Acta Scientiarum

http://www.uem.br/acta
ISSN printed: 1679-9291
ISSN on-line: 1807-8648
Doi: 10.4025/ actascihealthsci.v36i2.17877

Comparison of the functional profile of elderly women with urinary continence and incontinence

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ABSTRACT. Urinary incontinence (UI), more prevalent in women and influencing their functional decline, increases with age. Current longitudinal study with two data collection in 2005-2006 and 2011 compares the functional profile of urinary continence and incontinence in elderly women. Sixty-eight women were divided into females with urinary continence (CG; n = 62) and females with urinary incontinence (IG; n = 6). Dependent variables measured were obesity and body adiposity indexes and functional fitness. Data were given in means with standard deviation (±) and analyzed by the independent t-test ($p < 0.05$). There were six cases of UI. In the first evaluation group differences occurred for waist circumference (CG: 85.3±9.7 cm; IG: 91.2 ± 12.4cm; t=-2.267; $p < 0.05$) and cardiorespiratory fitness (CG: 517.9 ± 67.3 m; IG: 463.0±85.9 m; t = 2.571; $p < 0.05$). CG had a better functional profile, excepting flexibility and lower limbs strength, in the second evaluation. Women with UI had higher waist circumference and lower cardiorespiratory fitness. This may be due to the relationship between the variables and greater abdominal compression and functional decline. Results show that future public health strategies should focus on these factors to decrease the risk of people developing UI and to improve physical-functional and psycho-social benefits to elderly women.

Keywords: aging, body adiposity, functional fitness, urinary incontinence.

Comparação do perfil funcional de mulheres idosas com continentes urinária e incontinentes urinária

RESUMO. O risco de incontinência urinária (IU) aumenta com o decorrer da idade, sendo mais prevalente em mulheres e pode acelerar o declínio funcional. O objetivo do estudo foi comparar a aptidão funcional de idosas continentes e incontinentes. Estudo longitudinal com duas avaliações: 2005-2006 e 2011. Participaram deste estudo 68 mulheres classificadas em: continentes (GC; n = 62) e Incontinentes (GI; n = 6). Foram avaliados indicadores de obesidade e adiposidade corporal, e aptidão funcional. Os dados foram descritos pela média, desvio-padrão (±) e analisados pelo *Test-t* independente. Ocorreram seis casos incidentes de IU. Os grupos diferiram nas variáveis circunferência de cintura (GC: 85,3 ± 9,7 cm; e GI: 91,2 ± 12,4 cm; t = -2,267; $p < 0,05$) e aptidão cardiorrespiratória (GC: 517,9 ± 67,3 m; e GI: 463,0 ± 85,9 m; t = 2,571; $p < 0,05$) na primeira avaliação. O GC apresentou melhor perfil funcional, com exceção da flexibilidade e força de membros inferiores na segunda avaliação. Mulheres que desenvolveram IU apresentam excesso de adiposidade central e menor aptidão cardiorrespiratória. Tal fato pode ser explicado pela relação dessas variáveis com maior compressão abdominal e o declínio funcional. Sendo assim, recomenda-se que futuras estratégias de saúde pública enfoquem esses fatores a fim de minimizar o risco de IU, e consequentemente, refletindo em benefícios físico-funcionais, e psicossociais a estes indivíduos.

Palavras-chave: envelhecimento, adiposidade corporal, aptidão funcional, incontinência urinária.

Introduction

According to the Brazilian Geography and Statistics Institute, the number of Brazilian citizens over sixty years or more increased 35% between 1991 and 2000 (IBGE, 2000). In spite of increasing life expectancy worldwide during the last decades, the additional years have been associated with an increase in the prevalence of chronic diseases which may affect a decline on functional fitness (IBGE, 2009; RAMOS, 2003). Representative studies conducted in Brazil show that 69% of elderly people (+60 years) have at least one chronic condition. Further, a higher prevalence of functional incapacity, measured by the 10-meter walking test, has been reported among elderly females (26.2%), more than that in elderly males (17.6%). Functional

capacity is an important health indicator and is highly relevant to evaluate the independence and autonomy of elderly people (LIMA-COSTA et al., 2003; PARAHYBA; SIMÕES, 2007).

Functional capacity may be evaluated by fitness tests. Functional fitness is the physiologic ability to perform daily living activities (DLA) independently and safely without excessive fatigue. Furthermore, decrease in physical parameters may lead to functional limitations, and consequently, to a reduction in the capacity for performing DLA (RIKLI; JONES, 1999). Basic DLA comprise bathing, dressing, toileting, transferring, continence and feeding (KATZ et al., 1963), among which urinary incontinence (UI) has the highest prevalence among elderly women (KRAUSE et al., 2010). UI is particularly high among institutionalized elderly females (LAZARI et al., 2009).

UI has been considered a determinant factor for the development of dependency in elderly women (KRAUSE et al., 2009; TAMANINI et al., 2009). Besides functional limitations, UI may trigger psychosocial problems, such as the loss of self-esteem, isolation and constrains that may became a barrier for a normal social life. The subjects may subsequently reduce progressively their physical activity levels and thus contributing even more towards their functional degrading (HONÓRIO; SANTOS, 2009). UI prevalence increases with age (KRAUSE et al., 2010). In fact, it is estimated that between 20 and 35% of the elderly aged 65+ have some degree of UI, with higher levels in women than in men. The condition is an increasing concern for public health policies, with special reference to females (BRASIL, 2006; LAZARI et al., 2009).

Although there is a potential association between functional decline and UI developing, few studies have investigated this relationship. Current study determines the incidence of UI in a group of elderly women during 5.8 years (mean follow-up) and compares the functional fitness profile among females with urinary continence and those that developed UI.

Material and methods

Study design

Current longitudinal study was conducted in Curitiba, Paraná State, Brazil. First data were collected between 2005 and 2006 and during follow-up in the first half of 2011 (follow-up mean = 5.8 yrs). The functional profile of elderly women from all the regional districts of the city was determined in Phase 1. Phase 2 comprised an intervention by offering 12-week regular exercise program for elderly women (who did not participated in Phase 1), (Figure 1).

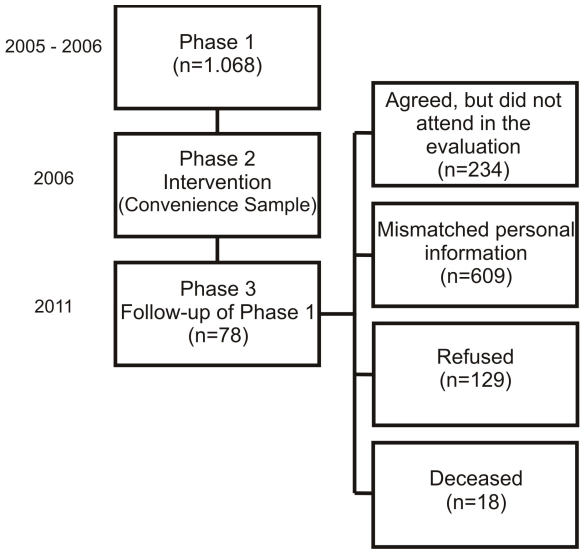

Figure 1. Phases of the Project Independent Elderly people (*Projeto Terceira Idade Independente*).

Sample

All participants in Phase 1 of the project were eligible for current investigation since they were non-institutionalized elderly people and did not present non-stabling major health conditions (cardiorespiratory, metabolic, neurological or orthopedic dysfunctions). The procedures on the subjects' recruitment in Phase 1 may be found in Krause et al. (2010). A staff member of the research group made a telephone contact with each participant, explained the purpose of the evaluation and scheduled an appointment for the follow-up evaluation. Prior to the evaluation, one investigator repeated the information on the study's purpose and procedures, and each potential participant signed voluntarily the informed consent form. The sample of the follow-up (Phase 3) consisted of 78 participants; however, 10 subjects were excluded for the analysis in the study because they were classified as incontinent in Phase 1. Therefore, the sample of current study comprised 68 elderly women. The study protocol was approved by the Ethics Committee of the Universidade Federal do Paraná (Phase 1: 003-2006) and *Pontifícia Universidade Católica do Paraná* (Phase 3: 0004798/2011).

Measurements

The follow-up evaluation was conducted during the first half of 2011. All assessments were made at the Laboratory of Physiology for Physical Activity and Health, at the Technological Federal University of Paraná - Department of Physical Education.

Descriptive variables

Social and economical levels were determined by a validated national socio-economic questionnaire which comprised assessment of schooling duration and ownership of home appliances (ABEP, 2003), with scores classifying the socioeconomic level in seven categories. First, the following classification is calculated by the sum of each item of the questionnaire: 0-5 points indicate E class; 6-10 points indicate D class; 11-16 points indicate C class; 17-20 points indicate B2 class; 21-24 points indicate B1 class; 25-29 points indicate A2 class; 30-34 points indicate A1 class. Consequently, three major categories are composed, namely, high socioeconomic level (A1 and A2), medium socioeconomic level (B1 and B2), and low socioeconomic level (C, D and E).

Presence of urinary incontinence

Urinary incontinence was determined by in-person interview asking the following standardized question: "During the previous year, have you ever had any problem in controlling your bladder that led to urine leakage or 'occasional accidents'?" (KRAUSE et al., 2010; TOWNSEND et al., 2008).

Obesity and adiposity indicators measurements

Obesity indicator was assessed by body mass index (BMI), body weight (kg) divided by height (m^2). Abdominal adiposity indicators were assessed by waist and hip circumferences (WC and HC respectively; cm) and the waist-to-hip ratio (WHR) was calculated. Waist circumference was measured at the narrowest area below the rib cage and above the navel, whereas hip circumference was measured at the largest circumference of the hips and buttocks. Measurements (height, weight, and circumferences) were assessed by a single trained examiner to avoid inter-examiner variability (LOHMAN et al., 1988).

Functional fitness test

Prior to tests, all participants were given the same instructions on the procedures, following recommendations by Rikli and Jones (1999).

The six-minute walk (6MW) test measured aerobic endurance. The test determines the maximum distance in meters that can be walked in six minutes along a rectangular course (54.4 m - 18 length x 9.2 width). (test-retest reliability: r = 0.91 (95%CI 0.84-0.95); criterion validity: r = 0.71) (RIKLI; JONES, 1999).

The arm curl (AC) test assessed upper limbs strength. The test determines the number of times a hand weight (5 Lb) can be curled through a full range of motion in 30 seconds. This protocol includes holding the weight in a handshake grip at full extension (to the side of the chair), then supinating during flexion so that the palm of the hand faces the biceps at full flexion. (test-retest reliability: r = 0.80; (95% CI 0.67-0.89); criterion validity: r = 0.78) (RIKLI; JONES, 1999).

The 30-second chair-stand (CS) test assessed lower limbs strength. This test involves counting the number of times within 30 seconds that an individual can rise to a full standing position from a seated position without pushing off with the arms. (test-retest reliability: r = 0.92 (95% CI 0.87-0.95); criterion validity: r = 0.71) (RIKLI; JONES, 1999).

The chair sit-and-reach (CSR) test measured lower limbs flexibility (primarily hamstrings; cm). The participant sat on the front edge of a chair and extended one leg straight out in front of the hip, with foot flexed and heel resting on the floor (the other leg was bent; foot flat on the floor). With the extended leg as straight as possible, the participant slowly bent forward at the hip joint sliding the hands (one on top of the other with the tips of the middle fingers even) down the extended leg in an attempt to touch the toes. The position was held for at least two seconds. The distance between the starting and ending positions was measured by a ruler (test-retest reliability: r = 0.96 (95% CI 0.93-0.98); criterion validity: r = 0.86) (RIKLI; JONES, 1999).

The 8-foot up-and-go (8-ft) test measured power, speed, agility and dynamic balance. The test involves getting out of a chair, walking eight feet to and around a cone, and returning to the chair in the shortest time possible. (test-retest reliability: r = 0.90 (95% CI 0.83-0.95); criterion validity has not been determined because no single criterion is available (RIKLI; JONES, 1999).

Handgrip strength was measured by a digital dynamometer (Takey - TKK 5002). The participant held the dynamometer with the dominant hand at full extension and then pressed it for about 5 seconds without moving the arms. The test was repeated twice and the best result was used for the analysis, according to procedures by Soares and Sessa (1995).

Statistical analyses

Descriptive statistics (means, standard deviations and frequency distribution) were calculated for all measurements. Two groups were formed: UG comprised women with UC; IG comprised women with UI, who developed urinary incontinence during the 5.8 years of the study, between Phase 1 and 3. Functional fitness comparison between the groups was investigated by independent t-test. Statistical significance was set a priori, with an alpha level at $p < 0.05$. The statistical analyses were performed by SPSS 18.0 (SPSS Inc., 2009).

Results

Only 68 elderly women participated in the follow-up evaluation after 5.8 years. There were six cases of urinary incontinence or 8.8% of sample. Subjects were predominantly white (Caucasian) and most (70.6%) were at the low socioeconomic level. Descriptive characteristic variables did not differ significantly ($p > 0.05$) between groups (Table 1).

Table 1. Descriptive characteristics of urinary continent (UC) and urinary incontinent (UI) groups at follow-up (Phase 3: 2011) – mean and standard deviation.

	Females with UC (n = 62)	Females with UI (n = 6)
Age_P3 (years)	72.6 (5.3)	75.3 (6.7)
Body mass_P3 (kg)	67.4 (12.7)	72.8 (9.3)
Height_P3 (cm)	154.0 (6.7)	157.4 (6.8)
Socioeconomic level_P3 (score)	14.4 (4.7)	13.5 (2.9)

P3: Phase 3. Independent T-test: there were no significant differences between groups ($p > 0.05$ for all variables).

Tables 2 and 3 show comparison of the functional fitness components between females with UC and those who developed UI.

Table 2. Comparison between obesity and adiposity indicators between urinary continent (UC) and urinary incontinent (UI) – mean and standard deviation.

	Females with UC (n = 62)	Females with UI (n = 6)
BMI_P1 (kg m^{-2})	28.29 (4.12)	28.89 (1.37)
BMI_P3 (kg m^{-2})	28.35 (4.56)	29.35 (2.91)
WC_P1 (cm)	85.37 (9.79)	89.66 (3.50)*
WC_P3 (cm)	91.25 (12.45)	95.08 (4.54)
HC_P1 (cm)	101.54 (8.95)	102.33 (3.77)
HC_P3 (cm)	104.34 (11.41)	105.33 (6.28)
WHR_P1	0.84 (0.06)	0.87 (0.04)
WHR_P3	0.87 (0.07)	0.90 (0.05)

*Independent T-test: significant difference between groups ($p < 0.05$). P1: Phase 1; P3: Phase 3; BMI: Body Mass Index; WC: Waist Circumference; HC: Hip Circumference; WHR: Waist-to-Hip Ratio.

Table 3. Comparison of functional fitness components between urinary continent (UC) and urinary incontinent (UI) – mean and standard deviation.

	Females with UC (n = 62)	Females with UI (n = 6)
6MW_P1 (m)	517.97 (67.36)	441.53 (69.73)*
6MW_P3 (m)	463.03 (85.91)	455.33 (121.46)
CSR_P1 (cm)	5.74 (10.83)	10.33 (12.53)
CSR_P3 (cm)	2.48 (9.80)	6.91 (12.83)
AC_P1 (rep)	15.52 (3.13)	12.83 (4.95)
AC_P3 (rep)	12.12 (3.80)	8.66 (1.52)
CS_P1 (rep)	13.66 (2.11)	12.67 (4.84)
CS_P3 (rep)	12.11 (2.79)	12.00 (2.82)
8-ft_P1 (seg)	5.98 (1.18)	6.72 (1.23)
8-ft_P3 (seg)	6.18 (1.52)	7.32 (3.03)
HS_P1 (kg)	24.61 (5.02)	24.50 (4.50)
HS_P3 (kg)	23.11 (4.81)	26.00 (2.82)

*Independent T-test: significant difference between groups ($p < 0.05$). P1: Phase 1; P3: Phase 3; 6MW: six-minute walk; CSR: Chair sit-and-reach; AC: Arm Curl; CS: Chair Stand; 8-ft: Eight foot up-and-go; HS: Handgrip Strength.

Among the obesity and adiposity indicators, only the waist circumference at Phase 1 (WC_P1) showed any significant difference between the groups ($t = -2.267$; $p < 0.05$). Data showed that elderly women who developed UI had a greater waist circumference (mean: 89.66 cm) or an excess of abdominal adiposity.

Results in Table 3 suggest that women in the CG had a better functional fitness profile in both evaluations (Phase 1 and 3), except for flexibility assessed by the chair sit-and-reach test (CSR_P1 and CSR_P3) and for lower limb muscle strength at Phase 3. However, only cardiorespiratory fitness, assessed by the 6-minute walk test at Phase 1 (6MW_P1), differed between groups ($t = 2.571$; $p < 0.05$). Data show that elderly women who developed UI had a lower cardiorespiratory fitness.

Discussion

Urinary incontinence (UI) incidence rate was 8.8% during 5.8 years. Several studies in Brazil have reported the prevalence of UI in elderly women instead of its incidence. São Paulo, one of the main cities in Brazil, had a UI prevalence of 26.2%, whereas Rio de Janeiro had a higher prevalence (37.6%), in which 7.5% of the cases reported frequent unintentional urinary leakage (ANDERSON et al., 1998; TAMANINI et al., 2009). The above results are even more relevant for institutionalized people. For example, UI prevalence may be as high as 48.2% in a home-care unit in Belo Horizonte, Minas Gerais State, Brazil (SOUZA, 1999) or 65.1% in Passo Fundo, Rio Grande do Sul State, Brazil (GUEDES; SILVEIRA, 2004). In spite of the prevalence rates which determined quantitatively people specific health conditions, the indicator is limited to identify potential risk factors associated with the outcome. Consequently, findings of current analysis may be helpful in the identification of elderly women with a potential for developing UI. The above data suggested that excess abdominal adiposity and poor functional fitness, mainly cardiorespiratory fitness, might affect UI development.

Other UI risk factors for elderly women have been highlighted elsewhere. They include age, pelvic floor injury, pregnancy and childbirth methods (normal, cesarean, forceps delivery), hereditary factors, race, menopause, obesity, abdominal adiposity, inactive lifestyle, chronic diseases, use of certain sympathomimetic and parasympathomimetic medications, constipation, smoking, caffeine consumption, depression and functional limitations. However, due to the methodological differences among studies, no consensus exists with regard to the association between UI and the above risk factors (HIGA et al., 2008; KRAUSE et al., 2010; OLIVEIRA et al., 2010; TAMANINI et al., 2009; TOWNSEND et al., 2008).

Abdominal or central adiposity have been considered one of the main risk factors for UI, as well as for other unfavorable health condition such as diabetes and hypertension (KRAUSE et al., 2007a, 2007b, 2009, 2010). The project's Phase 1, in which 1.064 elderly women participated, demonstrated that a single waist circumference measurement predicted independently the UI risk. Women with WC between 79-86cm had an odds ratio (OR) equal to 1.98 (95% CI 1.13-3.45); WC between 86-94cm had OR = 2.07 (95% CI 1.16-3.69); and an OR = 2.24 (95% CI 1.26-3.99) for women with WC > 94cm. Obesity indicator, assessed by the body mass index (BMI) was not associated with UI (KRAUSE et al., 2010).

Conversely, Townsend et al. (2008) showed that the chances for developing UI may increase as BMI rises. There was a 7-9% increase in the probability of elderly women developing UI for each 1kg/m^2 of accumulated BMI. Noblett et al. (1997) evaluated 136 patients with UI (mean age = 60.6 years) and reported a high correlation between BMI and intra-abdominal ($r = 0.76$; $p < 0.0001$) and intravesicular pressure ($r = 0.71$; $p < 0.0001$). The above results indicated that excess of body mass might increase UI risk, mainly stress UI. This association is partially explained by chronic bladder pressure and efforts made by the pelvic floor muscles and conjunctive tissues that support the urethra (BROWN et al., 1999; NOBLETT et al., 1997; TOWNSEND et al., 2008; MINASSIAN et al., 2008).

One of the strategies to minimize UI risk factors is the practice of regular exercises. Virtuoso et al. (2011) conducted a study with elderly women who had participated or not in a regular exercise regime. Results showed that elderly women who had participated in an exercise program retained a better function of the pelvic floor structure. Similarly, Danforth et al. (2007), investigating the association between physical activity and the risk in developing UI, demonstrated an inverse relationship between physical activity level and stress UI risk. For example, elderly women who reported walking regularly had 26% less risk for developing UI.

The relationship between cardiorespiratory fitness, assessed by walking capacity, and UI risk was also found in current analysis. Elderly women who developed UI had a lower cardiorespiratory fitness or they walked a lesser distance than those who maintained urinary continence control. It is well know that highest cardiorespiratory fitness is found in people who have been participating regularly in physical exercises (KRAUSE et al., 2007b). Further, improvements in cardiorespiratory fitness may decrease body adiposity and consequently contribute indirectly towards the minimization of abdominal compression and a reduction of UI risk (TOWNSEND et al., 2008; KRAUSE et al., 2010).

UI may affect physical-functional fitness and also the psychological and social aspects of the subjects´ life due to embarrassment brought about by urine leakage (HONÓRIO; SANTOS, 2009). The poor life quality of these subjects may be related to UI-caused restrictions or embarrassments which influence their sexual life and cause social seclusion and emotional disorders (LOPES; HIGA, 2006). Further, elderly women with physical-functional and recent cognitive decline reported more frequently weekly leakages or loss of urine control (HUANG et al., 2007).

Conclusion

Results show that public health interventions should be elaborated to prevent UI conditions and its consequences. In fact, they should include strategies for the maintenance of functional fitness and the control of body adiposity. Current findings demonstrated that a higher abdominal adiposity and a lower cardiorespiratory fitness influenced the developing of UI.

Acknowledgements

The authors would like to thank the Brazilian Council for Scientific and Technological Development (CNPq - 479491/2010-0); MCT/CNPq no. 014/2012 – Universal) for funding the investigation.

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Received on July 9, 2012.
Accepted on May 14, 2013.