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Relationship of Planned and Unplanned Directional Running Performance with Physical Fitness Levels and Motivation

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Abstract

Aim: There are low and high correlations in the studies examining the relationship between acute physical fitness levels with speed and agility skills. In addition, there are few studies examining the relationship between motivation, and physical fitness skills. The aim of this study was to investigate the relationship between the acute physical fitness levels with speed and agility skills.

Method: A total of 25 amateur young football players, all aged 18, participated in this study. Firstly, participants completed the motivation scale. Subsequently, the following performance tests were administered: static postural control on one leg, squat jump, countermovement jump with arm swing (also known as Abalakov jump), dominant leg vertical jump, non-dominant leg vertical jump, thirty-meter linear sprint, pro-agility test, and Y-reactive agility test.

Results: Since the data did not meet the assumption of normal distribution, Spearman correlation analysis was used, and the significance level was set at p>0.05. According to the results, no significant relationship was found between motivation levels and the performance test results (p>0.05). However, strong correlations were observed between squat jump, countermovement jump with arm swing (jump height in centimeters and leg muscle power in watts), and the thirty-meter linear sprint and pro-agility performance (with correlation coefficients ranging between 0.636 and 0.870). Additionally, high correlations were also found between dominant and non-dominant leg vertical jumps and sprint-agility performance (correlation coefficients ranging from 0.622 to 0.829).

Conclusion: This study suggests that coaches may benefit from guiding their athletes toward exercises that enhance both single-leg and double-leg strength in order to improve sprinting and agility performance more effectively.

Key words: *Balance Ability, Motivation, Performance Test, Speed.*

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INTRODUCTION

In an average of 727 movements with body rotation and 1000 to 1400 different movement forms occur between 2 and 4 seconds in a football competition (Bangsbo, 2014; Mohr et al., 2003; Stølen et al., 2005). Among such movement forms, footballers frequently perform change of direction runs and agility skills (Stølen et al., 2005). The successful application of these skills helps athletes to gain an advantage over their opponents in both training and competition. It's stated that agility is divided into two, these are change of direction speed and perceptual and decision-making factors (Young et al., 2002). The names of the skills involving these differences are defined as change of directions and reactive agility (Brughelli et al., 2008; Salaj & Markovic, 2011).

Reactive agility skill requires motor control and psychological perception, and decision-making skills compared to change of direction running skill (Spasic et al., 2015) and the application of reactive agility skill in training or competition has a key role (Pojskic et al., 2018). Athletes should anticipate the changes of their opponents and modify their movements. Therefore, change of direction (COD) and reactive agility test (RAT) are one of the issues that are investigated regularly, and different research are still being carried out. The athletes' stability (Edis, 2021; Sporis et al., 2010; Sekulic et al., 2013), muscle strength (Lockie et al., 2012) and functional movement skills (Lockie et al., 2015) may be related to their change of direction running performance. Dominant leg lateral jump performance has a significant relationship with reactive agility skill, also balance, coordination, cognitive skills and decision-making factors may also be important (Henry et al., 2016). Agility has a very complicated structure; however, studies have shown that there are contradictory relationships between physical fitness levels such as jumping, postural control with sprinting and CODS (Cronin & Hansen, 2005). Salaj & Markovic (2011) stated that the results with contradictory and different correlation relationships may be due to reasons such as age, gender, physical fitness, sample size and type of performance tests used. In addition, the measurement methods and equipment used in the research affect the test results and there may be a

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possibility of different results in correlation analyses. It is stated that tests performed with very complex equipment can provide clearer information about performance (Chavda et al., 2018). It is observed that psychological skills are an important factor affecting agility performance as well as the adequacy of physical skills. Human emotions affect cognitive processes, and cognitive skills are important for better performance of athletes (Oatley et al., 2006). Motivation, which can be one of these skills, can be important for athletes to demonstrate good physical performance. Motivation positively or negatively and a positive motivation level can make athletes active (Putri & Rasyid, 2022). Also, fun and pleasure are seen as the most important factors in participation in physical activity (Williams et al., 2006). It is stated that this situation is due to the increase in intrinsic motivation and the positive psychological effect on those who participate in sports (Wankel, 1993). In studies examining the interaction between motivation and physical skills, there are studies indicating that there is contradictory (Putri & Rasyid, 2022; Hammer et al., 2022; Forsman et al., 2016) and it is stated that the relationship between reactive agility skill and psychological skill should be examined (Henry et al., 2016).

The information given in this aspect in the research makes it curious to investigate the relationship between physical performance and motivation in detail. In addition, the fact that there are contradictory results between SJ, CMJ-Abalokov and single leg jump performance with linear sprint and agility skills in the literature and the highlighting that research explaining the relationships with detailed performance tests will be important. The aim of this study was to investigate the relationships between motivation, change of direction speed, agility, jump performance and balance skills of athletes.

METHOD

Research model

In this study, experimental research was conducted with the evaluation of acute performance values of athletes. The correlation relationships between the physical performance values obtained in the research applied through this model were examined. In addition, the acute motivation levels of the athletes were obtained by using the questionnaire form in the research article titled "Validity and Reliability of the Motivation Scale in Sport; Turkish Adaptation Study" by Demir (2022) and the necessary permission was obtained by e-mail. The correlation relationship between the numerical data obtained from the questionnaire and physical performance tests was examined.

Population and sample

A total of 25 well trained youth soccer players, who are aged 18 years, participated in the study. The athletes were healthy football players who participated in regular training 5 times a week, 1 official competition and did not have any sports injury and did not receive any ergogenic support. The tests were administered to the athletes participating in the study on different days. Due to the fact that there were athletes who came and did not come to the test on different days, the number of subjects in the statistical analysis is not constant, and the number of subjects in the correlation analyses is different.

Data collection tools

Motivation in Sports Scale (MSS): Motivation in Sport Scale: In this scale, which was adapted into Turkish by Demir (2022), the emotional reactions of the athletes in performing and their motivation in the environment were tested with 24 questions. This scale was filled out by the athletes before the tests and the data obtained were included in the statistical analysis as 6 sub-dimensions and total test results. The sub-dimensions in the motivation questionnaire consisted of Identified Regulation, Amotivation, Extrinsic Regulation, Integrated Regulation, Extrinsic Motivation and Intrinsic Motivation, and there were no negative questions in the questions.

Static Postural control Test (Pc): In this test, the right and left leg static Pc of the athletes were tested. Vald Performance Forcedesk device (ForceDeck force plate (Vald Performance, FD4000)) was used in Pc and all jump tests of the athletes. Pc tests were performed statically dominant (D) and non-dominant (ND) leg with hands on waist for 2 sets and 30 seconds. The test period was initiated by focusing on a point 2 metres away from the eye level in a quiet room to avoid distraction of the athletes. Postural control data were obtained by calculating the deviations from the centre of pressure (CoP) by the device in the anterior-posterior (ap) and medial-lateral (ml) directions. In addition, the distances to the CoP centre were recorded as total sway data (CoPtotal) and sway velocity (CoPvel).

Bipedal and Unipedal Jump Test: Vald Performance Forcedesk device (ForceDeck force plate (Vald Performance, FD4000) was used for this test. During the test, the athletes were shown the technique of the movement for the correct performance of the bipedal jumps. After the demonstration of the technique, the athlete was positioned on two platforms standing on the ground with the right and left leg at shoulder alignment. Firstly, 3 jumps were performed in squat position with hands on waist. Then, after resting for 3 minutes, the CMJ-Abalakov test was applied to the athletes. In this test, a quick sit-up with hands free and arms swinging, followed by a vertical jump up with maximum effort was applied. The tests of the athletes who successfully jumped 3 times in the hands-free jump were terminated. Detailed data such as the jump heights of the athletes in centimetres (flight time) [cm], the force levels produced by the legs in watts (W), peak power produced per kilgram PP/BM and the time to maintain their balance while falling to the ground after the jump were obtained and statistically analysed.

In the unipedal jump test, the tests were performed 3 times on the dominant leg (D-j) and 3 times on the non-dominant leg (ND-j) with maximum effort. After the right leg test was finished, the athlete rested for 3 minutes and then the left leg jump test was performed 3 times. Unlike the data obtained from the bipedal leg jump, the force watts (W) produced by the right and left leg, the jump height (flight time) [cm] and the differences between the right and left leg in the single leg jump were obtained and statistically analysed.

30 m Linear Sprint Test: For the 30 m sprint, Pro Agility and Y-reactive agility test, Vald Performance's Smart Speed device was used (Smart Speed, Fusion Sport, Queensland, Australia). Athletes will start the test 1 metre behind the starting point at a distance that will be standard for individuals. This test was performed 3 times with 3-minute rest intervals and the total time, peak and mean running metres per second (m/s) were included in the statistical analysis.

Pro Agility Test: The test was formed on a straight line with a total of 3 cones 5 metres away from the right and left sides of the midpoint. The athlete standing in the middle of the track completed the test by running first 5 metres to the right, then to the left-most mark 10 metres away and finally to the mark 5 metres away from the starting point. The test was performed 3 times in 3 minutes rest intervals and the average turn, best turn and total test times of the athletes were evaluated.

Y-Reactive Agility Test: The test was performed on a track with a 5 m linear run followed by a 5 metre turn to the left and right. After 5 metres of straight running, the athlete changed direction to whichever of the signal gates on the right or left was lighted. In this way, the change of direction after the reaction of the athletes to the light stimulus was tested. The athletes performed the test a total of 3 times with 3 minutes rest in between. After the test, total test time and reaction time after 5 m linear sprint were statistically analysed.

Data analysis

The Shapiro-Wilk test was used to determine whether the data obtained were suitable for normal distribution. It was determined that the data did not show normal distribution and Spearman correlation analysis was used in correlation analysis. The correlations between motivation scores, postural control, jumps, 30 m linear sprint and agility skills were indicated by r value and statistical significance was accepted as $p \geq 0.05$. The magnitude of the correlation (r) between test measures was assessed with the following thresholds: ≤0.1, trivial; >0.1-0.3, small; >0.3-0.5, moderate; >0.5-0.7, large; >0.7-0.9, very large; and >0.9-1.0, almost perfect (Hopkins et. all., 2009). The fact that the correlation of the numerical data in the same direction in the test of postural control (decrease in numerical values means that they can keep stability), speed and agility levels is interpreted as the emergence of a significant relationship. While the decrease in Pc data with the increase in motivation gives a significant relationship, the positive correlation with SJ, CMJ-Abalokov, bilateral jump reveals a significant relationship. In addition, the negative correlation of speed and agility skills with the increase in motivation and jump test data indicate a significant relationship.

RESULTS

Table 1. Descriptive statistics of anthropometric and physical fitness levels of athletes

Descriptive statistics of athletes		n	Min.	Max.	Mean±SD
Height		25	169,00	190,00	178,41±5,2506
Weight		25	52,00	86,00	64,44±7,34159
BMI (kg.m^{-2})		25	17,20	24,90	20,33±1,910
Squat Jump	Height (cm)	18	23,90	42,10	31,41±5,126
	Peak Power (W)	18	2340,00	5665,00	3296,27±701,206
	PP/BM (W)	18	41,50	85,90	51,94±9,689
CMJ-Abalokov	Height (cm)	18	29,40	47,70	36,91±5,435
	PP (W)	18	2585,00	7971,00	3916,86±1240,055
	PP/BM (W)	18	45,90	118,40	61,51±17,268
Unipedal Jump	D-j Height (cm)	18	10,30	22,00	15,79±2,747
	ND-j Height (cm)	18	11,50	23,90	16,18±3,433
	Height ASY (cm)	18	1,10	22,80	10,41±6,547
	D-j Peak Power (W)	18	1247,00	2515,00	1855,29±269,720
	ND-j Peak Power (W)	18	1423,00	20511,00	2742,04±3798,134
	D-j PP/BM (W)	18	24,10	35,40	29,08±2,771
	ND-j PP/BM (W)	18	25,30	39,80	30,92±3,828
	ND-j PP/BM (W) ASY	18	,50	24,70	9,10±6,689
Linear sprint (30 mt)	Total Time (second)	16	3,93	4,50	4,24±,174
	$Peak_{VEL-MS}$	16	6,94	8,01	7,40±,321
	$Mean_{VEL-MS}$	16	6,66	7,64	7,07±,293
	5 m Sprint Time (second)	16	0,81	0,97	0,86±,040
Pro agility	Total Time (second)	18	4,87	5,63	5,37±,202
	Best COD Time (second)	18	2,36	2,77	2,62±,106
	Mean COD Time (second)	18	2,44	2,81	2,68±,101
Y-reactive agility	Total Time (second)	25	2,10	3,58	2,45±,281
	Reactive Time (second)	25	1,25	2,49	1,5517±,237

PP/BM: peak power/body mass, ASY: asymmetry, VEL-MS: Velocity- metre per second, ND-j: non-dominant leg jump, D-j: Dominant leg jump

Table 1 shows the descriptive statistics of height, weight, BMI and physical fitness levels of the athletes. The age of the athletes is 18,00 years. Therefore, data on the age of the athletes were not included in the table.

Table 2. Correlations between motivation and physical fitness levels

Variables	CMJ-A PP/BM	D-j PP	CoP_{ndVEL}	$CoP_{ndTotal}$	Y-Reactive Agility Total Time	Y-Reactive Agility Time
Identified Regulation	-,122	-,210	,308	,299	,204	,253
Amotivation	-,106	-,484*	,425	,320	,013	-,064
External Regulation	,346	-,009	,252	,261	,336	,284
Integrated Regulation	-,103	-,172	,165	,176	,049	,061
Internalised Arrangement	,135	-,349	,513*	,465*	,189	,256
Intrinsic Motivation	,524*	,473	,138	,212	,471*	,470*
Total	,117	-,194	,428	,390	,385	,331

*n:20, *$p<0.05$, PP/BM: peak power/body mass, D-j PP: Dominant leg jumps peak power, CoP_{ndVEL}: centre of pressure non-dominant leg velocity, $CoP_{ndTotal}$: centre of pressure non-dominant leg total test score.*

Table 2 shows the relationships between 5 different sub-dimensions and total scores of athletes' physical fitness skills with motivations scores. It is seen that the level of D-j peak power output decreases as the level of amotivation of the athletes increases, while the level of CMJ-A PP/BM increases with the increase in intrinsic motivation level. However, it is seen that Pc and Y-reactive agility scores increase with the increase in intrinsic motivation, and the increase in motivation correlates with the increase in Pc and agility skill data, which can be considered negative meaning.

Table 3. Correlations between physical fitness levels with 30 m linear sprint, Pro agility and Y reactive agility

Variables		30 m Linear Sprint			Pro Agility		
		Total Time	Peak Veocity (m/s)	Mean velocity (m/s)	Total Time	Best Time	Mean Time
SJ H (cm)		-,834**	,870**	,834**	-,794**	-,711**	-,794**
	n	16	16	16	18	18	18
SJ PP (W)		-,644**	,671**	,644**	-,439	-,373	-,439
	n	16	16	16	18	18	18
SJ PP/BM (W)		-,706**	,718**	,706**	-,476*	-,350	-,476*
	n	16	16	16	18	18	18
CMJ-A JH (cm)		-,805**	,864**	,805**	-,656**	-,612**	-,656**
	n	16	16	16	18	18	18
CMJ-A PP (W)		-,688**	,700**	,688**	-,587*	-,465	-,587*
	n	16	16	16	18	18	18
CMJ-A PP/BM (W)		-,771**	,771**	,771**	-,636**	-,448	-,636**
	n	16	16	16	18	18	18
D-J H (cm)		-,782**	,685**	,782**	-,622**	-,492*	-,622**
	n	15	15	15	17	17	17
ND-J H (cm)		-,829**	,779**	,829**	-,731**	-,559*	-,731**
	n	15	15	15	17	17	17
ND-D PP (W) ASY (%)		,379	-,464	-,379	,517*	,522*	,517*
	n	15	15	15	17	17	17

**p<0.05, **p<0.001, PP/BM: peak power/body mass, ASY: asymmetry, VEL-MS: Velocity- metre per second, ND-j: non-dominant leg jump, D-j: Dominant leg jump*

Table 3 shows that there are high correlations between leg muscle strength, jump heights, dominant and non-dominant leg jump heights and 30 m linear sprint times. There are high correlations between jump heights of SJ, CMJ-A, CMJ-A PP/BM and dominant and non-dominant leg jump heights and pro agility, while there is a moderate correlation between non-dominant and dominant leg peak power (W) and pro agility times.

In the correlation analyses that could not be included in the tables, there was no correlation between the jumps take off force obtained in SJ, CMJ-A and unipedal jump tests and breaking time data after CMJ-A and bilateral jumps and 30 m linear sprint, Pro agility and Y-reactive agility times of the athletes ($p<0.05$).

DISCUSSION

In this study, while there were significant and insignificant correlations between athletes' motivation and performance values in physical fitness tests, no correlation was found between athletes' motivation levels and physical fitness levels and Y-reactive Agility performances (Table 2). In addition, moderate and high correlations were found between SJ, CMJ-Abalokov and unipedal jump performances and 30 metres linear sprint and Pro Agility times.

The agility skill depends on a combination of both physical and psychological skills (Young et al., 2002). Psychologically, athletes' ability to perceive and perform on the stimuli in the environment in a short time may help to perform a more successful agility skill (Forsman et al., 2016; Farrow et al., 2005). A better agility skill of athletes depends on their perception and quick decision-making time. It comes to mind that athletes' motivation should be at a well acute level to exhibit such skills in a positive performance. In the literature, it is seen that there is a relationship between different agility skills of athletes and perceived competence skills, but there is no relationship between motivation and agility skills (Henry et al., 2016; Forsman et al., 2016; Farrow et al., 2005). In this study, there were significant and insignificant correlations between the 6 sub-dimensions of the motivation scale and total motivation scores and athletes' linear sprint, Pro agility and Y-reactive agility performances, while there were significant relationships between athletes' motivation and leg muscle strength output (CMJ-A PP/BM), insignificant relationships were found with Pc and Y-reactive agility. The statistical results of the study do not provide strong data at this point. The results were in line with the literature in that there was no relationship between acute motivation and performance.

In research, it is seen that there are correlations between linear sprint skills and strength skills of athletes. In 14 professional basketball athletes aged 23.3±2.7 years, it was found that there was a correlation between 10 and 30 metre linear sprint skills and CMJ jump heights, while there was a correlation between Sj and 30 metre linear sprint. In another study, it was observed that there was a correlation between CMJ jump heights and 30 metre sprint times of Ruby athletes ($r=0.425$, $p<0.05$) (Cronin & Hansen, 2005). In different research results, it is seen that there are correlations between the vertical jump test results of athletes and their sprint performances (Barrera et al., 2021; Köklü et al., 2015). In this study, high correlations between SJ and CMJ-Abalokov jump heights, PP and BM/PP and 30 mt linear sprint and moderate correlations between single leg jump heights and sprint performance are in parallel with the results in the literature.

Postural control is very important in terms of maintaining stability of the body during locomotor movements performed while standing. It is also stated that postural control is important for athletes to remain stable during aceleration and deceleration and then to change direction rapidly in movement patterns that require direction change such as agility (Cometti et al., 2001; Sheppard & Young, 2006). It is reported that there is a correlation between the results of the Star Excursion Balance Test, one of the dynamic balance tests, Pro Agility and Reactive agility tests of female handball athletes aged 22.8±2.7 years (Bayraktar, 2017). Similarly, it was reported that there was a significant relationship between total balance scores and agility skills of 21 professional male basketball athletes aged 17±0.63 years, and that athletes with low balance test scores (low test numerical data indicates that they can sell standing) completed the agility test in a shorter time (Cengizhan et al., 2019). However, there are studies showing the opposite of these results. In a total of 17 athletes aged 22.05±4.54 years, there was no correlation between static and dynamic balance test results and running performances with 3 different changes of direction speeds, and it was concluded that athletes with poor postural control skills completed the CODS tests in a shorter time, and it was stated that the data measuring the balance skills of the athletes with more complex tests were related to the COD (Edis, 2021). In another study, the results of the Y balance test, which measures the dynamic balance skills of athletes, were not related to T agility times (Ahmed et al., 2022). In this study, insignificant correlations were found between the static balance skills of athletes Pro Agility and Y-reactive Agility times. According to the results of this study, it is concluded that there is no significant relationship between static balance tests and 30-metre linear sprint, Pro agility and Y-reactive Agility in 18-year-old amateur soccer players.

It is generally observed that jump heights and the force produced are related to the ability to change of direction (Emmonds et al., 2019; Castillo-rodríguez et al., 2012; Pereira et al., 2018). The fact that the coordinated flexion-extension of the hip-knee-ankle in jump tests is like the thrust force during CODS is stated to explain this relationship (Emmonds et al., 2019). However, there are articles showing that the results of the studies are different. The jump heights obtained from SJ and CMJ tests of 14 professional basketball athletes aged 23.3±2.7 years were not related to T Agility (Chaouachi et al., 2009). In a different study, although there was no correlation between SJ and CMJ jump heights and Pro agility and T test times of 20 male NCAA Division II soccer players aged 18-23 years, there were correlations between SJ power to watt ratio and Pro agility (-0.48*), CMJ power to watt ratio and Pro agility (-0.45*) (Mcfarland et al., 2016). In a more detailed study, it was reported that jump heights, peak power, landing force and peak power levels, especially peak power levels, were associated with unilateral agility in CMJ and single leg jump performance of recreational athletes (Dietze-hermosa et al., 2020). In this study, SJ and CMJ-Abalokov were associated with pro agility skills of athletes with a higher correlation than right and left leg jump heights and produced force, while a moderate relationship was found between produced force in watts and pro agility times. In addition, there was a high correlation between CMJ-Abalovkov PP/BM (W) and Pro Agility time. Although the results of this study show that the results are compatible with the literature, more correlations were found between jump heights and linear sprint and Pro agility. Differences in measurement methods, age group, branch differences and different devices used for measurement may give different results from literature.

Strength differences between skeletal muscles increase the risk of injury in athletes (Markovic et al., 2020). This may also cause loss of performance in athletes (Fort-vanmeerhaeghe et al., 2020). Research shows that athletes have associations with CODS with dominant and non-dominant leg strength differential (Castillo-rodríguez et al., 2012; Arede et al., 2023). In this study, in parallel with the literature, there was a moderate correlation between right and left leg SJ peak power production asymmetry and pro agility.

The limitations of this research are the equipment used, test methods, and the fact that the research group consists of football players and amateur football players. In addition, the motivation scale used for the research consists of a single scale. In addition, tests were applied with different numbers of athletes in different measurements. At this point, the number of athletes in the tests constitutes the limitation of the research.

CONCLUSION

In the light of the data, the fact that there are relationships between the athletes' speed, CODS, agility skills and jumping performances reveals strong predictions that coaches should increase leg muscle strength values for such performance improvements. Acute motivation and postural control skills were not associated with speed, CODS and agility. At this point, the research is considered to be deficient because it compares only static postural control test and dynamic performance skills, and it does not reveal clear information compared to researchers that include the relationship between different postural control data of athletes and other performance parameters.

SUGGESTIONS

Although it is seen that motivation levels do not affect the acute performance of athletes in performance evaluations, it is recommended to carry out research that will be associated with different motivation scales. However, it can be said that better performance of speed, CODS and agility skills of athletes may depend on better muscle strength and muscle strength tests are a preliminary informative test for this. At this point, it is recommended that athletes are advised to focus on muscle strength tests.

Etical Approval and Permission Information

Ethics Committee:	Trabzon University Social and Human Sciences Scientific Research and Publication Ethics Committee
Protocol/Number	2023-10/1.9

REFERENCES

Arede, J., Fernandes, J.F., Singh, H., Bishop, C., Romero-Rodriguez, D., & Madruga Parera, M. (2024). Assessing asymmetries and predicting performance in semi-professional soccer players. *International Journal of Sports Science & Coaching*, *19*(1), 192-201.

Ahmed, S., Saraswat, A., & Esht, V. (2022). Correlation of core stability with balance, agility and upper limb power in badminton players: a cross-sectional study. *Sport Sciences for Health*, 1-5.

Bangsbo, J. (2014). The physiology of intermittent activity in football. *In Science and football III,* (pp. 43-53). Routledge.

Brughelli, M., Cronin, J., Levin, G., & Chaouachi, A. (2008). Understanding change of direction ability in sport: a review of resistance training studies. *Sports Medicine,* 38, 1045-1063.

Bayraktar, I. (2017). The influences of speed, cod speed and balance on reactive agility performance in team handball. *International Journal of Environmental & Science Education, 3*(1), 451-461.

Barrera, J., Contreras, L.M.V., Lorca, Á.S., Cid, F.M., Zurita, E., & Sarmento, H. (2021). Relación del salto contramovimiento y pruebas de velocidad (10-30 m) y agilidad en jóvenes futbolistas chilenos. *Retos: Nuevas Tendencias En Educación Física, Deporte Y Recreación,* (41), 775-781.

Aksen Cengizhan, P., Cobanoglu, G., Gokdogan, C.M., Zorlular, A., Akaras, E., Erikoglu Orer, G., ... Guzel, N. A. (2019). The relationship between postural stability, core muscle endurance and agility in professional basketball players. *Annals of Medical Research, 26*(10), 2181-2186.

Cometti, G., Maffiuletti, N.A., Pousson, M., Chatard, J.C., & Maffulli, N. (2001). Isokinetic strength and anaerobic power of elite, subelite and amateur French soccer players. *International journal of sports medicine, 22*(01), 45-51.

Chavda, S., Bromley, T., Jarvis, P., Williams, S., Bishop, C., Turner, A.N., ... Mundy, P.D. (2018). Force-time characteristics of the countermovement jump: Analyzing the curve in Excel. *Strength & Conditioning Journal, 40*(2), 67-77.

Castillo-Rodríguez, A., Fernández-García, J.C., Chinchilla-Minguet, J.L., & Carnero, E.Á. (2012). Relationship between muscular strength and sprints with changes of direction. *The Journal of Strength & Conditioning Research, 26*(3), 725-732.

Cronin, J.B., & Hansen, K.T. (2005). Strength and power predictors of sports speed. *The Journal of Strength & Conditioning Research, 19*(2), 349-357.

Chaouachi, A., Brughelli, M., Chamari, K., Levin, G. T., Abdelkrim, N. B., Laurencelle, L., & Castagna, C. (2009). Lower limb maximal dynamic strength and agility determinants in elite basketball players. *The Journal of Strength & Conditioning Research, 23*(5), 1570-1577.

Demir, H. (2022). Validity and reliability of motivation scale in sports: Turkish adaptation study. *The Journal of Physical Education and Sport Sciences, 20*(4), 56-68.

Dietze-Hermosa, M.S., Montalvo, S., Cubillos, N.R., Gonzalez, M.P., & Dorgo, S. (2020). Association and predictive abilityof vertical countermovement jump performance on unilateral agility in recreationally trained individuals. *Journal of Physical Education and Sport,* 20, 2076-2085.

Edis, Ç. (2021). Which Postural Control and Functional Movement Screen Values Related to Change of Direction Runs?. *Annals of Applied Sport Science, 9*(4), 0-0.

Emmonds, S., Nicholson, G., Begg, C., Jones, B., & Bissas, A. (2019). Importance of physical qualities for speed and change of direction ability in elite female soccer players. *The Journal of Strength & Conditioning Research, 33*(6), 1669-1677.

Forsman, H., Gråstén, A., Blomqvist, M., Davids, K., Liukkonen, J., & Konttinen, N. (2016). Development of perceived competence, tactical skills, motivation, technical skills, and speed and agility in young soccer players. *Journal of sports sciences, 34*(14), 1311-1318.

Farrow, D., Young, W., & Bruce, L. (2005). The development of a test of reactive agility for netball: a new methodology. *Journal of Science and Medicine in Sport, 8*(1), 52-60.

Fort-Vanmeerhaeghe, A., Bishop, C., Buscà, B., Aguilera-Castells, J., Vicens-Bordas, J., & Gonzalo-Skok, O. (2020). Inter-limb asymmetries are associated with decrements in physical performance in youth elite team sports athletes. *PLoS One, 15*(3), e0229440.

Hammer, T.M., Pedersen, S., Pettersen, S.A., Rognmo, K., & Sagelv, E.H. (2022). Affective Valence and Enjoyment in High-and Moderate-High Intensity Interval Exercise. The Tromsø Exercise Enjoyment Study. *Frontiers in Psychology,* 13, 825738.

Hopkins, W., Marshall, S., Batterham, A., & Hanin, J. (2009). Progressive statistics for studies in sports medicine and exercise science. *Medicine Science in Sports Exercise, 41*(1), 3-13.

Henry, G.J., Dawson, B., Lay, B.S., & Young, W.B. (2016). Relationships between reactive agility movement time and unilateral vertical, horizontal, and lateral jumps. *Journal of Strength and Conditioning Research, 30*(9), 2514-2521.

Köklü, Y., Alemdaroğlu, U., Özkan, A., Koz, M., & Ersöz, G. (2015). The relationship between sprint ability, agility and vertical jump performance in young soccer players. *Science & Sports, 30*(1), e1-e5.

Karafil, A.Y., Ulaş, M., & Akgül, M.H. (2021). Achievement Goal Scale in Sports: A Validity and Reliability Study for Infrastructure Athletes (9-18 Years Old). *CBU Journal of Physical Education and Sport Sciences, 16*(1), 46-58.

Lockie, R.G., Schultz, A.B., Jeffriess, M.D., & Callaghan, S.J. (2012). The relationship between bilateral differences of knee flexor and extensor isokinetic strength and multi-directional speed. *Isokinetics and exercise science, 20*(3), 211-219.

Lockie, R.G., Schultz, A.B., Callaghan, S.J., Jordan, C.A., Luczo, T.M., & Jeffriess, M.D. (2015). A preliminary investigation into the relationship between functional movement screen scores and athletic physical performance in female team sport athletes. *Biology of sport, 32*(1), 41-51.

Mohr, C., Landis, T., Bracha, H. S., & Brugger, P. (2003). Opposite turning behavior in right-handers and non-right-handers suggests a link between handedness and cerebral dopamine asymmetries. *Behavioral neuroscience, 117*(6), 1448.

Markovic, G., Šarabon, N., Pausic, J., & Hadžić, V. (2020). Adductor muscles strength and strength asymmetry as risk factors for groin injuries among professional soccer players: A prospective study. *International journal of environmental research and public health, 17*(14), 4946.

McFarland, I.T., Dawes, J.J., Elder, C.L., & Lockie, R.G. (2016). Relationship of two vertical jumping tests to sprint and change of direction speed among male and female collegiate soccer players. *Sports, 4*(1), 11.

Okada, T., Huxel, K.C., & Nesser, T.W. (2011). Relationship between core stability, functional movement, and performance. *The Journal of Strength & Conditioning Research, 25*(1), 252-261.

Oatley, K., Keltner, D., & Jenkins, J.M. (2006). Understanding emotions. Blackwell publishing.

Pojskic, H., Åslin, E., Krolo, A., Jukic, I., Uljevic, O., Spasic, M., & Sekulic, D. (2018). Importance of reactive agility and change of direction speed in differentiating performance levels in junior soccer players: Reliability and validity of newly developed soccer-specific tests. *Frontiers in physiology,* 9, 506.

Putri, A.S., & Rasyid, W. (2022). The effect of lateral run training, zig-zag run training and motivation practice on player's agility women's football. *Gladi: Jurnal Ilmu Keolahragaan, 13*(02), 233-249.

Sheppard, J.M., & Young, W.B. (2006). Agility literature review: Classifications, training and testing. *Journal of sports sciences, 24*(9), 919-932.

Suarez-Arrones, L., Gonzalo-Skok, O., Carrasquilla, I., Asián-Clemente, J., Santalla, A., Lara-Lopez, P., … Núñez, F.J. (2020). Relationships between change of direction, sprint, jump, and squat power performance. *Sports, 8*(3), 38.

Stølen, T., Chamari, K., Castagna, C., & Wisløff, U. (2005). Physiology of soccer: An update. *Sports Medicine,* 35, 501-536.

Salaj, S., & Markovic, G. (2011). Specificity of jumping, sprinting, and quick change-of-direction motor abilities. *The Journal of Strength & Conditioning Research, 25*(5), 1249-1255.

Spasic, M., Krolo, A., Zenic, N., Delextrat, A., & Sekulic, D. (2015). Reactive agility performance in handball; development and evaluation of a sport-specific measurement protocol. *Journal of sports science & medicine, 14*(3), 501.

Sporis, G., Jukic, I., Milanovic, L., & Vucetic, V. (2010). Reliability and factorial validity of agility tests for soccer players. *The Journal of Strength & Conditioning Research, 24*(3), 679-686.

Sekulic, D., Spasic, M., Mirkov, D., Cavar, M., & Sattler, T. (2013). Gender-specific influences of balance, speed, and power on agility performance. *The Journal of Strength & Conditioning Research, 27*(3), 802-811.

Pereira, L.A., Nimphius, S., Kobal, R., Kitamura, K., Turisco, L.A., Orsi, R.C., ... & Loturco, I. (2018). Relationship between change of direction, speed, and power in male and female national olympic team handball athletes. *The Journal of Strength & Conditioning Research, 32*(10), 2987-2994.

Young, W.B., James, R., & Montgomery, I. (2002). Is muscle power related to running speed with changes of direction?. *Journal of sports medicine and physical fitness, 42*(3), 282-288.

Zapartidis, I., Makroglou, V., Kepesidou, M., Milacic, A., & Makri, A. (2018). Relationship between sprinting, change of direction and jump ability in young male athletes. *Journal of Physical Education, 5*(1), 71-76.

Williams, D.M., Papandonatos, G.D., Napolitano, M.A., Lewis, B.A., Whiteley, J.A., & Marcus, B.H. (2006). Perceived enjoyment moderates the efficacy of an individually tailored physical activity intervention. *Journal of Sport and Exercise Psychology, 28*(3), 300-309.

Wankel, L.M. (1993). The importance of enjoyment to adherence and psychological benefits from physical activity. *International Journal of Sport Psychology. 24*(2), 151–169.

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