THE RELATIONSHIP BETWEEN PLAYING POSITION AND INJURY
TENDENCY IN SEMI-PROFESSIONAL SOCCER PLAYERS ⁽¹⁾ALT YAPIDA OYNAYAN FUTBOLCULARDA OYNANAN MEVKİ İLE
SAKATLIĞA YATKINLIK ARASINDAKİ İLİŞKİNİN İNCELENMESİ*Tamer ÇANKAYA, Ömer DURSUN, Seda YAKIT YEŞİLYURT, Fatih UYSAL*¹⁻²⁻⁴*Bolu Abant İzzet Baysal University, Health Sciences Faculty, Department of Physiotherapy and Rehabilitation, Bolu / Turkey*³*Bolu Abant İzzet Baysal University, Health Sciences Institute, Department of Physical Therapy and Rehabilitation, Bolu / Turkey***ORCID ID:** 0000-0002-0871-2470¹, 0000-0002-0522-4228², 0000-0002-2522-6474³,
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Öz: Amaç: Bu araştırma alt yapı futbolcularında sakatlanma riski ile vücut kompozisyon ve performans parametreleri arasındaki ilişkinin değerlendirilmesi ve mevkiler arası farklılık gösterip göstermediğinin belirlenmesi amacıyla yapıldı. **Yöntem:** Çalışmaya toplam 97 altyapı futbolcusu dahil edildi. Katılımcıların tanita, y denge testi, fonksiyonel hareket görüntülemesi, t-koşusu ve otur-uzan testi ile vücut kompozisyonu, denge, sakatlanma riskleri, çeviklikleri ve esneklikleri değerlendirildi. **Bulgular:** Katılımcıların vücut kompozisyonu parametrelerinden yalnızca kemik mineral yoğunluğu ve vücut ağırlığı değerlerinde kaleciler ve orta saha oyuncular arasında kaleciler lehine anlamlı fark bulundu ($p<0,05$). Katılımcıların %27'sinde sakatlanma riski olduğu görüldü. Fonksiyonel hareket görüntülemesi toplam skorları ve alt skorları mevkilerde benzerdi ($p>0,05$). Çeviklik ve esneklik tüm mevkilerde benzerdi ($p>0,05$). Kalecilerin sağ anterior ve kompozit y denge skorları orta saha oyuncularından daha iyiydi ($p<0,05$). **Sonuç:** Çalışmamız bulguları neticesinde sakatlanma riskinin sporcunun oynadığı mevkiden bağımsız olduğu sonucuna varıldı. Bu doğrultuda performansa ve sakatlanma riskine özgü testlerin alt yapı oyuncularında mevkiler arası kıyaslamadan ziyade bireysel performans takibinde kullanılmasının daha faydalı olacağını düşünmekteyiz.

Anahtar Kelimeler: Sakatlanma, Çeviklik, Denge, Esneklik

Abstract: Aim: The aim of this study was to analyze the relationship between injury tendency, body composition and performance parameters and whether or not these findings varies according to the playing position in semi-professional soccer players. **Method:** 97 semi-professional soccer player included. Body composition, balance, injury tendency, agility and flexibility parameters of the participants were assessed with tanita, y balance test, functional movement screening, t-run and sit and reach tests. **Results:** Weight and mineral density values were the sole body composition parameters that had showed significant difference between goal keepers and mid-field players in favor of goal keepers ($p<0,05$). It was observed that 27% of the athletes had injury tendency. Functional movement screening and its sub scores were similar in all playing positions ($p>0,05$). Agility and flexibility values were similar in all positions ($p>0,05$). Right anterior and composite reach score of the goal keepers were better than mid field players ($p<0,05$). **Conclusion:** It was concluded that injury tendency is independent from playing position, it seems more beneficial using performance and injury tendency tests for individual follow-up instead of positional comparison.

Key Words: Injury, Agility, Balance, Flexibility

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INTRODUCTION

Soccer is a complex contact sport including relatively high rates of injury and injury tendency during competition and performance in professional, amateur and youth players (Pfirrmann et al., 2016: 410-424). Worldwide soccer has roughly 265 million participants and that number continues to increase (Moore et al., 2011: 1535-1544). Identification of gifted youth players is made by a systematic training programme targeting to develop technical and tactical skills, and fitness (Iga et al., 2009: 714-719). During the training programme injury incident causes significant time losses in matches and training (Kemper et al., 2015: 1112-1117). Moreover, semi-professionals getting closer to the professional league level become more vulnerable to the pre-season injuries (Pfirrmann et al., 2016: 410-424).

There are modifiable and unmodifiable risk factors for injury. Despite the importance of unmodifiable factors as gender and age was pointed out in varying studies, it is also vital to give a thought on modifiable factors such as physical training, behavioral approaches, dynamic balance and agility (BahrandHolme, 2003: 384-392). It is a known fact that balance training accompanying with speed and agility training significantly declines the knee and ankle injury risk (Hrysomallis, 2007: 547-556) and strength performance (Jovanovic et al., 2011: 1285-1292). Mus-

cular flexibility is an important risk factor for injury tendency especially for hamstring and quadriceps sprains (Lehance et al., 2009: 243-251). Injury results and findings should be analysed and controlled especially in youth players who has more injury risk due to individual growing differences (Price et al., 2004: 466-471). Injury risk reaches its peak level at U15-U16 teams (Deehan et al., 2007: 5-8). Thus, in a six years of prospective study made on 9-16 years of age children, it was stated that the being out of match rate due to seasonal injury was 21,3% (Johnston et al., 2009: 1161-1168).

Most of the studies in the literature is performed in limited population in geographic areas, states or local regions. Yet there are limited studies in positional injury risk (Badgeley et al., 2013: 160-169). Also, current knowledge shows different range of injury rates in playing position. It was stated that goal keepers had the lowest and the mid-field players had the highest rate of injury while these rate were analyzed (Deehan et al., 2007: 5-8).

Nowadays importance of semi-professional players for the soccer increasingly improves. In parallel to the increased importance brings out the determination of effective injury prevention approaches. From this point of view, positional injury risk and positional sufficiency of the semi professional soccer players will be assessed and discussed in our study. It

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was also aimed that the assessment of factors that affects injury risk and share of this data with the coaches and the sport clubs.

MATERIAL and METHODS

Prior to ethical approval obtained from Bolu Abant İzzet Baysal University Clinical Trials and Ethical Committee (28.12.2017 2017/186) 13 to 19 years of age athletes in Bolu Spor semi-professional soccer players were included into the study. Club management and the athletes were informed about the study and their written consent was taken. Athletes who had lower extremity injury in last six months or who had cardiac problems were excluded. Athletes were divided into four groups as goal keeper, defence, midfielder and striker. Due to data of the two athletes was lost during the data gathering process, study was completed with 97 players. Socio-demographic datas of the athletes such as age, training time and frequency, pre injury story.

Datas such as demographic datas, training frequency and time specific to the soccer, pre-injury story was recorded with pre-made assessment form. There after trochanter major-ground, umblicus-ground and anterior superior iliac spine-ground distance measured with tape measure. Then tanita was used for body fat rate, metabolic age and other metabolic descriptive datas assessment, sit and

reach test was used for hamstring and lumbar extensor muscle flexibility, functional movement screening (FMS) tool was used for injury tendency assessment, y balance test for dynamic balance assessment and lastly, t-run test was used for the agility assessment.

Tanita was used for the measurements and measurements were made as mentioned in previous studies. Basal metabolic rate, body mass index, fat free mass rate, mineral and protein rate of the athletes were recorded as a result of measurements.

Trochanter major-ground, umblicus-ground and anterior superior iliac spine- ground distance measurements were performed for the determination of extremity asymmetry.

(American College of Sports Medicine [ACSM], 2009: 65-66).

Hamstring and lumbar extensor muscle flexibility of the athletes were measured with sit and reach test. Athletes were asked to sit to test battery and place their sole on 26 cm marked flexiometer. Athletes were gradually reached to the point as far as it goes and waited in last point for two second. Score is the furthest point reached with the fingertips. Highest score of the two trials was recorded (ACSM, 2009: 100).

FMS was used for the injury tendency determination of the athletes. FMS consists of

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seven assessment tests; deep squat, hurdle step, inline lunge, shoulder mobility, active straight leg raise, trunk stability push up and rotatory stability tests. Each assessment was made three times. Five second rest was given between intra tests and one minute for the inter tests (Cook et al., 2006: 62).

Each test has 0-3 score. 3 point means the movement pattern is precisely performed as asked, 2 point means that the asked movement is partially performed, 1 point describes that the movement is not completed and lastly 0 means that pain during the test. Maximum test score is 21 and lower score is considered in bilateral lower extremity scoring in total score calculation. FMS score ≤ 14 illustrates higher injury risk (Butler et al., 2013: 11-7).

Y balance test was used for the dynamic balance assessment. Athletes were asked to stand and maintain their balance on the center of the platform with their one limb while trying to reach their other limb to anterior, posteromedial and posterolateral directions. Thereafter, athletes were asked to reach as far as they can with their toe. Once they reached, the maximum distance was recorded. While the athletes maintain their balance they returned the starting position after every trial. (Smith et al., 2015: 136-141). According to y balance test score; if the athletes' total score has bilateral discrepancy higher than 12

or sub total score discrepancy higher than 4 it means that athlete has increased risk of injury (Butler et al., 2013: 11-7).

All athletes practiced the test to minimize the apprehension effect before the actual measurement. After the practice athletes were rested for 5-10 minutes and then three times reach was performed to the each direction. The highest value of the three trial was recorded as y balance test score (de la Motte et al., 2016: 1619-1625).

T-run test was used for speed and agility measurement. In t-run test four cones were positioned in t shape as mentioned in earlier studies. Then athletes were asked to sprint and touch to the center of the cones in order by middle, left, right, middle and starting cone (Pauole et al., 2000: 444). Trials that the athletes couldn't touch to the center of the cone or turning around during returning to the starting point didn't recorded (Pauole et al., 2000: 445).

Demographic datas of the athletes were shown as median, minimum, maximum, frequency and percentage. Normal distribution of the data was analyzed with Kolmogorov Simirnov test. Kruskal wallis test was used for the analysis of numerical datas of the athletes by playing position and Fisher exact test was preferred for categoric value analysis. Significance level for data analysis was

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set as $p < 0,05$ and SPSS 23 programme was used for the statistical analysis.

RESULTS

Average stature, weight and BMI of the athletes were 175 cm, 63,85 kg and 20,86.

In inter positional comparison of body composition parameters significant difference was found between the weight and bone mineral density of the goal keeper and mid fielder ($p < 0,05$) (Table 1).

Table 1. Positional Comparison Of Demographic, Anthropometric And Physical Characteristics Of The Athletes

	Goal keeper		Defence		Mid-fielder		Striker		
	Median	(Min-Max)	Median	(Min-Max)	Median	(Min-Max)	Median	(Min-Max)	p
Age	15,85	(14,00-18,00)	15,79	(14,00-19,00)	15,71	(14,00-18,00)	15,90	(14,00-18,00)	,945
Stature	184,71	(179,00-198,00)	175,86	(150,00-195,00)	173,71	(156,00-184,00)	175,51	(160,00-19,00)	1,000
Weight	75,42	(57,00-89,70)	64,54	(34,80-92,90)	60,40	(40,70-72,10)	63,73	(43,50-77,20)	,029
BMI	21,98	(19,70-24,36)	20,69	(15,50-24,40)	19,90	(15,90-23,10)	20,61	(16,40-24,10)	,091
Fat	11,50	(7,70-15,50)	9,72	(4,00-14,80)	9,23	(5,50-13,90)	9,77	(5,90-17,60)	,396
Mineral	3,45	(2,74-4,04)	3,01	(1,74-4,23)	2,89	(1,96-4,65)	2,98	(2,12-3,58)	,038
Body intensity	1,07	(1,06-1,08)	1,07	(1,06-1,09)	1,07	(1,06-1,08)	1,07	(1,05-1,08)	,400
Muscle	83,57	(80,00-87,00)	85,20	(80,00-90,00)	85,5	(81,00-89,00)	85,18	(78,00-89,00)	,474
Protein	15,15	(11,36-22,36)	12,82	(7,26-17,57)	11,93	(8,14-15,50)	12,69	(8,78-17,42)	,056

Kruskal-Wallis test; $p < 0,05$

Sit and reach test values were similar in all groups ($p > 0,05$) while significant difference

was found in all anthropometric measurement values ($p < 0,05$) (Table 2).

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Table 2. Positional Analysis Of Anthropometric And Flexibility Characteristics Of The Athletes

	Goal keeper		Defence		Mid-fielder		Striker		p
	Median	(Min-Max)	Median	(Min-Max)	Median	(Min-Max)	Median	(Min-Max)	
Sit and reach	12,00	(-4,00-16,00")	7,00	(-6,00-22,00)	6,00	(-5,00-21,00)	8,00	(-5,00-19,00)	0,185
Umblicus - ground (right)	109,00	(100,00-115,00)	104,74	(89,00-119,00)	102,32	(89,50-112,00)	104,08	(94,00-110,00)	0,04
Umblicus – ground (left)	109,00	(100,00-115,00)	104,74	(89,00-119,00)	102,32	(89,50-112,00)	104,08	(94,00-110,00)	0,04
Trochanter major – ground (right)	91,42	(82,00-97,00)	88,26	(78,00-99,00)	87,08	(74,00-96,00)	88,68	(78,00-97,00)	0,202
Trochanter major – ground (left)	91,42	(82,00-97,00)	88,26	(78,00-99,00)	87,08	(74,00-96,00)	88,68	(78,00-97,00)	0,202

Kruskal-Wallis test; $p < 0,05$

FMS sub scores were similar in all of the playing positions ($p > 0,05$) (Table 3).

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Table 3. Positional Analysis Of FMS Sub Scores And Injury Tendency

	Score	Goal keeper	Defence	Mid-fielder	Striker	Total	p
DS final	1,00	3	4	6	10	23	0,153
	2,00	2	23	17	20	62	
	3,00	2	2	5	3	12	
HS final	1,00	0	0	0	1	1	0,787
	2,00	5	15	13	17	50	
	3,00	2	14	15	15	46	
IL final	1,00	0	1	6	8	15	0,123
	2,00	5	14	10	16	45	
	3,00	2	14	12	9	37	
SM final	0,00	0	1	1	1	3	0,398
	1,00	1	3	4	12	20	
	2,00	2	12	9	7	30	
	3,00	4	13	14	13	44	
ASLR final	0,00	0	1	0	0	1	0,322
	1,00	1	2	2	2	7	
	2,00	1	15	18	16	50	
	3,00	5	11	8	15	39	
TSP final	0,00	0	0	1	0	1	0,159
	1,00	1	1	0	6	8	
	2,00	0	6	5	6	17	
	3,00	6	22	22	21	71	
RS final	1,00	2	10	11	12	35	0,832
	2,00	5	15	14	14	48	
	3,00	7	29	28	33	97	

Fisher exact test; *DS: deep squat, HS: hurdle step, IL: inline lung, SM: shoulder mobility, ASLR: active straight leg raise, TSP: trunk stability push up, RS: rotator stability; $p < 0,05$

ker, in total 26 (27%) of the athletes had 14 or lower FMS score. No significant difference was found in inter positional analysis of the FMS total score (Table 4).

According to the FMS total score; two goal keeper, 5 defense, 7 mid fielder and 12 stri-

Table 4. Positional Analysis of FMS Score

	Goal keeper	Defence	Mid-fielder	Striker	p
FMS total	15,85±3,23	15,89±1,83	15,64±2,21	14,90±2,30	0,231

Kruskal-Wallis test; $p < 0,05$

In y balance test score comparison, only the right side composite and anterior reach dif-

ference was found between goal keepers and mid fielders in favor of goal keepers ($p < 0,05$) (Table 5).

Table 5. Positional Balance Comparison Of The Players

	Goal keeper		Defence		Mid-fielder		Striker		p
	Median	(Min-Max)	Median	(Min-Max)	Median	(Min-Max)	Median	(Min-Max)	
Left anterior	25,00	(21,50-31,00)	24,00	(16,50-31,50)	23,50	(17,00-26,50)	24,50	(19,00-30,00)	0,244
Left Posteromedial	31,50	(25,50-38,50)	29,50	(20,50-37,00)	28,00	(19,50-34,50)	29,50	(20,50-38,00)	0,273
Left Posterolateral	29,50	(24,00-36,50)	28,50	(22,50-35,50)	26,50	(19,00-33,50)	28,50	(19,50-39,00)	0,089
Left composite	87,00	(71,50-101,50)	83,50	(67,50-101,00)	77,50	(63,00-89,00)	81,00	(62,50-101,50)	0,065
Right anterior	26,00	(21,00-28,00)	25,00	(16,00-32,00)	23,00	(16,00-27,00)	24,00	(19,50-31,00)	0,034
Right posteromedial	34,00	(24,50-35,50)	30,50	(24,00-36,00)	28,75	(21,00-36,50)	28,50	(23,50-35,50)	0,055
Right posterolateral	31,50	(21,50-37,50)	29,00	(20,50-37,50)	27,00	(15,50-32,00)	82,00	(65,50-99,00)	0,113
Right composite	91,50	(70,00-98,00)	83,00	(69,50-96,00)	78,25	(58,50-89,00)	82,00	(65,50-99,00)	0,013

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Agility comparison of the athletes showed that playing position has no role in agility

performance of the athletes ($p < 0,05$) (Table 6).

Table 6. Positional Agility Comparison Of The Players

	Goal keeper		Defence		Mid-fielder		Striker		
	Median	(Min- Max)	Median	(Min- Max)	Median	(Min- Max)	Median	(Min- Max)	p
T run 1	2,16	(1,90- 2,42)	2,13	(1,72- 2,58)	2,09	(1,70- 2,33)	2,06	(1,74- 2,41)	0,202
T run 2	1,71	(1,52- 1,93)	1,60	(1,26- 2,05)	1,62	(1,27- 2,34)	1,65	(1,38- 2,09)	0,310
T run 3	2,89	(2,70- 3,32)	2,76	(2,30- 3,20)	2,76	(2,20- 3,48)	2,70	(2,20- 3,43)	0,344
T run 4	1,63	(1,37- 1,94)	1,61	(1,40- 2,38)	1,69	(1,35- 2,44)	1,61	(1,35- 1,90)	0,156
T run 5	2,58	(2,16- 2,84)	2,60	(2,06- 3,60)	2,64	(2,19- 3,50)	2,60	(1,95- 3,19)	0,501
T run Total	10,98	(10,30- 11,88)	10,80	(9,79- 13,02)	10,74	(9,93- 12,25)	10,64	(9,60- 11,94)	0,202

DISCUSSION

As a result of our study it was determined that playing position has no role on injury tendency, flexibility and agility among semi professional soccer players, and goal keepers are better in some sub parameters of the dynamic balance. Besides; it was confirmed that body weight and bone mineral density are higher in goal keepers compared to the mid fielders.

We consider that positional undifferentiation of flexibility loss and muscular imbalance which underlies in FMS characteristics and also the undecided positional play resulted

with multiple playing position as a primary reason for not finding any relationship between playing position and FMS score. Secondly demographic and physical factors such as age, fat rate, BMI might have impact on FMS score as well. Finding of our study points out sit and reach test shows no variation according to the playing position and study of Lockie et al (2015: 41-51) which states that sit and reach test and FMS sub tests; active straight leg raise and inline lunge are directly related, support our flexibility hypothesis. Besides, use of same training programme on all of the athletes which includes the FMS

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sub test movements might have an impact on positional FMS scoring by affecting the FMS score of the athletes.

Our result which states that FMS score of 27% of the athletes is either 14 or below and also this rate does not differentiate from playing position, actually shows us the fact that semi-professional soccer players have injury tendency and this tendency is independent from playing position. At this point, multiple positional playing due to undecided precise playing position might cause this finding of ours. Considering the study of Van Doormaal et al., (2017: 121-126) which states athletes might play in variety of positions, this fact might prevent the position specific characteristics in athletes.

Muscular imbalance occurs in soccer characterized with joint range of motion limitations (López-Valenciano et al., 2019: 102-109). It is possible to say that related movement limitations might develop as a result of mechanical adaptations specific sport (Tak et al., 2016: 682-688). Positional similarities in t-run test, training programme that doesn't required extreme performance and power due to athletes' age might have a preventive effect on muscular imbalance development. Also variety of studies which points the direct or indirect effect of insufficient mobility and range of motion limitation on FMS score supports our findings (Kibler et al., 1996: 279-285; Lake

et al., 2010: 3180-3185; López-Valenciano et al., 2019: 102-109; MathersandGreal, 2014: 1005; Tak et al., 2016: 682-688).

It is a known fact that secondary factors as we mentioned which are fat rate and BMI cause joint range of motion losses and incoordination (Park et al., 2010: 102-108). Gathering our finding about positional similarity in BMI and fat rate values and related studies together it seems quite possible to have similar FMS scores in all positions. Also the study of Nicolozakes et al., (2018: 431-437) suggesting that fat rate and BMI negatively affect the FMS especially the inline lunge and deep squat supports our result.

We consider that training programme time and content are the reasons for not finding any relationship between playing position and agility. Considering the training programme which takes one hour that mostly consists of endurance programme, not including plyometric exercises and the study of Perroni et al., (2017: 364-371) mentioning that lower limb explosive power is the determinant for athlete's sprint are in line with our finding. As the athletes were semi-professional, positional specific skills such as agility, sudden shift and burst movements might not differentiate (Costa et al., 2009: 657-668; Johnston et al., 2014: 1161-1168; WongandHong, 2005: 473-482). The related situation shows itself

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in our study as not finding any relationship between playing position and agility.

We consider that the training content and efficient use of trunk balance strategies by the goal keepers are the reason for us finding a significant difference in right composite and anterior score between the goal keepers and the mid fielders in favor of goal keepers. In addition to others' training goal keepers were having dynamic balance training as well. This training programme might affect the dynamic balance and trunk balance strategy of the goal keepers. Kang et al., (2015: 1152-1158) reports that trunk movements play an important role in y balance test measurement especially in anterior measurements.

We held responsible the general positional idea of soccer which states that mid fielders should be the highest for us finding only significant BMI difference between goal keepers and the mid fielders. Body weight of the mid fielders in related studies also the highest compared to other players (Coelho E Silva et al., 2010: 790-796; Gjonbalaj et al., 2018: 41-47).

We consider that the anthropometric differences are the mean reason for us to find significant bone mineral density difference only between goal keepers and mid fielders. It is known that athletes have more bone mineral density compared to their peers and the most

dramatic difference seen in femur and lumbar vertebraes (Vicente-Rodriguez et al., 2003: 853-859). It seems quite a normal to have this result in favor of goal keepers when this information and the finding of ours which shows that the trochanter major- ground distance of the goal keepers are higher compared to mid-fielders got together.

In our study no significant difference was found in sit and reach test scores. We consider fat rate and the age are the mean reason. The study of Nikolaidis (2014: 74-79) pointing that the high fat rate negatively correlated with the sit and reach score encourage our idea. Another study related to age (Nikolaïdis, 2012: 110-115) states that muscular flexibility and aging has mid grade correlation. From this perspective similar age in all position might cause having the similar muscular flexibility resulting with similar sit and reach score in our study.

It was concluded that 27% of the semi-professional soccer players had injury tendency which is independent from playing position. In addition, our study showed that risk factors that may underlie in injury tendency mechanism such as muscular imbalance and flexibility loss were similar in all playing positions.

All measurements and assessments couldn't be taken in standard hour due to training

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programme and also the exhaustion grade of the players.

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