

Influence of amateur futsal practice on pelvic floor muscle strength

Influência da prática de futsal amador na força muscular do assoalho pélvico

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RESUMO | INTRODUÇÃO: há poucas informações sobre o impacto do treinamento intenso de bola na biomecânica dos músculos do assoalho pélvico em atletas de futsal. **OBJETIVO:** avaliar a influência da prática de futsal amador na força muscular do assoalho pélvico. **MATERIAIS E MÉTODOS:** Estudo observacional descritivo, transversal, de natureza quantitativa, com atletas amadores de futsal. Aplicou-se um questionário sobre o histórico ginecológica e prática esportiva. O exame físico com um perineômetro demonstrou contração muscular através da Escala de Sauer. **RESULTADOS:** Idade média de $27,0 \pm 4,1$ anos, índice de massa corporal $23,9 \pm 3,3$ kg / cm², atletas com função regular do assoalho pélvico (n = 8,80%), tempo de contração da musculatura do assoalho pélvico de $9,2 \pm 1,6$ s tempo de jogo de $18,4 \pm 4,9$. Encontramos uma associação moderada entre o tempo de contração dos músculos do assoalho pélvico versus tempo de jogo ($r = -0,653$; $p = 0,040$) e esse achado foi ratificado por uma análise de regressão linear simples, onde há uma influência de 36% da prática de futsal na força dos músculos do assoalho pélvico. **CONCLUSÃO:** Há influência direta da prática de futsal amador na força de contração dos músculos do assoalho pélvico. É essencial enfatizar a importância dos músculos do assoalho pélvico nesses atletas, uma vez que a fraqueza muscular é um fator predisponente para a presença de sintomas de perda urinária.

PALAVRAS-CHAVE: Atletas. Força muscular. Diafragma da pelve. Saúde da mulher. Futebol.

ABSTRACT | INTRODUCTION: In futsal athletes there is few information about the impact of intense ball training on pelvic floor muscles' biomechanics. **PURPOSE:** to evaluate the influence of amateur futsal practice on pelvic floor muscle strength. **MATERIALS AND METHODS:** Cross-sectional, descriptive observational study of a quantitative nature with 10 amateur futsal athletes. A questionnaire on gynecological history and sports practice was applied. Physical examination with a perineometer demonstrated muscle contraction through the Sauer Scale. **RESULTS:** Average adult age of 27.0 ± 4.1 years, body mass index 23.9 ± 3.3 kg/cm², the athletes had regular pelvic floor function (n = 8, 80%), contraction time of the pelvic floor muscles 9.2 ± 1.6 s, playing time 18.4 ± 4.9 . We found a moderate association between the pelvic floor muscles' contraction time vs. playing time ($r = -0.653$; $p = 0.040$) and this finding was ratified by a simple linear regression analysis, where there is a 36% influence of the futsal practice on pelvic floor muscles' strength. **CONCLUSION:** There is a direct influence of amateur futsal practice on pelvic floor muscles' contraction force. It is essential to emphasize pelvic floor muscles' importance in these athletes, since muscle weakness is a predisposing factor to the presence of urinary loss symptoms.

KEY-WORDS: Athletes. Muscular strength. Pelvic floor. Physical therapy specialty. Soccer.

Pelvic floor muscles (PFMs) are divided in: pelvic diaphragm muscles (levator ani muscle that includes the pubococcygeus, puborectalis, and iliococcygeus) and urogenital muscles (bulbocavernosus muscle, superficial transverse perineal muscle and ischiocavernosus muscle), it is evident that the correct anatomical-functional maintenance of these structures is extremely important for the normal functioning of the pelvic floor (PF)^{1,2,3}. However, it is estimated that approximately 40% of the women do not know how to properly contract PFMs or perform it incorrectly with compensation of the accessory muscles; glutes, hip adductors and abdominals⁴. Factors ranging from a lack of perineal awareness to absence of muscle contraction of this region may be directly related⁵.

Physical exercises practice can contribute positively to PF function, acting in the continence mechanism, body weight maintenance and obesity prevention⁶. Despite of that, it is known that high-impact exercises may be associated with an abrupt increase of intra-abdominal pressure and when PFMs' contraction is not correctly performed it can lead to dysfunctions including Urinary Incontinence (UI) symptoms.

Currently, there is convergence in the literature regarding exercises' effects on PFMs^{7,8}. Carvalhais et al.⁹ emphasized that the increase in impact, abdominal pressure and soil reaction forces can lead to a PFMs' pre-contraction resulting in a muscle training effect. Strenuous physical activity without simultaneous co-contraction can overwhelm the muscles, causing stretching of the fibers and thus weakening the PF.

There are few evidences on the effect of intense ball training in amateur futsal athletes on the PFMs, in addition to that it is known that the main characteristics of this modality that these athletes need are power, anaerobic resistance, speed, agility, aerobic capacity and impulsions^{10,11}. Therefore, we aimed to evaluate through perineometry, the pelvic floor muscular strength in amateur futsal athletes.

Study design

Cross-sectional, descriptive observational study of a quantitative nature¹², following STROBE statement, that evaluated 10 female athletes, practitioners of amateur futsal in October, 2017 at Fisiounisc Physiotherapy Clinic in University of Santa Cruz do Sul (UNISC), Santa Cruz do Sul/RS. The research project was approved by UNISC's Research Ethics Committee (protocol n° 2.127.940; CAAE 62855816.3.0000.5343). The volunteers participating in the study were clarified about the research objectives through the informed consent term.

Subjects

Female amateur futsal players aged 18-35, that were athletes for at least one year, with training frequency twice a week and lasting at least one hour were included in the study. Patients with risk factors associated with UI such as: being pregnant, giving birth, gynecological surgeries performed less than one year, and those with associated comorbidities including diabetes mellitus (DM) and systemic arterial hypertension (SAH) were excluded.

Measurements

Each volunteer was individually evaluated in a single meeting. Initially, a brief evaluation was conducted with questions elaborated by the researchers regarding sports practice and obstetric history, as well the calculation of the Body Mass Index (BMI), according to the values of the Brazilian Obesity Guidelines for 2016¹³.

Perineometer

To measure PFMs' strength, a physical examination was performed with the perineometer. The participant was placed covered with a sheet, in dorsal decubitus on a stretcher, with lower limbs abduction and flexion of hip and knee bilaterally. The test was performed according to the norms of asepsis and the device used was T.I.U Kroman kg350M® digital perineometer that meets the requirements of the safety standards

and demonstrates muscle contraction in scores from 0 to 100 (Sauer Scale).

Sauer Scale

The Sauer Scale has an equivalence in pounds of pressure, where, 28 Sauers equate to a healthy musculature being classified as; 0-10 Sauers poor, regular 11-25, normal 26-40, good 41-60, excellent of 61-80 and extraordinary of 81-100.

First, the participant was advised on how to perform the contraction properly. Afterwards, the probe previously coated with a disposable condom was introduced to the vagina and a maximal contraction of the PF musculature was requested, which it should be sustained for as long as it could. This contraction was repeated three times in succession, with an interval of 30 seconds between each, for not fatiguing the muscles. The three scores were recorded, but the highest value was considered for analysis. It was inspected if there was simultaneous contraction of accessory muscles during contraction of PFMs.

Statistical Analysis

We used Statistical Package for Social Sciences (SPSS 23.0, IBM, Armonk, NY, USA) to analyze the data. Normality was evaluated through Shapiro-Wilk Test and data were described in frequency, mean and standard deviation. We applied Pearson correlation to evaluate association of variables and a simple linear regression model to evaluate the effect of futsal practice time on the contraction of PFMs. We considered significant $p \leq 0.05$.

Results

Table 1 shows the characterization of the evaluated sample. 10 amateur futsal athletes, with adult age, predominance of normal BMI, who train 3 times/week with average duration of 180 minutes, present regular PF function and use of accessory muscles during contraction of the PLMs.

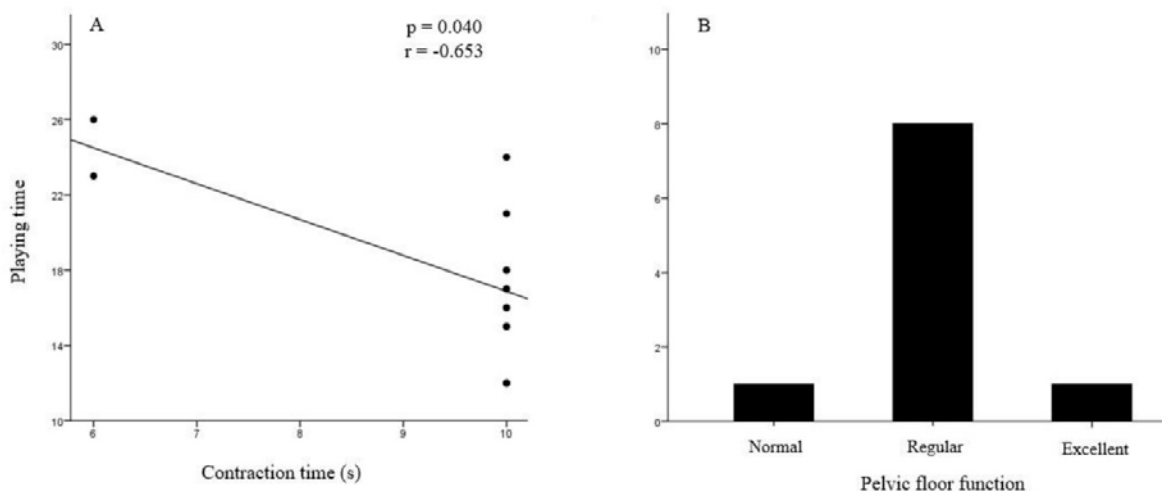
Table 1. Evaluated athletes' characteristics the pelvic floor muscular strength in amateur futsal athletes. Santa Cruz do Sul/RS-2017

Variables	n= 10
Age (years)	27.0 ± 4.1
BMI (kg/cm ²)	23.9 ± 3.3
BMI classification n. (%)	
Normal	8 (80)
Overweight	1 (10)
Obese	1 (10)
Training frequency (weekly)	3 (100)
Training length of time (min)	180 (100)
Playing time (years)	18.4 ± 4.9
Sauers	24.4 ± 11.7
PFMs contraction time (s)	9.2 ± 1.6
Use of accessory muscles n. (%)	
Yes	9 (90)
No	1 (10)

BMI = body mass index; PFMs = pelvic floor muscles. Data presented in frequency, mean ± standard deviation, median and interquartile range

We found moderate correlations between athletes' playing time and PFMs' contraction time (Figure 1A), that is, the longer the athletes play, lower muscles' time of contraction. We also highlight the higher frequency of regular PFMs' function (Figure 1B).

Figure 1. Correlation between playing time and PFMs' contraction time
Figure 1A: Negative association between athletes' playing time and PFMs contraction time; Figure 1B: PFMs' function



The results found in Figure 1A, are ratified through a simple linear regression analysis, where the athletes' playing time influences 36% in the PFMs' contraction force, Table 2.

Table 2. Simple linear regression analysis to predict PFMs contraction time from playing time. Santa Cruz do Sul/RS-2017

Variables	B Coefficient	p-value
Constant	13,3	0,001
Playing time (years)	-0,21	0,041

Adjusted R: 0,365; F: 5,93 (p=0,041).

Discussion

We highlight as main findings of our study the direct association between PFMs' loss of muscle strength and longer futsal practice time, that is, the more those athletes train, lower is their PFMs' contraction force.

Maia et al.¹⁴ state that PF muscle fatigue is highly related to endurance modalities and abdominal muscle strength that tends to be high in these athletes, since PF is composed of 70% of type I (slow) fibers, but when there is a decrease in oxygen supply, type II (fast) fibers are recruited, fibers who do not have the same efficiency compared to type I fibers to maintain PF's muscle tone. In the systematic review

of Martins et al.¹⁵ futsal is considered a low-impact sports modality, but when considered with high-impact activities, thus practicing a large volume of training (hours per week) also increases the risks of developing symptoms of urinary loss in the future. In this sense, the correlation between PFMs' strength loss, accessory muscle use and the intense training time of these athletes can be explained, since 100% of the sample in our study presented 180 minutes of training at a frequency of three days a week.

Regarding futsal practice, there are few findings on the influence of this modality for UI¹¹. Filoni et al.¹⁶ found UI in young futsal athletes aged 11 to 19 years. According to Ferreira et al.¹⁷ one of the main risk factors for PF dysfunctions is overweight

and obesity, which may stress the PF by increasing intra-abdominal pressure and consequently progressing to PFMs weakness. Dias et al.¹⁸ stated that whilst in athletes with normal BMI there may be an abrupt intra-abdominal pressure that will result in hypermobility of the bladder and urethra even with absence of risk factors. Corroborating with the characteristics presented by the athletes evaluated in our study, which, even presenting normal BMI (80%), have a regular PFMs function (80%) through the Sauer Scale and presence of accessory muscles use (hip, abdominal and gluteal adductors) in 90% of the sample population may influence PF muscle weakness.

The present study presented limitations such as the low sample size due to the perception of privacy invasion of the contacted athletes, which was manifested by the refusal to comply with the research proposal. The second limiter mentioned refers to the reduced thematic approach in the target population before the scientific studies accessed, making it difficult to compare data with other studies restricting the results to the studied sample. It is recommended the continuation of studies on the subject as well as a greater sample size. We emphasize the importance of physiotherapy not only in the rehabilitation process, but also in the development of prevention strategies, re-education and perception of the PFMs, contributing to the quality of life of these athletes.

Conclusion

We conclude that there is a direct influence of amateur futsal practice on PFMs' contraction force. It is extremely important to raise awareness on PFMs' perception in these athletes, since muscle weakness is a predisposing factor to the presence of urinary loss symptoms over the years.

Author contributions

Wollmann L, Goulart CL, Mansour KMK, Cerentini TM, Carvalho LL and Sudbrack AC participated in the design, collection of research data, analysis of research data, interpretation of results and writing of the scientific article.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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