

Variation in Stair Performance among Adults Aged 55 and Older in A 14 Month Follow-Up

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Abstract

Objective: To analyze variation in stair performance among adults aged 55 years and older in a 14 month follow-up study.

Methodology: A population-based cohort study in Cambé, a city located in the state of Paraná, Brazil. The variables analyzed were age, gender, educational level, socioeconomic profile, depression, obesity, and diabetes. Self-reported ability to go up and down stairs was assessed at baseline and end of follow up.

Results: Four hundred and four individuals were analyzed (164 men, 240 women) with median age of 65.6 years. Difficulty in going up or down stairs was 36.5% at baseline and 37.5% after a 14.3 month follow-up period. Depressive, obese and female individuals, as well as the ones with lower educational and socioeconomic status more frequently experienced difficulty in stair performance. Most negative variations in ability to go up or down stairs were identified among male, depressive, and obese individuals (-7.9%, -6.1%, and 2.8% respectively).

Conclusions: These data reinforce the role of incapacity for stair utilization in functional assessment of elderly people and highlight the need for specific actions towards more vulnerable aged groups, such as the depressive and obese elderly individuals.

Keywords: Aged; Mobility; Disability

Introduction

One of the most important challenges in elderly health care is preserving functional capacity in elderly individuals. Disabilities are responsible for significant financial expenditures by society, and they considerably affect quality of life [1,2].

Therefore, the inclusion of functional assessments in the routine diagnosis of elderly, carried out by healthcare professionals, enhances the perception of the concept of health in this age group. Usually, specialized services in geriatric care apply the assessment of basic activities of daily living (BADL) and instrumental activities of daily living (IADL); however, these evaluations are not yet routinely used in primary health care.

Motor disorders such as decreased walking speed and difficulty in stair performance are commonly observed in geriatric populations. These may be considered as markers of vulnerability to future functional disabilities [3] and therefore could be single and simple measurements of functional assessment [4,5].

Elderly adults consider stair climbing and descending to be one of the difficulties that is more associated with aging [6]. Due to its easy application, stair performance is recognized as an important method for evaluating functionality and is therefore included in most functionality scales [7]. Nevertheless, it is still rarely applied as single evaluation in the protocols of geriatric care services at the primary level.

Therefore, this study aims to assess the autonomous use of the stairs in a group of elderly adults and the variation in their performance in a 14 month follow-up period.

Methods

Study design:

Population-based cohort study with an average follow-up period of 14 months

Study Population:

Individuals aged 55 years or older living in the urban area of the municipality of Cambé (96,735 inhabitants, Paraná State, Brazil) [8].

Sampling:

The sample was originally designed for the Cardiovascular Disease Project (VIGICARDIO (9)) and comprised 1,180 individuals aged 40 years and older, according to the representative age of men and women calculated in 86 census sectors conducted in the city. The present analysis used data from only 501 participants older than 54 years.

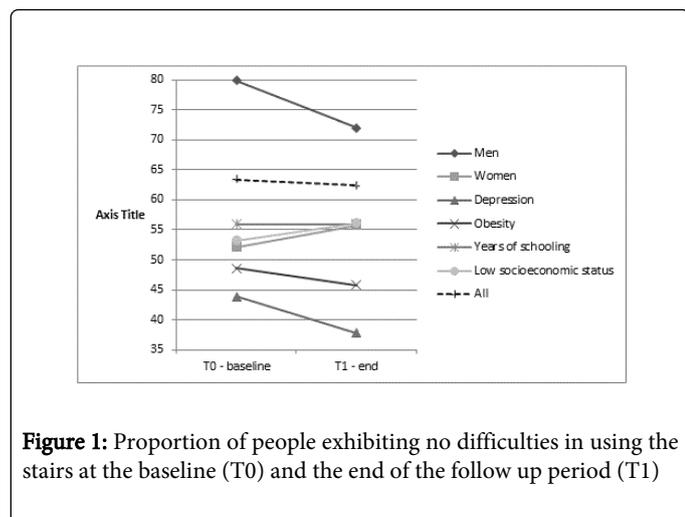


Figure 1: Proportion of people exhibiting no difficulties in using the stairs at the baseline (T0) and the end of the follow up period (T1)

Data collection:

This was carried out in two distinct occasions:

First Assessment (T0): population-based study conducted between February and June 2011—initial analysis of VIGICARDIO. Data on sociodemographic characteristics, comorbidities, and functional capacity were obtained.

Second Assessment (T1): targeted household survey conducted between April and August 2012 to obtain data related to functional capacity.

Analyzed variables

Sociodemographic characteristics: age (age groups: 55–64 and older than 65), gender, low educational level (less than 4 years of schooling) and low socioeconomic profile (1st tertile: Brazilian socioeconomic score) [10].

Comorbidities: Depression: self-reported depression or regular use of antidepressant medications. Diabetes: fasting glucose > 125 mg/dL or regular use of antidiabetic medicines [11]. Obesity: Body Mass Index (BMI) ≥ 30.0 kg/m² [12].

Functional capacity: Basic activities of daily living (BADL) [13] and instrumental activities of daily living (IADL) [14].

Stair performance: Data on stair climbing and descending performance were obtained from self-reports or provided by primary caregivers. It was classified as without difficulty, with some difficulty/

insecurity, inability, or need another person's help to use the stairs [15].

Statistical Analysis

The data were stored and analyzed using the program Epi Info version 3.5.4. The descriptive analysis was stratified by gender, using the chi-squared test to compare sampling distribution. An ANOVA was used to analyze quantitative variables with homogenous variance as shown by the Bartlett's test. The Kruskal-Wallis test was used for variables with non-parametric distributions.

The stairs performance was analyzed as dependent variable in two different situations: 1) without difficulty in climbing or descending the stairs. Variation in the ability to climb and descend stairs (Figure 1). The independent variables were measured in the baseline only.

The assumed statistical significance is $p \leq 0.05$.

Ethical aspects

The Research Ethics Committee of the State University of Londrina approved the initial project (VIGICARDIO) (CEP/Uel 236/10) as well as the project referring to the second survey (CEP /Uel 042/2011). The agreement of individuals and caregivers to be included in the two evaluations was requested by signing an informed consent form.

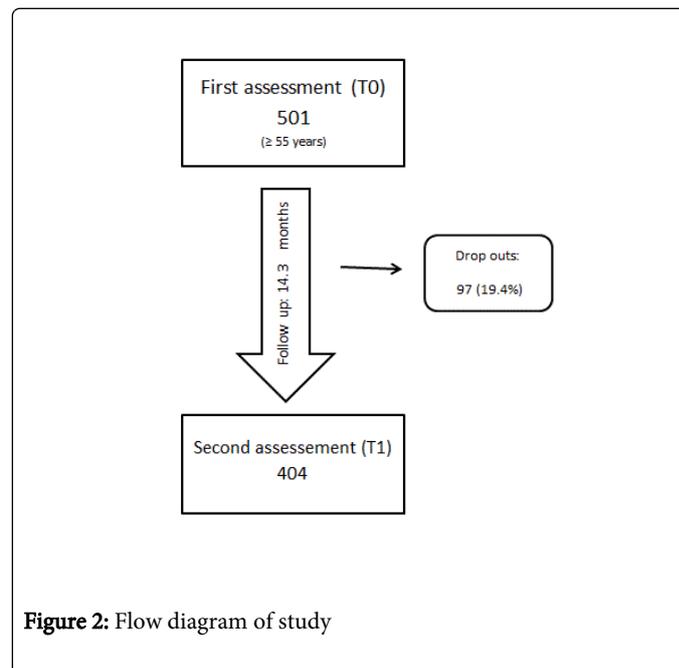


Figure 2: Flow diagram of study

Results

Of the 501 individuals aged 55 and older that were analyzed in the first evaluation, it was possible to carry out a second assessment only in 404 (attrition of 19.4%). The reasons for attrition were death (3), prolonged hospitalization (9), change in address (22), refusal (15), and difficulty in reaching the individual after three attempts (48) (Figure 1).

The average age was 65.5 years, and 59.4% were female. Women had poorer socioeconomic status and higher proportions of depression and obesity (Table 1).

Regarding stair climbing and descending performance, 36.5% of the individuals presented some difficulties, a proportion that was higher among women (47.9%) (Table 1).

Variable	Total (404)	Men (164)	Women (240)
Age of onset (years)	65.5	65.1	65.7
Age group 55–65 years	49.0%	51.8%	47.1%
Mean follow-up period in months	14.3	14.1	14.5
Low educational level (<4 years of years of schooling)	44.3%	39.0 %	47.9%
Low socioeconomic profile (1st tertile)	34.4 %	23.2 %	42.1% **
Depression	16.1%	6.7%	22.5% **
Diabetes	17.3%	21.3%	14.6%
Obesity	35.1%	27.4%	40.4% *
BADL (at least 2 compromised)	5.4%	4.3 %	6.3%
IADL (at least 2 compromised)	14.1	17.1	9.8 *
Difficulty in using the stairs (T0-baseline)	36.6%	20.1%	47.9% **
Difficulty to use the stairs (T1-end)	37.6%	28.0%	44.2%
BADL: basic activities of daily living IADL: instrumental activities of daily living; * p < 0.05; ** p < 0.001			

Table 1: Sample characteristics according to gender

The average interval between the two assessments (T0 and T1) was 14.3 months (median=14.2). In this period, there was a small decrease in the proportion of individuals who reported no difficulties in stair

performance (63.4% vs. 62.4%). The proportion of the individuals that could not use the stairs or required assistance increased from 2.7% to 5.2% (Table 2).

	Without difficulty	With some difficulty and insecurity	Does not use or requires the assistance of another person
T0 – baseline	256 (63.4%)	137 (33.9%)	11 (2.7%)*
T1 – end	252 (62.4%)	131 (32.4%)	21 (5.2%)*
P = 0.07			

Table 2: Ability to climb and descend the stairs at the baseline (T0) and the end (T1) of the follow-up period (14 months)

In the analysis of stair performance in specific population groups, it was observed that individuals with depression presented the worse rates, followed by obese individuals, women, and people with low

socioeconomic status. However there were not statistically significant difference between baseline and the end of follow up (Table 3) (Figure 2).

Variable (n)	Without difficulty in climbing or descending the stairs		P value
	T0–baseline n (%)	T1–end n (%)	
Men (164)	131 (79.9)	118 (72.0)	0.09
Women (240)	125 (52.1)	134 (55.8)	0.40
55–65 (206)	144 (69.9)	142 (68.9)	0.98
Over 65 (198)	112 (56.6)	110 (55.6)	0.83
Depression (82)	36 (43.9)	31 (37.8)	0.55
Without depression (322)	220 (68.3)	221 (68.3)	1.00

Diabetes (70)	41 (58.6)	39 (55.7)	0.73
Without diabetes (334)	215 (64.4)	213 (63.8)	0.87
Obesity (142)	69 (48.6)	65 (45.8)	0.63
Not obese (262)	187 (71.4)	187 (71.4)	1.00
Years of schooling: >3 years (225)	156 (69.3)	152 (67.6)	0.68
Years of schooling: 0–3 years (179)	100 (55.9)	100 (55.9)	1.00
Socioeconomic status: >1 st Tertile (270)	182 (68.7)	174 (65.7)	0.46
Low socioeconomic status (1 st Tertile) (134)	74 (53.2)	78 (56.1)	0.62

Table 3: Independence in using the stairs at the baseline and the end of the follow-up period according to gender, age, education, socioeconomic status, and depression

In the second evaluation (T1), stair performance decreased mainly among men (-7.9%; $p < 0.05$) and depressive individuals (-6.1%; $p < 0.05$) (Figure 3).

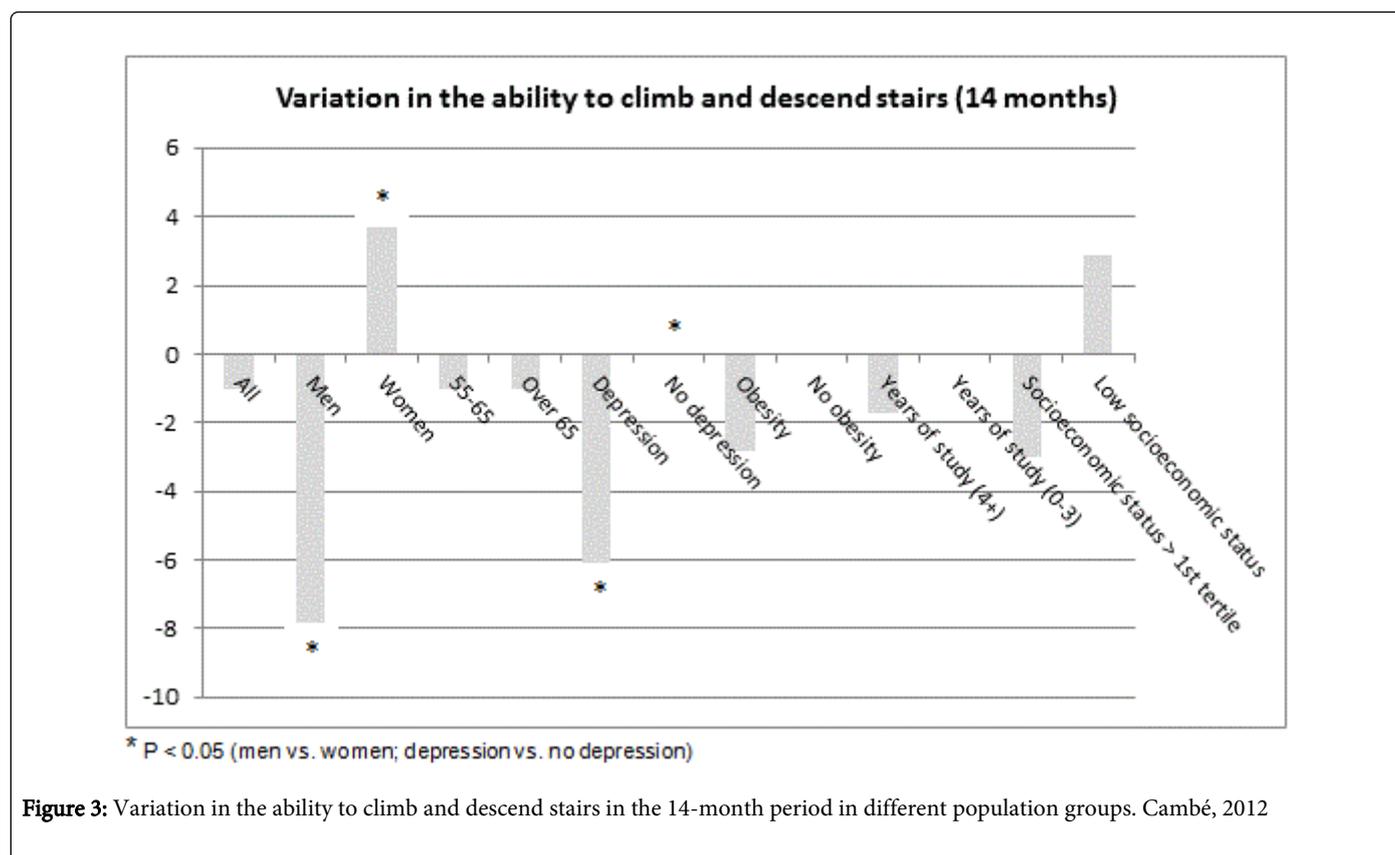


Figure 3: Variation in the ability to climb and descend stairs in the 14-month period in different population groups. Cambé, 2012

Discussion

The results showed that a third of the individuals aged 55 years or older presented with some difficulties in using the stairs. This proportion was higher in women as well as depressed, obese and elderly with lower socioeconomic status and educational level. Stair climbing and descending ability over the 14 month follow-up period decreased to a lesser extent in the general population, although this decrease was more pronounced among men and depressive individuals.

The use of stair performance as an indicator of functional capacity is justified by the need to simplify functional assessment methods used for elderly adults, especially in primary health care services. Moreover, difficulty in using the stairs, although not affecting health conditions, may be considered as a dysfunction that, with higher clinical repercussions, precedes other functional disabilities [15].

The incidence of disability is a multifactorial and dynamic phenomenon, based on the hierarchical existence of functional declines that occur initially in specific and instrumental activities and

then evolve, compromising basic activities of daily living [16]. Difficulty in climbing and descending the stairs may represent for most individuals the initial phase of motor disability [17,18].

It was observed that a significant proportion even in younger elderly (55 to 65 years) presented with difficulties in stair performance (30.1%). Few studies on functional capacity include individuals from 55 to 60 years old. In an analysis involving more than 7,000 persons over 55 years old, 32% presented certain types of disabilities [2].

Chen and colleagues (2010) reported that 35.3% of the individuals aged 60 years or older in their sample presented at least one motor disability [17]. A study on elderly adults older than 70 years, who presented with no sign of dementia and compromised BADLs, showed that 52.9% had some difficulty in climbing or descending the stairs. The incidence of walking difficulty in elderly adults (70 years and older) was 4.5% after two-year follow-up [19].

The analysis of the variation in the level of independence in using the stairs during the follow-up period showed a slight decline in this proportion of subjects who were independent. The small change may be justified by the inclusion of younger elderly, with lower frequency of comorbidities. It is also possible that losses to follow up occurred predominantly in elderly adults with worse health conditions.

It is difficult to collect data from other authors that comparable with those obtained in this analysis, due to the differences in age and follow up period. In a cohort formed by 70–80 year old women, 11.7% presented with a decline in functional capacity within 18 months [15]. During a three-year follow up, in individuals aged 65 years or older, the proportion of elderly without disability was 26.9%, 23.9%, and 19.9% at baseline, 12 months, and 36 months post follow up, respectively [20]. In a study carried out by Herbertete and colleagues (1997) in elderly aged 75 years and older, these authors observed a functional decline of 20% in the first year [21].

Many authors have reported a difference in frequency of functional disability between elderly men and women [1,2,19,22]. Women have higher levels of disability, involving mainly motor functioning [21]. Our results show that 80% of the men had no difficulty in climbing and descending the stairs at T0; however, a larger decline was observed in this group of elderly during the follow-up period (-7.9%). It is possible that men present better motor function until the onset of old age, due to different working practices and behavioral issues. In contrast, elderly men showed the worse indicators of self-care and adherence to regular physical activity, which may have contributed to the decline in functionality in this short period.

Another group of elderly that exhibited higher difficulties in stair performance was individuals with lower educational level, although a decline was not observed in this group. Low educational level has already been identified as a contributor to functional decline in elderly adults [23,24]. In contrast to the results of these studies, Weiss and colleagues observed that older women with difficulties in motor function had higher education levels [3].

As low-educated individuals, the elderly presenting the lower social levels also include a lower proportion that were autonomously capable of using the stairs. This association between functional capacity and low social profile has already been observed by other authors [25,26].

Obesity has been losing importance as a cardiovascular risk factor in elderly populations [27]; however, its importance in assessing functional capacity is well established [2,28,29]. In this study, less than half (48.6%) of the obese elderly could use the stairs without

difficulties at baseline, and after 14 months, this proportion diminished to 45.8%. Some authors observed that the obesity by itself was responsible for the walking difficulty in elderly [3].

The group with the lower proportion of autonomy in using the stairs was that of depressed elderly, in which it was observed the higher negative variations of performance during the follow-up period (43.9% vs. 37.8%).

Depression is one of the most impactful comorbidities in the geriatric population. It has been associated with cardiovascular diseases, dementia, cancer, and musculoskeletal disorders [30]. Some authors also reported a strong correlation between depression and functional disabilities [2], even in shorter follow-up periods such as 12 months [31]. Countless factors contribute to functional decline in depressive individuals. Depressive patients exhibit reduced social interaction and engagement in physical activity, due to psychic apathy. Neural, immunological, hormonal, and biological factors are also involved in this condition [32].

Our results should be analyzed taking into account several methodological limitations present in the study. The sample size limited the analysis of the determinants of the outcomes studied. There were several individuals that we could not analyze in the second assessment. Some of the drop outs of this study may also have been elderly adults with more severe comorbidities and consequently higher functional disability and greater functional decline in the period analyzed. Moreover, the baseline comorbidities were not controlled during the follow up.

Data on functionality were not obtained through observation, but via self-report, which could generate inaccuracies. However, other studies have reported satisfactory agreement between these two ways of evaluation of stair performance has already been observed in elderly [23].

Although sensory disturbances, such as difficulty with vision and hearing, could influence independence in using the stairs [33], these factors were not included in this analysis.

The analysis did not distinguish between difficulties in climbing or descending the stairs. However, some authors suggest that the difficulty in stair performance should be differentiated between climbing, descending, and both, as they may present different determinants and consequences [23].

Therefore, despite the above limitations that restrict the generalizability of the study, the results indicate that stair performance can be a potential indicator of future motor disabilities [34].

Moreover, they show that certain characteristics of the elderly are related to higher levels of functional disability. From the perspective of health care services, the present findings can inform the development of preventive measures against functional decline in elderly adults, including earlier screening for motor function disorders particularly for male, depressive, and obese individuals, who were identified as most vulnerable to functional decline.

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Authorship:

Designing and planning of the research project: Cabrera, Dip, Prato, Dellaroza, Yonamine, and Souza Collection, analysis, and interpretation of the data: Cabrera, Dip, Prato Yonamine, Guariente, and Carvalho.

References

- Mitra S, Sambamoorthi U (2014) Disability prevalence among adults: estimates for 54 countries and progress toward a global estimate. See comment in PubMed Commons below *Disabil Rehabil* 36: 940-947.
- TaÁÿ U, Verhagen AP, Bierma-Zeinstra SM, Hofman A, Odling E, et al. (2007) Incidence and risk factors of disability in the elderly: the Rotterdam Study. See comment in PubMed Commons below *Prev Med* 44: 272-278.
- Weiss CO, Wolff JL, Egleston B, Seplaki CL, Fried LP (2012) Incident preclinical mobility disability (PCMD) increases future risk of new difficulty walking and reduction in walking activity. See comment in PubMed Commons below *Arch Gerontol Geriatr* 54: e329-333.
- Abellan van Kan G, Rolland Y, Andrieu S, Bauer J, Beauchet O, et al. (2009) Gait speed at usual pace as a predictor of adverse outcomes in community-dwelling older people an International Academy on Nutrition and Aging (IANA) Task Force. See comment in PubMed Commons below *J Nutr Health Aging* 13: 881-889.
- Peel NM, Kuys SS, Klein K (2013) Gait speed as a measure in geriatric assessment in clinical settings: a systematic review. See comment in PubMed Commons below *J Gerontol A Biol Sci Med Sci* 68: 39-46.
- Startzell JK, Owens DA, Mulfinger LM, Cavanagh PR (2000) Stair negotiation in older people: a review. See comment in PubMed Commons below *J Am Geriatr Soc* 48: 567-580.
- van Iersel MB, Olde Rikkert MG, Mulley GP (2003) Is stair negotiation measured appropriately in functional assessment scales? See comment in PubMed Commons below *Clin Rehabil* 17: 325-333.
- Censo I (2010) Censo 2010 - IBGE.
- Souza RKT, Bortoletto MSS, Loch MR (2013) Prevalence of cardiovascular risk factors in people aged 40 years or more from the city of Cambé, PR, Brazil (2011): a population-based study. *Epidemiol Serv Saúde* 22: 435-444.
- Brasil CPdCE, Filiadas BE (2011) ABEP—associação brasileira de empresas de pesquisa.
- Expert Committee on the Diagnosis and Classification of Diabetes Mellitus (2003) Report of the expert committee on the diagnosis and classification of diabetes mellitus. See comment in PubMed Commons below *Diabetes Care* 26 Suppl 1: S5-20.
- [No authors listed] (2000) Obesity: preventing and managing the global epidemic. Report of a WHO consultation. See comment in PubMed Commons below *World Health Organ Tech Rep Ser* 894: i-xii, 1-253.
- Katz S, Akpom CA (1976) 12. Index of ADL. See comment in PubMed Commons below *Med Care* 14: 116-118.
- Lawton MP, Brody EM (1969) Assessment of older people: self-maintaining and instrumental activities of daily living. See comment in PubMed Commons below *Gerontologist* 9: 179-186.
- Fried LP, Bandeen-Roche K, Chaves PH, Johnson BA (2000) Preclinical mobility disability predicts incident mobility disability in older women. See comment in PubMed Commons below *J Gerontol A Biol Sci Med Sci* 55: M43-52.
- Barberger-Gateau P, Rainville C, Letenneur L, Dartigues JF (2000) A hierarchical model of domains of disablement in the elderly: a longitudinal approach. See comment in PubMed Commons below *Disabil Rehabil* 22: 308-317.
- Chen HY, Wang CY, Lee MY, Tang PF, Chu YH, et al. (2010) A hierarchical categorisation of tasks in mobility disability. See comment in PubMed Commons below *Disabil Rehabil* 32: 1586-1593.
- Yeh CJ, Wang CY, Tang PF, Lee MC, Lin HS, et al. (2012) Hierarchy of higher-level physical functions: a longitudinal investigation on a nationally representative population of community-dwelling middle-aged and elderly persons. *Disabil Rehabil* 34: 1271-1276.
- Dunlop DD, Manheim LM, Sohn MW, Liu X, Chang RW (2002) Incidence of functional limitation in older adults: the impact of gender, race, and chronic conditions. See comment in PubMed Commons below *Arch Phys Med Rehabil* 83: 964-971.
- Nikolova R, Demers L, Béland F, Giroux F (2011) Transitions in the functional status of disabled community-living older adults over a 3-year follow-up period. See comment in PubMed Commons below *Arch Gerontol Geriatr* 52: 12-17.
- Hébert R, Brayne C, Spiegelhalter D (1997) Incidence of functional decline and improvement in a community-dwelling, very elderly population. See comment in PubMed Commons below *Am J Epidemiol* 145: 935-944.
- Butler AA, Menant JC, Tiedemann AC, Lord SR (2009) Age and gender differences in seven tests of functional mobility. See comment in PubMed Commons below *J Neuroeng Rehabil* 6: 31.
- Vergheze J, Wang C, Xue X, Holtzer R (2008) Self-reported difficulty in climbing up or down stairs in nondisabled elderly. See comment in PubMed Commons below *Arch Phys Med Rehabil* 89: 100-104.
- Gregory PC, Szanton SL, Xue QL, Tian J, Thorpe RJ, et al. (2011) Education predicts incidence of preclinical mobility disability in initially high-functioning older women. The Women's Health and Aging Study II. See comment in PubMed Commons below *J Gerontol A Biol Sci Med Sci* 66: 577-581.
- Plantinga LC, Johansen KL, Schillinger D, Powe NR (2012) Lower socioeconomic status and disability among US adults with chronic kidney disease, 1999-2008. See comment in PubMed Commons below *Prev Chronic Dis* 9: E12.
- Strax TE, Luciano L, Dunn AM, Quevedo JP (2010) Aging and developmental disability. See comment in PubMed Commons below *Phys Med Rehabil Clin N Am* 21: 419-427.
- Cabrera MA, de Andrade SM, Mesas AE (2012) A prospective study of risk factors for cardiovascular events among the elderly. See comment in PubMed Commons below *Clin Interv Aging* 7: 463-468.
- Jensen GL, Hsiao PY (2010) Obesity in older adults: relationship to functional limitation. See comment in PubMed Commons below *Curr Opin Clin Nutr Metab Care* 13: 46-51.
- Wee CC, Huskey KW, Ngo LH, Fowler-Brown A, Leveille SG, et al. (2011) Obesity, race, and risk for death or functional decline among Medicare beneficiaries: a cohort study. See comment in PubMed Commons below *Ann Intern Med* 154: 645-655.
- Mitchell AJ, Subramaniam H (2005) Prognosis of depression in old age compared to middle age: a systematic review of comparative studies. See comment in PubMed Commons below *Am J Psychiatry* 162: 1588-1601.
- Kazama M, Kondo N, Suzuki K, Minai J, Imai H, et al. (2011) Early impact of depression symptoms on the decline in activities of daily living among older Japanese: Y-HALE cohort study. See comment in PubMed Commons below *Environ Health Prev Med* 16: 196-201.
- Penninx BW, Guralnik JM, Ferrucci L, Simonsick EM, Deeg DJ, et al. (1998) Depressive symptoms and physical decline in community-dwelling older persons. See comment in PubMed Commons below *JAMA* 279: 1720-1726.
- Hairi NN, Bulgiba A, Peramalah D, Mudla I (2013) Do older people with visual impairment and living alone in a rural developing country report greater difficulty in managing stairs? See comment in PubMed Commons below *Prev Med* 56: 8-11.
- Vergheze J, Wang C, Holtzer R (2011) Relationship of clinic-based gait speed measurement to limitations in community-based activities in older adults. See comment in PubMed Commons below *Arch Phys Med Rehabil* 92: 844-846.

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