

# Symptoms of lower urinary tract in women who practice physical exercise regularly.

Sintomas do trato urinário inferior em mulheres que praticam exercício físico regularmente.

**Eliana Barreto<sup>1</sup>, Eduardo Filoni<sup>2</sup>, Fátima Faní Fitz<sup>3</sup>**

*Universidade de Mogi das Cruzes (UMC), São Paulo (SP), Brazil.*

## Abstract

**Introduction:** The practice of regular physical exercise provides benefits to health and quality of life. However, these are seen as promoters of dysfunctions of the pelvic floor muscles (PFMs). **Objective:** To evaluate the physical activity level and the presence of urinary symptoms in women who perform exercise regularly and check the relation between them. **Method:** Forty-seven women who practice regularly physical exercise were evaluated in two gyms in the State of São Paulo/Brazil. The participants were characterized in accordance with the age, number of pregnancies, parity, body mass index, waist circumference, duration of physical exercise, weekly frequency of exercise and time spent in physical exercise. The level of physical activity was assessed by the "International Physical Activity Questionnaire" (IPAQ) long form, and the presence of urinary symptoms and their severity were assessed by the *International Consultation on Incontinence Questionnaire - Short Form* (ICIQ-SF). **Results:** Approximately 51.9% of women were considered active (greater than 600 METs value) and 49.1% were considered highly active (more than 1500's MET value). It was observed the presence UI in 72.3% of study participants. Approximately 52% of women showed a moderate UI according to the ICIQ-SF. **Conclusion:** Women were considered active or very active according to the recommendations of the IPAQ. It was observed a high prevalence of urinary symptoms in women on efforts in women who perform any physical activity regularly. The severity of the incontinence was classified as moderate according the ICIQ-SF. No significant relation it was observed between the severity of the UI and the level of physical activity.

**Keywords:** Urinary incontinence, stress urinary incontinence, Exercise.

**Submission date 25 August 2014; Acceptance date 27 November 2014; Publication date 04 December 2014**

1. PT graduated from Universidade de Mogi das Cruzes (UMC), São Paulo (SP), Brazil.
2. PhD, Professor and Coordinator of Faculdade de Fisioterapia of Universidade de Mogi das Cruzes (UMC), Centro de Ciências Biomédicas, São Paulo (SP), Brazil.
3. MSc, Professor of Faculdade de Fisioterapia of Universidade de Mogi das Cruzes (UMC), Centro de Ciências Biomédicas, São Paulo (SP), Brazil.

## Corresponding Author:

Fátima Faní Fitz. Avenida Imperatriz Leopoldina, 550, Vila Leopoldina, Zip Code: 05305-000, São Paulo (SP), País. Phone: (11) 3648-5050. E-mail: fatima.fitz@umc  
The authors declare no conflicts of interest.  
Financial support: None.

## Resumo

**Introdução:** A prática de exercício físico regular traz benefícios para a saúde e qualidade de vida. Entretanto, são apontados como promotores das disfunções dos músculos do assoalho pélvico (MAP). **Objetivo:** Avaliar o nível de atividade física e a presença de sintomas urinários em mulheres que realizam exercício físico regularmente e verificar a relação entre ambos. **Método:** Avaliou-se 47 mulheres praticantes de exercícios físicos regularmente em duas academias no Estado de São Paulo/Brasil. As participantes foram caracterizadas pela idade, número de gestações, paridade, índice de massa corporal, circunferência abdominal, tempo de prática do exercício físico, frequência semanal do exercício físico e tempo gasto na prática do exercício físico. O nível de atividade física foi avaliado pelo "Questionário Internacional de Atividade Física" (IPAQ) longo, e a presença de sintomas urinários e sua severidade pelo *International Consultation on Incontinence Questionnaire – Short Form* (ICIQ-SF). **Resultados:** Cerca de 51,9% das mulheres foram consideradas ativas (valor superior a 600 MET's) e 49,1% foram consideradas muito ativas (valor superior a 1500 MET's). Observou-se a presença IU em 72,3% das participantes do estudo. Cerca de 52% das mulheres apresentaram IU moderada, de acordo com o ICIQ-SF. **Conclusão:** As mulheres foram consideradas ativas e muito ativas de acordo com as recomendações do IPAQ. Observou-se uma alta prevalência de sintomas urinários aos esforços nas mulheres que realizam atividade física de forma regular. A severidade da IU foi classificada como moderada, conforme o ICIQ-SF. Não observou-se relação significativa entre a severidade da IU e o nível de atividade física.

**Palavras-chave:** Incontinência urinária; incontinência urinária por estresse, exercício físico.

## INTRODUCTION

Regular physical exercise, considering aerobic, the muscle-building and flexibility, brings many benefits, such as improved cardiovascular system; reduced body fat; improve physical appearance; increased physical strength, mass, muscle strength and bone mineral density. All these advantages imply a better quality of life.<sup>(1)</sup>

Although the exercise bring several benefits to health, they are seen as promoting factor for the appearance of dysfunction in the pelvic floor muscles (PFM).<sup>(2)</sup> The PFM make up the pelvic and urogenital diaphragms, which are responsible, together with the fascias, for supporting the internal organs and close the pelvic openings, urethra, vagina and anus.<sup>(3)</sup> Among the pelvic floor dysfunction are urinary and fecal incontinence, pelvic organ prolapse and pain sexual disorders.<sup>(4)</sup>

Urinary incontinence (UI), according to the International Continence Society (ICS) is defined as any involuntary loss of urine that results social and hygienic problem for the patient.<sup>(5)</sup> The UI presents specific etiology and pathophysiology and can be classified in stress urinary incontinence (SUI), which occurs due to a deficiency in the bladder and urethral support, causing the loss of urine during effort activities such as coughing, sneezing and exercise, being the most prevalent in the population in general, affecting approximately 80% of women between 25 and 60 years of age; the urgency urinary incontinence (UUI), which is described as the involuntary loss of complaint accompanied or preceded urgency of urine, or sudden desire to urinate and hardly deferrable, being prevalent in 11% of cases of female incontinence; and mixed urinary incontinence (MUI), characterized by symptoms of SUI and UUI, affecting about 36% of incontinent women.<sup>(5,6)</sup>

A high prevalence of UI has been reported in athletes who practice gymnastics, hockey and ballet, with rates at around 28% to 80%.<sup>(7)</sup> Values of IU prevalence for individuals who practice physical activity on a regular basis are still scarce. There are two hypotheses about how accomplished exercise intensely may affect the PFM, the first is that physical activity can strengthen the muscles, and the second is that physical activity can overwhelm and weaken the PFM.<sup>(8)</sup> However, a little bit is known about the direct impact of physical activity on the anatomy and function of the pelvic floor. In a study that examined the prevalence of urinary symptoms in elderly women undergoing physical activity on a regular basis, it was found that the lower prevalence of urinary incontinence was observed in more active women.<sup>(9)</sup> Given the above, this study aims to evaluate the level of physical activity and the presence of urinary symptoms in non-elderly women who perform physical exercise regularly and correlate the impact of urinary symptoms with the level of physical activity.

## METHODS

### Casuistry

This is a descriptive study with women frequenters two gyms located in the State of São Paulo and was conducted from August / 2013 to October / 2013. For this survey, the ethical principles were complied with in accordance with Resolution No. 196/96 of the Conselho Nacional de Saude. The study was sent to the Research Ethics Committee of the Universidade de Mogi das Cruzes-UMC, São Paulo/SP and approved under the number 367 760/13.

Women were included who practiced physical exercises regularly for a period of not less than three months.

Women who agreed to participate in the study signed the Informed Consent.

The study did not include women who practiced physical exercise for less than three months, women with neurological disorders, women who were in menopausal period and women who did not agree to participate in the study period.

### Tools for data collect

First the volunteers have gone through an interview guided in a Physical Therapy Assessment Form consists of interview, in which was carried out to characterize the participants (age, body mass index, waist circumference, gynecological and obstetrical history, practice time, weekly frequency and time spent in physical activity).

After the assessment of the level of physical activity through the "International Physical Activity Questionnaire" (IPAQ) was held over. This instrument allows to estimate the weekly time spent on physical activities of moderate to vigorous intensities in different contexts, such as work, transportation, housework, exercise and leisure and the time spent sitting.<sup>(10)</sup>

To estimate the level of physical activity of the participants it was used the classification criteria for habitual physical activity level (HPAL), using the formula suggested by the IPAQ Research Committee (2004), which presents the results in Metabolic Equivalent of Task (MET 's) in minutes per week. The data were summed for each domain of activity (work, transportation, home, leisure exercise and sitting) and thus calculated the total of all physical activity in minutes per week (Total Physical Activity). Energy expenditure was calculated for the minutes per week for each activity estimated in MET's. Vigorous activities range from 5.5 to 8 MET's moderate 3.3 to 4 MET's. From the application of this instrument, the practitioners were classified in active individuals (> 600 METs minutes per week) and very active (> 1500 METs minutes per week).<sup>(10)</sup>

The evaluation of the presence and impact of urinary symptoms on quality of life of women who practice physical activity on a regular basis were carried out by the

International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF).<sup>(11)</sup>

### Data analysis

The collected data were stored in Microsoft Office Excel 2007 program and each participant was registered with a number encoder. The analyzes of the characteristics of the sample, with the frequency distribution, central trend calculations (average) and minimum and maximum were drafted to Microsoft Office Excel 2007. The intensity of physical activity was calculated according to the recommendations of the IPAQ (Met 's per minute / week). The ICIQ-SF variables were analyzed descriptively using simple percentages frequency (categorical variables) and position and dispersion measures (numeric variables). Spearman correlation test was used to correlate the values of the ICI-Q and the IPAQ.  $p < 0.05$  was considered to indicate the level of statistical significance. The power of the relationship between variables was classified as: 0.80-1.00, high reliability; 0.60-0.80, moderate reliability; and <0.59, questionable reliability.<sup>(12)</sup>

### RESULTS

A total of 47 women were approached and agreed to answer the interview which was held from August/2013 to October/2013. The epidemiological profile of the women interviewed is in Table 1.

Regarding the types of births, 50% of women had caesarean sections and 50% vaginal births. Among women who had vaginal deliveries, all required performing episiotomy. Among the 47 interviewed, none had a history of smoking.

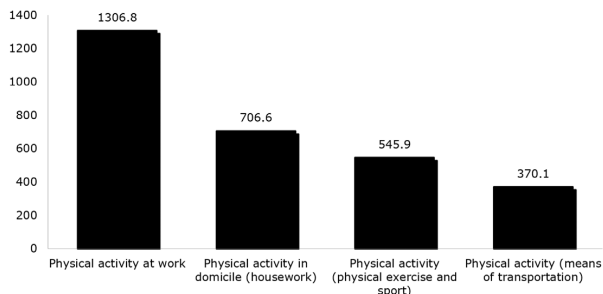
The level of physical activity of women was assessed by the IPAQ questionnaire. The IPAQ score was calculated, and the mean value (minutes / week) according to each section of the questionnaire can be seen in Figure 1.

Among the 47 women interviewed, 51.9% were considered active since reached a value greater than 600 METs (minutes/week); and 49.1% considered very active since reached a value greater than 1500 METs (minutes/week).

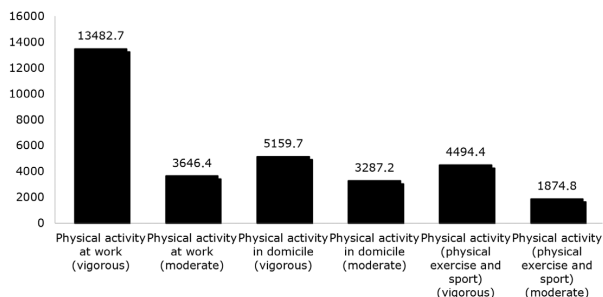
**Table 1.** Epidemiological profile of the women interviewed.

Variables (N=47)	Mean (Minimum-Maximum)
Age (years)	32.0 (18-47)
Gestation (N=29)	2.2 (1-5)
Parity	1.9 (1-4)
BMI (kg/m <sup>2</sup> )	24.8 (17.9-36.5)
Abdominal circumference (cm)	83.6 (60-113)
Physical exercise time (months)	12.5 (3-56)
Weekly frequency of physical exercise (days)	4.9 (3-6)
Time spent in physical exercise (hours)	1 hours and 40 minutes (45 minutes - 3 hours)

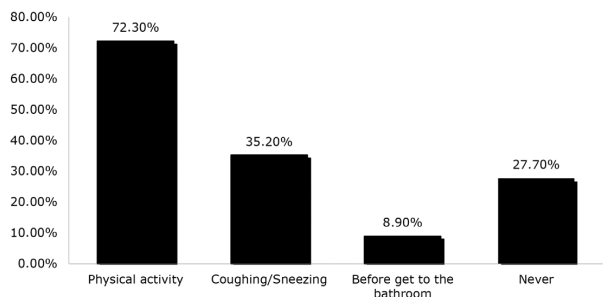
Subtitle: N=sample; BMI=Body mass index; cm=centimeters.



**Figure 1.** Average IPAQ score (MET`s minutes / week).



**Figure 2.** Average IPAQ score to estimate energy expenditure (MET`s minutes/week).



**Figure 3.** Assessment of situations of urinary incontinence according to the ICI-Q.

We evaluated the levels of moderate and vigorous physical activity through the IPAQ questionnaire, and found the prevalence of vigorous physical activity in the evaluated contexts (physical activity at work, home physical activity and leisure physical activity and exercise). The results are shown in Figure 2.

To assess the urinary incontinence was used ICI-Q questionnaire which evaluates the frequency, severity and impact of urinary incontinence. There was loss of urine in 34 women, who represent 72.3% of the 47 women interviewed. The mean questionnaire score was 10.5 (between 4 and 19 points). This score discloses a urinary incontinence classified as moderate (6 to 12 points).<sup>11</sup>

The ICI-Q questionnaire also assesses the situations in which there is urine leakage. These can be seen in Figure 3.

The women were asked about the interference of urinary loss in physical activity. It can be seen that the 34 women with urinary incontinence, about 50% reported avoid

**Table 2.** Impact of urinary loss in physical activity.

Activity (n= 17)	%
Run	29.4%
Increase the intensity of exercises	29.4%
Crouch	17.7%
Skip	17.7%
Lift Weight	5.8%

Subtitle: n=sample.

**Table 3.** Physical exercises and devices that the participants reported losing urine during the practice of physical exercises in the gym.

Physical exercises and equipments (n=34)	%
Jumping	52.9%
Squat with weight	52.9%
Leg press	29.4%
Run	23.5%
Walk	11.8%

Subtitle: n=sample.

making any physical activity due to urinary incontinence. These activities are shown in Table 2.

The women were also asked about the exercises and devices that would lose urine during physical exercise in the gym. Among the women who were interviewed, 34 reported losing urine during practice just a physical exercise and 10 women report lose urine in more than one year. These activities are shown in Table 3.

The analysis of correlation between the severity of UI reviewed by ICI-Q score and the level of physical activity assessed by the IPA-Q in different situations (physical activity at work, physical activity at home, physical activity as a means of transportation and physical activity as recreation) revealed a positive correlation between ICI-Q variables and physical activity as a means of transport  $r = 0.23$  ( $p = 0.18$ ) and between ICI-Q variables and household physical activity  $r = 0.16$  ( $p = 0.35$ ), but not significant. Both analyzes demonstrated to be questionable, according Richman et al.<sup>(12)</sup> the other variables showed no correlation.

**DISCUSSION**

The practice of physical activity by the population has increased and this has been the focus of many researchers around the world. To quantify the level of physical activity the IPAQ can be used, considers that physically active individuals when they perform physical exercise at least 3.3 MET`s (minutes/week).<sup>(10)</sup> Thus, the participants of this study were considered active or very active, because they follow the IPAQ recommendations.

The high level of physical activity reported by these women may be justified because the IPAQ assess physical activity in different contexts, including professional, domestic

and transport, and not restricted to activities at leisure, exercise and sport. In developing countries like Brazil, the activities related to the occupation and transport, as well as household chores, form a significant part of the total activity of middle-aged women.<sup>(13)</sup> This study agrees with these figures since the IPAQ average for physical activity at work was 1306.8 MET`s for physical activity at home (796.6 MET`s) for physical activity such as exercise and leisure (545.9 MET`s) and activity physical and transport (370.1 MET`s).

It was observed in this study that the average physical activity level calculated in MET`s (minutes / week) was higher in vigorous-intensity exercise in all areas assessed by the IPAQ, ie at work, at home and in exercise, leisure and sport. Hay-Smith et al. show a lower incidence of UI in middle-aged and elderly women who perform physical exercise low and moderate intensity.<sup>(14)</sup> In the present study was not made the correlation of urinary symptoms with the level of physical activity.

To evaluate the presence of urinary symptoms and their severity, we used a specific questionnaire: the ICIQ-SF<sup>(11)</sup> It has the largest occurrences of loss of urine came forward during physical activity with 72.3%, followed by coughing and sneezing, with 35.2%. Physically active women present more often SUI because the exercises that require much physical effort and demand high impact can cause excessive increase in intra-abdominal pressure. This increase in intra-abdominal pressure pushes the bodies down, causing damage to the muscles responsible for your support.<sup>(15,16)</sup> In this sense, the exercise becomes a risk factor for the development of UI in women, mainly for who do not have histories of births and pregnancies.<sup>(15)</sup> This study confirms these findings, since about 49% of the women studied were considered very active, and among them 18 reported being nulliparous.

Corroborating the findings of this study, Davis et al. evaluated Army military women, mean age 32 years, and found that about 30% reported UI experience during exercise in training camp.<sup>(17)</sup> Another study found that in 291 athletes with an average age of 22 years about 52% had experienced urine loss during their respective sports and in different situations of daily life, and about 43% reported losing urine only during sports practice.<sup>(18)</sup>

Bo et al. compared a group of physical education students with nutrition students with an average age of 22 years (19-59 years). In the study we considered the age, parity and participation in different types of physical exercises. About 26% of physical education students reported losing urine, rather than 19% among nursing students. This difference, according to the authors, was not significant between the groups. However, when physical education students who exercised more than three times a week were compared with sedentary nutrition students,

the prevalence of SUI was significantly higher: 31% and 10%, respectively.<sup>(19)</sup>

Another risk factor for UI is the Body Mass Index (BMI) and abdominal obesity because it is assumed that the UI association with obesity is a result of the high intra-abdominal pressure, mainly by the increase of weight in the region waist-hip ratio and, consequently, increased intra-bladder pressure, overloading the organs of the pelvic region.<sup>(2,20)</sup> In this study, the average women's BMI is within normal levels (24.8 kg/m<sup>2</sup>) and waist circumference showed up high by the World Health Organization. This may be due to the fact that some participants performed physical activity for only three months.

The realization of physical activity and sports for women with UI seems to be embarrassing and uncomfortable, as these activities can lead to unexpected and involuntary loss of urine. The presence of more severe symptoms of UI can lead to decreased physical activity by these women.<sup>(21)</sup> Moreover, the motivation for fitness acquired by physical activity may interfere with the behavior of women with UI in relation to exercise. Some of them seek medical treatment to continue exercising, downplay the loss of urine, or adopt strategies such as the use of liners and absorbent, emptying the bladder before training and water restrictions.<sup>(18,19)</sup>

In this study, participants were asked if they would cease to perform some exercise because of the loss of urine. About 50% said yes. Among the activities are run and increase the intensity of exercise (29.4%), squat and jump (17.7%) and lift weight (5.8%). Fultz et al. evaluated the impact of SUI in 605 American women and a significant proportion of women responded that the problem affected the physical activities (54%), trust (42%), activities of daily living (38%) and social activities (36%). Despite all these uncomfortable symptoms, only a quarter of women with urinary incontinence seek medical help because of low number mainly to the embarrassment caused by urinary loss.<sup>(22)</sup>

The highest rates of UI are in sports that involve high impact activities such as gymnastics, athletics, jumps, exercises that require maximum and repetitive abdominal contractions, and sports with abrupt changes of movement.<sup>(23)</sup> According to the literature, this study notes that the activities in which women lose urine are high impact, such as jumping and squatting with weight in the urine loss complaint was present in 52.9%, followed by the leg press with 29.4%, and of 23.5% of the race, and walk with 11.8%.

When correlated with the severity of UI level of physical activity, there was a positive correlation only between the severity of UI and the realization of physical activity as a means of transport and the household level. However, this correlation was classified as questionable according Richman et al.<sup>(12)</sup> and was not statistically significant.

This can be explained because as said before, a little bit is known about the impact of physical activity on muscle function of the pelvic floor. There are also other factors considered promoters of the UI, such as the number of pregnancies and parity,<sup>(2)</sup> that may also contribute to the onset of symptoms.

The physically active, as well as athletes, should learn how to perform the pre-contraction or a simultaneous contraction of the perineal muscles while performing the exercise or high impact sport. These guidelines are necessary because studies indicate that women who have learned to contract the muscles during coughing had a significant reduction in loss of urine.<sup>(24)</sup> All women, athletes or not, need the stimulation of these muscles to identify it and contracting during school gymnastics and aerobic training, preventing the emergence or worsening of urinary symptoms.<sup>(24,25)</sup>

Physical therapy is essential in the rehabilitation of the pelvic floor, reducing and even eliminating the symptoms of urinary loss. Thus, it becomes essential to its performance in the awareness of the location of the pelvic floor muscles and their function for maintaining urinary continence, promoting and reestablishing the functionality of this muscle group and improving the quality of life of individuals with such symptoms.

## CONCLUSION

Women were considered active or very active according to the IPAQ recommendations. There was a high prevalence of urinary symptoms to the efforts in the women studied, and this was classified as moderate according to the ICIQ-SF. Urinary loss during physical activity was the biggest complaint of women, followed by symptoms of urinary incontinence sneeze and cough. Also it was found that about 50% of women cease to perform some physical activity, such as jumping and squat weight due to loss of urine. Positive but not significant correlation between the impact of urinary symptoms and the level of physical activity as a means of transportation and household physical activity was found.

## REFERENCES

- Carroll S, Dudfield M. What is the relationship between exercise and metabolic abnormalities? A review of the metabolic syndrome. *Sports Med.* 2004; 34(6):371-418. <http://dx.doi.org/10.2165/00007256-200434060-00004>. PMID:15157122.
- Alling Møller L, Lose G, Jørgensen T. Risk factors for lower urinary tract symptoms in women 40 to 60 years of age. *Obstet Gynecol.* 2000 Sep;96(3):446-51. [http://dx.doi.org/10.1016/S0029-7844\(00\)00915-7](http://dx.doi.org/10.1016/S0029-7844(00)00915-7). PMID:10960640.
- Ashton-Miller JA, DeLancey JOL. Functional anatomy of the female pelvic floor. *Ann N Y Acad Sci.* 2007 Apr;1101(1):266-96. <http://dx.doi.org/10.1196/annals.1389.034>. PMID:17416924.
- Bump RC, Norton PA. Epidemiology and natural history of pelvic floor dysfunction. *Obstet Gynecol Clin North Am.* 1998 Dec;25(4):723-46. [http://dx.doi.org/10.1016/S0889-8545\(05\)70039-5](http://dx.doi.org/10.1016/S0889-8545(05)70039-5). PMID:9921553.
- Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardization of terminology tract function: report from the standardization of terminology subcommittee of the International continence Society. *Urology.* 2003 Jan;61(1):37-49. [http://dx.doi.org/10.1016/S0090-4295\(02\)02243-4](http://dx.doi.org/10.1016/S0090-4295(02)02243-4). PMID:12559262.
- Hannestad YS, Rortveit G, Sandvik H, Hunskaar S. A community-based epidemiological survey of female urinary incontinence: The Norwegian EPICONT Study. *J Clin Epidemiol.* 2000; 53(11):1150-7. [http://dx.doi.org/10.1016/S0895-4356\(00\)00232-8](http://dx.doi.org/10.1016/S0895-4356(00)00232-8). PMID:11106889.
- Goldstick O, Constantini N. Urinary incontinence in physically active women and female athletes. *Br J Sports Med.* 2014 Feb;48(4):296-8. <http://dx.doi.org/10.1136/bjsports-2012-091880>. PMID:23687004.
- Bø K. Urinary incontinence, pelvic floor dysfunction, exercise and sport. *Sports Med.* 2004; 34(7):451-64. <http://dx.doi.org/10.2165/00007256-200434070-00004>. PMID:15233598.
- Virtuoso JF, Mazo GZ, Menezes EC. Prevalência, tipologia e sintomas de gravidade da incontinência urinária em mulheres idosas segundo a prática de atividade física. *Fisioter Mov.* 2012; 25(3):571-82. <http://dx.doi.org/10.1590/S0103-51502012000300013>.
- Matsudo SM, Araújo T, Matsudo VR, Andrade D, Andrade E, Oliveira LC, et al. Questionário Internacional de Atividade Física (IPAQ): estudo de validade e reprodutibilidade no Brasil. *Rev Bras Ativ Fís Saúde.* 2001; 6:5-18.
- Tamanini JT, Dambros M, D'Ancona CA, Palma PC, Rodrigues Netto N Jr. Validação para o português do "International Consultation on Incontinence Questionnaire -- Short Form" (ICIQ-SF). *Rev Saude Publica.* 2004 Jun;38(3):438-44. <http://dx.doi.org/10.1590/S0034-89102004000300015>. PMID:15243675.
- Richman J, Mackrides L, Prince B. Research methodology and statistics. Part 3: measurement procedures in research. *Physiother Can.* 1980; 32:253-7.
- Hallal PC, Victora CG, Wells JCK, Lima RC. Physical inactivity: prevalence and associated variables in Brazilian adults. *Med Sci Sports Exerc.* 2003 Nov;35(11):1894-900. <http://dx.doi.org/10.1249/01.MSS.0000093615.33774.0E>. PMID:14600556.
- Hay Smith J, Nygaard I, Wyman J, Yamanishi T, Berghmans B, Hagen S, et al. Adult conservative management. In: Abrams P, Cardozo L, Khoury S, Wein A. *Incontinence: 4th International Consultation on Incontinence.* Paris: Health Publication; 2009. p. 1025-12.
- Crist T, Singleton HM, Koch GG. Stress incontinence and the nulliparous patient. *Obstet Gynecol.* 1972 Jul;40(1):13-7. PMID:5044932.
- Wolin LH. Stress incontinence in young, healthy nulliparous female subjects. *J Urol.* 1969 Apr;101(4):545-9. PMID:5776039.

17. Davis G, Sherman R, Wong MF, McClure G, Perez R, Hibbert M. Urinary incontinence among female soldiers. *Mil Med.* 1999 Mar;164(3):182-7. PMID:10091490.
18. Thyssen HH, Clevin L, Olesen S, Lose G. Urinary incontinence in elite female athletes and dancers. *Int Urogynecol J Pelvic Floor Dysfunct.* 2002; 13(1):15-7. <http://dx.doi.org/10.1007/s001920200003>. PMID:11999199.
19. Bo K, Hagen R, Kvastein B, Larsen FF. Female stress urinary incontinence and participation in different sport and social activities. *Scand J Sports Sci.* 2000; 18:398-9.
20. Fitz FF, Costa TF, Feitosa SM, Yuaso RD, Alves GA, Sartori MGF, et al. Qual o índice de massa corporal de mulheres com disfunções dos músculos do assoalho pélvico que procuram tratamento fisioterapêutico? *Fisioter Pesq.* 2012; 19(4):309-13. <http://dx.doi.org/10.1590/S1809-29502012000400003>.
21. Nygaard I, Girts T, Fultz NH, Kinchen K, Pohl G, Sternfeld B. Is urinary incontinence a barrier to exercise in women? *Obstet Gynecol.* 2005 Aug;106(2):307-14. <http://dx.doi.org/10.1097/01.AOG.0000168455.39156.0f>. PMID:16055580.
22. Fultz NH, Herzog AR. Self-reported social and emotional impact of urinary incontinence. *J Am Geriatr Soc.* 2001 Jul;49(7):892-9. <http://dx.doi.org/10.1046/j.1532-5415.2001.49179.x>. PMID:11527480.
23. Araújo MP, Oliveira E, Zucchi EVM, Trevisani VFM, Girão MJBC, Sartori MGF. Relação entre incontinência urinária em mulheres atletas corredoras de longa distância e distúrbio alimentar. *Rev Assoc Med Bras.* 2008 Mar-Apr;54(2):146-9. <http://dx.doi.org/10.1590/S0104-42302008000200018>. PMID:18506324.
24. Brown WJ, Miller YD. Too wet to exercise? Leaking urine as a barrier to physical activity in women. *J Sci Med Sport.* 2001 Dec;4(4):373-8. [http://dx.doi.org/10.1016/S1440-2440\(01\)80046-3](http://dx.doi.org/10.1016/S1440-2440(01)80046-3). PMID:11905931.
25. Stach-Lempinen B, Nygård CH, Laippala P, Metsänoja R, Kujansuu E. Is physical activity influenced by urinary incontinence? *BJOG.* 2004 May;111(5):475-80. <http://dx.doi.org/10.1111/j.1471-0528.2004.00105.x>. PMID:15104613.