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The Relationship between Anthropometric Features and Dynamical-Statical Balance

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Abstract

Aim: This study aims that searching whether hemispheric differences do any effects into dynamical-statical balance levels and anthropometric features or not on the spotters who had active sport-life.

Methods: 98 spotters who have done exercise at least 6 days and 2 hours each day have been included in the search. Anthropometric features were measured of study group. Dynamical-statical balance levels were measured by using KAT 2000 (OEM Medical, Carlsbad, California, USA) balance system. Evaluated databases were analyzed using by SPSS 20 for Windows. P significance was taken as 0.01 and 0.05.

Results: There were no statistical significant difference between right-handed, left-handed or two-handed active sporters and dynamical-statical balance and anthropometric features on all sportsmen/women ($p<0.05$).

Conclusion: Two-handed sporters had more advantages as to handedness. Tiredness does not affected by side-using handed. Fatigue does affect statical balance. There are no significant differences between right-handed and left-handed according to balance.

Keywords Anthropometric features; Dynamical-statical balance values; Competitor sporters

Introduction

Balance is the coordination of posture and muscle activity [1,2]. Balance is the ability to keep the body in balance while the person is in various positions. At rest and during activity, the displaced postural adaptation in the gravitational center that affects the body [3]. Vestibular, proprioceptive, and visual databases are parts of the central nervous system [4].

According to Horrak, equilibrium is the ability to control the body with minimal muscle activity in statical and dynamical positions, against Body Center of Gravity (BCG) changes [5,6]. This balance of care and maintenance of the BCG on the support surface is the appropriate neural and musculoskeletal coordination. At the medical literatüre, lateralization is defined as the use of one hand in preference to other or the dominance or superior development of one side of the bofy or brain.

Investigating the relationship and interaction between Dynamical Balance (DB) and Statical Balance (SB) levels on some anthropometric properties, which are important sensory and physical factors in determining and maintaining the sportive performances of contest athletes in active sport-life is concern point of this study. It is being investigated whether the athletes who go on active sport-life cause a difference between their SB and DB levels and some anthropometric features, which are important sensory and physical factors in achievement, performance, ability and skill in hemispheric differences and rightness, leftism and both fathers.

Materials and Methods

At the Institute of Health Sciences of Ataturk University, this study was conducted on 97 male athletes who were exercising for at least 2 hours a day for at least 6 days a week with approval dated 31-12-2010 and numbered 6.1/20. Anthropometric properties, dynamical and statical equilibrium values were obtained with the following measures. Balance is more important physical factor as competitor sportmen than other branches.

Height and body weight measurements; The subjects were weighed with a bare leg and minimal clothing in a sensitive 20 gm canteen (Angel). Height measurements were made with the Holtain brand calipers so that the subjects were standing and standing in a vertical position while touching the scalpel's scalp over the scalp. It was read and recorded with precision for one minute. Sitting height, arm and leg length were measured with tape meter. The "Body Mass Index", which describes the weight distribution according to the length of the body, is calculated from the obtained male and body weight values (BMI=Body weight (kg)/Height (meter)^2).

The measurements are measured in 6 areas, namely the chest meter, the rib, the abdomen, the hip, the femur, the knee and the calf. Diameter measurements were measured in 9 areas, including shoulder, chest, breast depth, bi-iliac, bi-trochanteric, elbow, wrist, knee, ankle with Holtain brand anthropometric set.

Percent body fat According to Sloan and Weir's formula for men; Body Density (gm/ml)=1.1043-(0.00133xFemur DKK)-(0.00131xSubscapular DKK), Body Fat Percentage (in%)=(4.57/density-4.142)×100.

A sitting-lying test was used to measure flexibility, with a resilient platform. The subject flexes his body forward as far as possible and the most distant point is 1-2 sec. And this point was recorded as the test result. Measurement that were stable and without kinetic movements were applied for SB as dynamometer. KAT 2000 were used for DB paramaters.

Measurements were made using leg dynamometer. After the subjects placed their legs on the dynamometer pedestal at the knees bent, the arms were stretched, the back flat and the body slightly inclined forward, measurements were done.

Equilibrium tests were performed using a new version of the Stabilometer instruments KAT 2000 (OEM Medical, Carlsbad, California, USA). The test protocol was carried out using the KAT 2000 Instruction Manual.

As to search the relationship between balance and blood molecules, some blood samples were collected from all sportmen. FSH (Folicule Situmulatin Hormone), LH (Luteinizing Hormone), Prolactin, Growth Hormone, ACTH (Adreno Cortico Tropin Hormone), TSH (Troid Stimulating Hormone), ADH (Antidiuretic Hormone), Oxytocin were searched in the blood sample of all sportmen. These were the hormones that may be important blood paticipants for balance. All studies were conducted on the voluntary students of Sport Science Academy by the maintained all ethical consent forms.

The obtained data were analyzed in the SPSS 20.0 for Windows©. The minimum, maximum and standard deviation values of all data obtained were calculated. The normality test of the databases was performed with the Skewness test. The difference between groups with normal distribution was determined by One Way Anova test. The difference between the groups with no normal distribution was analyzed by the Kruskal Wallis test. The relationship between the databases were also examined with Pearson Correlation. The level of significance was 0.01 and 0.05.

Results

The mean age of sportsmen was 21.3 ± 3.7 year, the mean sport age was 8.3 ± 3.9 year, the mean body weight was 69.7 ± 10.8 kg and the mean height was 176.1 ± 5.9 cm. Significant correlations were found between Static Balance (SB) and Body-Weight (BW), height and somatotype (Endo, Meso and Ekto) values ($p<0.01$), $p<0.01$ for age, BW and somatotype values and $p<0.05$ significance level for height, There was a correlation between BW values of $p<0.01$, age, endomorph and mesomorphic values at $p<0.05$ significance level. Significant correlation was found between SB and Body-Surface (BS%) and BMI values at $p<0.01$ significance level and $p<0.05$ significance level between PP and AP values at $p<0.01$ significance level between clockwise dynamic balance and BS %, BMI, AP and PD values and $p<0.05$ was found to be related to significance level, $p<0.01$ significance level in clockwise dynamic balance and body surface (%) values, $p<0.05$ significance level in BMI and PD values were found to be significant. $p<0.01$ between SB and clockwise dynamic balance and anti-clockwise dynamic balance values, $p<0.01$ between clockwise dynamic balance and anti-clockwise dynamic balance It was observed that there was a relationship at the level of significance.

There was a significant positive correlation ($p<0.01$) between balance values and body weight. As the body weight increases, the balance scores increase, which can be interpreted as the body weight increases and the balance deteriorates. Statical equilibrium ($p<0.01$) and clockwise dynamical equilibrium ($p<0.05$) values have a correlation with height values. It can be said that the balance has deteriorated as the length increases. It is seen that there is a correlation between the balance values (statical equilibrium ($p<0.01$, clockwise dynamical equilibrium ($p<0.01$) and anti-clockwise dynamical equilibrium ($p<0.05$)) and sitting height. (Statical equilibrium ($p<0.01$, clockwise dynamical equilibrium ($p<0.05$) and anti-clockwise dynamical equilibrium ($p<0.05$)) and arm length were significantly correlated with each other and equilibrium was deteriorated as the arm length increased. It is seen that there is a correlation between limb strength and balance ($p<0.01$), clockwise dynamical equilibrium ($p<0.01$) and anti-clockwise dynamical equilibrium ($p<0.05$)) and leg strength is disrupted Equilibrium values (statical equilibrium ($p<0.01$, clockwise dynamical equilibrium ($p<0.01$) and anti-clockwise dynamical equilibrium ($p<0.05$)) and BMI were found to have a correlation with increasing BMI. There was a correlation between BS(%) ($p<0.01$). The balance is deteriorating as BS (%) increases.

There was a significant ($p<0.01$) positive correlation between the balance values and the breast, rib, abdomen, hip and calf circumference measurements. As the chest circumference measurement increases, the balance points also increase. That is, as the length of the chest circumference increases, the balance is distorted. Statical equilibrium, clockwise dynamical equilibrium and anti-clockwise dynamical equilibrium ($p<0.01$) values were found to be positively correlated with breast, rib, abdomen, hip and calf environmental values. In this context, it can be said that the balance is deteriorated as the environmental length increases. It is seen that there is a correlation between femur and knee circumference measurement values with equilibrium values (statical equilibrium ($p<0.01$), clockwise dynamical equilibrium ($p<0.01$) and anti-clockwise dynamical equilibrium ($p<0.05$)). As the femur and knee circumference measure increases, the balance is distorted.

There is a significant ($p<0.01$) positive correlation between clockwise DB and chest diameter and chest depth. That is, as the diameter of the chest and the depth of the chest increase, the balance is distorted. There is a significant ($p<0.05$) negative correlation between anticlockwise DB and ankle diameter. The balance is deteriorating as the ankle diameter decreases. There was a significant ($p<0.01$) positive correlation between SB and chest diameter, chest depth and bi-trochanteric diameter, while there was a correlation between SB and bi-iliac diameter ($p<0.05$). Namely, as the chest, bi-trochanteric diameter and chest depth increase, the balance is distorted. Similarly, when the bi-iliac diameter increases, it is understood that the balance is distorted.

After the measurement of FSH (Folicule Situmulatin Hormone), LH (Luteinizing Hormone), Prolactin, Growth Hormone, ACTH (Adreno Cortico Tropin Hormone), TSH (Troid Stimulating Hormone), ADH (Antidiuretic Hormone), Oxytocin, all results were evaluated as separately for each sportmen. All hormonal measurement were in range of physiological changes as a normal.

Discussion

Balance is divided into two parts as statical and DB [7]. Tittel describes the SB as the ability of an individual to maintain his/her

position while being above the support of the center of gravity only for a certain period of time and DB as the control of the body during the application of an action [4].

Maintaining balance and a stable posture is an integral part of most motion applications [8]. Stability control is a complex motor skill that involves the planning and implementation of flexible motion patterns as well as the integration of sensory inputs [9]. The integration of information from sensor systems can be used to maintain space posture control, orientations [10]. However, sensory inputs are not alone in maintaining postural control. The integrity of the postural stability muscle mass depends on the efficiency of the systems in the central nervous system and the complete neural pathways for motor control.

The necessary condition for the continuation of the equilibrium is that the vertical projection of the body center of gravity lies within the support surface. Anthropometry is a systematic technique that classifies the objective properties of the human body according to their dimensions and constructional qualities by means of certain measurement methods and principles [11]. It explains the shape and components of the human body structurally and objectively. In this way, it helps to provide basic data on the development of human body and athletic performance [12]. It is a technique for measuring body proportions and exposing proportional expressions. For the evaluation of general and regional structures of the body, the body's diameter, circumference, length and subcutaneous fat thickness should be used [13].

The well-defined state of a person's balance state is the angular displacement of the center of gravity from the gravitational vertical line. In that case, the gravitational oscillation center is defined as the angle formed by the first line coming from the center of gravity center from the center of the support surface and the second line extending vertically from the support center. It is also not true that the ideal body type and anthropometric properties are considered as the only norms that determine spudal success and performance. Human physical structures are different from each other. At the end of long studies, human structure has been classified according to the permanent characteristics of different types of life and factors, meaningful relationships between somototiors and motor and psychic abilities have been determined. Thus, it is possible to determine in advance the basic items such as motor skills and psychic structure that make sportive success through somatotypes which show little change depending on age, and to determine in advance which of the individual sports branches will be in better harmony. For this reason, sport anthropometrical measurements has been fully incorporated into sports science in recent years.

The balance is essentially the coordination of muscle activity [14]. We can emphasize that the balance of control and coordination of talent and skill, which is a consequence of the sense of movement and coordination with the neuromuscular system in the sense of proprioception; the ability to discipline and control the body in dynamical and statical situations. It is also important to maintain the body center of gravity in the face of changing conditions and momentary effects, as well as to minimize the risk of falls and injuries, as well as the athletic performance of the athletes. Each sport branch has its own balance level. Maintaining the most suitable body position against dynamical and statical movements and effects is the success and skill scale in most sporting branches. And this scale can also cause differences between the athletes in terms of balance, sporting ability, performance and skill.

Many organ and tissues work for balance as a in harmony. Labyrinths, eyes, deep sense sensors, central nervous system is the part of balance system. Especially, many molecules in blood divines (seruloplasma, total blood) affects the balances. When the evaluating the balance system, all blood molecules must be considered. The ability to perform sportive activities at professional level and even participation at national and international competitions at the elite level is possible only if the body composition possessed can be used effectively and efficiently.

Limitations

There were some limitations of our study. Proposals made in line with the results obtained from this study; as a result of this study, it may be advisable to consider hand preference in talent selection. The education methods and techniques that a large majority of the world's population are based on are planned according to the right, and the training method should be developed according to those who prefer to use the left side. It is recommended that both transfers be planned and scheduled under control. Training can be planned to improve the balance ability of right, left, and both fifty athletes.

This working group can be made by duplicating the number of both hands both right and left and both hands. According to sports branches, lateralization can be considered as a balance effect. After measuring the dynamical and statical balance, the SB and DB of the dominant foot and the non-dominant foot can be compared. Balance effect of acute exercise on hand and foot preference can be examined. All these studies can be done for female recruits, too.

Conclusion

When the anthropometric gauge is integrated with the characteristics of the sport branches, it is a known fact that it affects the performance of the athletes. Performance and skill formation is releated body height, length of arms, legs and other body parts as well as the basic motoric properties, neuro-muscular coordination and sport. On the target way of these study group, there is new and updated balance tests and also applying these test for sportwomen. Anthropometric features were is seeming to direct the SB and DB at the active sportmen.

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