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The Effect of Postural Anomalies on SAQ, Muscular Strength and Flexibility Performance of the Semipro Soccer Athletes

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Abstract**—**The objective of the study is to investigate the effect of a footballer's postural on selected physical fitness components. Twenty-one (21) subjects of the university male footballers under the Sport Excellence Center programme were photographed using qualitative analysis. The postural variables were stratified manually into normal and anomalies group and their flexibility, strength and SAQ performance were compared using the Mann-Whitney Test. The AROM assessment and SAQ test reported no significance difference ($Z=-.398$, $p=0.711$, $p>0.05$), similar to the lower body strength was shown with no significance different ($Z=-.493$, $p=0.640$, $p>0.05$). In contrast, only 1 RM strength test for the upper body strength test shown with a significance different ($Z=-2.537$, $p=0.009$, $p<0.05$) the. Hence, the Body posture among the football athletes with anomalies does not influence selected physical fitness components. This study has proven, that postural anomalies will not affect or influence the physical performance the respective athletes.

Keywords**—**Postural Analysis, Anomalies, Flexibility, Strength, SAQ.

I. Introduction

GENERALLY, postural abnormalities/anomalies can increase the risk of musculoskeletal and orthopaedic injuries after long-term episodes of training [1]. However, there is lack of evidence to claim that athlete's postural anomalies can jeopardize their performance. To name a few example, there is a study on postural abnormalities of soccer player and related injuries [2] where it only focuses on the relationship of posture and injury and another study on postural control in thirteen (13) year old soccer players [3] where the study solely focuses on postural control on stability performance of soccer athletes and nothing related to strength, flexibility, speed and agility performanceThe arguments whether an athlete's postural anomalies may impair his/her performance are still debated by sport scientists until today. Thus, this study will investigate the relationship between the footballer's postural anomalies and his/her performance. The footballer's postural anomalies will be assessed through qualitative analysis and will be linked with the result of the footballer's performance based on the three (3) performance components which are flexibility (AROM), strength and SAQ.

Postural assessment is defined as *the process of evaluating a patient's positioning of his or her body and limbs to determine directly observable physical abnormalities* [4]. It is used to assess any flaws or abnormalities of a postural contour and function. Usually health practitioners used postural assessment to assess individuals that suffer from musculoskeletal injury prior to the intervention program. They found out that postural anomalies had a high association or correlation with muscle ROM and wasting after a series of chronic injury.

However, having asymmetry body posture is a normal thing among the athletes. Many athletes are having an imbalance of muscles mass and size based on their specific roles in the sports. For instance, soccer athletes in the position of a winger tend to have a higher muscular mass and strength in their lower body particularly in quadriceps and gluteus muscles compared to the upper body. This imbalance of muscle mass can be obtained when the postural assessment from sagittal plane is conducted. Indirectly, this has generate more interest on related topic such as an athlete's postural imbalance has any similarity with sedentary people's assessment. Generally there are still many players/footballers having an abnormal posture. If posture is really important in order to enhance performance, then why are there still athletes with postural anomalies? Is posture anomaly an important indicator in sport performance? Do the coaches need to emphasize more on the postural exercise regime in order to overcome thus? These are the questions that need to be uncovered and answered in this study.

In short, this study will investigate a relationship between a footballer's postural anomalies and the his/her performance on three (3) specific components, which are (a) Flexibility or Active Range of Motion (AROM), (b) Strength, and (c) Speed, agility and quickness (SAQ). The footballer's postural anomalies will be assessed through qualitative analysis and

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will be linked with the result of the his/her performance based on the three (3) components, flexibility (AROM), muscular strength and SAQ.

II. Methodology of Study

A. Sample and Research Design

This study will use a single measure and descriptive research designed in order to compare the two groups. The purposive method of sampling of twenty-one (21) subjects from the varsity male footballers under the Sport Center Excellence (PKS) program were conducted in this study. Their age range between 18 to 25 years. Subjects recruited were actively involved in domestic tournaments and leagues by having at least one match every week. All varsity football players in the study are students from Universiti Teknologi Mara (UiTM) Shah Alam.

There were four tests in this study which consisted of 1) Postural assessment using the postural grid, 2) AROM test using the goniometer, 3) Upper and lower body strength by having 1 repetition maximum on bench press and leg press or plate loaded squat press machine and 4) SAQ components with SAQ tests.

B. Testing and Measurement

a) Postural Assessment

This test required the subjects to be photographed in an anatomical position in four different planes such as: Frontal, Sagittal left and right and Posterior Planes. The subject was then analyzed using a qualitative method where postural anomalies would be detected and then categorized manually. A standard template that pasted the picture analysis with all parameters set up was included in the template analysis. All subjects would be categorized into normal and abnormal group based on the result of the postural assessment.

b) AROM Assessment

The AROM assessment was done by assessing the participant's active range of motion of their lower limbs by using a goniometer. The measurement includes specific lower body regions such as hip – flexion, extension, abduction, adduction, lateral and medial movement and knee – extension and flexion. The main purpose of doing lower body flexibility test is because these varsity football players normally their uses lower body movement more actively compared to their upper bodies during the games [5].

c) 1 RM Bench Press and Leg Press Test

The 1 repetition maximum test is done to measure the strength component of the varsity football players. This test aimed to measure the upper body and the lower body strength of the players. The equipment used in this test was an incline bench press (upper body strength measurement) and plate loaded squat press (lower body strength measurement) [6]. There is a study that examines the reliability of 1-Repetition Maximum estimation of the upper and lower body muscular strength measurement of the untrained middle age Type 2 Diabetic (T2D) patients. What they found is that the test-retest reliability was excellent for all measurements. The study findings suggest that estimation of 1-RM is reliable for upper and lower body muscular strength measurement of the untrained middle age T2D patients [7].

d) Illinois Agility Test

This test was able to measure the elements of speed, agility and quickness of the varsity football players. The test requires the participants to run as fast as possible within the stations where the players would be tested for their alertness, agility by running or striding in a valgus manner as well as their sprinting capabilities. The reliability would depend on how strict the test was conducted and the individual's level of motivation to perform the test. In terms of validity, there are published tables to relate results to a potential level of fitness and the correlation is high [8]. All tables and figures you insert in your document are only to help you gauge the size of your paper, for the convenience of the referees, and to make it easy for you to distribute preprints.

C. Data Collection Procedure

The results gathered were tested based on the varsity footballer's posture and the footballer's performance in the three (3) components consisting of flexibility, strength and SAQ. An alpha of $p=0.05$ was set for all statistical tests. The data would first be analyzed using a descriptive analysis to show the result of total anomalies gathered from the observation during the postural assessment earlier. The data were then categorized according to respective classes; normal group and anomaly group. To ascertain whether the result of the three (3) tests had shown any significance, the two (2) groups were compared using a nonparametric statistical test, which was the Mann-Whitney U statistical test since the subjects were lower than thirty (<30) and according to Central Limit Theorem (CLT) this would lead to a non-normal distribution

III. Result

A total of twenty-one (21) varsity football players were tested for this study and it was found that a total of 10 varsity footballers were diagnosed with forward head. In addition, there were five (5) cases of forward shoulder, six (6) cases of elevated or dropped shoulder, nine (9) cases of adducted shoulder, one (1) case of abducted shoulder, one (1) case of khyposis, two (2) cases of lordosis, three (3) cases of lateral pelvic tilt, two (2) cases of anterior pelvic tilt, two (2) cases of external tibial torsion, one (1) case of flexed knee, and eight (8) cases each for knee valgus and pronated foot. Overall, there were a total of 58 anomalies detected among the subject in this study.

A. Postural Anomalies Stratification

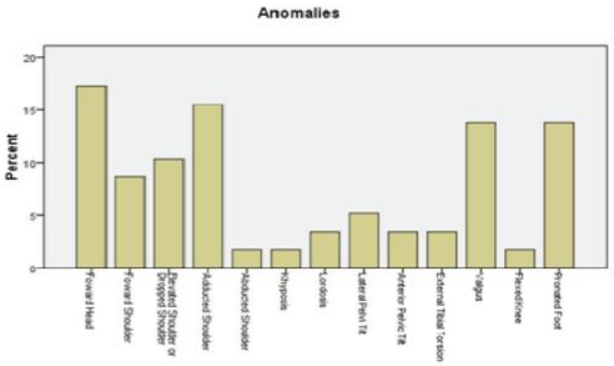

Fig. 1 The above graph obtained the percentage of postural anomalies that been diagnosed and stratified amongst all samples

Based on the descriptive data, most of the anomalies detected among the varsity football players were forward head, forward shoulder, knee valgus and pronated feet. Most anomalies detected in both regions, which are the upper body and the lower body region. Therefore, we had decided to compare the upper body anomalies with upper body tests, while the lower body anomalies with the lower body tests. The three (3) tests were conducted, in order to measure the varsity footballer's performance flexibility (lower body only), strength, agility and quickness (upper body and lower body) performance

B. Flexibility

For the AROM or flexibility assessment, we only measured the lower body regions as they are more related to the motion applied in football where majority of movement is in the lower body region. To achieve the objective of this test, 2 groups were compared which were the 'NAD (no anomalies detected)' group or normal group and 'lower body anomalies' group using the Mann-Whitney U statistical test. The results of related variables are presented justified in table I.

TABLE I
COMPARISON BETWEEN THE NAD GROUP AND THE LOWER BODY POSTURAL ANOMALIES GROUP

Flexibility	*Groups*	*Median*	*Mann-Whitney U*	*P value*
Hip Flexion Dominant	NAD Lower Body	128.0000 135.0000	40.0000	0.496
Hip Flexion Non Dominant	NAD Lower Body	119.5000 123.0000	37.5000	0.454
Hip Extension Dominant	NAD Lower Body	21.5000 25.0000	42.0000	0.374
Hip Extension Non Dominant	NAD Lower Body	18.5000 18.0000	49.5000	0.716
Hip Abduction Dominant	NAD Lower Body	45.5000 43.0000	41.0000	0.339
Hip Abduction Non Dominant	NAD Lower Body	40.5000 38.0000	34.0000	0.144
Hip Adduction Dominant	NAD Lower Body	26.0000 28.0000	49.0000	0.685
Hip Abduction Non Dominant	NAD Lower Body	23.0000 25.0000	53.5000	0.930
Hip Medial Rotation Non Dominant	NAD Lower Body	47.5000 45.0000	52.0000	0.849
Hip Medial Rotation Non Dominant	NAD Lower Body	40.5000 36.000	50.0000	0.743
Hip Lateral Rotation Dominant	NAD Lower Body	45.0000 44.0000	51.0000	0.795
Hip Lateral Rotation Non Dominant	NAD Lower Body	38.0000 42.0000	41.0000	0.339
Knee Extension Dominant	NAD Lower Body	7.5000 8.0000	53.0000	0.900
Knee Extension Non Dominant	NAD Lower Body	6.0000 7.0000	37.0000	0.206
Knee Flexion Dominant	NAD Lower Body	143.5000 140.0000	48.5000	0.666
Knee Flexion Non Dominant	NAD Lower Body	137.5000 135.0000	42.5000	0.393

Table I covers the median value and P value of the comparisons between the NAD group and the lower body postural anomalies group. The comparisons were done in order to identify which variable had shown a significant difference that could change the flow or findings of the study.

C. Strength

For the 1 repetition maximum test, the researcher measured both the upper and lower body regions since both the upper body and lower body strength were tested. Two sessions (Upper body 1 RM test and Lower body 1 RM test) were conducted. For the upper body 1 RM session, 2 groups were compared which were the 'NAD' (no anomalies detected or no anomalies in the upper body) group or 'normal' group and the 'upper body anomalies' group using the Mann-Whitney U statistical test. The second session were slightly the same except it involved the lower body 1 RM test of 2 groups which were the 'NAD (no anomalies detected or no anomalies in the lower body)' group and 'lower body anomalies' group using the same statistical test, Mann-Whitney U. The results of related variables are presented in Table II.

TABLE II
COMPARISON BETWEEN THE NAD GROUP AND THE POSTURAL ANOMALIES GROUP

Strength	*Groups*	*Median*	*Mann-Whitney U*	*P value*
Upper Body Test	NAD	.925000		0.007
	Upper Body	.833000	13.0000	
Lower Body Test	NAD	4.847500		0.622
	Lower Body	4.635000	37.5000	

Table II covers the median and P value of the 2 comparison tests between the NAD group and upper body anomalies group for the upper body 1 RM test and the NAD group with the lower body postural anomalies for the lower body 1 RM test of the varsity football players.

D.Speed Agility and Quickness (SAQ)

For the Illinois test we categorized both upper and lower body regions as during agility upper body and lower body posture will play a big role in performance which will be thoroughly explained in the discussion section. Thus for this test, the two (2) groups will be categorized into 'less than two (2) postural anomalies' and 'more than two (2) postural anomalies' group and analyzed using the Mann-Whitney U statistical test. The result is then justified in table 3 on the related variables.

TABLE III
COMPARISON BETWEEN 'LESS THAN 2 POSTURAL ANOMALIES GROUP' AND 'MORE THAN 2 POSTURAL ANOMALIES GROUP'

Agility	*Groups*	*Median*	*Mann-Whitney U*	*P value*
Illinois Test	Less than 2 anomalies	15.775000		0.526
	More Than 2 Anomalies	15.730000	40.500	

Table III covers the median value and P value of the two (2) groups, comparing between less than two (2) postural anomalies group and more than two (2) postural anomalies group of the varsity football players in identifying which variable shows a significant difference that could change the flow or findings of the study.

IV. DISCUSSION

The results also showed that there was no significant difference in the AROM flexibility fitness of the respective lower body regions between normal (NAD) and postural anomalies group. Therefore, it can be implied that an anomaly in the posture may not cause a decrease in flexibility or its range of motion, and inhibit flexibility performance. However, such anomalies may contributing injury as postural anomalies have always been related to injuries such as sore muscles, spinal curvature, subluxations, blood vessel constriction and even nerve constrictions [9].

For strength training, the results showed that there was a significant difference in the upper body strength test between the NAD group and upper body anomalies group. This is an interesting finding, which shows that postural anomalies do have an effect on the upper body strength performance. The finding however was not conclusive because in the next test, which involved the testing of 1 RM in the lower body between the NAD group and the lower body anomalies group no significant difference found between them. The reason why there was a significant differences in the upper body 1 RM strength between the two group was probably because they did not put too much effort in conditioning the upper body. Based on the 1 RM test of the upper body most of the subject stand in the average group when compare to the norms of their relative strength. The amount of strength enhancement is dependent on the muscle actions used, intensity, volume, exercise selection and order, rest periods between sets, and training frequency rather than just having a bad posture [10]. Therefore the logical explanation is without the presence of good upper body conditioning, a proper and good posture will become an important in contributing towards the upper body strength performance.

Based on the article written by Clark and Russell from the National Academy of Sports Medicine: Performance Enhancement (2007), to have a good or optimum performance in speed, agility and quickness, athletes need to have the ability to perform proper mechanics or posture in each region of their body during executing the action [11]. The researcher's first assumption was that postural anomalies would affect the ability to perform proper mechanics in order to achieve a good performance in terms of speed, agility and quickness. The findings however did not support the assumption, as there were no significant differences found in postural anomalies and their effects on speed, agility and quickness. The reason for this is probably that although the subjects have several anomalies, none of them appeared have any severe or chronic problem. Therefore this had allowed them to actually execute a proper form of technique during the SAQ test.

V. CONCLUSION

Overall, the relationship of postural anomalies with selected performances is not viable and the study has supported all hypotheses except for one (1). Thus this shows that postural anomalies may not affect soccer performance on flexibility, strength, speed, agility and quickness components. Although postural anomalies may not affect performance, the probability of the development of chronic injuries is still high.

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