment, players had maximum sway velocity on foam surface with eyes closed with a mean of 0.76 (deg/sec) followed by eyes open on a foam surface with a mean of 0.54 (deg/sec). Reaction Time of players was found to be affected most in the forward component with a mean of 0.98(deg/sec) followed by Right direction and Left back direction component with mean of 0.69 and 0.67 respectively. The players showed lack of directional control maximum in the Right component with a mean of 87.25 (deg/sec) followed by Forward and Left components with mean of 86.89 and 81.10 respectively. Conclusion: Elite Indian under-19 players Football players were found to have low Anaerobic power and capacity with their reaction time and directional control affected on the dominant leg side.***

Keywords: Anaerobic power, anaerobic capacity, balance, football players

1. Introduction

Interest in soccer has increased considerably over the last decade. Football is one of the most popular sports in India.[1]Football is an intermittent, highly-intensive and complex sport that requires different physical attribute and skills from an individual. Soccer as a player requires an appropriate mixture of mental, physical, technical and tactical abilities.[2]According to estimates of Fédération Internationale de Football Association (FIFA), the average treatment cost is 150 U.S. dollars per injury that leads to about 30 billion dollars a year for treatment of injuries in soccer around the world.[1]In a study on British major league, it was found that risk of getting injured was higher during the first and the last 15 minutes of the match, in the areas in which competition for owning the ball was tenser (midfield, attack and defence regions).[3]The overall injury rate in NCAA men's soccer is 7.7 per 1,000 athlete exposures .There were more than 55,000 injuries and 7.1 million athlete exposures from 2004-2009. Muscle strains, followed by ligament sprains, are the most common types of injury. Ligament sprains of the lateral ankle, hamstring muscle strains, concussions, and adductor (groin) muscle strains are the most common specific types of injury in men'ssoccer.[4]

Football players from division to elite level have to perform/cover 10-20km over 90min max intensity on outfield position.[2] basic motions of the sport include passing and shooting with the foot, most frequently being the basic kicking technique, the side-foot kick.[5]Motions of the side-foot kick have five phases beginning with a preparation of the support limb and ending with the follow through of the kicking limb[5]The player utilizes different muscles and bones for each scenario of running and stationary kicks. Muscles and bones connected at the hip, knee, and ankle accelerate the kicking foot towards the soccer ball.[5]Anaerobic training is used to increase strength and power through intense muscular activity. Anaerobic power is only available as short bursts of energy for no more than around two minutes. It is utilized when the body is being pushed as hard as possible. With the correct training, anaerobic power capacity can be increased to improve athletic performance. It has been studied that anaerobic conditioning is important for athletes who require near-maximal; quick burst of muscular power, such as sprinters, rowers, and soccer and lacrosse players, as it results in an enhanced efficiency of anaerobic energy during exercise. The ATP-CP system supplies the immediate source of fuel for approximately the first 10 seconds of exercise or until the intracellular supply of ATP-CP is exhausted.In soccer, anaerobic metabolic pathways are utilized during very short bursts of moderate to intensive effort that can directly determine a match's outcome[6] During the game, many decisive moments are defined by anaerobic activities; sprinting, jumps, change in direction, tackling backward running, sideways movements under defensive pressure.[2]

Balance is a dynamic process by which the body is maintained in equilibrium (Kisna and Colby, 2007). It is an ability to maintain the line of gravity of a body within the base of support with minimal postural swaywhich requires coordination of input from multiple sensory systems including the vestibular, somato-sensory and visual systems.Dynamic balance is believed to be more challenging because it requires the ability to maintain equilibrium during a transition from a dynamic to a static state, requiring an effective integration of visual, vestibular, and proprioceptive inputs to produce an efferent response to control the body within its base of support (Irrgang et al., 1994; Guskiewicz& Perrin, 1996). While stability has been defined as the level of challenge at which one can still maintain their balance, linear stability is putting up resistance against being moved in a given direction, depending upon an athlete's ability to put the line of gravity towards an oncoming force. The movement temporarily unbalances the athlete, but then the impact of the force re-balances on the player. A broader base of support increases stability. (United States Sports Academy America's Sports University) The senses must detect changes of body position with respect to the base of support, regardless of whether the body moves or the base moves or changes size. Vision is very important to balance in order to achieve accuracy performing a specific activity. As noted above, we need to be able to see the target or the ball in the case of soccer while our head is in motion, finally the strength and endurance of specific hip and trunk muscles in order to maintain the balance. In order to achieve better hand[7] eye coordination and to do so while in motion, our vestibular system needs to be highly tuned.

Despite its popularity, soccer also has a high injury incidence among players considering the financial and personal costs of injuries and delays in returning to competition, there is a growing interest in prevention of soccer injuries as to develop rehabilitation measures to promote safe return to competition. The key for improving the anaerobic power and performance lies in generating the highest possible force in short period of time[2] The Indian national team is currently ranked 132 out of 204 (9 March 2017) according to the Fédération Internationale de Football Association (FIFA). This ranking suggests that Indian playing standards need to be improved through a focus on the three key areas of physical, technical and tactical skills, as they have been reported to being related to successful football performance.[8]Thus,Anaerobic power assessment can help us as physiotherapists to devise a training plan for further power development. It has been postulated that the test should be conducted every few months to allow for changes in the athletes abilities during this time, and in order to constantly develop the best possible training regime for the individual's need.[6]

There are many studies that are done in soccer player to see the effect of balance training with various equipment's on athletic performance, but no study as per author's knowledge has been done on assessment of anaerobic power and static and dynamic balance among Indian Elite under 19 soccer players. Therefore, our purpose of study was to get a better insight of the parameter like Anaerobic Power and Balance among elite under-19 football players.

2. Aim and Objective

To assess Anaerobic Power and Static and Dyamic Balance in Elite Indian Under-19Football players.

3. Review of Literature

1. Michael F.Zupn, Alan W.Arata,LetitiaH.Dawson et al did a study "Wingate Anaerobic Test Peak Power and Anaerobic Capacity Classification for Male and Female" The purpose of this study was to develop a classification system for anaerobic peak power and anaerobic capacity for male and female NCAA Division I college athletes using theWingate Anaerobic Test(WAnT). 1374 male and 21 female athletes were tested ranging from the ages of 18 to 25 using the WAnT. Absolute and relative peak power and anaerobic capacity data were recorded. One-half standard deviations were used to set up a seven-tier classification system (poor to elite) for these assessments which could be used by athletes, coaches and practitioners to evaluate anaerobic peak power and anaerobic capacity in their athletes.[9]

2. Marie L. Pickerill, Rod A. Harteret al did a study "Validity and Reliability of Limits-of-Stability Testing: A Comparison of 2 Postural Stability Evaluation Devices" To compare postural stability measures between and within devices to establish concurrent and construct validity and to determine test-retest reliability for LOS measures generated by the NeuroCom Smart Balance Master and the Biodex Balance System. Three NeuroCom LOS variables (directional control, endpoint excursion, and movement velocity) and 2 Biodex LOS variables (directional control, testduration) where the outcome measures, Test-retest reliability ranged from high to low across the 5 LOS measures (intra class correlation coefficient [2,k] = 0.82 to 0.48). Pearson correlations revealed 4 significant relationships ($P < .05$) between and within the 2 computerized posturography devices ($r = 0.42$ to –0.65).[10]

3. NiyaziSıdkıAdigüzel, and Mehmet Günaya did a study "The Effect of Eight Weeks Plyometric Training On Anaerobic Power, Counter Movement Jumping and Isokinetic Strength in 15–18 Years Basketball Players" This study included 30 male Basketball player which were divided into two groups as: the experimental group (n=15) and the control group (n=15). The combine training (The plyometric training and techniques – tactics) was performed by the experimental group for eight weeks. In comparison between groups; it was found that exercise had significant effect on Peak Power (w/kg), Average Power (w), Average Power (w/kg) and Power Drop (w/kg) in experimental group ($p < 0.05$). While significant difference was found in Right leg 60° Hamstring and Quadriceps peak torque of experimental group ($p < 0.05$), there was no significant difference in pre- and post-training in Isokinetic leg power parameters of control group ($p>0.05$). In addition, significant differences were found in free jump, 120° Squat jump and Active jump values of Vertical jump parameters for experimental group ($p < 0.05$).[11]

4. 'Recovery Time on Limits of Stability from Functional Fatigue in Division II Collegiate Athletes'was done by Toshimitsu Ishizuka. It was a quasi-experimental, within-subject design. 18 Division II collegiate soccer athletes completed two testing sessions (fatigue and non fatigue conditions). The purpose of this study was to determine recovery timeline on limits of stability (LOS), as measured by the Biodex Balance System (BBS), from functional fatigue in collegiate athletes. They concluded that the Twenty minutes of functional activities are likely to have a negative influence on dynamic balance, with balance recovery occurring within 10 minutes after the cease of exercise in Division II collegiate athletes.[12]

4. Methodology:

- **Study design :** Experimental
- **Study setting :** D.Y Patil Physiotherapy sports lab
- **Study Sample:** Twenty twoUnder- 19 Elite Indian Football playersaged between 12 to 18 yrs.
- **Ethical clearance:** The Ethical clearance for the studywas taken from the Institutional Ethics committee of Dr. D. Y.

Patil University, Nerul, Navi Mumbai.

- **Inclusion Criteria:** No pain in extremities, Age between 16 to 19 yrs, Full range of motion, no swelling, good neuromuscular control (dribbling), pain free weight squats and no pain on single leg squat.
- **Exclusion Criteria :** Participants not fulfilling the inclusion criteria
- **Study duration :** 4months
- **Procedure:**

1. Monark cycle – For Anaerobic Testing: Prior to testing, body weight was collected using a Detecto electronic scale.The athletes were then fitted for their optimal seat height on a Monark 8248 or 874E weight ergometer. These ergometers were specially designed WAnT ergo meters, with instantaneous load and braking systems. The seat height was adjusted so that no more than 5 degrees of knee flexion was present when the leg was fully extended. Each subject was then given a 3 to 5 minute warm-up period on a Monark 868 cycle ergometer, striving to achieve a warm-up heart rate of 130 to 140 beats per minutes (bpm). Athletes who had not previously taken the WAnT were required to perform 2 or 3, 5-second high revolution spins during their warm-up. This was completed to acquaint the athletes with the pedaling speed requirements of the WAnT. The resistance load was set at 7.5 % of the subject's bodyweight within a 0.1-kg resolution of resistance range. Monark weight ergometers have a pin that is pulled (824E) or a lever (874E) that allows for instantaneous weight loading. All subjects were verbally encouraged to continue to pedal as fast as they could for the entire 30 seconds. Peak power and anaerobic capacitywere calculated and recorded in watts (W) and watts per kilogram body weight (W/kg-1)and heart rates were recorded in bpm.[9]

2. Balance master: For the assessment of balance, the subjects were assessed individually on the Balance Master, with the help of two tests for assessment of dynamic and static balance respectively.

Dynamic balance assessment: LOS (limits of stability) test was used. In this test, the subject had to stand over the stable force plate. The test began with initially adjusting and maintaining one's COG in the center alignment over the plate and then shifting the COG in the direction within the time duration towards the indicated direction. There are in all eight targets spaced at 45degrees interval around the body's COG as represented on the computer monitor. Subjects were instructed to "keep their body in a straight line, using their ankle joints at the primary axis of motion and to move toward each target as directly and quickly as possible." They were visually cued to each target separately, as independent subtests (8 seconds each). Target placement takes into account the conversion of the angular motion of leaning to linear movement of the COG represented on the screen. The two dependent measures recorded were directional control and Reaction time.[10]

Static balance assessment: For this purpose, modified CTSIB (Modified Clinical Test of Sensory Interaction and Balance) test was used. This test quantifies postural control under various sensory conditions. The subject stands over the stabilized force plate with hands aside the body. The first test was performed over a firm surface under two components, one with the eyes open and the other one with eyes closed, with each of them having three trials. The second test was performed over a foam surface under the same two components that were followed with the firm surface. The test was terminated if the subject's arms or feet were changed to other position.[10]

5. Data Analysis & Interpretation

1] Anaerobic Power

VARIABLE	*Mean ± SD*	*SLL*	*SUL*	*PLL*	*PUL*
Peak Power (W)	498.71 ± 175.26	155.20	842.22	425.47	571.95
Anaerobic Capacity (W/Kg)	7.75 ± 2.15	3.53	11.97	6.85	8.65
Avg Peak Power	360.10 ±109.47	145.54	574.67	314.36	405.85
Avg Anaerobic Capacity	5.60±1.36	2.94	8.27	5.04	6.17

*SLL (standard lower limit), SUL (standard upper limit), PLL (population lower limit) & PUL (population upper limit)

Table 1: The above table shows that mean for peak power (w) was 498.7091with a normal range between 155.20 to 842.22 while, the mean for the anaerobic capacity (w/kg) was 7.75 with the normal range between3.53 to 11.97.

2] Balance Assessment:

Static Balance

VARIABLE	*Mean ±SD*	*SLL*	*SUL*	*PLL*	*PUL*
Max speed	100.72 ± 22.98	55.67	145.77	91.11	110.32
COGFIRMEO	0.35 ± 0.11	0.12	0.57	0.29	0.40
COGFIRMEC	0.36± 0.11	0.15	0.57	0.31	0.41
COGFOAMEO	0.54± 0.14	0.26	0.81	0.47	0.60
COGFOAMEC	0.76± 0.21	0.35	1.16	0.66	0.85

*EO=Eyes Open, EC=Eyes Closed; ***SLL (standard lower limit), SUL (standard upper limit), PLL (population lower limit) & PUL (population upper limit)

Table 2: The above table shows that players had maximum sway velocity on foam surface with eyes closed with a mean of 0.76 (deg/sec) with a range between 0.35 (deg/sec) to 1.16 (deg/sec), followed by eyes open on a foam surface with a mean of 0.54(deg/sec)

VARIABLE	*Minimum*	*Maximum*	*Mean ± SD*	*SLL*	*SUL*	*PLL*	*PUL*
RTForward	0.41	3.22	0.98 ± 0.72	0.42	2.38	0.66	1.30
RTRtforward	0.08	0.81	0.53 ± 0.22	0.10	0.96	0.43	0.63

RTRt	0.38	1.25	0.69 ± 0.27	0.15	1.23	0.57	0.81
RTRtBack	0.08	0.95	0.55 ± 0.20	0.17	0.94	0.47	0.64
RTBack	0.18	1.46	0.61 ± 0.28	0.05	1.17	0.48	0.73
RTLtBack	0.16	1.15	0.67 ± 0.28	0.12	1.21	0.54	0.79
RTLeftForward	0.33	1.40	0.62 ± 0.28	0.06	1.17	0.49	0.74

Dynamic Balance– Reaction Time

RT=reaction time;*SLL (standard lower limit), SUL (standard upper limit), PLL (population lower limit) & PUL (population upper limit)

Table 3: The above table shows that the player took maximum time for initiation in the forward component with a mean of 0.98(deg/sec) with a normal range between 0.42(deg/sec) to 2.38(deg/sec) followed by Right direction and Left back direction component with mean of 0.69 and 0.67 respectively.

Directional Control

VARIABLE	*Minimum*	*Maximum*	*Mean ± SD*	*SLL*	*SUL*	*PLL*	*PUL*
DCForward	72.00	95.00	86.89 ± 5.96	75.21	98.58	84.21	89.58
DCRtforward	47.00	93.00	78.30 ±13.27	52.29	104.31	72.48	84.12
DCRt	75.00	93.00	87.25 ± 4.13	79.16	95.34	85.44	89.06
DCRtBack	42.00	91.00	71.95 ±15.95	40.68	103.22	64.96	78.94
DCBack	0.00	95.00	66.35 ±26.81	13.81	118.89	54.60	78.10
DCLtBack	49.00	91.00	70.95 ±12.80	45.87	96.03	65.34	76.56
DCLeft	67.00	92.00	81.10 ± 6.15	69.05	93.15	78.41	83.79
DCLtForward	63.00	94.00	79.60 ± 9.45	61.08	98.12	75.46	83.74

DC=directional control;*SLL (standard lower limit), SUL (standard upper limit), PLL (population lower limit) & PUL (population upper limit)

Table 4: The above table shows that players showed affection of directional control most in the Right component with a mean of 87.25 (deg/sec) with the normal range of 79.16(deg/sec) to 95.34(deg/sec) followed by Forward and Left components with mean of 86.89 and 81.10 respectively.

6. Discussion

In this study, the Anaerobic Peak Power and Balance were studied among Under-19 Elite Football players.The mean age of the players was 17 years with a minimum of 2 years of Elite football experience.

High fitness levels are required to cope with the ever-increasing energy demands of match play (Iaia, Rampinini, &Bangsbo, 2009). Anaerobic power, or anaerobic fitness, represents a local characteristic of a muscle that exists independent of blood and oxygen supply to that muscle; ability of the body's musculature to generate significant amounts of power and is considered to be a strong predictor of athletic success, especially when the physical preparation of elite players has become an indispensable part of contemporary professional soccer.[13]Sprint-type activities in particular are widely considered to be a crucial element of performance but only contribute a small proportion to the overall motion activity during competition; accounting for approximately 10% of the total distance covered over the course of matches (Carling, Bloomfield, Nelsen, & Reilly, 2008), with each sprint covering up to 30 meters[14] and mainly involving non-linear movements. Thus, acceleration, speed, and agility are all essential attributes that are influenced by the muscular strength and power of the athlete.[15] Many attempts have been made to elucidate the physiological demands of football match-play based upon estimates of distance covered and fluctuations in running intensity throughout a game (Bangsbo, Nørregaard, &Thorsøe, 1991; Mohr et al., 2003; 2008; Rampinini et al., 2007a) and such analysis have provided evidence that the distance covered at high intensity depends upon the playing position, standard of competition, physical capacity of the player, and physical performance of the opponent (Krustrup et al., 2003; Mohr et al., 2003; Rampinini et al.2007). Currently anaerobic power tests are implemented in both clinical and field settings to assess an athlete's capability to produce both power and speed in a short period of time or over a relatively short distance[16]

Anaerobic power capacity has been shown to be one of the essential components of physical fitness due to the dependency of many physical activities upon a significant amount of the total energy requirements from anaerobic energy sources (Skinner and McLellan, 1980) which can be seen as an accurate quantification of an individual's anaerobic capacity serves as an important valuation criteria for fitness/training assessment (Bouchard, Taylor and Dulac, 1982). Currently, Wingate cycle ergometry test is considered the "gold standard" to which most other tests are compared (Vandewalle, Peres and Monod, 1987). The most common test consists of a 30 second all-out ride on ergometer against a set resistance (typically based upon a percentage of a person's body weight). The subject's work output, the product of the resistance, and the distance covered (i.e., pedal revolutions completed), is subsequently converted to their power output (Bouchard, Taylor and Dulac, 1982). Many sports require high leg power and anaerobic capacities while some require absolute power or the highest power output possible, independent of body size, such as football linemen, power lifters, or hammer throwers, where the athlete must move his or her body across a field with a quick burst of energy, requiring a high relative peak power and anaerobic capacity. Also, football is a sport where body size, shape, body composition and level of fitness, play an important part in providing distinct advantages for specific playing positions particularly at the highest levels of performance where there is a high degree of player specialization (Bale, 1986).

The intent of our study was to attempt Wingate anaerobic power (WAP) test that could assess the anaerobic capacity in Elite Indian under-19 football players, an assessment of anaerobic performance and as a means to analyze physiological responses to supra-maximal exercise[23], Also, it has been found to be safe to assume that peak power which is a reflection of the ability of either the arms or the legs to produce high amounts of mechanical power and mean power reflects the endurance of the muscle groups involved in the test.(Stauffer KA. The comparison of the Max Jones With the vertical jump andWingate Cycle Tests as a method to access anaerobic power in female Division I College Basketball Players. University of Pittsburgh 2005.)

The major findings of the present study were that the Peak Power (W) of the footballers was found to be a mean of 498.71 with normal range of 155.20-842.22 and Peak Power (W/KG) of 7.7 with normal range of 3.53 – 11.97. A previous study done in American Inter-collegiate footballers, formulated a 7-bin category structure of peak power and anaerobic capacity (W and Wkg-1) for intercollegiate athletes, in which Peak Power (W) of <739 and Peak Power (W) of <9.57 as poor. According to this category structure, the Elite Indian Under-19 football players exhibited poor peak power as well anaerobic capacity but the players performance statistics show a range of higher limit being of about 842 for peak power which is categorized as Below Average considered better than the fair grade; 11.97 for anaerobic capacity, which could be categorized as Average on the considered structure. Thus, the Indian football players showed a wider range from below average to average for anaerobic performance on caparison to their American counterparts.

The possible reasons that could have contributed to the findings of this study include –A study on physiological profiles of Indian national club footballers study reveals that the mean values of height and weight were less than their International counterparts. Another research on anaerobic power through an alternative method of vertical jump found the difference between Asians and Non-Asians. Generally, Asians are smaller in size than Non-Asians (Ekblom, 1994), probably due to the genetic cause. It is also well established that ethnic and racial factors do affect the average body size (Hirata, 1966), which in soccer might determine a positional role most appropriate for the players (Ekblom, 1994). This study had similar findings.

Demonstrating a variation of physical performance in youth soccer players attributed to their maturation, earlier studies have shown that older players significantly outperformed younger participants in all tests[17] Also, in a study it was hypothesized that the process of bone accretion at the very early phase of puberty is more intensely stimulated by the combination of physical exercise and sexual impregnation than by one of these factors alone; possibly explaining the variation range found in the mean Peak Power as well as Anaerobic capacity among the under-19 Elite Indian football players.[18] These findings are supported by a similar study where differences in the explosive power (as assessed by various jumps) were found to be moderate between 2 groups with respect to body size and composition.[19]Furthermore, it has been demonstrated that body composition has the greatest impact on anaerobic power and suggest that Body Fat can also negatively influence cycling anaerobic performance.[20]Supporting our study findings, another research that studied Physical and Physiological Characteristics of Elite Indian National Football Players found that professional Indian footballers were not aerobically fit enough when compared to other international players and possessed a greater percentage of body fat than other professional footballers, suggesting that Indian players were not meeting physical and physiological standards expected for professional international footballers.[21]

Studies have also shown that various motor abilities and physiological parameters to be less in case of Indian national club footballers as well as Indian national players which were attributed to genetic factors that determine body size and also to some extent physiological qualities, concluding lesser physical and physiological qualities of Indian soccer players as compared to their International counterparts may be due to genetic influence and also the difference among the players of various playing positions, their activity in the game and difference in their training regimen.

A probable factor that has been earlier discussed in literature is the equipment itself. Since power is a function of the force applied to the flywheel (resistance setting) and the velocity of pedalling, there exists an optimal combination of these two factors where maximal power values are obtained. Basic information on the force-velocity relationship during muscular contraction would suggest that the greater the resistance at the flywheel, the slower the maximal pedalling rate.[22, 23, 24, 25, 26,27.]

Balance in football players:

Balance is considered to be one of the most basic required abilities in everyday life and sports (Martin et al 1991). It consists of a complex network of neuronal links, centers as well as central and peripheral feedback mechanisms (Gayton 1991). The sources of sensory stimuli to the posture control system originate from the optical, the vestibular and the somatosensory systems including into the Balance control (Nashner 1982).[28]Postural control (or balance) can be defined statically as the ability to maintain a base of support with minimal movement and dynamically as the ability to perform a task while maintaining a stable position[29]. Posturalchanges are different according to the sport practiced [30]While static balance comprises the activities that has the center of gravity stable, in dynamic balance activities the center of gravity is needed to change continually Many studies have shown the advantageous effectProprioception training can have on soccer players (and generally athletes) is injury prevention and reduction (Malliou et al 2004), while poor balance has been correlated to increased risk of injury in athletes (McLeod et al 2009). Good balance seems to be effective in neuromuscular control performance (Zech et al 2010), while being a distinctive characteristic of high level soccer players at the same time (Paillard et al 2006). Soccer is a sport requiring a great amount of technical skills as well as static, semi-dynamic and dynamic balance. Most of these skills, such as passing, juggling the ball in the air, dribbling or receiving the ball, are achieved through standing on one leg. Balance plays a pivotal role in the harsh conditions, such as pushing opponents, slippery grass, changes to the ball's orbit, moving, etc facing footballers during a football game. This suggests that improved balance, or underlying postural control, may elicit an improved rate of force development in the muscles (Hyrsomallis, 2011).

Athletes usually had superior balance ability than non-athletes[31] and athletes with the higher the level of competition had more stable posture than the lower the level of competition (Paillard and Noe, 2006). The experienced athletes generally used specific sensorial knowledge in organizing posture in relation with the requirements of each discipline (Perin et al., 1998, Vuillerme et al., 2001).

Also, it has been demonstrated that injuries to the knee and ankle are common in today's athletes, and they are most prevalent in cutting and jumping sports such as volleyball, football, soccer and basketball (Griffin, 2000). Non-contact mechanisms, such as landing from a jump, frequently lead to joint or ligament injuries that are probably the result of strength deficits or impaired stability and balance (Wikstrom et al., 2004). Some literature evidence suggests that a superior balance among experienced athletes is the result of repetitive training experiences that influence motor responses (Balter et al., 2004) while others argue that superior balance is the result of training experience.Therefore, it is suggested that changes in both sensory and motor systems influence balance performance.

The playing of football requires a unipedal balance to perform different technical movements such as shooting, dribbling, and passing (Paillard et al., 2006). The balance on the supporting foot is essential to shoot as accurately as possible (Paillard et al., 2006) which in our study was the left foot which possibly explains better performance of the players on the left sided components on the dynamic balance testing as compared to their dominant (Right) foot. On the other hand, football training brings out to a strong visual dependence in relation to the ball, opposing players and other team members, as well as the postural proficiency which has been shown as one of the criterion for performance or ability in conditions specific to the playing of football (Paillar et al., 2006). Maintaining balance has been proven to depend upon physical fitness factors such as muscle strength and anaerobic capacity (Era and Heikkinen, 1985; Nguyen et al., 1993) explaining a possible factor that could have affected their balance performance on the assessment tests.

7. Conclusion

Anaerobic Peak Power (W) for professional Indian under-19 football players was 498.70, while the mean for the Anaerobic Capacity (W/Kg) was 7.75. On Balance assessment, players had maximum sway velocity on foam surface with eyes closed with a mean of 0.76 (deg/sec) with a range between 0.35 (deg/sec) to 1.16 (deg/sec), followed by eyes open on a foam surface with a mean of 0.54 (deg/sec). Reaction Time of players was found to be affected most in the forward component with a mean of 0.98(deg/sec) followed by Right direction and Left back direction component with mean of 0.69 and 0.67 respectively while the players showed lack of directional control maximum in the Right component with a mean of 87.25 (deg/sec) followed by Forward and Left components with mean of 86.89 and 81.10 respectively.

8. Future Implications

Our study could be used as a pilot study towards further in-depth assessment of Anaerobic Power and Balance of Indian Elite Football Players for their better athletic performance and may be used as an outcome measure to monitor their progress on their training regimes. It could also be used as a first step towards developing normative values for Elite Indian under-19 Football players for parameters like Anaerobic power and Balance.

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