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Urinary incontinence is associated with physical performance decline in community-dwelling older women: results from the International Mobility in Aging Study (IMIAS)

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Abstract

Objective: To evaluate the influence of urinary incontinence (UI) on physical performance.

Methods: In prospective analyses from the International Mobility in Aging Study (IMIAS), 915 women (65–74 years) from Canada, Colombia, Albania and Brazil were evaluated in relation to self-reported UI (past week) and physical performance (Short Physical Performance Battery - SPPB), with re-evaluation after 2 years. Linear mixed models examined the influence of UI on SPPB, adjusted by covariates (age, study site, education, income sufficiency, BMI and parity).

Results: Women reporting some UI presented lower SPPB mean ($P = -0.41$, $p = 0.009$), and a greater reduction ($\beta = -0.53$, $p = 0.001$) over two years than those reporting no UI.

Discussion: Compared to no reported UI, some UI was associated with worse and more pronounced declines in physical performance over two years. This study highlights the importance of practices to reduce UI to contribute to healthier aging.

Keywords

Women's health; physical performance; urinary incontinence; aging; epidemiology

Introduction

Physical performance measures evaluate a person's performance on standardized tasks, according to predetermined criteria that may include counting repetitions or timing for an activity, such as walking or rising from a chair (Guralnik et al., 1994). These measures characterize mobility function and loss and can inform clinical practice, since they are

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Conflict of Interests

The Author(s) declare(s) that there is no conflict of interest.

potential predictors of adverse outcomes such as disability, institutionalization, and premature mortality, particularly in older adults (Studenski et al., 2003; Winter et al., 2014; Rolland et al., 2006). It is recognized that measures of physical and cognitive function provide a broader assessment of the health of older persons than reports of disease status (Ferrucci et al., 2016; WHO, 2015). Furthermore, older people themselves value mobility highly and view its loss as a key aging-related disadvantage (Ferrucci et al., 2016; Jopp et al., 2015).

Previous studies document notable differences in physical performance measures between the sexes (Hansen et al., 2014; Zunzunegui et al., 2015). Older women tend to perform poorer at physical performance tests than men of similar ages, suggesting that there are sex-related factors that may influence physical performance over a lifetime (Cooper et al., 2008).

A number of possible explanations for these differences have been raised, including biological factors, such as menopause (Cooper et al., 2008); social aspects, such as gender inequality (Mechakra-Tahiri et al., 2012); and physical and psychological violence (Ahmed et al., 2016). Yet, to date, the factors underpinning the lower average levels of physical performance among older women compared to similarly aged men have been poorly delineated and require additional investigation.

Reproductive history is hypothesized as one explanation for women's poorer physical performance as they age. The negative effects of high parity and early age at first childbirth on physical performance have been reported in studies of older and middle-aged women (Pirkle et al., 2014; Câmara et al., 2015). An elevated number of pregnancies and deliveries can permanently impair the function of muscles around the pelvic floor, pelvis and hips and contribute to the development of detrimental gynecological disorders such as urinary incontinence (UI) (Özdemir et al., 2015; Wall et al., 1999), which in turn, may contribute to impairment of women's physical performance, as UI is associated with lower average function in community dwelling older women (Morrisroe et al. 2014). However, it is rare for studies to consider both women's reproductive histories and UI when examining physical performance.

Urinary incontinence is estimated to affect approximately 25% of older women based on epidemiological studies of large representative samples in the United States (24.7% in women aged 60–69 years) (Wu et al., 2014), Spain (26.6% in women aged 65–74 years) (Espuña-Pons et al., 2009), and Brazil (22.2% in women aged 60–74 years) (Tamanini et al., 2009). It is also documented that UI increases with advancing age (Wu et al., 2014; Espuña-Pons et al., 2009).

Age-related decline in muscle strength and physical function in older women is directly associated with incidence of UI, likely because of reduced coordination and strength of the pelvic floor muscles (Huang et al., 2007; Goode et al., 2008; Chiu et al., 2015; Suskind et al., 2016). There have also been a few prospective studies showing that physical performance decline was greater among older women who developed UI, compared to those who did not (Miles et al., 2001; Parker-Autry et al., 2017). The relationship between physical performance impairment and UI may also be a direct consequence of difficulty

getting to the bathroom and removing clothing in time, in what is known as urge incontinence (Goode et al., 2008; Chiu et al., 2015).

Alternatively, UI may also contribute to loss of physical performance, but studies examining the inverse relationship - UI contributing negatively to physical performance - are absent in the literature. It is possible that the social, physical and psychological impacts caused by UI contribute to physical inactivity in women and thus, decline in physical performance (Nygaard et al., 2012). For example, low impact activity, like walking, is associated with lower rates of UI (Danforth et al., 2007), but women experiencing UI may stop such activities for fear of losing urine (Nygaard et al., 2012). Yet, physical activity protects against functional and mobility loss and may even slow decline in older adults with existing disability (Pahor et al., 2014). It is also possible that the fear of episodes of lost urine affects women's performance on commonly used tests of physical performance, since the trunk and lower body movements required during testing cause an increase in intra-abdominal pressure in a cephalocaudal direction (Roza et al., 2015). The movement needed to complete these tests may cause an overload on the pelvic floor muscles sufficient to allow intravesical pressure to exceed intraurethral pressure, thus predisposing urine leakage (Jiang et al., 2004). In other words, women with UI may slow their movements on these commonly applied tests of physical performance in order to protect against leakage.

Using data from the IMIAS (International Mobility in Aging Study), which contains a multi-site sample of older women from communities in Canada, Albania, Colombia, and Brazil, we aim to investigate the effect of UI on physical performance changes over two years of follow-up in a sample from diverse settings with differing levels of the exposure (UI) and outcome (physical performance). The objective of this study is two-fold: 1) To assess if there is a cross-sectional association between UI and physical performance, and 2) To evaluate the influence of UI on physical performance changes over a two-year period of follow-up. We hypothesize that UI will be associated with lower average physical performance measures. We also hypothesize that women reporting UI at baseline will experience a greater decline in physical performance over two years than women not reporting UI at baseline.

Method

Study design

IMIAS is a prospective longitudinal study whose main objective is to evaluate changes in mobility and disability in community-dwelling older adults living in five sites with different socioeconomic conditions: Saint-Hyacinthe (Quebec, Canada), Kingston (Ontario, Canada), Manizales (Colombia), Tirana (Albania), and Natal (Brazil). Details of the study sites and procedures can be found elsewhere (Zunzunegui et al., 2015; Pirkle et al., 2014; Gomez et al., 2018).

Sampling strategy

A sample of 2002 community-dwelling participants, ages 65–74 years, was recruited in 2012, with approximately 200 women and 200 men per site. Re-evaluations were conducted

in 2014 and 2016. For this study, we used data from 2014 and 2016, as information on pelvic floor dysfunction was only collected in 2014.

Because of different human subjects' requirements in Canada related to how to contact potential study participants, compared to the other study sites, recruitment of participants was different in the Canadian cities, as described below. Participants in Natal, Tirana and Manizales were recruited through primary care centers. At these sites, a random sample of older adults registered at each health center was drawn and participants were approached directly by our interviewers to invite them to participate. Response rates were greater than 90% in Tirana and close to 100% in Natal and Manizales. At the Canadian research sites, potential participants received a letter from their family physician inviting them to contact our field coordinator for information about the study. In Kingston and St Hyacinthe, 30% of people receiving a letter from their physician contacted us and, of those, 95% agreed to participate, resulting in overall response rate of 28%. Comparisons with census data suggest that the population sampled in Saint-Hyacinthe was representative of the population of that city, whereas those in Kingston were slightly better educated than the general population of older adults of that city.

Among those recruited, the Leganes Cognitive Test (LCT) was used to screen for severe cognitive impairment. Those with four or more errors were excluded from IMIAS, since low scores indicated an inability to complete study procedures (de Yébenes et al., 2003).

Data collection

All participants were evaluated by trained interviewers according to standard protocols, as described below. Procedures' manuals were available in the local study languages (Albanian, Spanish, Portuguese, English and French) and are available upon request.

Measures

Outcome: Physical performance—Physical performance was assessed by the Short Physical Performance Battery (SPPB), which consists of a set of three tests that evaluate static balance, gait speed at usual pace, and chair stands (Guralnik et al., 1994). The SPPB is one of the most commonly used instruments for measuring physical performance in studies with older adults and it has been reported as a valid measure for different settings (Gómez et al., 2013; Freire, et al., 2012).

Balance Test: Participants were invited to stand for 10 seconds in three positions with increasing difficulty level: (1) feet side by side; (2) semi-tandem (heel of one foot alongside the big toe of the other foot); (3) tandem (heel of one foot directly in front of the other foot). If in any of the first two tests the participant could not sustain the position, the balance test was stopped. In the first two positions, 1 point is assigned if the test is successfully performed for 10 seconds. In the third position, the score varies from 0 if the stand is held for <3 seconds, 1 point for stands between 3 and 9.99 seconds and 2 points if the participant balances for 10 seconds.

Gait Speed Test: Participants were instructed to stand with both feet touching a starting line and to start walking after a specific verbal command. Participants were asked to walk at their usual pace over a 4-meter course. The faster of two walks was used to calculate the result, with a value of 0 when the participant was unable to perform the test, 1 point if the time was > 8.70 seconds, 2 points if the time was between 6.21 and 8.70 seconds, 3 points between 4.82 and 6.20 seconds, and 4 points if time was <4.82 seconds.

Chair Stand Test: Participants were asked to stand up and sit down five times as quickly as possible with arms folded across their chests. This was done only after participants first demonstrated the ability to rise from the chair once. The time taken to complete the five movements was recorded and assigned a score of 0 when if the participant was unable to complete the test, 1 point if the test took >16.7 seconds, 2 points between 13.7 and 16.69 seconds, 3 points between 11.2 and 13.69 seconds and 4 points if <11.19 seconds.

The SPPB final score is the sum of the points scored in the three tests, ranging from a minimum of 0 points to a maximum of 12 points (4 points for each stage). The same protocol was repeated in all three waves of IMIAS data collection. For these analyses, we evaluated changes in SPPB scores from 2014 to 2016.

Exposure: Urinary incontinence (UI)—Information about UI was self-reported and collected in the 2014 data collection of IMIAS through the question “In the last 7 days, how many times did you accidentally lose urine?”. The possible answers were: “none”, “once” and “more than once”. Those reporting once or more than once were categorized as “some in the last 7 days” and those who answered none were categorized as “none in the last 7 days”.

Covariates: Socio-demographic variables—The socio-demographic variables analyzed for the purposes of this investigation were age, education level and income and they were collected at baseline (2012) and revalidated in later waves (2014 and 2016) for consistency. Age was self-reported and recorded in years. Participants reported the numbers of years of study they had completed. This information was used to categorize education as into the lowest, middle and highest tertiles, according to the 25th and 75th percentiles of each city of study. This categorization was necessary for cross-site comparisons due to the large differences in years of schooling among sites of study (Hwang et al., 2017). Participants' income sufficiency was self-reported and categorized as “sufficient”, “suitable”, and “insufficient”. We used this variable instead of the current income to characterize socioeconomic status, since we believed that, in many cases, such as when there are multiple dependents, the participant's income may not reflect her ability to meet her needs. Education and income were considered as potential covariates since previous studies have shown their association with both UI (Kubik et al., 2004) and physical performance (Kuh et al., 2005).

Anthropometric Measures—Weight (kg) and height (m) were collected in all years following a standardized protocol and used to calculate participant body mass index (BMI), which was categorized as: underweight/normal weight (<18.5–24.9), overweight (25.0–29.9), and obese (>30.0) (WHO et al., 2000). Elevated BMI is associated with higher risk of

UI (Suskind et al., 2016) and worse physical performance on tests such as gait speed and chair stand test (Hergenroeder et al., 2011).

Reproductive History—At baseline (2012) participants reported the number of children they gave birth to throughout their lives to establish lifetime parity. Since all participants were postmenopausal, and would not be giving birth to any more children, we used 2012 data for this covariate in our analyses. Parity was categorized as “nulliparous”, “1–3 children” and “4 or more”. Previous studies report that women with more than 3 children have higher odds of worse physical performance (Câmara et al., 2015) and chronic disease (Pirkle et al., 2014). Moreover, elevated parity is a known risk factor for UI (Özdemir et al., 2015).

Ethical considerations—The study was approved by ethics boards at the University of Montreal Hospital Complex and the Queen’s University (Canada), the Albanian Institute of Public Health (Albania), the Federal University of Rio Grande do Norte (Brazil) and the University of Caldas (Colombia). All participants were informed about the research procedures and provided written informed consent. Additional details about the main study are available in previous publications (Pirkle et al., 2014; Zunzunegui et al., 2015).

Statistical analysis—Analyses were carried out using STATA/SE (version 14.0) and R (version 3.4.1). First, descriptive analyses were performed for the entire sample and in subsamples by UI status. Chi-square tests and Student’s t-tests were used to assess associations between UI and categorical variables and continuous variables, respectively. Linear regression analyses were used to evaluate the cross-sectional associations between physical performance (SPPB scores) and UI. Two sets of models were constructed. In the first model, the association was adjusted only for socioeconomic variables (age, study site, education and income sufficiency). In the second model, we added the variables of BMI and parity. Lastly, we performed linear mixed model analyses to evaluate factors contributing to longitudinal changes in the SPPB scores between 2014 and 2016. We included an interaction effect of UI and time to examine if the change in SPPB over two years (i.e., slope of time) was modified by UI, adjusted for all covariates. The interaction effect allows us to estimate the different changes in SPPB for women with and without UI. Random intercept of study participants was used to account for the within subject correlations of repeated measures. A 5% level of statistical significance was used for all analyses and estimates were reported with their 95% confidence intervals (CI).

Results

The characteristics of the sample according to UI status in the 2014 wave of IMIAS data collection are presented in the table 1. The prevalence of UI in the sample ranged from 11.4% to 30.9%; it was lowest in Natal and highest in Kingston. Those with no UI in 2014 presented, on average, higher SPPB scores in 2014 ($p=0.09$) and 2016 ($p<0.001$) compared to those reporting some UI (table 1).

Table 2 shows the cross-sectional multiple linear regression results for the SPPB mean score in 2014. Women reporting some UI have significantly lower mean SPPB scores compared to those reporting no UI, a finding that remained intact in the fully adjusted model.

Table 3 shows the multivariate linear mixed models for the longitudinal SPPB scores in 2014 and 2016 and Figure 1 illustrates the interaction effects adjusting for age, study site, education, BMI, income sufficiency and parity. The mean SPPB scores declined for all women regardless of their incontinency status. At baseline (2014), the mean SPPB score for women reporting some UI was 0.45 points lower (95% CI= [0.11 to 0.79]) than women reporting no UI. After two years, the SPPB score for women with no UI decreased by 0.21 points (95% CI: 0.05 to 0.38), and the difference between women with UI versus no UI increased by 0.53 points, indicating that women with UI had a faster decline in physical performance (95% CI: 0.20 to 0.89). In sum, those who reported some UI at baseline had worse physical performance in the first evaluation and had an additional decline in SPPB score after two years.

Discussion

Summary of the results

This study investigated the effect of UI on physical performance over a two-year period in older women from five highly diverse settings. We hypothesized that this urogynecological disorder affects physical functioning, contributing to decline of mobility in aging, and thus lower objectively measured physical performance scores. According to our results, UI is associated to physical performance in a sample of older women from different settings, and also prospectively predicts physical performance decline over the course of two years. Women reporting some episodes of UI performed worse in the physical performance tests and presented greater decline in physical performance after two years of follow-up than those reporting no UI episodes.

Interpretation

The association between UI and physical performance decline may be explained by the fact that women with this condition avoid risks and constraints during activities of daily-living, because of the fear of losing urine involuntarily in public (Sinclair et al., 2011; Nicolson et al., 2008). This may be true particularly for activities that demand muscle strength and increase the intraabdominal pressure, imposing overload to the pelvic floor muscles, such as rising fast from a chair and walking at a faster speed. The reduction in the frequency or intensity of these activities may lead to a greater physical decline over the long-term. Similarly, these women may not have used their full capacity when performing the physical tests that compose the SPPB test, because of fears of losing urine. Corroborating these results, the severity of UI seems play an important role on physical functioning; in a study of 1942 French older women, those reporting severe UI presented worse results of performance on motor and balance skills than those reporting lower degrees of UI (Fritel et al., 2013).

The association between UI and physical performance decline may be also explained by life course exposures that contribute to both UI and physical performance decline, such as

reproductive history. Previous studies suggest that different factors related to women's reproductive history, such as pregnancy and childbirth can increase the overload on the pelvic floor muscles and lead to UI (Pirkle et al., 2014; Memon et al., 2013). Hormonal factors related to pregnancy, vaginal childbirth, and higher numbers of deliveries can cause lesions in the fascia, muscles, ligaments and pelvic floor nerves, and lead to reduction of the pelvic floor muscle strength and hence expose women to a higher risk of developing UI (Özdemir et al., 2015; Memon et al., 2013). Moreover, there is consistent evidence indicating an association between reproductive history and physical performance (Aiken et al., 2012; Pirkle et al., 2014; Câmara et al., 2015). A study of middle-aged women from Northeast Brazil reported that women who were adolescent mothers and/or had at least three children performed worse on the chair stands tests than those who had no children, had their first childbirth during their adult life, and/or had only 1–2 children (Câmara et al., 2015). The association between early maternal age and physical performance was also demonstrated in the IMIAS population (Pirkle et al., 2014). There is a possibility that reproductive history leads to both UI and decline in physical performance. However, after adjustment for lifetime parity, the association between UI and physical performance remained intact. Moreover, in additional analyses we examined age at first childbirth instead of parity, and observed the same associations (data not shown). More research is needed to elucidate these hypotheses.

Studies have shown that decline in physical function, particularly impairment of mobility and lower body strength, is an important risk factor for the development and/or increase of UI frequency (Huang et al., 2007; Chiu et al., 2015; Suskind et al., 2016). In women, a slower time to stand from a chair five times was a significant independent predictor of incident incontinence (Goode et al., 2008) and women who had declines in walking speeds and chair stands were more strongly correlated with having more frequent UI (Huang et al., 2007). This association can be a direct consequence of the inability of getting to the toilet and removing clothes before losing urine. Thus, it is possible that the relationship between physical performance and UI is bidirectional, generating a vicious cycle where the reduction of physical performance causes an increase in cases of UI and UI causes a reduction in physical performance.

Relevance of the study findings

UI is a common condition among older women and its incidence and severity tend to increase with age. The involuntary leakage of urine interferes negatively with quality of life, and may generate stressful situations, social embarrassment, anxiety and depression, thus resulting in social isolation and decrease of physical activity, contributing to the decline of the physical performance (Fritel et al., 2013; Morrisroe et al., 2014). In addition, UI can be directly related to general health status (Tamanini et al., 2009; Kwon et al., 2010; Cardoso et al., 2014).

Previous studies have reported that low scores in the SPPB are associated with adverse health conditions such as loss of physical abilities and premature mortality (Studenski et al., 2003; Rolland et al., 2006; Pavasini et al., 2016; Cooper et al., 2010). Even minimal changes of 0.3 – 0.8 points in the SPPB average over 12 months have been considered meaningful for

older adults (Kwon et al., 2009). Thus, the reduction in the SPPB scores we observed for those with UI in this study (0.45) is a meaningful change that may contribute to future adverse health outcomes.

Our findings help elucidate sex-specific factors associated with the age-related decline in physical performance. These may serve as the basis for planning and applying early and appropriate interventions to improve physical performance at older age with health benefits such as reduction in disability rates, and improvement in quality of life for women.

Strengths and Limitations

To our best knowledge, this is the first study investigating the longitudinal effects of UI on physical performance in a sample of older women from diverse populations. Most of the studies performed on this subject investigated the inverse relationship (physical performance decline leading to UI), and there is also a paucity of studies with samples from middle- and low-income populations. The IMIAS dataset allowed us to observe this association in distinct geographical and socioeconomic locations. However, this study has some limitations. It was not possible to perform a clinical assessment to identify UI, and it is possible that there is some under-reporting of this condition, since the evaluation of UI was carried out using self-report. Consequently, we were able to estimate only self-reported rates of UI across the study sites. However, there is no reason to believe that people with greater physical performance decline in the two years following UI ascertainment under-reported UI differently from those with less or no decline, as physical function was measured with objective tests at two time points. Thus, any induced misclassification due to measurement error is likely non-differential biasing the results toward null. Further, self-reported incontinence questions are widely used and considered as acceptable research tools in epidemiological studies (Bradley et al., 2011). A systematic review of 15 studies showed that self-report of stress urinary incontinence has a sensitivity of 0.92 (95% CI 0.91 to 0.93) and specificity of 0.56 (95% CI 0.53 to 0.60) compared to diagnostic by urodynamics (Martin et al., 2006). This suggests self-report of UI is a relatively valid measure with low false positive rates (very high sensitivity).

Conclusion

This research shows that older women with UI present worse physical performance and a greater decline over two years than those reporting no episodes of UI. The study contributes to a better understanding of issues influencing women's physical performance as they age, and highlights the importance of health promotion practices to reduce the incidence of UI on this population, thus contributing to a healthier aging.

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Predicted Mean SPPB

Figure 1:

Trajectories of SPPB scores in 2014 and 2016 for older women some and no episodes of UI (urinary incontinence) in the past week estimated by linear mixed models (N=778) adjusting for age, study site, education, BMI, income sufficiency and parity. This figure visualized the interaction effect of UI and time in Table 3 with absolute values of the estimates and 95% CIs.

Table 1:

Sample characteristics in 2014 according to urinary incontinence.

	Urinary Incontinence ^a			p-value
	Full Sample (N=915)	Some in the last 7 days (N=211)	None in the last 7 days (N=703)	
Age (mean, SD)	71.2 (2.88)	71.2 (2.86)	71.2 (2.89)	0.994
Study Site (N,%)				<0.001
Kingston	182 (19.9%)	56 (30.9%)	125 (69.1%)	
St. Hyacinthe	184 (20.1%)	54 (29.4%)	130 (70.6%)	
Tirana	194 (21.2%)	46 (23.7%)	148 (76.3%)	
Manizales	188 (20.5%)	36 (19.2%)	152 (80.8%)	
Natal	167 (18.3%)	19 (11.4%)	148 (88.6%)	
Educational Level (N,%)				0.298
Low	351 (38.4%)	90 (25.6%)	260 (74.4%)	
Medium	361 (39.4%)	80 (22.2%)	281 (77.8%)	
High	203 (22.2%)	41 (20.2%)	162 (79.8%)	
Income Sufficiency (N,%)^a				0.136
Very well	230 (25.1%)	64 (27.8%)	166 (72.2%)	
Suitably	277 (30.3%)	59 (21.3%)	218 (78.7%)	
Not very well	407 (44.6%)	88 (21.9%)	318 (78.1%)	
Lifetime parity (N,%)^b				0.489
Nulliparous	102 (11.4%)	20 (19.6%)	82 (80.4%)	
1–3 children	510 (55.9%)	123 (24.3%)	386 (75.7%)	
4 or more	297 (32.7%)	64 (21.5%)	233 (78.5%)	
BMI (N,%)^c				0.009
Underweight/Normal	237 (26.1%)	43 (18.1%)	194 (81.9%)	
Overweight	360 (39.5%)	78 (21.7%)	282 (78.3%)	
Obese	313 (34.4%)	90 (28.9%)	222 (71.1%)	
SPPB mean in 2014 (mean, SD)	9.17 (2.19)	8.92 (2.35)	9.21 (2.17)	0.094
SPPB mean in 2016 (mean, SD)	8.95 (2.49)	8.28 (2.87)	9.17 (2.31)	<0.001

Note. BMI = Body Mass Index.

^a 1 missing value.^b 6 missing values.^c 5 missing values.

Table 2:

Adjusted multiple linear regression models for physical performance (SPPB score) in 2014.

	Model 1 (N=912) *		Model 2 (N=901) *	
	β	95% CI	β	95% CI
(Intercept)	10.89	(10.48, 11.29)	10.98	(10.43, 11.53)
Urinary Incontinence				
None in last week	Ref.		Ref.	
Some in last week	-0.47	(-0.78, -0.16)	-0.41	(-0.72, -0.10)
Study Site				
Kingston	Ref.		Ref.	
St. Hyacinthe	-0.21	(-0.63, 0.21)	-0.16	(-0.57, 0.25)
Tirana	-1.26	(-1.78, -0.75)	-1.12	(-1.63, -0.62)
Manizales	-1.47	(-1.99, -0.95)	-1.46	(-1.99, -0.93)
Natal	-1.01	(-1.53, -0.48)	-0.86	(-1.40, -0.33)
Educational Level				
High	Ref.		Ref.	
Middle	-0.25	(-0.60, 0.10)	-0.18	(-0.53, 0.16)
Low	-0.62	(-0.97, -0.26)	-0.50	(-0.85, -0.14)
Income sufficiency				
Very sufficient	Ref.		Ref.	
Suitable	-0.32	(-0.72, -0.09)	-0.21	(-0.61, 0.19)
Insufficient	-0.90	(-1.38, -0.42)	-0.89	(-1.36, -0.41)
BMI				
Underweight/Normal	-	-	Ref.	
Overweight	-	-	-0.02	(-0.34, 0.30)
Obese	-	-	-0.76	(-1.10, -0.43)
Lifetime parity				
Nulliparous	-	-	Ref.	
1-3 children	-	-	0.04	(-0.38, 0.46)
4 or more	-	-	-0.09	(-0.56, 0.37)

Note. BMI = Body Mass Index.

* Models adjusted by centered age at 71.20, which is the mean age in 2014.

Table 3:

Multivariate linear mixed models for longitudinal effects of urinary incontinence on physical performance (SPPB score) (N=778).

Variables	β	95%CI
(Intercept)	19.41	(16.23, 22.59)
Wave and UI interaction		
Wave2016	-0.21	(-0.38, -0.05)
Some UI	-0.45	(-0.79, -0.11)
Wave 2016 * some UI	-0.53	(-0.86, -0.20)
Age	-0.12	(-0.16, -0.07)
Study Site		
Kingston	Ref.	
St. Hyacinthe	-0.01	(-0.41, 0.39)
Tirana	-1.37	(-1.88, -0.86)
Manizales	-1.22	(-1.75, -0.70)
Natal	-0.79	(-1.33, -0.25)
Educational Level		
High	Ref.	
Middle	-0.21	(-0.53, 0.12)
Low	-0.36	(-0.71, -0.02)
Income sufficiency		
Very sufficient	Ref.	
Suitable	-0.10	(-0.49, 0.28)
Insufficient	-0.59	(-1.06, -0.12)
BMI		
Underweight/Normal	Ref.	
Overweight	-0.16	(-0.47, 0.15)
Obese	-0.90	(-1.24, -0.57)
Lifetime parity		
Nulliparous	Ref.	
1-3 children	0.02	(-0.39, 0.43)
4 or more	-0.05	(-0.52, 0.42)

Note. UI = Urinary Incontinence; BMI = Body Mass Index.