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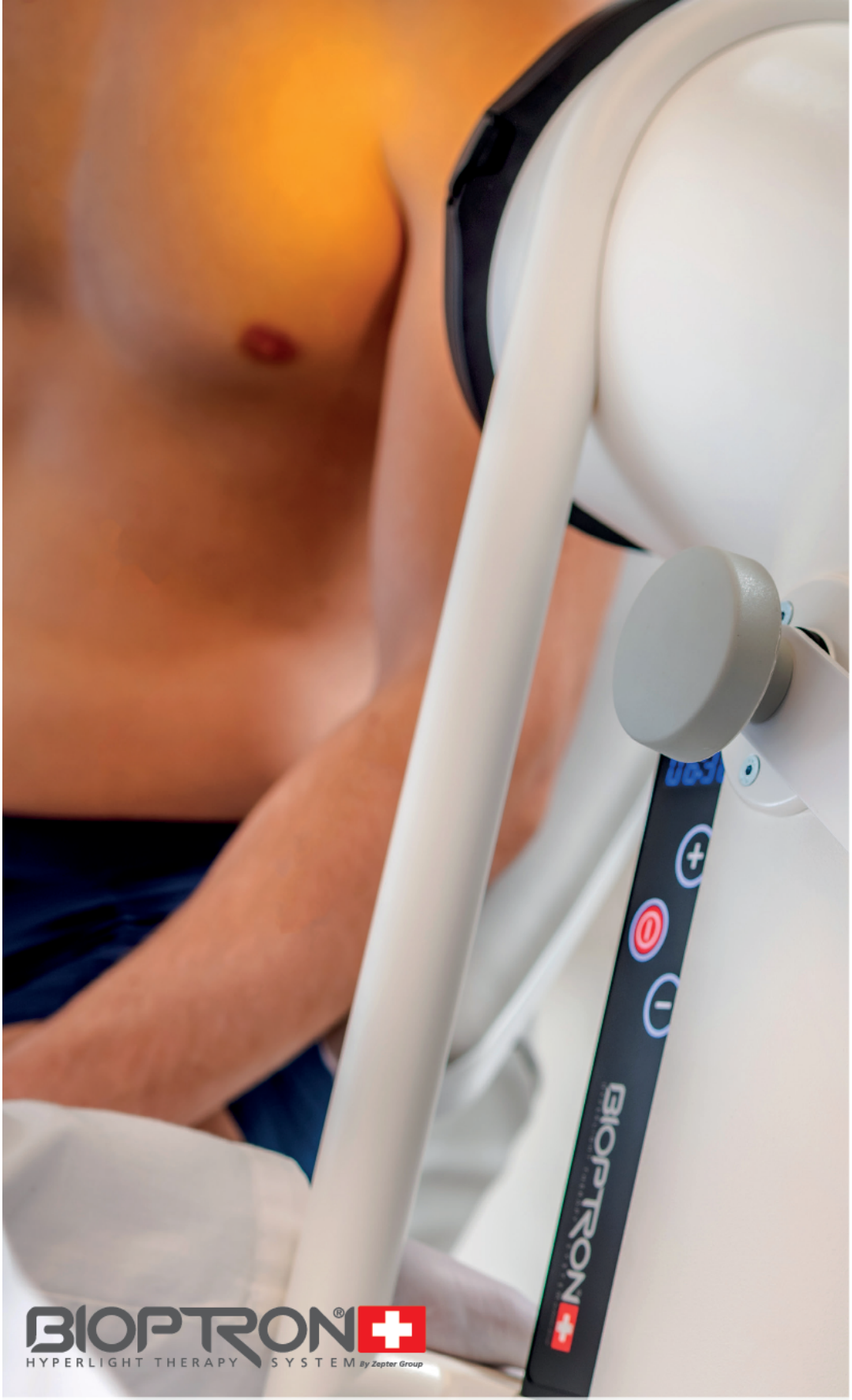

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nr 3/2021 (21)

Prevalence of dynamic instability among football players in the UAE: A cross-sectional study

Powszechność dynamicznej niestabilności wśród piłkarzy w Zjednoczonych Emiratach Arabskich: badanie przekrojowe

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Abstract

Although dynamic balance is one of the most important components of stability, it is not considered properly during athletic evaluations.

Aim. To investigate the prevalence of dynamic instability among a group of football players in the UAE. In addition, to investigate the possible association between dynamic instability and player position, weight, and body mass index (BMI).

Materials and Methods. 142 Emirati football players from different emirates, between the ages of 16-24 years free from any upper or lower limb injuries at least 3 months prior to the study. The participants were assessed for dynamic balance using the overall stability index during single leg stance measured by the Biodex balance system Results. revealed a high prevalence of dynamic instability among football players in the UAE as 73.2% of the participants showed to be unstable. In addition, there was a strong negative correlation observed between field position and single leg stability index (P = 0.002), however, there was no correlation found between dynamic instability and weight (P = 0.106) or BMI (P = 0.212).

Conclusions. Study results suggest the prevalence of dynamic instability among UAE football players with a strong negative correlation between dynamic instability and player position with no significant correlation with weight or BMI.

Key words:

Balance, instability, Biodex

Streszczenie

Chociaż równowaga dynamiczna jest jednym z najważniejszych składników stabilności, nie jest właściwie brana pod uwagę podczas oceny sportowców.

Cel. Zbadanie występowania niestabilności dynamicznej wśród grupy piłkarzy w Zjednoczonych Emiratach Arabskich. Ponadto zbadanie możliwego związku między dynamiczną niestabilnością a pozycją gracza, wagą i wskaźnikiem masy ciała (BMI). Materiały i metody. 142 piłkarzy z różnych emiratów w wieku od 16 do 24 lat bez urazów kończyny górnej lub dolnej co najmniej 3 miesiące przed badaniem. Uczestnicy byli oceniani pod kątem równowagi dynamicznej za pomocą ogólnego wskaźnika stabilności podczas stania na jednej nodze mierzonego przy użyciu systemu równowagi Biodex. Wyniki wykazały wysoką częstość występowania niestabilności dynamicznej wśród piłkarzy w Zjednoczonych Emiratach Arabskich. Niestabilnością wykazało się 73,2% uczestników. Ponadto zaobserwowano silną ujemną korelację między pozycją na boisku a wskaźnikiem stabilności podczas stania na jednej nodze (P = 0,002), jednak nie stwierdzono korelacji między niestabilnością dynamiczną a masą ciała (P = 0,106) lub BMI (P = 0,212). Wnioski. Wyniki badań sugerują występowanie niestabilności dynamicznej wśród piłkarzy ZEA z silną ujemną korelacją między niestabilnością dynamiczną a pozycją zawodnika, bez istotnej korelacji z masą ciała lub BMI.

Słowa kluczowe

Równowaga, niestabilność, Biodex

Introduction

"Balance is a complex process involving the coordinated activities of multiple sensory, motor and biomechanical components" [1]. It is an essential element of many direct contact sports such as football, in which the player is moving or facing any perturbations [2]. Football players are generally known to the public as being strong and enduring due to their intensive training programs. They also assume that their balance is perfect although it has been contradicted in literature. A study conducted in 2013 stated that players who have been previously injured have shown to have diminished postural stability [3]. Other studies linked poor balance to an increased risk of injuries [4-6]. Not only deficits in balance have been related to injuries but also balance and proprioceptive training programs have significantly shown reduced recurrence of ligament injuries in different sports [4].

Furthermore, most of the studies that were done previously to test the dynamic balance of athletes used the star excursion balance test (SEBT) [6-8]. The SEBT is a reliable and feasible test that is used to test dynamic balance. It involves maintaining balance on one leg while reaching out to 8 different directions (anterior, anteromedial, medial, posteromedial, posterior, posterolateral, lateral, and anterolateral) with the other [6]. Although the test involves some movement, the movement involved is not frequent in functional daily activities or sports [9]. However, a more objective option for the measurement of dynamic balance is the Biodex balance system. Yet there are no existing studies conducted using the Biodex balance system to measure dynamic balance in UAE athletes. Moreover, the subjects in previous studies were referred to as athletes in general whereas our study focuses on a specific sport for athletes based in the UAE.

Therefore, the primary purpose of this study was to detect the prevalence of dynamic instability among football players in the UAE using the Biodex balance system. The secondary purposes were 1) To investigate which position has the highest prevalence of dynamic instability and 2) to investigate if there was an association between dynamic instability and weight.

Methods

Study Design

A Cross sectional study design to explore the prevalence of dynamic instability among football players in the UAE during the period from December 2020 to February 2021. This study was approved by the research ethics committee in the University of Sharjah, UAE; REC-19-8-15. This study was registered on Clinicaltrial.gov.

Participants

Two hundred and fifty Emirati football players assessed for eligibility after were recruited from different clubs in the UAE and from different official University teams. Inclusion criteria included male players, between the age of 16-24 years, who plays/trains at least 3 times a week. Participants were excluded from the study if they had a history of previous injury around the head, hip, knee, or ankle joints, if the participant was undergoing any physical therapy treatment and if the participant suffers from vertigo or any other condition that affects the vestibular system. A flowchart for players participation is shown in figure 1.

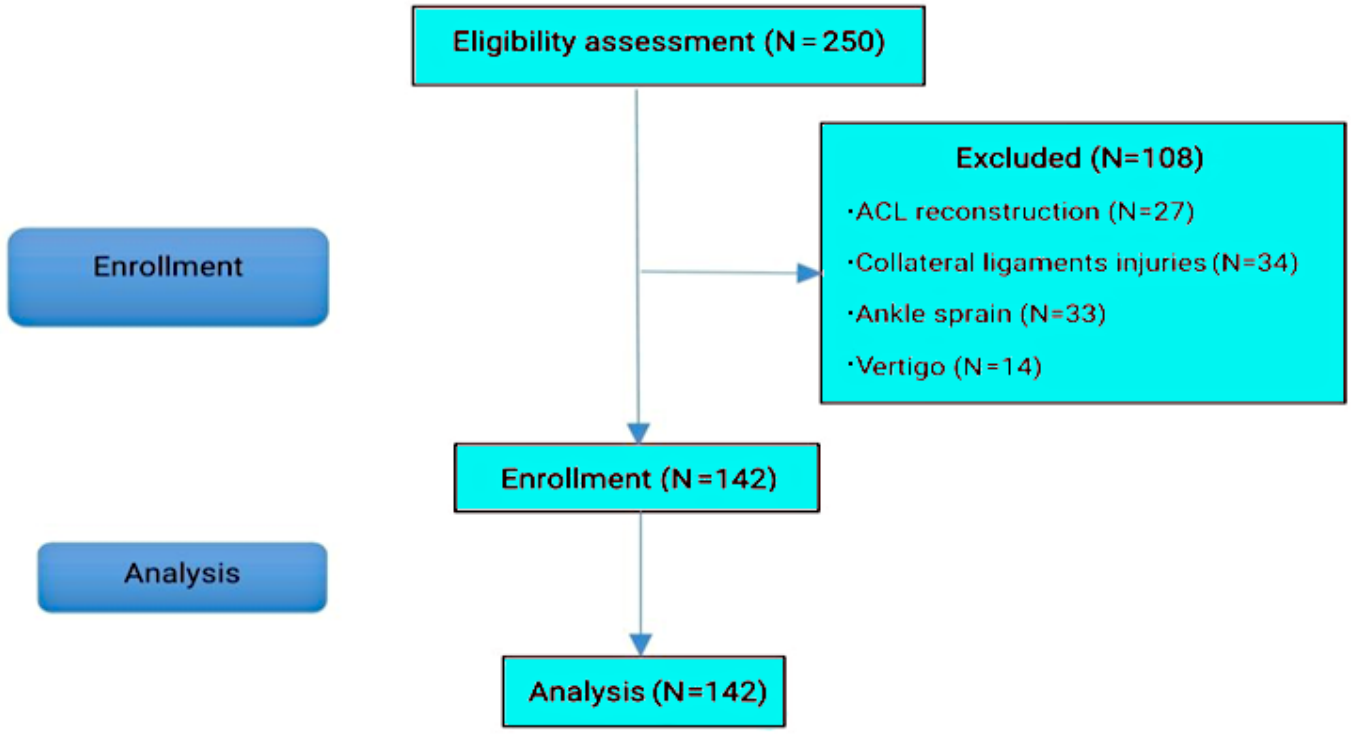

Figure 1. Flowchart of the study

Outcome measure and tools

A Data collection survey was used to screen if the subjects fit the inclusion criteria.

The survey was constructed by the primary investigator including 12 items including demographic data, field position, previous injuries and previous proprioceptive training.

The Biodex balance system was used as the primary tool of investigation. It is an objective system that quantifies balance and delivers valid measurement data that can be used to recognize balance deficits in athletes and other adults [9]. The Biodex Balance System (BBS) SDTM (Model 950-441) is an important therapeutic tool used for the assessment and training the subjects with deficits in balance [10]. The BBS is a reliable and valid device used to evaluate the participant`s ability to maintain static and dynamic balance stability on the unstable tilting platform; clinicians could evaluate postural control by measuring the ability to maintain dynamic unilateral and bilateral posture stability on the unstable surface. During the posture stability test, we evaluate the variance from the center by measuring the ability to control the platform's angle of tilt by the participant [11]. A dynamic balance test was performed on stability level eight according to a prior pilot study. The outcome measure was: Over All Stability Index (OASI) during single leg stance on the dominant side that refers to the ability of the player to maintain his balance in all directions while the player stands on one leg.

Each participant maintained single leg stance on one leg for 20 sec with the platform in the most stable level. The position of the foot on the platform grid was recorded and kept constant during re-testing.

Once the patient had acclimated to the platform, three tests were performed starting with level 8 permitting minimal movement of the platform, going to level 2 permitting almost 10° of tilt in all directions. A 1-min rest period was given between trials.

During the test, the non-dominant leg was held in a flexed position off of the platform and arms were placed across the chest.

Procedures

Before starting any procedure, a written consent was taken from the subject to participate. Following that, an orientation was given to the subjects about the Biodex balance system and the whole study procedure. The Biodex stability system is a movable platform with variable degrees of instability (static, from 1 to 8). The platform could be tilted up to twenty degrees of surface tilt from horizontal in all directions. It has a foot grid for determination of foot position before testing. It has 8 stability levels. Stability level 8 is the most stable platform surface, whereas stability level 1 is a very unstable platform surface [12]. Once they were familiarized with the device, the testing sequence was as follows: A trial test was done before the actual test. The test was performed with a platform stability level starting with eight and ending with one.

The testing was conducted in the Biodex balance system laboratory in the physiotherapy department, University of Sharjah, UAE. The study required around 9 months of recruitment and about 2 months to finalize and wrap up the data analysis and interpretations.

Statistical analysis

Prior for final analysis, data were screened, for normality assumption test by using Shapiro-Wilk test ($P > 0.05$) and homogeneity of variance by Levene's test ($P > 0.05$). The data was normally distributed and parametric analysis was used. The statistical analysis was conducted by using statistical SPSS Package program version 25 for Windows (SPSS, Inc., Chicago, IL). The numerical data were expressed as mean and standard deviation for demographic data and single leg stability index variables. The categorical data were expressed as number and percentage for the field position variable. The association between filed position and single leg stability index was computed by Chi-square test. One-way analysis of variance (ANOVA) test was used to compare mean values of single leg stability index among filed positions. confidence interval was set at 95%.

Pearson correlation was computed to determine the relation and direction between single leg stability index with weight and BMI. Spearman rank correlation was used to determine the relation and direction between single leg stability index and field position. Significant level is accepted at level of probability $P \leq 0.05$.

Sample size calculation

The sample size for this study was calculated using the G*power program 3.1.9 (G power program version 3.1, Heinrich-Heine-University, Düsseldorf, Germany). Sample size calculation based on Exact tests (CORRELATIO: Bivariate normal model), Type I error (α) = 0.05, power (1-α error probability) = 0.80, Correlation p H1 = 0.24 and Critical r = 0.1703143 with one independent group comparison for one major variable outcomes. The appropriate minimum sample size for this study was 133 players.

Results and discussion

A total of 142 patients participated in this study; the mean values of age (year), weight (kg), height (cm), BMI (kg/m^2), and single leg stability index were 17.06 ± 1.44 years, 62.81 ± 3.61 kg, 173.17 ± 3.45 cm, 24.30 ± 1.36 kg/m^2 respectively (Table 1).

The overall distribution of field positions were 8 (5.60%) goalkeepers, 64 (45.10%) defenders, 40 (28.20%) central midfield, and 30 (21.10%) strikers. There was a significant difference ($P = 0.0001$; $P < 0.05$) observed among this distribution of field positions (Table 2) (Fig. 2).

The overall subjects with instability accounted for 104 participants. Their field positions were 8 (7.7%) goalkeeper, 50 (48.1%) defender, 32 (30.8%) central midfield, and 14 (13.5%) strikers. There was significant no difference ($P = 0.263$; $P > 0.05$) in mean values of instability among field position (Table 3), (Fig. 3).

Table 1. Mean values of demographic data in study group

Variables	Mean ± SD
Age [Year]	17.06 ± 1.44
Weight [kg]	62.81 ± 3.61
Height [cm]	173.17 ± 3.45
BMI [kg/m^2]	24.30 ± 1.36

Data are expressed as mean ± standard deviation (SD)

Table 2. Distribution of instability field position in study group

	MD (95% CI)	P-value
Goalkeeper	8 (5.60%)	0.0001*
Defender	64 (45.10%)	
Central midfield	40 (28.20%)	
Striker	30 (21.10%)	

*Data are expressed as number (percentage). * Significant (P-value < 0.05)*

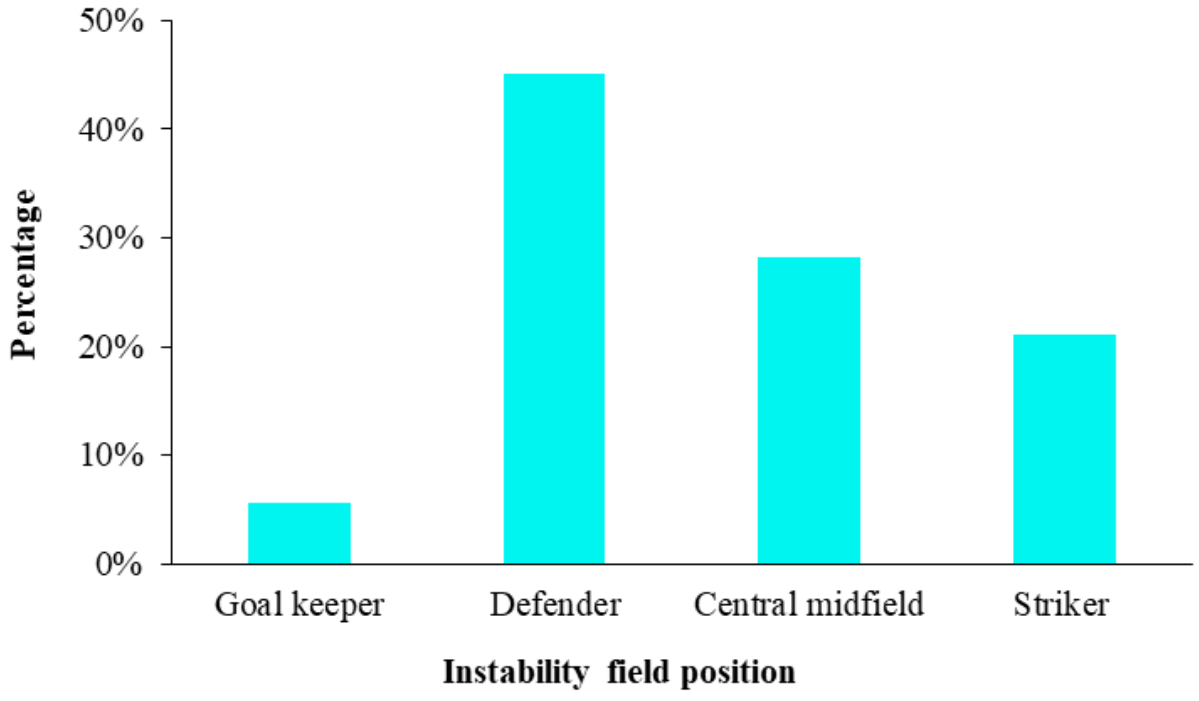

Figure 2. Distribution of instability among field position

Table 3. Distribution and mean values of single leg stability index and instability in study group

Field position	Stability (n = 38)		Instability (n = 104)	
	Number (%)	Mean ± SD	Number (%)	Mean ± SD
Goalkeeper	0 (0.0%)	-----	8 (7.7%)	9.21 ± 1.38
Defender	14 (36.8%)	3.89 ± 0.38	50 (48.1%)	7.75 ± 2.84
midfield	8 (21.1%)	4.08 ± 0.27	32 (30.8%)	6.68 ± 3.86
Striker	16 (42.1%)	3.60 ± 0.40	14 (13.5%)	7.33 ± 2.61
P-value	0.225	0.513	0.0001*	0.263

Data are expressed as number (percentage) and compared by Chi-square test.

*Data are expressed as mean ± SD and compared by analysis of variance test (ANOVA-test). * Significant (P-value < 0.05)*

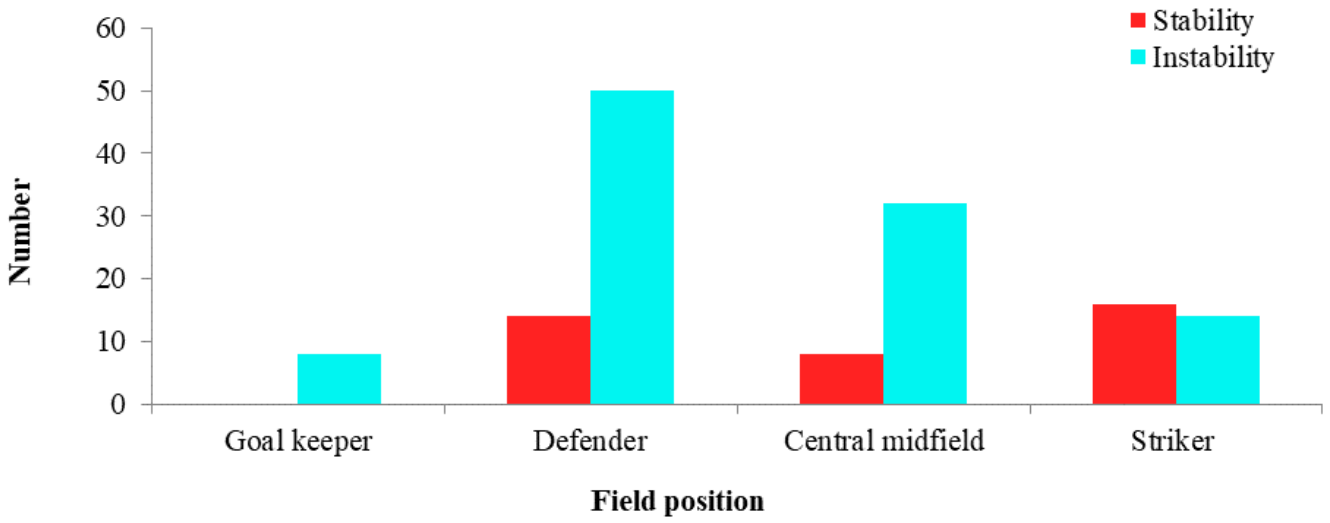

Figure 3. Distribution of stability and instability within each field position in study group

Pearson rank correlation coefficients were computed between single leg stability index with weight and BMI. The results of these correlational analyses (Table 4) revealed that no significant relation between single leg stability index with weight ($r = 0.14$; $P = 0.106$; $P > 0.05$) and BMI ($r = 0.11$; $P = 0.212$; $P > 0.05$). Meanwhile, Spearman rank correlation coefficient (r) between field position and single leg stability index was ($r = 0.86$; $P = 0.002$; $P < 0.05$). The result indicated that there was a negative correlation ($P = 0.002$; $P < 0.05$). This means that change in the instability is consistent with change in field position.

Table 4. Relation between Single leg instability, weight, BMI, and field position

Relation	Correlation coefficient (r)	P-value
Instability and weight	−0.14	0.106
Instability and BMI	−0.11	0.212
Instability and field position	−0.86	0.002*

*r: Spearman rank correlation P-value: probability value *Significant (P-value < 0.05)*

Discussion

In the current study the methods proposed to assess dynamic instability via the overall stability index. The results demonstrated that dynamic instability was found to be prevalent among UAE football players as 73.2% of our participants showed to be unstable. Moreover, the results revealed that there was no association between weight and stability index ($P = 0.106$) nor BMI ($P = 0.212$). The results also showed that the position with the highest instability was the goalkeeper with a mean overall stability index of 9.21 ± 1.38. this was followed by the defenders, striker, and midfielder positions with a mean score of 7.75 ± 0.84, 7.33 ± 2.61and 6.68 ± 3.86, respectively.

Most of the athletes assume having high stability and perfect balance compared to the general population, however our results showed that even football players are prone to be dynamically unstable despite their good strength and muscle power. This suggests that balance and proprioceptive training are often neglected, a negative factor that will influence players' performance. As stated earlier, balance training has shown to reduce the risk of injuries in football players [5] and this was also indicated by another study that showed that there is a measurable effect of neuromuscular and proprioceptive training interventions on the risk of ACL injury [13]. Although the players have not been injured before, they are still at high risk of injury due to their poor balance and this should be addressed through intensive proprioceptive and balance training programs.

The finding that there was no correlation between instability and weight, nor BMI can be explained by the fact that although weight might affect the center of pressure, subjects adjust their motor control strategies' timing to deal with unsteady situations regardless to their weight.

Balance is not only important for the execution of complex technical gestures, but it is also connected to the overall athlete's strength [14] and it can be connected to injury risks [13]. Many studies have proved that balance can be used as a predictor of injury risk factors [13-16] and it was found that athletes with poor balance are more prone to ankle injuries [17-18]. All of these studies recommend that dynamic stability must be one of the assessment variables that should be included when evaluating football players and accordingly it is important to add specific training protocols to improve stability. However,

since the focus in training sessions is to increase strength and endurance, it is essential to raise awareness about balance training and its effect on players' performance. There are many studies that used different methods to assess dynamic balance [19-21] but unfortunately none was conducted on the UAE athletic population. Our findings may support the fact that proprioceptive and balance defects are strong predictors of expected injuries [22-23] as well as decreased athletic abilities [24].

Limitations

Although the study has reached its aim, there were few limitations to be acknowledged including the subject's performance and gender differences. Some of the football players overloaded training sessions, this may have affected, their performance during the dynamic stability test which in turn may have affected their scores. Also, no female participants were available to compare for gender differences. Finally, the overall stability index was considered in this study although analysis of specific directions may reveal directional defects.

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Conclusion

The results of this study concluded that dynamic instability may be prevalent among football players in the UAE. Also, it was discovered that there is no association between instability and player weight or BMI, but a strong correlation was evident emphasizing the field positions of goalkeeper, midfield and striker consecutively. The results also highlight an important point for the sport therapists to focus on balance and proprioceptive training as a means of improving balance as much as they focus on strength, endurance and power as evidence has proven that balance exercises do reduce the risk of injury in football players. This study should further investigate the gender effect as well as effects of different sports.

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