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PHYSICAL AND PHYSIOLOGICAL PROFILE OF FEMALE FUTSAL PLAYERS

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ABSTRACT

The physical and physiological profile of futsal players are associated with technical, tactical, physical, and physiological performance. Objective: Identify the physical and physiological profile of female futsal players, as well as correlate anthropometrical, body composition variables with physiological indicators of performance on futsal. Materials and methods: Nineteen athletes from a college team participated in the study. BM, height, BMI, %BF, and %FFM were assessed. The VO_{2max}, HR_{max}, vVO_{2max}, VT_1 and VT_2 and YOYO-IR1 was assessed by a maximum aerobic test. The absolute peak power (APP), absolute power average (AP_{AVG}), relative peak power (RPP), relative power average (RP_{AVG}), total work (TW), and fatigue index (%FI) were determined by the Wingate Test. Results: The physical profile consisted of body mass 63.3±12.06 kg, BMI 24±3.35 (kg.m^{-2}), %BF 26.3±3.7, and %FFM 73.6±4.9. Physiological profile consisted of absolute VO_{2max} 2720.7±391.8 ml.min^{-1}, relative VO_{2max} 44.5±5.6 ml.kg^{-1}.min^{-1}, vVO_{2max} 13.3±1.5 km.h^{-1}, HR_{max} 193.7±7.4, VT_1 34.2±3.5 ml.kg^{-1}.min^{-1}, VT_2 39.9±4.4 ml.kg^{-1}.min^{-1}, APP 562.3±71.5 (W), AP_{AVG} 403±40.8 (W), RPP 9±1.03 W.kg^{-1}, RP_{AVG} 6.5±0.8 W.kg^{-1}, TW 12090±1224 (J) and %FI 48.55±7.42. Negative correlation was established among %BF and distance covered at YoYo-IR1 (p<0.02; r= -0.6), relative VO_{2max} (p<0.00; r=-0.7), vVO_{2max} (p<0,01; r= - 0.5), VT_2 (p<0.02; r= -0.5), and RPP (p<0.00; r= -0.7). Significant positive correlation was established among %FFM and distance covered at YoYo-IR1 (p<0,05; r=0.6), relative VO_{2max} (p<0.00; r=0.7), vVO_{2max} (p<0.01; r=0.5), VT_2 (p<0.01; r=0.5), and RPP (p<0.00 r=0.7). Conclusion: Female futsal players showed a normal body composition and VO_{2max} values, but the anaerobic capacity was considerable weak.

Key words: Physiological sport. Futsal. Aerobic exercise. Anaerobic exercise.

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RESUMO

Perfil físico e fisiológico de jogadoras de futsal feminino

O perfil físico e fisiológico dos jogadores de futsal está associado ao desempenho técnico, tático, físico e fisiológico. Objetivo: Identificar o perfil físico e fisiológico de jogadoras de futsal, bem como correlacionar variáveis antropométricas e de composição corporal com indicadores fisiológicos de desempenho no futsal. Materiais e métodos: Dezenove atletas de uma equipe universitária participaram do estudo. MC, estatura, IMC, %GC e %MLG foram avaliados. O $VO_{2máx}$, $FC_{máx}$, $vVO_{2máx}$, VT_1 e VT_2 e YOYO-IR1 foram avaliados por um teste máximo aeróbico. A APP, AP_{AVG}, RPP, RP_{AVG}, o TW e o % FI foram determinados pelo Teste de Wingate. Resultados: O perfil físico consistiu em massa corporal de 63,3±12,06 kg, IMC 24±3,35 (kg.m^{-2}),% GC 26,3±3,7 e% FFM 73,6±4,9. O perfil fisiológico consistiu em $VO_{2máx}$ absoluto 2720,7±391,8 ml.min^{-1}, $VO_{2máx}$ relativo 44,5 ± 5,6 ml.kg^{-1}.min^{-1}, $vVO_{2máx}$ 13,3 ± 1,5 km.h^{-1}, $FC_{máx}$ 193,7±7,4, VT1 34,2±3,5 ml.kg^{-1}.min^{-1}, VT2 39,9±4,4 ml.kg^{-1}.min-^{1}, APP 562,3±71,5 (W), APAVG 403±40,8 (W), RPP 9±1,03 W.kg^{-1}, RPAVG 6,5±0,8 W.kg-^{1}, TW 12090±1224 (J) e %FI 48,55±7,42. Correlação negativa foi estabelecida entre %GC e distância percorrida no YoYo-IR1 (p<0,02; r=-0,6), $VO_{2máx}$ relativo (p<0,00; r=-0,7), $vVO_{2máx}$ (p <0,01; r=-0,5), VT_2 (p<0,02; r=-0,5) e RPP (p<0,00; r=-0,7). Correlação positiva significativa foi estabelecida entre %FFM e distância percorrida no YoYo-IR1 (p<0,05; r=0,6), $VO_{2máx}$ relativo (p<0,00; r=0,7), $vVO_{2máx}$ (p<0,01; r=0,5), VT_2 (p<0,01; r=0,5) e RPP (p<0,00 r=0,7). Conclusão: As jogadoras de futsal apresentaram composição corporal e valores de $VO_{2máx}$ normais, mas a capacidade anaeróbia foi consideravelmente fraca.

Palavras-chave: Fisiologia do esporte. Futsal. Exercício aeróbico. Exercício anaeróbico

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INTRODUCTION

Futsal is one of the most popular team sports in the world and the number of practitioners in the female athletes has progressively rise due to increased investment by national and international federations (Gayardo, Matana e Silva, 2012).

Futsal is a sport played in 2 teams of 5 players each (a goalkeeper and four outfield players) on a field of 40×20m and can be characterized by high intensity intermittent actions (Buchheit et al., 2010; Stølen et al., 2005), in which physical, physiological, technical, tactical and psychological factors can influence the match and the results (Barbero-Alvarez et al., 2008; Gayardo, Matana e Silva, 2012).

Running is predominant physical activity and international-level female futsal athletes cover from 3 - 3.5 km during official matches, with 13 to 25% of this distance being covered at high intensity (velocity >18 $km.h^{-1}$) (Beato et al., 2017; Dogramaci, Watsford e Murphy, 2011; Makaje et al., 2012; Oliveira Bueno et al., 2014; Vieira et al., 2016).

The athletes perform 12.38 ± 3.98 sprints for game in a maximal velocity (>18 $km.h^{-1}$) that represents approximately 70m running with accelerations, decelerations and changes of direction (Palucci Vieira et al., 2021).

The intensity remains most part of time above 85-90% of the maximum heart rate (HR_{max}) during the match (Barbero-Alvarez et al., 2008, 2015; Castagna, D'Ottavio, et al., 2009; Dogramaci, Watsford e Murphy, 2011; Makaje et al., 2012; Rodrigues et al., 2011; Soares et al., 2011), requiring a high physical, technical, and tactical demands (Barbero-Alvarez et al., 2008; Dogramaci, Watsford e Murphy, 2011; Makaje et al., 2012).

Anthropometric characteristics and body composition play an important role to maximize performance during the competitive season. A team in which the athletes have a low percentage of fat and a higher percentage of muscle mass, have greater capacity to produce strength, power, and endurance (Jovanovic, Sporis e Milanovic, 2011; Spyrou et al., 2021).

The studies with female futsal athletes examined the physical and physiology demands during the match (Barbero-Alvarez et al., 2015; Gacar, Yalcin, 2015; Queiroga et al., 2019; Spyrou et al., 2021).

However there is a limitation of studies on the physical and physiological profile of female futsal athletes, especially at college level (Lesinski et al., 2017).

In this way, understand the physical, aerobic, and anaerobic power profile have been considered important for monitoring and prescribing training loads, as well as for maximizing performance.

The high aerobic capacity has been considered important for futsal performance, mainly because it is responsible for providing a large amount of energy for the game's actions.

Athletes with high levels of aerobic capacity can tolerate the high physical demands during match in both halves, too are able to increases total distance covered, number of engagements with the ball, and high intensity activities such as sprints (anaerobic performance) during the game (Buchheit et al., 2010; Castagna, Impellizzeri, et al., 2009; Mendez-Villanueva et al., 2012).

In addition, can recover faster between consecutive high-intensity efforts (Naser, Ali e Macadam, 2017). It is also important identify parameters of aerobic performance, such as ventilatory thresholds (VT_1 and VT_2), velocity correspondent to ventilatory thresholds (vVT_1 and vVT_2) and velocity at maximal oxygen uptake (vVO_{2max}), whereas these variables have positive relationship with the distance covered at high intensity during the match affecting game's performance (Castagna, Impellizzeri, et al., 2009).

For example, athletes with higher levels of maximal oxygen uptake (VO_{2max}), vVO_{2max}, and vVT_2 perform more high-intensity activities during the match than their counterparts with lower levels (Buchheit et al., 2010; Castagna, Impellizzeri, et al., 2009).

For futsal male athletes it is estimated that the VO_{2max} should be between 49.4–57.6 $mL.kg^{-1}.min^{-1}$ (Spyrou et al., 2020) and the VT_2 is estimated in 44.4 ± 4.6 $ml.kg^{-1}.min^{-1}$, whereas for semi-professionals the VT_2 was 39.1 ± 4.0 $ml.kg^{-1}.min^{-1}$.

However, for female futsal athletes, there is a lack of studies on VO_{2max}, vVO_{2max}, and VT_2 leaving a gap in the literature regarding the physical fitness profile of this population.

Just as aerobic capacity plays an important role in futsal performance, anaerobic power is equally important, especially for high intensity, short duration performances that involve high levels of power.

In general, the maximum anaerobic power (MAP) is measured through the Wingate Test or by indirect test that analyzes repeated sprints ability (Bar-Or, 1987).

Anaerobic power plays an important role in futsal performance mainly during high intensity activity (sprints, kicks, jumps) (Castelli et al., 2013).

Athletes with high levels of anaerobic power are able to kick harder, jump higher, perform better repeated sprints ability as well as sprints with changes of direction and show low levels of fatigue than their peers with lower levels (Amani-Shalamzari et al., 2019; Castagna, Impellizzeri, et al., 2009; Spyrou et al., 2021; Stølen et al., 2005) in a futsal match, the distance covered at high intensity corresponds to 5% to 8.9% of the total distance covered (Barbero-Alvarez et al., 2008; Castagna, D'Ottavio, et al., 2009; Oliveira Bueno et al., 2014), where the athletes performs 2 to 3 sprints every 15 seconds (Caetano et al., 2015).

The ability to perform repeated sprints must be developed to allow athletes to maintain high levels of anaerobic power while performing high intensity activities while experiencing lower levels of fatigue (Hader et al., 2014).

Therefore, it is important to identify the physical and physiological characteristics of female futsal players, aiming to optimize the assessment, prescription, monitoring the training loads, thus allowing to maximize performance in sport. Physical and physiological characteristics of futsal players have recently been established almost exclusively for male athletes, and thus generating a gap in literature around the female futsal players.

The objective of study was identifying the physical and physiological profiles of female futsal athletes, as well as to correlate physical and physiological indicators of performance.

MATERIALS AND METHODS

Subjects

The sample comprised 19 college female futsal players aged between 18 and 28 years. All participants were engaged in formal futsal training (three training sessions per week, 90-120 minutes per session) including local and regional competitions during an 8-months competitive season.

All players had at least 5 years of experience as futsal players. The study was approved by the University Research Ethics Board (Project ID#: 2.507.031) and was conducted in compliance with the standards set by the Declaration of Helsinki. Athletes were informed of the experimental protocol and potential risks and provided written informed consent prior to participation in the study.

Anthropometry

Body mass and height were assessed using a digital scale and a stadiometer (Urano Personal Modelo UP-150). These values were used to calculate the body mass index (BMI). Sun of eight skinfolds (mm) were measured at the following eight sites: pectoral, middle axillary, triceps, subscapular, suprailiac, abdominal, thigh and calf using skinfold caliper (Mitutoyo-CESCORF, Porto Alegre-RS, Brazil).

The Jackson and Pollock (1980) and Brozek (Brožek et al., 2006) equations were used to calculate the percentual body fat (%BF) and percentual of fat-free-mass (%FFM). The skinfolds followed the recommendations established by the International Society for the Advancement of Kineanthropometry (Marfell-Jones MJ, Olds T, 2006).

Aerobic Capacity

The cardiopulmonary exercise testing (CPET) was realized to determine the VO_{2max}, ventilatory thresholds (VT_1 and VT_2), and velocity at VO_{2max} (vVO_{2max}) assessed by open circuit spirometry (breath by breath). Following the manufacturer's instructions, the ergospirometry device (Quark CPET, Cosmed, Itália) was manually calibrated using known gas concentrations.

Before each test all athletes were adapted to the test procedures (treadmill - Quinton Instruments, Seattle-USA) and warm up for 5 minutes of running at low intensity followed by 3 minutes of running at 7 km.h^{-1}. Together with the ergospirometry, the intensity was monitored continuing by a heart rate monitor (Polar S610, Electro Oy, Kempele, Finland) to measure the maximum heart rate (HR_{max}).

Participants then performed a single progressive maximum effort test, which consisted of running for 3 minutes at 7 km.h^{-1} followed by increases of 0.5 km.h^{-1} every 30 s until exhaustion. The participants were verbally

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encouraged during the test to achieve their maximal performance.

To verify an exhaustive effort, each participant had to satisfy at least two of the following criteria upon termination of the treadmill test due to volitional exhaustion: 1) a plateau of VO_2 that was defined as an increase in VO_2 of less than 2.1 $mL.kg^{-1}.min^{-1}$ with a corresponding increase in exercise intensity; 2) heart rate at the end of the test ≥ 95% of the predicted maximal heart rate, 3) respiratory exchange ratio (RER) ≥ 1.15, subjective perception of effort greater than 18; or 5) voluntary interruption. VO_{2max} was considered as the minimum intensity at which VO_2 values reach a plateau. When a plateau was not observed, the peak oxygen uptake was considered.

According to these criteria, all participants showed a valid VO_{2max} (Cunha et al., 2011, 2016; Leites et al., 2016).

Ventilatory thresholds were determined in plots of the ventilation (VE), ventilatory equivalents (VE/VO_2 and VE/VCO_2), partial pressure of end-tidal carbon dioxide ($PETCO_2$), and partial pressure of end-tidal oxygen ($PETO_2$) as a function of oxygen uptake. Criteria to determine ventilatory thresholds were as follows: VT_1 was determined when there was a rapid increase in the VE/VO_2 and $PETO_2$ with no concomitant increase in VE/VCO_2 and $PETCO_2$.VT_2 was determined as the point at which a rapid rise in VE/VCO_2 and a fall in $PETCO_2$ were observed. VT_1 and VT_2 were defined as the work rates associated with a first and a second nonlinear increase of VE and VCO_2 (Cunha et al., 2011, 2016).

Two independent reviewers blindly determined ventilatory thresholds following the criteria previously described.

Intermittent Running Performance

To determine the intermittent running performance the Yo-Yo Intermittent Recovery Test Level 1 (Yo-YoIR1) was realized (Krustrup et al., 2003). The test consists of running 20-meters at progressive speed accompanied by 10 seconds of active recovery every 40-meters until exhaustion. The Yo-YoIR1 test started with a running speed of 10 $km.hr^{-1}$. The speed of test was controlled by an audible signal (beep). The test was completed when the athlete fails twice in complete the 20-meters distance within the time stipulated by the beep or when the athlete gives up running because she can no longer support the intensity of the exercise (voluntary withdrawal).

The total distance covered was considered the maximal intermittent running performance.

Wingate Anaerobic Test

To determined absolute peak power (APP), absolute power average (AP_{AVG}), relative peak power (RPP), relative power average (RP_{AVG}), total work (TW) and fatigue index (%FI) the Wingate test (Bar-Or, 1987) in cycle ergometer (Cybex - model “The Bike” - USA) was used. The protocol started with warm-up for 5 to 10 minutes with self-selected load, alternating 30s with exercise and 30s with rest. Before starting the test, the evaluator emphasized the need to pedal as fast and as hard as possible, maintain maximum performance during the 30s of the tests.

The load used was 7.5% of the total body mass. All athletes were verbally encouraged to achieve maximum performance. Fatigue index (%FI) values were analyzed using the equation (Zagatto, Beck e Gobatto, 2009):
%FI= ((Peak power - Lowest power) ÷ Peak power)) x 100

Statistical Analyses

Data are presented as mean ± SD. Data normality and homogeneity were verified through Shapiro-wilk and Levene’s tests, respectively.

Pearson’s correlations were used to establish any relationships between physical and physiological profile.

Pearson’s analysis of correlation was used to investigate correlations among body composition and physical fitness variables.

The magnitude of correlations was interpreted as follows: trivial ($r< 0.1$), small ($0.1< r < 0.3$), moderate ($0.3< r <0.5$), large ($0.5< r <0.7$), very large ($0.7< r <0.9$), and nearly perfect ($r>0.9$) (Hopkins et al., 2009). A significance level of $p<0.05$ was adopted for all statistical tests.

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RESULTS

Table 1 presents the physical profile whereas Table 2 show the physiological profile of the female futsal players. Table 3 presents the correlation between physical and physiological profile.

Table 1: Physical profile of female futsal players.

Variables	Values
Age (yrs)	23.6±3.4
Heigh (m)	1.62±0.05
Body mass (kg)	63.3±12.06
BMI (kg.m^{-2})	24.0±3.35
Body fat mass (%)	26.3±3.7
Body fat mass (kg)	17.16±6.7
Fat free mass (%)	73.6±4.9
Fat free mass (kg)	46.1±4.9

Legenda: Data expressed as mean and standard deviation (mean ± SD). Note: BMI: Body mass index.

Table 2 - Physiological profile of female futsal players.

Variables	Values
VO_{2max} (ml.min^{-1})	2710.7±391.8
VO_{2max} (ml.kg^{-1}.min^{-1})	44.5±5.6
vVO_{2max} (km.h^{-1})	13.3±1.5
HR_{max} (bpm)	194±7.4
VT_1 (ml.kg^{-1}.min^{-1})	34.2±3.5
VT_2 (ml.kg^{-1}.min^{-1})	39.9±4.4
Distance covered YoYo-IR1 (m)	400±106.9
APP (W)	562.3±71.5
RPP (W.kg^{-1})	9.00±1.03
AP_{AVG} (W)	403.0±40.8
RP_{AVG} (W.kg^{-1})	6.5±0.8
TW (J)	12090±1224
%FI	48.5±7.4

Legenda: Data expressed as mean and standard deviation (mean ± SD). Note: HR_{max}: maximal heart rate; VO_{2max}: maximal oxygen uptake; vVO_{2max}: velocity at maximal oxygen uptake; VT: Ventilatory threshold; %FI: fatigue index; APP: absolute peak power; AP_{AVG}: absolute power average; RPP: relative peak power; RP_{AVG}: relative power average; TW: total work; %FI: fatigue index.

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Table 3 - Correlations between physical fitness and body composition of female futsal players.

	BF (%)		FFM (%)		FFM (kg)		YoYo-IR1 (m)		VO_{2max} (ml.kg⁻¹min⁻¹)		vVO_{2max} (km.h⁻¹)		VT_1 (ml.kg⁻¹min⁻¹)		VT_2 (ml.kg⁻¹min⁻¹)	
	r	p	r	p	r	p	r	p	r	p	r	p	r	P	R	P
BF (%)	-	-	-	-	-	-	**-.608***	.028	**-.793****	.000	**-.570***	.017	-.328	.232	**-.571***	.026
FFM (%)	-	-	-	-	-	-	**.608***	.028	**.793****	.000	**.570***	.017	-.328	.232	**.571***	.026
FFM (kg)	-	-	-	-	-	-	-.168	.583	-.282	.020	-.151	.564	-.106	.706	-.291	.293
YoYo-IR1 (m)	**-.608***	.028	**.608***	.028	-.168	.583	-	-	**.632***	.020	.356	.232	.097	.753	.338	.258
VO_{2max} (ml.kg⁻¹min⁻¹)	**-.793****	.000	**.793****	.000	-.282	.273	**.632***	.020	-	-	**.664****	.004	.479	.071	**.776****	.001
vVO_{2max} (km.h⁻¹)	**-.570***	.017	**.570***	.017	-.151	.564	.356	.232	**.664****	.004	-	-	.143	.612	**.623***	.013
VT_1 (ml.kg⁻¹min⁻¹)	-.328	.232.	.328	.232	-.106	.706	.097	.753	.479	.071	.143	.612	-	-	.397	.143
VT_2 (ml.kg⁻¹min⁻¹)	**-.571***	.026	**.571***	.026	-.291	.293	.338	.258	**.776****	.001	**.623***	.013	.397	.143	-	-
APP (W)	.448	.054	-.448	.054	**.680****	.001	-.036	.906	-.105	.690	.030	.910	-.053	.851	-.066	.815
APP (W)	.268	.267	-.268	.267	**.679****	.001	-.126	.682	.141	.589	.392	.119	-.069	.806	.140	.618
RP_{AVG} (W.kg⁻¹)	**-.771****	.000	**.771****	.000	**-.709****	.001	.333	.266	**.715****	.001	**.709****	.001	.125	.657	**.619***	.014
TW(J)	.268	.267	-.268	.267	**.679****	.001	-.126	.682	.141	.589	.392	.119	-.069	.806	.140	.618
%FI	.265	.273	-.265	.273	.111	.650	.163	.595	-.230	.375	-.381	.132	.057	.840	-.193	.491

Note: HR_{max}: maximal heart rate; VO_{2max}: maximal oxygen uptake; vVO_{2max}: velocity at maximal oxygen uptake; VT: Ventilatory threshold; %FI: fatigue index; APP: absolute peak power; AP_{AVG}: absolute power average; RPP: relative peak power; RP_{AVG}: relative power average; TW: total work; %FI: fatigue index. *Significant correlation $p<0.05$; **significant correlation $p<0.01$. |

DISCUSSION

The present study aimed to identify the physical and physiological profile of college female futsal players, as well as to correlate body composition with the physiological variables. In our knowledge this is the first study that analyzed the physical and physiological profile in college female futsal players correlating body composition with physiological variables.

The physical profile can influence the match performance. We found strong and negative correlations among BMI, %BF, and physiological indicators of performance, showing that high adiposity can harm the performance of specific futsal skills (e.g. kicking, pass, change of direction, repeated sprint's ability, offensive e defensive skills) (Brocherie et al., 2014).

In the present study, the VO_{2max} values are in accordance with previous studies (Apriantono et al., 2021; Barbero-Alvarez et al., 2015; Datson et al., 2014a; Karahan, 2012; Rocha, Waltrick e Venera, 2013). Nonetheless, high VO_{2max} values (49.4–57.6 mL.kg⁻¹.min⁻¹) has also been established for elite soccer female athletes (Datson et al., 2014b).

Female futsal athletes from the Brazilian team have showed higher values compared to the present study (57 mL.kg⁻¹.min⁻¹) (Rocha, Waltrick e Venera, 2013). On the other hand, lower values of VO_{2max} (40.0±0.04 ml.kg⁻¹.min⁻¹) have been found in younger college female futsal players (19 years old) (Apriantono et al., 2021), as well as in Turkish players (43.6 mL.kg⁻¹.min⁻¹) compared whit the present study (Karahan, 2012).

These differences may be assigned to genetic factors, level and experience of training and competitions of the athletes.

The VO_{2max} values found are of paramount importance for high-level performance in futsal, since athletes spend 5 to 12% of their time in activities of high intensity or maximum effort, that is, 13.7% and 8.9 % of the total distance covered during match, respectively (Barbero-Alvarez et al., 2008).

Futsal is characterized for being a high-intensity intermittent sport, in which athletes perform numerous activities as accelerations, deaccelerations, change of direction, kicks, jumps, and sprints (Barbero-Alvarez et al., 2008).

In this context, it has been suggested that high aerobic and anaerobic power levels are related to better physical performance in futsal. High levels of VO_{2max} allowing them to maintain performance for a longer time and allows a better recovery between stimuli due to also improves anaerobic and phosphocreatine system (MacInnis e Gibala, 2017).

This prevents a significant decrease in the intensity and velocity of the match from the first to the second half, maintaining the intensity of the game (Palucci Vieira et al., 2021).

Anaerobic power is defined as the maximum energy released per unit of time and is directly linked to game actions and energy supply for explosive movements (Naser, Ali e Macadam, 2017).

High levels of anaerobic power have been associated to better ability to sprint, kick, jump and tackle during the match (Apriantono et al., 2021). In the present study we found an APP of 562.3±71.5 (W), while Karahan et al., (2012) found lower values of APP compared to the present study (413.4 ± 17.6 W) even after eight weeks of training.

On the other hand, Apriantono et al., (2021) found higher values of APP (1813.2±344.4 W) in female futsal players. This difference can be attributed to status and level of training, models of training, volume, intensity, and frequency of training, competitive level, biological individuality, chronological age, and genetic factors (Cruz, da et al., 2020).

A higher anaerobic power induce a large recruitment of type II muscle fibers, improving sprint repetition skill (RSA) and muscle power (Gibala e McGee, 2008), however, the poor anaerobic capacity found in the present study can be explained by the athletes being at the beginning of the season (Lesinski et al., 2017).

The anaerobic capacity is capable of training, therefore, it is important to analyze the athletes' power at the beginning of the season to periodize training that promotes the improvement of this variable.

Specific strength and power training can be used to improve aerobic and anaerobic power and consequently improving fatigue tolerance and the recovery between repeated sprints during the match.

Due to the high physical and physiological demands of a futsal match, high levels of aerobic and anaerobic power and capacity are related to better futsal performance compared to their peers with lower levels.

Thus, the aerobic and anaerobic power must be trained, because the athlete have the ability to improvement through running training programs and sessions with and without the ball that perform plyometric exercises, running, agility, sprints and/or all-out training (Brocherie et al., 2014; Karahan, 2012; Lesinski et al., 2017). This will improve short-term recovery and the ability to increase match intensity.

Practical Applications and conclusion

The female futsal practice has increased considerably and knowing the physical and physiological profile of the athletes is important to maximize the positive adaptions of the training. We conclude that college female futsal players showed moderate VO_{2max} values, as expected, based in other futsal and soccer players with same age and training status.

However, athletes' anaerobic power is considered weak compared to other athletes (female, male, amateur and/or professional).

Futsal training can improve body composition, aerobic and anaerobic power. In this way, training sessions with high intensity demands as plyometrics, sprints and all-out exercises can improve physical performance in a short training period (4-8 weeks) (Gillen e Gibala, 2018; Spinks et al., 2007).

The results can help futsal coaches to periodize the athletes' training with the objective of improving the aerobic and anaerobic power.

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CONFLICT OF INTERESTS

The authors declare no conflict of interest.

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