NIH Public Access
Author Manuscript
Maturitas. Author manuscript; available in PMC 2013 August 01.

Published in final edited form as:
Maturitas. 2012 August ; 72(4): 379–382. doi:10.1016/j.maturitas.2012.05.009.

Alternative Scoring for Physical Activity Scale for the Elderly (PASE)

Carlos Siordia[1,*]

[1]Community Health and Preventive Medicine, University of Texas Medical Brach, Galveston, Texas, USA.

Abstract

Background—Studies assessing physical functioning with the Physical Activity Scale for the Elderly (PASE) should be aware that the instrument may be age and culture insensitive.

Objectives—To asses "classical" PASE scoring in a sample of aged (mean age 74) Mexican origin Latinos in the Southwestern United States and provide a new scoring algorithm.

Method—Information from a cross sectional study of 2,438 community-dwelling minority subjects who completed the PASE scale was scored with the classical and a new scoring approach to compare their similarity and predictive power on three items of functional ability.

Results—The classical and new scoring procedures for PASE items render different total scores.

Conclusion—The classical approach for scoring PASE in aged minorities may fail to capture the age and culture insensitivity of the instrument. The new approach, or a derivation of it, should be used to compute the total PASE score for minority aged populations as further research continues.

Keywords

HEPESE; Mexican; PASE; aging; ADL; POMA

1. INTRODUCTION

Aged adults' physical performance is measured in many circumstances and with various tools. The Physical Activity Scale for the Elderly (PASE) is a popular instrument, evident from the fact that a quick search on any academic journal engine will turn up hundreds of articles that make use of the scale. Because of its wide use, the survey instrument merits special attention. The specific aim of this short communication is to offer a "new" method

© 2012 Elsevier Ireland Ltd. All rights reserved.

[*]Correspondence to author: Dr. Carlos Siordia, Community Health and Preventive Medicine, University of Texas Medical Branch, Galveston, Texas, 77555. Phone: (409) 772-1128, Fax: (409) 772-5272, Carlos.Siordia@utmb.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Contributors and their role
The single author completed all items on the manuscript

Competing Interest
The author has no competing interest or conflict of interest with Maturitas

Competing Interest
Ethical approval and informed consent were obtained from all HEPESE study participants.

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

for scoring PASE items in minority aged adults. In doing so, it offers a critique of the "classical" scoring approach when scoring the total PASE score with minority aged populations.

Almost twenty years ago, Washburn and colleagues[1] created and evaluated the Physical Activity Scale for the Elderly (PASE) with a small sample (n=193) of community-dwelling adults in Massachusetts. Their motive for creating PASE was that by the early 1990s, there were no established assessment methods for measuring physical activity in the aged. They pilot tested the first version of their PASE questionnaire on a group of 36 adults (age 65+) in Boston and Amherst, Massachusetts (MA) and established the validity and reliability of the instrument with 222 subjects.

For the full implementation of their final instrument, they targeted a 25-mile radius area in western Massachusetts. Some would argue this part of the procedure determined their sample "universe"—and consequently the scope of generalizability for their study. In order to give survey participants a total PASE score, Washburn et al [1] created statistically derived (as apposed to theory driven) item weights to "provide the best overall estimate of an older person's physical activity level" [1]. Using several statistical procedures with the responses from 193 subjects, they derived a set of "optimal item weights" for each PASE item. Their scale ranged from 0 to 360 with a mean of 103. In their study, Washburn and colleagues found their PASE scale was associated with various items (e.g., grip strength) and conclude that it is their scale provided a "brief, easily scored, reliable and valid instrument for the assessment of physical activity in epidemiologic studies of older people" [1]. More importantly, they argue that their "validation and reliability results may be generalized to the population of community-dwelling older persons" [1].

In a subsequent study, the same lead author and a completely new set of co-authors, assessed the validity of the PASE score with 190 sedentary (lacking in regular movement) adults with an average age of 67 [2]. They conclude that in conjunction with the 1992 study, their investigation supports the use of PASE as an instrument that can measure "physical activity in epidemiologic studies of older adults" [2]. In closing, they do advice that "work with the PASE using alternative scoring schemes and additional validation criteria should be undertaken in larger samples of varying socioeconomic status and ethnicity" [2]. In a related publication by the same leading author, he and his co-author warn that the PASE instrument should be "further evaluated in larger more representative samples using a variety of validation criteria" [3]. Although I do not validate the instrument with the analytic sample, I pay heed to their calls by developing an alternative scoring algorithm.

Research has found that alternate examples in questions are necessary to make the instrument more culturally sensitive [4]. With the classical scoring system, the PASE scale may not be sensitive to assessing an individuals' environment or other important cultural factors that would influence the total score. Exercise examples provided in "leisure questions" may alter response patterns in community dwelling aged minority adults.

Limitations with the PASE instrument have been noted. For example, some have studied aged adults in continuing care retirement communities and found no "relationship between measures of physical performance, physical activity, and PASE scores" [5]. On the "recall" element of the instrument, researchers have pointed out that "questionnaires such as the PASE are obviously dependent on the accurate recall of the subject and the ability of the instrument to recognize and fairly weight the diverse activities" [6]. Investigations dating back to the 1990s have admonish the careful use of the PASE instrument, because, for example, "PASE questionnaire overestimates women's physical activity as compared to men, due to an incorrect weighing of heavy housework and caring for others" [7]. Alternate

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

measures physical performance measures like pedometer-derived steep counts have been compared with PASE more recently and found to be a "more valid measurement of overall physical activity" than PASE scoring [8]. Others have argued that "PASE is not recommended as a valid tool to examine [physical activity] level for patients with hip [osteoarthritis]" [9].

From a more theoretical view, some have highlighted that because reliability and construct validity on self-reported physical activity remains scarce for older adults, "more high-quality validation studies are needed" [10]. Since a sample of aged Mexican origin Latinos is used in this project, it is important to note that recent work on Latinos/as has argued that elements in their cultural lifestyle (e.g., physical activity) need careful attention as researchers "consider aspects of cultural values and beliefs, and their impact on health status, for future research and health promotion interventions." [11].

Since more "objective" measures than self-reports on physical activities is not always available with existing secondary data, researchers frequently make use of PASE items to measure an aged adult's physical activity. Here I introduce how the "Siordia logic" (interchangeably refer to as the *new approach*) differs from what I will label as the "Washburn approach" (interchangeably refer to as the *classical approach*). By Siordia logic I simply mean that a non-statistically derived set of rules/assumptions is used in an outlined algorithm to assign a new set of "weights" and "anchors" to score PASE items. In the new approach, the Siordia logic is used to order PASE items by their presumed level of physical intensity/expenditure. The order is arbitrary and not based on anything other than derived logic from reading and subjectively interpreting the (sometimes vague) questions and examples given for each PASE item.

2. METHODS

2.1 Study design and participants

Participants were recruited for the Hispanic Established Population for the Epidemiological Study of the Elderly (HEPESE) in the early 1990s. At Wave 1, information was collected through in-person interviews on 3,050 community-dwelling Mexicans aged 65 years and above who resided in one of the five southwestern states of Arizona, California, Colorado, New Mexico and Texas [12]. This study extracts data from a sample of 2,438 observations from (those with a PASE score) Wave-2—data collected during 1995–1996.

2.2 PASE

The HEPESE longitudinal study administered the PASE instrument during Wave-2 data collection (please see Appendix A for HEPESE survey questions). The Washburn Weights (W^{W}), Washburn Main Anchors (W^{MainA}), and Washburn Mini Anchors (W^{MiniA}), for each of the items are given in a SAS macro program in Appendix B. Siordia Weights (S^{W}), Siordia Main Anchors (S^{MainA}), and Siordia Mini Anchors (S^{MiniA}), are given in a SAS macro program in Appendix C. Please see Appendix D for a discussion on the two scoring schemes.

2.3 Statistical Analysis

A table showing the main weights, main- and mini-anchors is given broken down by approach. To determine if the two PASE scoring approaches created significantly different PASE total scores, I conduct a Kolmogorov-Smirnov Test. In addition to this, I perform linear regressions to investigate the "predictive power" of each PASE total score by approach (new versus classical) using the following dependent variables: total Basic Activities of Daily Living (BADL) score; total Instrumental Activities of Daily Living

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

(IADL) score; and total Performance Mobility Assessment Score (POMA). BADL ranges from 0 to 7 and high scores indicate more difficulties in performing basic ADLs. IADL ranges from 0 to 10 and high scores indicate more difficulties in performing instrumental ADLs. POMA ranges from 0 to 12 and high scores indicate a high level of mobility.

3. RESULTS

3.1 Difference in coding by approach

Table 1 gives the main weights, main- and mini-anchors by approach. Please note that W^W range from 20 to 36 and do not follow a specific order with regards to what could potentially be interpreted as physical expenditure by item. In contrast, S^W range from 1.03 to 18 and amplify as you increase on what I interpret to be greater physical expenditure.

For example, with S^W, "light housework" is weighed with a 1.03 while "muscle strength" weighted with an 18 as they contribute to the overall PASE score. In contrast, with W^W, "light housework" is weighed with a 25 while "muscle strength" weighted with a 30 as they contribute to the overall PASE score. With S^W, the movement from light housework to muscle strength is magnified by almost 18 times as you move between the extreme ends of ten PASE items. With W^W, the movement from light housework to muscle strength is only magnified by about 1.2 times and varies as you move between the extreme ends of ten PASE items. The Siordia logic is considered a viable alternative to the classical approach as it uses a "common sense" (albeit unscientific) approach in assigning weights.

From Table 1, we also see the main and mini anchors by approach. On the main anchors, "time" categories with S^{MainA} use the "seldom" (15%) as the baseline and increase by about a factor of 2.07 to get to "sometimes" (31%) and by a factor of 3.6 to get to "often" (54%). In contracts, "time" categories with W^{MainA}, with "seldom" at 6% as the baseline, increases by about a factor of 4.35 to get to "sometimes" (26%) and by a factor of 11.35 to get to "often" (68%). The Siordia logic uses a more "category sensitive" approach for the time categories and as such, could be considered a viable alternative to the classical approach for assigning main anchors. Both W^{MiniA} and S^{MiniA} approaches are similar in how they distribute the mini anchors.

3.2 Washburn approach

With all of the above procedures, we see in Table 2 that the minimum Washburn PASE Score (W^{PASE}) on leisure items, using the syntax in Appendix B, is 0 with a maximum score of 128.7 on the muscle strength item. The minimum W^{PASE} score for the household items is 20 (on garden work) and the maximum score is 36 (on the lawn work item). Although not shown here, analysis on the W^{PASE} distribution shows that it is positively skew in the sample (n=2,438; variance=665.5; skewness=1.86; kurtosis=4.1)—please see Figure 1 for a visual comparison on the distributions with both coding schemes.

3.3 Siordia approach

From Table 2, we also see that the minimum Siordia PASE Score (S^{PASE}) on leisure items is 0 and the maximum score is a 402.1 (on moderate sports). The minimum S^{PASE} score for the household items is 1, with a maximum score of 8.2 (gardening). Background analysis on the S^{PASE} distribution showed it was more unstable than the W^{PASE} distribution (variance=7,430; skewness=2.26; kurtosis=7.1)—Figure 1 shows there are no observations at or below two standard deviations from the S^{PASE} mean.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

3.4 Kolmogorov-Smirnov Test

After conducting the Kolmogorov-Smirnov test for equality of distribution functions, I find that the distribution between W^{PASE} and S^{PASE} are not equal (KS-0.45; KSa=30.8; D=0.91; Pr>KSa=<0.01). Graphs on the normality of variable distribution for W^{PASE} and S^{PASE} are available upon request from the author.

3.4 Linear Regressions

Each of the six linear regression models includes sex and age as covariates. From Table 3, we see both W^{PASE} and S^{PASE} are useful in predicting BADL (indirect relationship: higher BADL scores are associate with lower PASE scores), IADL (indirect relationship: higher IADL scores are associate with lower PASE scores), and POMA (direct relationship: higher POMA scores are associate with higher PASE scores). When evaluating the fit of the regression line to the data, we see that the *root means squared error*s are smaller for S^{PASE} than for W^{PASE}. For example, on BADL for W^{PASE}=1.64, while in S^{PASE} it only equals 1.12. From Table 3, we can also see that S^{PASE} has smaller t-values and standard errors than W^{PASE} in all models.

4. DISCUSSION

This project has given detail information for an alternative coding scheme of PASE items. In doing so, it has questioned the generalizability of the classical weights found in the classical scoring approach and has raised issues of cultural insensitivity in the examples given within PASE items. Others have followed alternate procedures to the classical approach [7]. This paper delineates the details for a Siordia logic driven approach. When possible, investigations on physical activity with aged Mexicans should consider the new approach in scoring PASE.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Funding

This study was supported by the Longitudinal Study of Mexican American Elderly Health (PI-KM), funded by the National Institute of Health (NIH) through the National Institute on Aging (NIA)(R01 AG10939-18).

REFERENCES

1. Washburn RA, Smith KW, Jette AM, Janney CA. The physical activity scale for the elderly (PASE): Development and Evaluation. J Clin Epidemiol. 1993; 46:153–162. [PubMed: 8437031]
2. Washburn RA, McAuley E, Katula J, Mihalko SL, Boileau RA. The physical activity scale for the elderly (PASE): Evidence for Validity. J Clin Epidemiol. 1999; 52:643–651. [PubMed: 10391658]
3. Washburn RA, Ficker JL. Physical activity scale for the elderly (PASE): the relationship with activity measured by a portable accelerometer. J Sports Med Phys Fitness. 1999; 39:336–340. [PubMed: 10726435]
4. Hagiwara A, Ito N, Sawai K, Kazuma K. Validity and reliability of the physical activity scale for the elderly (PASE) in Japanese elderly people. Geriatr Gerontol Int. 2008; 8:143–151. [PubMed: 18821997]
5. Zalewski KR, Smith JC, Malzahn J, VanHart M, O'Connell D. Measures of physical ability are unrelated to objectively measured physical activity behavior in older adults residing in continuing care retirement communities. Arch Phys Med Rehabil. 2009; 90:982–986. [PubMed: 19480874]

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

6. Kochersberger G, McConnell E, Kuchibhatla MN, Pieper C. The reliability, validity, and stability of a measure of physical activity in the elderly. Arch Phys Med Rehabil. 1996; 77:793–795. [PubMed: 8702373]

7. Schuit AJ, Schouten EG, Westerterp KR, Saris WHM. Validity of the physical activity scale for the elderly (PASE): according to energy expenditure assessed by the doubly labeled water method. J Clin Epidemiol. 1997; 50:541–546. [PubMed: 9180646]

8. Ewald B, McEvoy M, Attia J. Pedometer counts superior to physical activity scale for identifying health markers in older adults. Br J Sports Med. 2010; 44:756–761. [PubMed: 18625631]

9. Svege ID, Kolle E, Risberg MA. Reliability and validity of the physical activity scale for the elderly (PASE) in patients with hip osteoarthritis. BMC Muscu Dis. 2010; 13:26.

10. Forsen L, Loland NW, Vuillemin A, Chinapaw MJM, van Popel MNM, Mokkink LB, et al. Self-administered physical activity questionnaires for the elderly: a systematic review of measurement properties. Sports Med. 2010; 40:601–623. [PubMed: 20545382]

11. Wallace PM, Pomery EA, Latimer AE, Martinez JL, Salovey P. A review of acculturation measures and their utility in studies promoting Latino health. Hisp J of Behav Sci. 2010; 32:57–54.

12. Markides, KS.; Stroup-Benham, CA.; Black, SA.; Satish, S.; Perkowski, LC.; Ostir, G. The health of Mexican American Elderly: Selected findings from the Hispanic EPESE. In: Wykle, ML.; Ford, AB., editors. Serving minority elders in the 21st century. 1st edn.. Springer; 1999. p. 72-90.

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

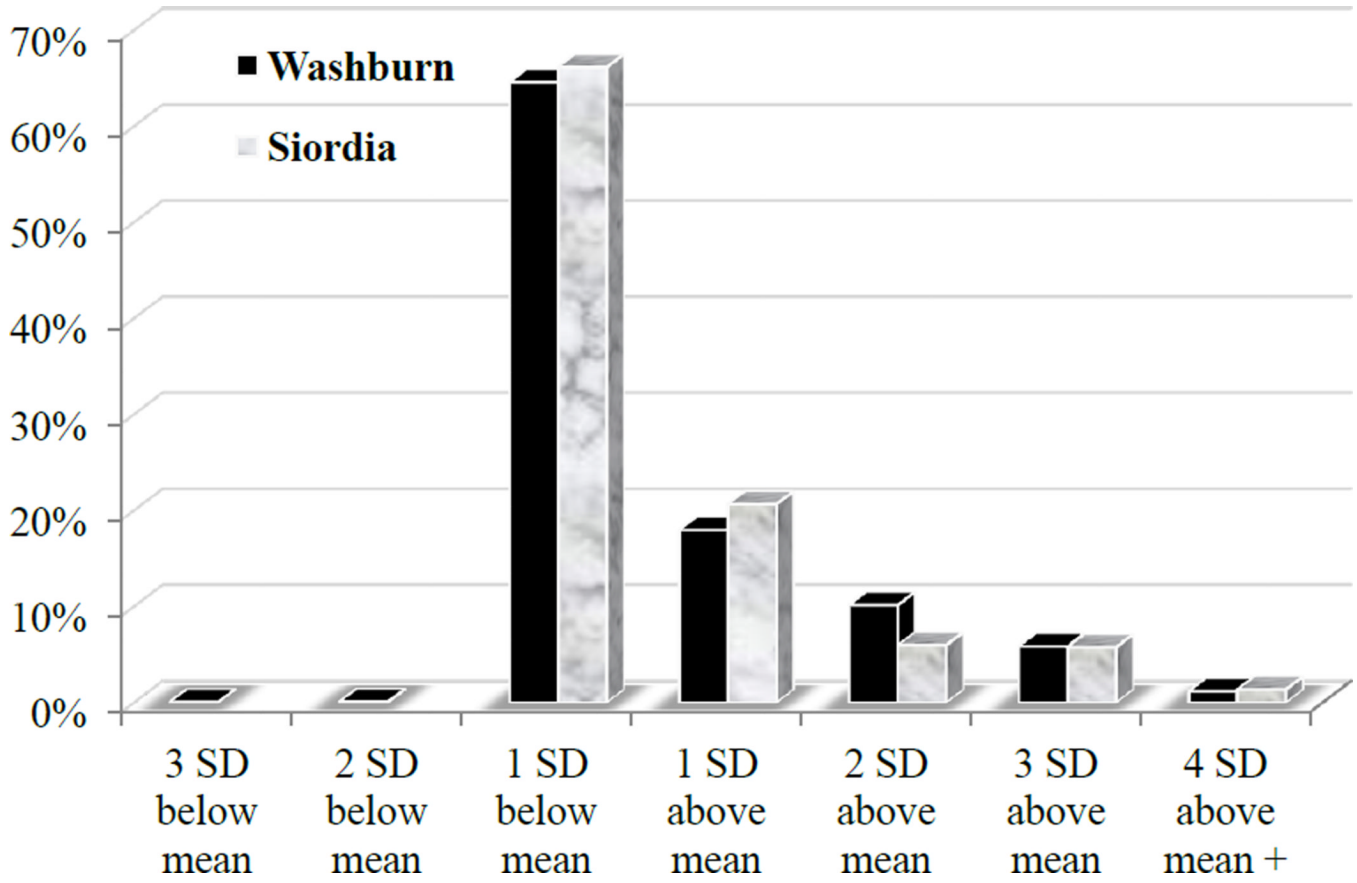

Figure 1.
Standard Deviations from the Mean by PASE Coding Approach

NIH-PA Author Manuscript

NIH-PA Author Manuscript

NIH-PA Author Manuscript

Table 1

Main Weights, Main- and Mini-Anchors by Approach

	Washburn	Siordia
Weights[1]		
House Hold		
Light housework	25	1.03
Heavy housework	25	2.06
Home repair	30	4.12
Lawn work	36	6.18
Outdoor gardening	20	8.24
Caring for another person	35	Omitted
Leisure		
Walking outside home	20	10
Light sports	21	12
Moderate sports	23	14
Strenuous sports	23	16
Muscle strength	30	18
Work		
Work for pay	21	Omitted
Main[2] **& Mini**[3] **Anchors**		
Seldom	6%	15%
< 1 hour	0.11	1.03
1–2 hours	0.32	2.06
2–4 hours	0.64	4.12
> 4 hours	1.07	8.24
Sometimes	26%	31%
< 1 hour	0.25	2.05
1–2 hours	0.75	4.10
2–5 hours	1.50	8.20
> 4 hours	2.50	16.4
Often	68%	54%
< 1 hour	0.43	3.59
1–2 hours	1.29	7.18
2–6 hours	2.57	14.36
> 4 hours	4.29	28.72

[1]These values represent the amount of contribution each “PASE item” (i.e., light housework, etc.) is allowed to have on the overall score.

[1]The percents represent the amount of contribution each “time section” (i.e., seldom, sometimes, often) is allowed to have for each leisure response.

[3]The values represent the amount each “hour category” (i.e., <1 hour, 1–2 hours, 2–3 hours, >4 hours) is allowed to have within each time section.

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

Table 2

Descriptive Statistics by PASE Approach

	Washburn PASE					Siordia PASE				
Variable	**N**	**Mean**	**SD**	**Min**	**Max**	**N**	**Mean**	**SD**	**Min**	**Max**
Leisure										
Walking	2,438	17.8	22.63	0.0	85.8	2,161	55.8	70.35	0.0	287.2
Light Sports	2,438	0.7	5.54	0.0	90.1	2,163	2.5	19.70	0.0	344.6
Moderate Sports	2,438	0.6	5.22	0.0	98.7	2,164	2.1	19.88	0.0	402.1
Strenuous Sports	2,438	0.4	3.13	0.0	59.1	2,160	2.0	12.69	0.0	229.8
Muscle	2,438	0.5	4.03	0.0	128.7	2,166	2.2	16.55	0.0	517.0
House Hold										
Light HH Work	2,438	25.0	0.00	25.0	25.0	1,678	1.0	0.00	1.0	1.0
Heavy HH Work	2,438	25.0	0.00	25.0	25.0	1,058	2.1	0.00	2.1	2.1
HH Repair	2,433	30.0	0.00	30.0	30.0	347	4.1	0.00	4.1	4.1
HH Lawn	2,436	36.0	0.00	36.0	36.0	836	6.2	0.00	6.2	6.2
HH Garden	2,438	20.0	0.00	20.0	20.0	1,196	8.2	0.00	8.2	8.2
PASE Sub-Scales										
Leisure Sub-Scale	2,438	20.0	25.68	0.0	214.5	2,166	64.5	83.44	0.0	804.2
House Sub-Scale	2,438	170.9	2.16	105.0	171.0	1,861	10.9	7.19	1.0	21.6
Total Score										
PASE	2,438	191.0	25.80	120.0	385.5	2,166	73.9	86.20	0.0	815.5

Maturitas. Author manuscript; available in PMC 2013 August 01.

NIH-PA Author Manuscript
NIH-PA Author Manuscript
NIH-PA Author Manuscript

Table 3

Predicting[1] BADL[2], IADL[3], POMA[4] with PASE by Different Coding Schemes

	Washburn PASE			Siordia PASE		
	BADL	**IADL**	**POMA**	**BADL**	**IADL**	**POMA**
PASE						
Coefficient	−0.005	−0.02	0.03	−0.002	−0.01	0.01
Standard Error	0.001	0.002	0.003	0.0003	0.001	0.001
t-Value	−3.57	−8.44	9.71	−7.64	−13.51	12.01
Pr>|t|	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Model Performance						
F-Value	90.7	222.0	160.7	56.6	145.3	190.4
Root MSE	1.64	2.84	3.25	1.12	2.33	3.05
Adjusted R^2	0.10	0.21	0.18	0.07	0.21	0.17
Sample Size	2,435	2,437	2,241	2,163	2,165	2,119

[1] All models include age and sex covariates

[1] Total Basic Activities of Daily Living Score

[2] Total Instrumental Activities of Daily Living Score

[3] Total Performance Mobility Assessment Score

Maturitas. Author manuscript; available in PMC 2013 August 01.