
URINARY LOSS IN OLDER WOMEN DURING PHYSICAL EXERCISE: A COMPARATIVE STUDY BETWEEN AEROBIC AND NON-AEROBIC ACTIVITIES**PERDA URINÁRIA EM MULHERES IDOSAS DURANTE EXERCÍCIO FÍSICO: COMPARAÇÃO ENTRE ATIVIDADES AERÓBIAS E NÃO AERÓBIAS**Enaiane Cristina Menezes¹, Janeisa Franck Virtuoso¹ and Giovana Zarpellon Mazo¹¹Universidade do Estado de Santa Catarina, Florianópolis-SC, Brasil.

RESUMO

Este estudo objetivou comparar a perda urinária de mulheres idosas durante exercícios físicos aeróbios e não aeróbios. Vinte e sete idosas que praticam exercício físico participaram do estudo ($66,48 \pm 5,29$ anos). A sintomatologia e a tipologia da IU foram verificadas por autorrelato e a perda urinária durante exercício foi verificada pelo pad test de 1 hora. Foi utilizado estatística descritiva e inferencial. Em relação a tipologia, 29,6% apresentaram IU de esforço, 29,6% IU de sintomas mistos e 3,7% relataram IU de urgência. A média do pad test foi de $0,687 \pm 0,467$ gramas. Não houve diferença significativa nos valores de pad test e o tipo de exercício físico ($p=0,810$) e entre a tipologia da IU ($p=0,294$). Conclui-se que as idosas com essa sintomatologia não perdem urina durante a prática de exercício físico aeróbios e não aeróbios, sugerindo que o exercício pode ser um fator protetor para IU em idosas.

Palavras-chave: Incontinência urinária. Idoso. Exercício.

ABSTRACT

The purpose was to compare urinary loss in older women during practice aerobic and non-aerobic physical exercises. Twenty-seven older women who practice physical exercise participated in the study (66.48 ± 5.29 years). The symptomatology and typology of the UI were verified by reporting, while the urinary leakage during exercise was verified by a 1-hour pad test. Descriptive and inferential statistics were used. In terms of typology, 29.6% presented UI during stress, 29.6% presented UI with mixed symptoms and 3.7% reported UI related to urgency. The pad test mean was 0.687 ± 0.467 grams. No significant differences were found in the pad test between the types of physical exercise ($p=0.810$) and between the UI typology ($p=0.294$). Symptomatic older women do not have urinary leakage during practice aerobic and non-aerobic physical exercises, suggesting that exercise may be a protective factor for urinary incontinence in older women.

Keywords: Older people. Physical exercise. Urinary incontinence.

Introduction

Urinary leakage is common in women during physical exercise, especially during high impact exercises due to increased intra-abdominal pressure, which weakens the pelvic floor muscles and compromises the sustaining and restraining mechanisms of these muscles¹⁻⁴. Nevertheless, some authors assert that mild and moderate physical exercise may be beneficial to Urinary Incontinence (UI) symptoms, since a reflex contraction of pelvic floor muscles occurs simultaneously to the intra-abdominal pressure increase during physical exercise^{2,5}. Thus, it observed that the effects of exercise on urinary leakage of women are still latent, showing two hypotheses about what happens in the pelvic structure during exercise.

A study carried out by Ree, Nygaard and Bø⁵ verified that the vaginal resting pressure and the sustaining time of contraction of the pelvic muscles decrease immediately after vigorous and extenuating exercise, as well as the maximum voluntary contraction pressure, resulting in a decrease of 24.4% of their capacity. Studies are scarce in terms of the pelvic floor function and the incidence of UI in older women during physical exercise. According to Da Roza et al.⁶ the area lacks studies that use methods such as the pad test during physical

activity to confirm the efficacy of exercising against urinary leakage, because studies with prevalence and incidence of urinary incontinence during physical exercise show these data by reporting the leakage.

Study certifies that the understanding of physical activity as a protective factor or a risk factor for urinary incontinence is not clearly evident⁷. Therefore, it is important to verify the occurrence of UI during different types of physical exercise, especially among the aging population. The results of this study, can they support the clinical practice of health professionals, increasing scientific evidence of the relationship between exercise and the loss of urine. We hypothesize that older women, even with symptoms of UI, don't loss urine, regardless of the type of exercise performed. Thus, the objective of this study was to compare urinary loss in older women during practice aerobic and non-aerobic physical exercises.

Methods

Population and Sample

The population of this semi-experimental pilot study was composed of 60 older women practicing physical exercises in a university extension program. The following inclusion criteria were considered for the selection of the sample: practice, for at least three months, one of the physical exercises from the program (strength training, walking, pilates, dance and gymnastics); and have 75% minimum frequency in classes and not report symptoms of urinary tract infection.

Were excluded from the study: women needed to go to the bathroom during exercise, older women due to technical difficulties (one came in late for data collection and the materials delivered for collection were spoiled, which precluded the final weighting). From these criteria the sample was composed of 27 older women with an average age of 66.48 ± 5.29 years. As to the physical exercise practiced by older women, ten practiced pilates, four walking, three strength training, six gymnastics and four dance. The modalities occurred two to three times per week, with a duration of 50–60 minutes each, as described in Table 1.

Table 1. Characteristics of physical exercise modalities.

Modality	Activities	Weekly Frequency	Load/ Intensity
Pilates	Warming (5 min). Strength and muscular resistance with emphasis on lower limbs and abdomen (50 min). Stretching/ relaxation (5 min).	02	Repetitions vary between 04 and 12, in accordance with the exercise and objective (strength or resistance).
Gymnas-tics	Warming (5 min). Circuit with five stations, muscular resistance with emphasis on lower limbs and motor wide coordination (40 min). Stretching/ relaxation (5 min).	02	1 minute for each station with body mass load
Dance	Stretching (5 min). Samba basic steps (40 min).Stretching/relaxation (5 min).	02	Musical rhythm
Walking	Stretching (5 min). Walk (40 min). Stretching/relaxation (5 min).	03	Walk between 70–80% of the maximum heart rate
Strength training	Stretching (10 min). Hypertrophy/ muscular strength of adductors and abductors of the hip, knee flexors and extensors, flexors and extensors of the elbow, pectoral and large dorsal (45 min). Stretching/relaxation (5 min).	03	03 series of 12 repetitions with load between 60–70% of 1 RM.

Legend: PFM= Pelvic Floor Muscles; min = minute; RM= repetition maximum
Source: The authors.

Instruments and Data Collection

In data collection, the presence of urinary incontinence was evaluated using the self report of urinary loss symptoms through the question: "During the last year, did you leak urine, at least once a month?". An affirmative answer was characterized as the presence of UI symptoms. The types of UI were identified by means of the following questions: Do you leak urine when you cough, sneeze, undertake physical efforts or carry weight? (stress urinary incontinence - SUI); Do you leak urine before getting to the bathroom after feeling a strong urge to urinate or without noticing? (urge urinary incontinence - UUI). Mixed urinary incontinence (MUI) was considered in the cases when both symptoms.

Behavioral and anthropometric risk factors were also checked. Among the behavioral factors identified were the consumption of diuretics, coffee, tea and alcoholic drinks (yes/no) in the hours preceding the evaluation. Among the anthropometric factors identified were body mass by a Plenna Wind MEA 07710 digital scale, and stature through the stadiometer WCS 217 cm. Body mass index (BMI) was obtained by dividing body mass (kg) and the square of height (m²)⁸. A metric tape CESCORF mark was used to measure the perimeter of waist circumference. The middle point between the last rib and the iliac crest after normal expiration was measured⁸.

We used the Pad Test for measuring urinary loss during the modalities lessons. This test is recommended and validated by the International Continence Society (ICS)⁹ and also recommended by the International Urogyn ecological Association (IUGA)¹⁰. The test consists of the use of a toilet absorbent previously weighed on a precision scale and placed in the perineal region, near the external urethral meatus, followed by the implementation of a series of activities. In this study, the Pad Test was performed according to the protocol; however, the activity performed by older women was physical exercise. A quantity greater than 2 grams on the Pad Test was considered an involuntary loss of urine¹⁰.

For applying the Pad Test, participants were instructed to arrive 30 minutes in advance of the physical exercise session. Initially, they were forwarded to the bathroom to empty their bladders and put on the absorbent. To facilitate handling, the absorbent was weighted inside a plastic bag on a precision scale of brand Precision Standard OHAUS® and delivered to the participants. Then, participants were told to ingest 500 ml of water. During the waiting period of 30 minutes, participants identified the presence of urinary incontinence in daily activities and also the presence of some risk factors.

After the waiting time of 30 minutes and the interview application, the older women went to their normal physical exercise session. While the participants used the Pad Test, the researcher made use of a field diary to describe the physical exercise session, including the objective of the lesson and the main exercised muscles. The frequency in the classes was evaluated by the presence list filled in each session of physical exercises, by teachers of the modalities. The modalities of physical exercises and their characteristics regarding the activities, weekly frequency, load/intensity and stimulation of the contraction of the PFM are described in Table 1, prepared from the field diary.

Data Analysis

The data were tabulated and stored in Microsoft Excel® program and analyzed using the statistical package SPSS (Statistical Package for Social Sciences, version 20.0). All variables were analyzed in a descriptive form by simple and relative frequency (categorical variables) and measures of position and dispersion (numeric variables). The distribution of the data was checked using the Shapiro Wilk test.

To compare the obtained values in urinary loss (Pad Test) and type of physical exercise (aerobic/ not aerobic), the U Test of Mann Whitney was used, while the Kruskal-Wallis test was used to compare urinary loss between groups (no UI/ SUI/ UII/ MUI).

To compare the anthropometric factors (numerical variables: BMI and waist circumference) and behavioral factors (categorical variables: consumption of diuretics, coffee, tea and alcoholic beverages) with the presence of a UI self report, due to the data distribution, we used the Analysis of Variance tests (ANOVA) unifactorial and Chi-Square or Fisher Exact test, respectively. The level of significance adopted was 5%.

Ethical Aspects

This research was conducted within the required standards by resolution no. 196/96 of the National Health Council of Brazil, and approved by the Committee for Ethics in Research on Human Beings of the University of Santa Catarina State (UDESC), under the protocol number 03/2010.

Results

In this study, we evaluated 27 older women with an average age of 66.48 ± 5.29 years, varying from 61 to 81 years old. The modalities of physical exercise were pilates (n= 10), walking (n= 4), strength training (n= 3), gymnastics (n= 6) and dance (n= 4). It were classified as aerobic modalities: walking and dancing (n= 08; 29.6%; 65.13 ± 3.72 years) and not aerobic: pilates, gymnastics and strength training (n= 19; 70.4%; 67.05 ± 5.82 years).

In the assessment of urinary leakage during physical exercise, measured by means of the pad test, the average difference between the final and the initial weight of the pad was 0.687 ± 0.467 grams. The Figure 1 presents the distribution of the value measured in the pad test and the age of the older women who participated in the study. It can be observed that only one participant presented urinary leakage above 2 grams, as recommended by the IUGA to classify as urinary incontinence in the standard test. Figure1 shows that the types of exercise performed by the women with leakage above 1 gram are mainly aerobic and, therefore, with a greater production of sweat.

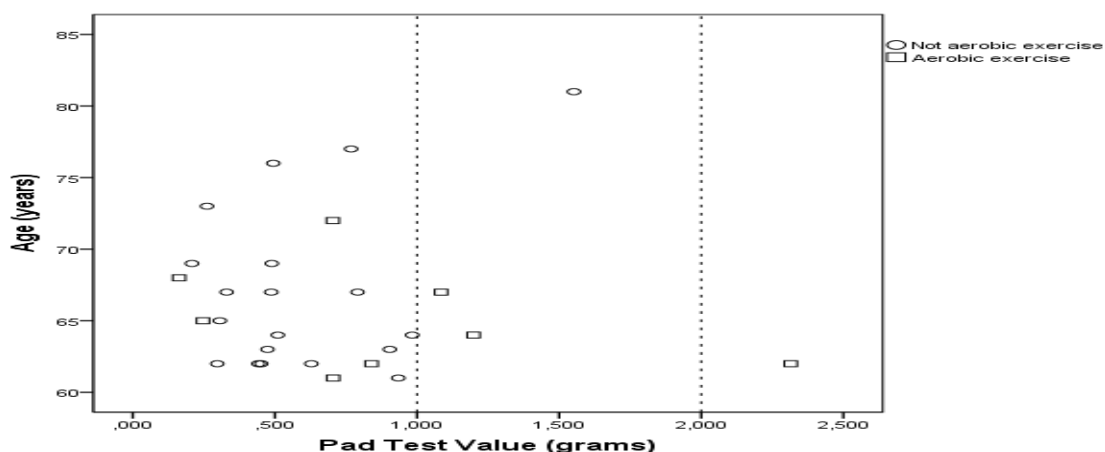


Figure 1. Mean values of urinary leakage (grams) according to the age of the participants (n=27).

Source: The authors.

By comparing the urinary leakage measured by means of the pad test and the types of physical exercise practiced (Figure 2), it was verified that the aerobic activities presented higher mean values (0.91 ± 0.67 grams) compared non-aerobic activities (0.59 ± 0.33). The

higher values found for activities aerobics may be attributed to the sweat generated by this activity or for being a higher impact activity compared to the others. From Figure 2, it is possible to observe that there was no significant difference in urine leakage according to the types of exercise analyzed (U= 55.00; p= 0.26).

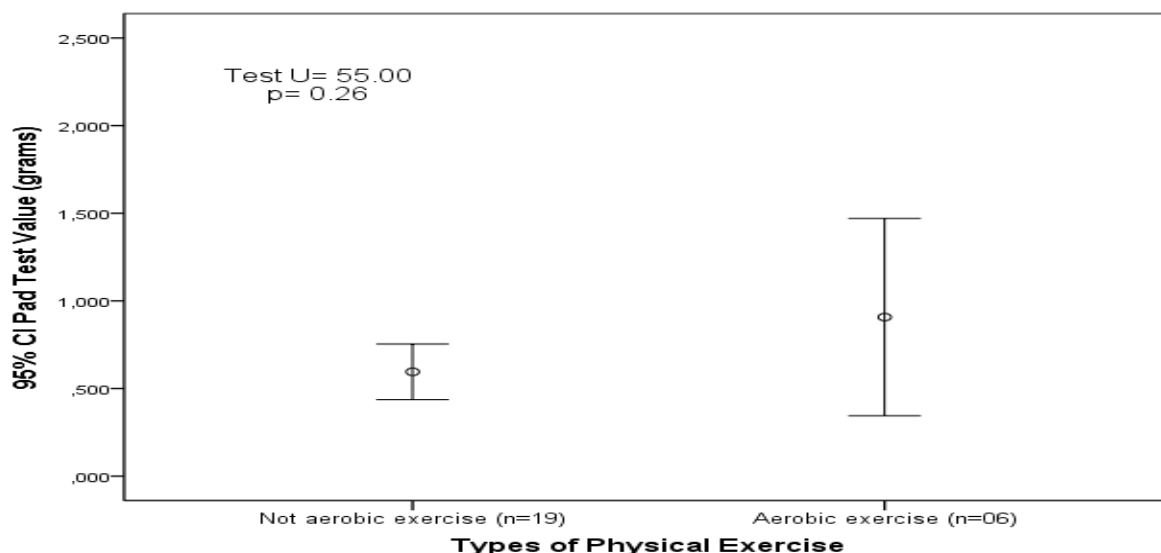


Figure 2. Comparison of mean values found in the pad test according to the types of physical exercise (n=27).

Legend: CI= Confidence interval; Test U= Mann-Whitney Test; p= Significance value

Source: The authors.

With regard to the self-reporting of urinary leakage, 37.0% (n= 10) of the older women did not have any complaints, while 29.6% (n= 08) presented stress urinary incontinence (SUI), 29.6% (n= 08) presented mixed urinary incontinence (MUI) and only 3.7% (n=01) reported incontinence associated with micturition urgency (UUI).

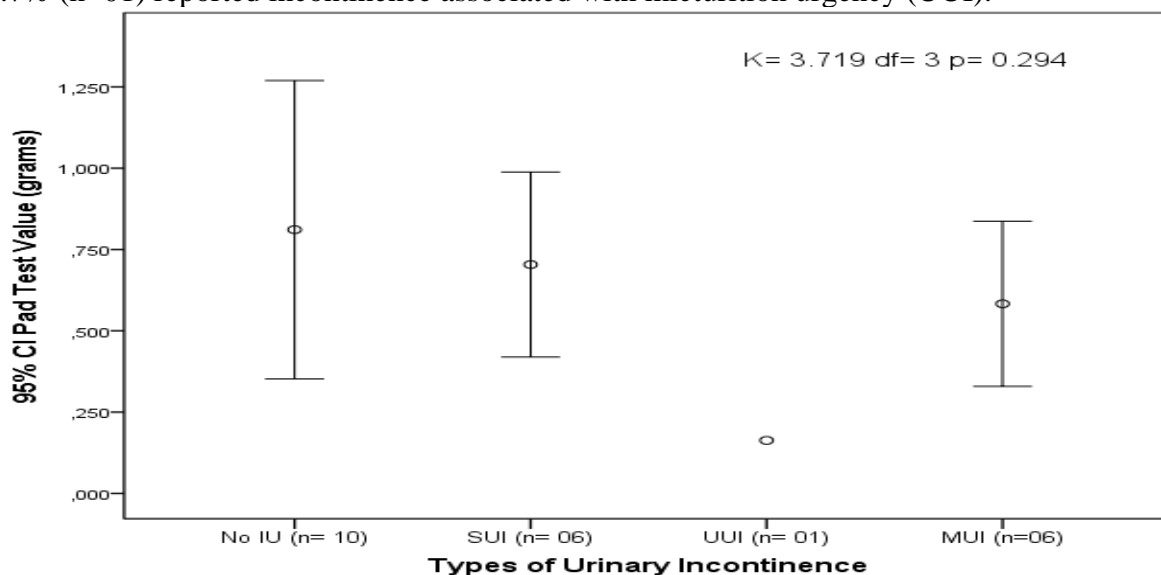


Figure 3. Comparison of mean values found in the pad test according to self-reported urinary incontinence (n=27).

Legend: CI= Confidence interval; K= Kruskal-Wallis test; df= Degrees of Freedom; p= Significance value; UI= Urinary Incontinence; SUI= Stress Urinary Incontinence; UUI= Urge Urinary Incontinence; MUI= Mixed Urinary Incontinence.

Source: The authors.

The values found in the pad test were also compared to the presence of self-reported symptoms of urinary incontinence (UI). Figure 3 shows that the women with UI, regardless their typology, presented a lower mean of their pad test values. The mean of women with SUI was 0.70 ± 0.34 grams and with MUI was 0.58 ± 0.30 grams, while the women without UI was 0.81 ± 0.64 grams. Only one woman presented symptoms specific of UUI, and her pad test value was 0.163 grams. However, it is verified that there is no significant difference in urinary leakage during physical exercise according to the presence of the different types of UI ($p=0,294$).

The anthropometric (BMI and waist circumference) and behavioral (bladder irritating food consumption and duration of the type of physical exercise practiced) variables were controlled during this study, and no significant difference was found between the older women with self-reported urinary incontinence and the ones who did not report incontinence ($p>0,05$). Thus, there is no effect of these risk factors on the occurrence of UI in this sample.

Discussion

In this study, did not find any significant difference between the values of urinary leakage found in the pad test and the types of physical exercise. Similarly, there were no differences between the values found in the pad test and the presence of symptoms of UI reported by the participants, which indicates that the symptomatic older women do not present urinary leakage during physical exercise.

This study presents some limitations such as: some risk factors for UI, e.g. the obstetric, gynecological and hereditary factors were not controlled; the sampling was carried out by voluntary help, which meant the prevalence of older women with UI and explains the differences in weekly frequency and duration of exercise sessions. Although there are some limitations these findings are important for practicing professionals of Physical Education and Physiotherapy for comprehension of times of occurrence of urinary loss, and mainly for exercise prescription for people with such symptoms. Furthermore this study confirms that physical exercise can act as a protective factor for this symptom because older women with urinary incontinence presence in their day-to-day, do not lose urine during the practice of aerobic and non-aerobic exercises.

Studies that analyze the prevalence of UI amongst the aging population practicing physical exercise are still scarce. Virtuoso et al.¹¹ verified, through a semi-structured interview, that 30.8% of the older people who practice physical exercises reported urinary leakage. In this study, the prevalence of incontinent women was higher than the value found in the abovementioned study (62.9%). It is believed that this high prevalence was due to the interest of the older women with urinary leakage symptoms in participating in the research. This type of bias may occur in research studies whose sampling is carried out by voluntary help.

With regard to urinary leakage during physical exercise, Nygaard et al.³ concluded that 28% of athletes leak urine during the practice of different types of sports and that this prevalence is more evident in high impact activities, such as gymnastics (67%) and basketball (66%). This high prevalence may be explained by the impact that the activity has on the pelvic muscles, causing structural damages¹ or by the lack of contraction of the pelvic muscles followed by an increase in the intra-abdominal pressure¹²⁻¹³. In this study we found different values in relation to the study by Nygaard et al.³, because the exercises performed by the participants of the study are characteristic for the older population, activities that do not carry the impact on pelvic structures as in the study by Nygaard et al.³.

Within the aging population, few studies approach the subject of urinary leakage during physical exercise. Virtuoso et al.¹¹, by means of a semi-structured interview, found that

10% of the active older women self-reported that they leak urine during physical exercise. In this study, only one woman was classified as incontinent (pad test value above 2 grams) during physical exercise. This result is in accordance with the “Integrated Continence System” purpose developed by Grewar and McLean¹⁴, which suggests that the behavioral factors, the motor control and muscle-skeletal factors may influence the urinary continence system function. Between behavioral factors to physical activity may have protective effects on the symptoms of urinary incontinence¹⁴. Bø² and Ree, Nygaard and Bø⁵ state that, amongst behavioral factors, the mild and moderate intensity physical activity arises as a protecting factor against urinary leakage, suggesting that a reflex contraction of the pelvic floor muscles occurs simultaneously to the increase in the intra-abdominal pressure during physical exercise, which aids the control of urinary leakage.

Accordingly, some studies reiterate this statement. Kikuchi et al.¹⁵ identified that the prevalence of UI was lower amongst the aging population at 70 years of age or more with a high level of physical activity (16.6%) when compared to older people with a low level (31.8%). The study carried out by Townsend et al.¹⁶ with middle aged women (37 to 54 years old) found that the practice of physical exercise above 34 MET hours/week has been proved to be a protection factor against the incidence of UI (OR= 0.89; IC95%= 0.80 – 0.99) compared to the women who practiced physical exercises for less than 8.9 MET hours/week. Additionally, the study carried out by Virtuoso, Mazo and Menezes¹⁷ verified that older women who practice physical activities regularly presented a better function of the pelvic floor muscles than the ones who did not practice exercises.

Studies¹⁸⁻¹⁹ were carried out in order to investigate the effect of a physical exercise protocol associated with the strengthening of the pelvic floor muscles to minimize urinary leakage amongst older people. This protocol was composed of exercises aimed at raising corporeal awareness, strengthening the lower limbs, abdomen and the back with approximately 60-minute sessions carried out twice a week over a 12 week period. The research conducted by Kim et al.¹⁸ verified that the group receiving the intervention showed a significant reduction of the body weight ($p<0,004$), the body mass index ($p<0,02$), the frequency of urinary loss ($p<0,02$) and the increase in strength of the adductor muscle in the sitting ($p<0,001$) and supine position ($p<0,002$), besides reporting the cure of UI (54,5%).

Regarding the values of urinary leakage measured by the pad test, the mean value found in this study was 0.687 ± 0.467 grams. In incontinent women at the average age of 60.6 years old, the mean values found in the pad test were 4.22 grams²⁰. Studies carried out by means of the pad test are scarce for older women practicing physical exercises. A study carried out by Ree, Nygaard and Bø⁵ found mean values of 3.8 grams of urinary leakage during physical exercise. However, this study was conducted with women around the ages of 24 ± 1.7 years old practicing vigorous and extenuating physical exercise. In spite of the absence of data for comparison with the older population, a great difference in urinary leakage is found during physical exercise in the older women who participated in this study in comparison to the studies mentioned.

Moreover, studies reporting the types of practiced physical activities and their relation with urinary incontinence categorize these activities in METs Townsend et al.¹⁶, Lee and Hirayama²¹, precluding comparison with the type of activity (predominantly aerobic and non aerobic). However, the studies analyzed separately just walking (aerobic). Studies of Lee and Hirayama²¹ and Danforth et al.²² found that high levels of MET in the form of walking in elderly women are protective factors for urinary incontinence (OR= 0.43; IC95%= 0.20 – 0.96; $p=0.04$ and OR= 0.74; IC95%= 0.63 – 0.88; $p<0.01$, respectively).

In conclusion, the results found in this study indicate that there was no significant difference between the values of urinary leakage, the types of physical exercise (aerobic and

not aerobic) and the presence of UI symptoms. These findings point out that, even in the presence of UI symptoms, the older women did not present urine leakage during the practice of physical exercise. It was observed that moderate physical exercise may be a protecting factor against urinary leakage.

We suggest that future studies invest in expanding the sampling size and in the control of other risk factors which interfere in UI symptomatology, in controlling the frequency and severity of urinary loss, the level of habitual physical activity and exercise intensity, besides studies with more detailed methods, such as randomized clinical trials, aimed at advancing the knowledge production and the understanding of the effects of physical exercises on the pelvic floor function and the symptomatology of UI in older women.

Acknowledgment: This study was supported by a National Counsel of Technological and Scientific Development (CNPq) of Ministry of Science, Technology and Innovation of Brazil and Support Fund the Maintenance and Development of Higher Education (FUMDES) of the Education Department of the State of Santa Catarina.

Conflict of interest statement: On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

1. Jiang K, Novi JM, Darnell S, Arya LA. Exercise and urinary incontinence in women. *Obstet Gynecoll Surv* 2004;59(10):717-721. Doi: 10.1097/01.ogx.0000140037.53928.64.
2. Bø K. Urinary Incontinence, pelvic floor dysfunction, exercise and sport. *Sports Med* 2004;34(7):451-464. Doi: 10.2165/00007256-200434070-00004.
3. Nygaard IE, Thompson FL, Svengalis SL, Albright JP. Urinary incontinence in elite nulliparous athletes. *Int J Obstet Gynecol* 2004;84(2):183-187. Doi: 10.1016/0020-7292(95)90255-4.
4. Thyssen HH, Clewin L, Olesen S, Lose G. Urinary incontinence in elite female athletes and dancers. *Int Urogynecol J Pelvic Floor Dysfunct* 2002;13(1):15-17. Doi: 10.1007/s001920200003.
5. Ree ML, Nygaard I, Bø K. Muscular fatigue in the pelvic floor muscles after strenuous physical activity. *Acta Obstet Gynecol Scand* 2007;86(7):870-876. Doi: 10.1080/00016340701417281.
6. Da Roza T, Araujo MP, Viana R, Viana S, Jorge RN, Kari Bø K, et al. Pelvic floor muscle training to improve urinary incontinence in young, nulliparous sport students: a pilot study. *Int Urogynecol J* 2012;23(8): 1069-1073. Doi: 10.1007/s00192-012-1759-2.
7. Nygaard I, Shaw J, Egger JM. Exploring the association between lifetime physical activity and pelvic floor disorders: study and design challenges. *Contemp Clin Trials* 2012;33(4):819-827. Doi: 10.1016/j.cct.2012.04.001.
8. Norton, K. Técnicas de medição em antropometria. In: Norton K, Olds T. *Antropométrica*. Porto Alegre: Artmed; 2005.
9. Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, et al. The standardization of terminology in lower urinary tract function: report from the Standardization sub-committee of the International Continence Society. *Urol* 2003;61(1): 37-49. Doi: 10.1016/S0090-4295(02)02243-4.

10. Ghoniem G, Stanford E, Kenton K, Achtari C, Goldberg R, T. Mascarenhas T, et al. Evaluation and outcome measures in the treatment of female urinary stress incontinence: International Urogynecological Association (IUGA) guidelines for research and clinical practice. *Int Urogynecol J Pelvic Floor Dysfunct* 2008;19(1): 5-33. Doi: 10.1007/s00192-007-0495-5.
11. Virtuoso J, Balbé G, Dias R, Mazo G. Sintomas de incontinência urinária em idosos praticantes de atividade física. *Fit Perform J* 2009;8(5):366-371. Doi: 10.3900/fpj.8.5.366.p.
12. Amarenco E, Ismael SS, Lagauche D, Raibaut P, Rene-Corail P, Wolff N, et al. Cough anal reflex: strict relationship between intravesical pressure and pelvic floor muscle electromyographic activity during cough. Urodynamic and electrophysiological study. *J Urol* 2005;73(1):149-152. Doi: 10.1097/01.ju.0000147305.00443.df.
13. Dumoulin C, Glazener C, Jenkinson D. Determining the optimal pelvic floor muscle training regimen for women with stress urinary incontinence. *Neurourol Urodyn* 2011;30(5):746-753. Doi: 10.1002/nau.21104.
14. Grewar H, Mclean L. The integrated continence system: A manual therapy approach to the treatment of stress urinary incontinence. *Man Ther* 2008;13(5): 375-386. Doi: 10.1016/j.math.2008.01.003.
15. Kikuchi A, Niu K, Ikeda Y, Hozawa A, Nakagawa H, Guo H, et al. Association between physical activity and urinary incontinence in a community-based elderly population aged 70 years and over. *Eur Urol* 2007;52(3):868-874. Doi: 10.1016/j.eururo.2007.03.041.
16. Townsend MK, Danforth KN, Rosner B, Curhan GC, Resnick NM, Grodstein F. Physical activity and incident urinary incontinence in middle-aged women. *J Urol* 2008;179(3):1012-1017. Doi: 10.1016/j.juro.2007.10.058.
17. Virtuoso JF, Mazo GZ, Menezes EC. Urinary incontinence and perineal muscle function in physically active and sedentary elderly women. *Rev Bras Fisioter* 2011;15(4):310-317. Doi: 10.1590/s1413-35552011005000014.
18. Kim H, Suzuki T, Yoshida Y, Yoshida H. Effectiveness of multidimensional exercises for the treatment of stress Urinary Incontinence in elderly community-dwelling Japanese women: A randomized, controlled, crossover trial. *J Amer Geriatr Soc* 2007;55(12):1932-1939. Doi: 10.1111/j.1532-5415.2007.01447.x.
19. Kim H, Yoshida H, Suzuki T. The effects of multidimensional exercise treatment on community dwelling elderly Japanese women with stress, urge, and mixed urinary incontinence: a randomized controlled trial. *Int J Nurs Stud* 2011;48(10):1165-1172. Doi: 10.1016/j.ijnurstu.2011.02.016.
20. Pereira VS, Correia GN, Driusso P. Individual and group pelvic floor muscle training versus no treatment in female stress urinary incontinence: a randomized controlled pilot study. *Eur J Obstet Gynecol Reprod Biol* 2011;159(2): 465-471. Doi: 10.1016/j.ejogrb.2011.09.003.
21. Lee AH, Hirayama F. Physical activity and urinary incontinence in older adults: a community-based study. *Curr Aging Sci* 2012;5(1):35-40. Doi: 10.2174/1874609811205010035.
22. Danforth KN, Shah AD, Townsend MK, Lifford KL, Curhan GC, Resnick NM, et al. Physical activity and urinary incontinence among healthy, older women. *Obstet Gynecol* 2007;109(3):721-727. Doi: 10.1097/01.aog.0000255973.92450.24.

Received on Feb 13, 2015.
Reviewed on May 29, 2015.
Accepted on Aug 07, 2015.

Author Address: Enaiane Cristina Menezes, St São Cristóvão, number 438 – Coqueiros – Florianópolis – SC – Brazil. Code
Zipe: 88080-320. E-mail: enaianemenezes@gmail.com