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Decline in Physical Function and Risk for Elder Abuse Reported to Social Services in a Community-Dwelling Population of Older Adults

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Abstract

Objectives—Elder abuse is an important public health and human rights issue and is associated with increased morbidity and mortality. This study aimed to examine the longitudinal association between decline in physical function and the risk for elder abuse.

Design—Prospective population-based study

Setting—Geographically defined community in Chicago.

Participants—Chicago Health and Aging Project (CHAP) is a population-based study (N=6,159), and we identified 143 CHAP participants who had elder abuse reported to social services agency from 1993–2010.

Participants—The primary independent variable was objectively assessed physical function using decline in physical performance testing (Tandem stand, measured walk and chair stand). Secondary independent variables were assessed using the decline in self-reported Katz, Nagi, and Rosow-Breslau scales. Outcomes were reported and confirmed elder abuse and specific subtypes of elder abuse (physical, psychological, caregiver neglect and financial exploitation). Logistic regression models were used to assess the association of decline in physical function measures and risk for elder abuse.

Results—After adjusting for potential confounders, every 1 point decline in physical performance testing (OR, 1.13(1.06–1.19)), Katz impairment (OR, 1.29(1.15–1.45)), Nagi impairment (OR, 1.30(1.13–1.49)) and Rosow Breslau impairment (OR, 1.42(1.15–1.74)) were associated with increased risk for elder abuse. Lowest tertiles of physical performance testing (OR, 4.92 (1.39–17.46), highest tertiles of Katz impairment (OR, 3.99 (2.18–7.31), Nagi impairment (OR, 2.37 (1.08–5.23), and Rosow Breslau impairment (2.85 (1.39–5.84) were associated with increased risk for elder abuse.

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Conflict of Interest

The editor in chief has reviewed the conflict of interest checklist provided by the authors and has determined that the authors have no financial or any other kind of personal conflicts with this paper.

Author Contributions:

Drs. Dong, Simon and Evans were responsible for the conception and design as well as analysis and interpretation of data. All these authors were involved in the drafting of the manuscript, critical revision of the manuscript and statistical analysis of the manuscript. Drs Dong, Simon and Evans declare no conflict of interest.

Conclusion—Decline in objectively assessed physical function and self-reported physical function are associated with increased risk for elder abuse.

Keywords

elder abuse; decline in physical function; aging; population-based study

Introduction

Elder abuse affects millions of US elderly persons each year (1;2). Recent study suggested that the prevalence of self-reported elder abuse is 7.6%, with financial exploitation being the most common(4.2%), followed by physical and sexual abuse(2.2%), neglect(1.8%) and psychological abuse(1.6%)(3). This is alarming as the literature suggests that elder abuse is associated with increased risk of morbidity and mortality (4–6). However, our current understandings of the risk factors for elder abuse in the general population remain limited.

Physical function impairment has been associated with substantial morbidity and mortality (7–9). Prior studies have found conflicting associations between levels of self-reported physical function and the risk for elder abuse (10–14). We are not aware of any epidemiological study that has utilized directly observed physical performance testing to examine its association with elder abuse, its specific subtype as well as multiple forms of elder abuse.

In this report, we examine the prospective association between the directly observed physical performance testing and self-reported physical function and the risk for elder abuse reported to social services agency. Our underlying hypothesis is that decline in physical performance, as measured by directly observed and self-reported measures of physical function, are associated with increased risk for elder abuse. In addition, we hypothesize that the degrees of association between different physical function measures vary across different subtypes of elder abuse in this community-dwelling population.

METHODS

Design and Participants

The study population consists of participants in the Chicago Health and Aging Project (CHAP)(15;16). Briefly, the study population enrolled residents age 65 years and older in four adjacent neighborhoods in Chicago. Data collection includes an in-person interview conducted in participant's homes, which include standardized questionnaires and tests for the assessment of health history, physical function, health behaviors and social factors. Written informed consent was obtained and the study was approved by the Institutional Review Board.

Elder Abuse

Reports of elder abuse to social services agencies can come from a variety of sources. The definition of abuse includes physical abuse, sexual abuse, psychological abuse, neglect, and financial exploitation (17). Physical abuse is defined as inflicting physical pain or injury upon an older adult. Sexual abuse is touching, fondling, intercourse, or any other sexual activity with an older adult, when the older adult is unable to understand, unwilling to consent, threatened or physically forced. Psychological abuse involves verbal assaults, threat of abuse, harassment or intimidation. Neglect is a caregiver's failure to provide an older adult with life's necessities, including, but not limited to, food, clothing, shelter or medical care. Financial exploitation includes the misuse, or withholding of an older adult's resources

by another, to the disadvantage of the elderly person or the profit or advantage of someone else.

Record Linkage

We matched data from CHAP participants to elder abuse cases reported from 1993 through 2010. Matching was based on an algorithm that compared the following information: date of birth, sex, race, exact home address, zip codes, and the home phone number. This resulted in a total of 143 older CHAP participants who had elder abuse reported, of whom 75 were confirmed elder abuse cases.

Assessment of Physical Function

Physical function was assessed by direct performance testing, which consisted of measures of tandem stand, timed walk, and ability to rise to a standing position from a chair (18). Summary measures of these above tests were created as physical performance test scores (range 0–15, higher score indicate better function). For self-reported physical function, we used the Katz Index of Activities of Daily Living (Katz ADL), which measures limitations in an individual's ability to perform six basic self-care tasks; bathing, dressing, toileting, transferring, continence and feeding(19). The second measure was an index of mobility, based on work by Rosow and Breslau(20). It is composed of three items measuring the ability to do heavy work around the house, walk up and down stairs, and walk half a mile. The third measure used in this study was an index of basic physical activities, and is based on work by Nagi which measures five activities of upper or lower extremity function(21). Higher scores for self-reported measures indicate poorer function.

Study Variables

Reported elder abuse consists of all cases whether confirmed or unconfirmed. Confirmed elder abuse consists of subset of reported elder abuse cases based on the above indicators determined by social services agencies. Elder abuse subtypes include physical abuse, sexual abuse, emotional abuse, financial exploitation and caregiver neglect. Demographic variables included age (yrs), sex (men and women), and race (non-Hispanic black and non-Hispanic white [Total proportion of Hispanic, Asian and all other races are less than 1% of the CHAP population]), education (yrs) and 10 income categories (1=\$0–4,999; 2=\$5,000–9,999; 3=\$10,000–14,999; 4=\$15,000–19,999; 5=\$20,000–24,999; 6=\$25,000–29,999; 7=\$30,000–34,999; 8=\$35,000–49,999; 9=\$50,000–74,999; 10=\$75,000 and over). Self-reported medical conditions include hypertension, diabetes mellitus, stroke, shingles, Parkinson's disease, thyroid disease, heart disease, hip fracture, and cancer. Medical conditions were categorized as either present or not present and then constructed into a continuous measure of number of medical conditions (range 0–9). Cognitive function was measured using the Mini-Mental State Examination (MMSE)(22). Symptoms of depression were measured using a modified version(23) of the Center for Epidemiologic Studies of Depression Scale (CES-D)(24). Social network was summarized as the total number of children, relatives, and friends seen at least monthly(25). Social engagement was assessed by asking how often older adults participate in social activities outside of their house.

Analytic Approach

Descriptive analyses were conducted by elder abuse status across all variables. For change in physical function measures, we summarized the differences in physical function scores. For elder abuse, we summarized the differences between first available physical function measure to the most immediate physical function measure prior to the reporting of elder abuse. For participants without elder abuse, we summarized the differences between the first

available physical function measure to the most immediate assessment prior to the end of year 2010.

We used a series of logistic regression models to consider potential confounding factors. Our independent variable was physical function and our dependent variable was elder abuse. The core model (Model A) was adjusted for age (continuous variable), sex (men vs. women), race (black vs. white), education and income (continuous variables). In Model B, we added the number of medical conditions (continuous variable). In Model C, we included depressive symptoms, social network and social participation (all as continuous variables) as potential confounders. All of the above models were conducted for physical performance testing, tandem, chair stand and measured work, Katz, Nagi and Rosow Breslau abilities. As a sensitivity analysis, we repeated all above models for confirmed elder abuse.

Prior models utilized continuous measures of physical function to maximize power and increase the understanding of the association between incremental levels of physical function and elder abuse. However, in order to increase practical and clinical relevance of relative differences in physical function among groups, we repeated all prior models using tertiles of physical function measures above. Odds Ratio (OR), 95% Confidence Interval (CI), parameter estimate (PE), standard error (SE) and p values were reported for all analyses. With our sample size, we had 95% power for physical performance testing, Katz, Nagi, Rosow-Breslau to detect the corresponding OR of 1.1, 1.2, 1.2 and 1.3 for elder abuse outcome. Analyses were carried out using SAS®, V9(SAS Institute Inc., NC)(26).

RESULTS

Baseline Characteristics

There were 6,159 participants and 143 were identified for elder abuse (42 psychological abuse, 12 physical abuse, 2 sexual abuse, 41 caregiver neglect, and 53 financial exploitation). Of the 143 participants with elder abuse, 70 experienced one type, 46 experienced two types and 26 experienced three or more types. The mean age of the elder abuse victims was 72.5 years (standard deviation [SD] = 5.6 years) compared to 72.1 (6.2) in the non-abused study population. At baseline, the mean score for the directly observed physical performance testing was 9.32 (3.79) for participants with elder abuse and 10.98 (3.31) for those without elder abuse ($p < 0.001$). Although elder abuse had lower baseline physical function, the mean decline in physical performance score was -4.12 (4.61) for those with elder abuse and -2.64 (3.97) for those without elder abuse ($p < 0.001$). Similar trends were found for all self-reported physical function of Katz, Nagi and Rosow Breslau scales.

Physical Function and Elder Abuse

In the fully-adjusted model (Table 1, Model C), every 1 point decline in physical performance score is associated with increased risk for reported elder abuse (OR, 1.10 (1.05–1.15)). For self-reported physical function, every 1 point of change in Katz (OR, 1.23 (1.12–1.34)), Nagi (OR, 1.18 (1.06–1.30)) or Rosow Breslau (OR, 1.31 (1.14–1.54)) scales were also associated with increased risk for elder abuse. The results were similar for confirmed elder abuse. Figure 1 demonstrates the association between decline in physical function measures and risk for elder abuse.

In addition to the physical function above being modeled as a continuous variable, we also modeled it as tertiles to increase clinical relevance. The lowest tertiles of physical performance score was associated with increased risk for elder abuse (OR, 4.92 (1.39–17.46)) (Table 2). The lowest tertiles in chair stand ability was associated with increased risk for elder abuse (OR, 5.32 (1.42–19.97)). For self-reported physical function, greatest decline in

Katz ADL (OR,3.99(2.18–7.31)), Nagi (OR,2.37(1.08–5.23)), and Rosow Breslau (OR, 2.85(1.39–5.84)) scales were associated with increased risk for elder abuse.

Physical Function with Multiple Forms of Elder Abuse

Every 1 point decline in physical performance testing score was associated with increased risk for 3 or more forms of elder abuse (OR,1.14(1.01–1.28)). Every 1 point decline in Katz ability was associated with increased risk for 2 forms of elder abuse (OR,1.42(1.18–1.70)). Every 1 point decline in Nagi ability was associated with increased risk for 3 or more forms of elder abuse (OR,1.48(1.13–1.94)). Lowest tertiles of Katz ADL (OR,4.52(2.16–9.49)) and middle tertile of Katz ADL (OR,2.41(1.03–5.64)) were associated with increased risk for two types of elder abuse.

Physical Function with Specific Types of Elder Abuse

Every 1 point decline in physical performance score was associated with increased risk for psychological abuse (OR, 1.09(1.01–1.18)) and caregiver neglect (OR,1.16(1.07–1.26)). Every 1 point decline in Katz ADL (OR,1.36(1.16–1.59)), Nagi (OR,1.28(1.05–1.56)), and Rosow Breslau (OR,1.47(1.09–1.99)) scores were associated with increased risk for caregiver neglect. Every 1 point decline in Nagi score was associated with increased risk for psychological abuse (OR,1.22(1.01–1.46)). Lowest tertile of Rosow Breslau score was associated with increased risk for caregiver neglect (OR,4.18(1.63–10.71)).

DISCUSSION

In this population-based study of 6,159 older people, we found that decline in physical performance testing score and greater impairments in self-reported physical function were associated with increased risk for elder abuse. In addition, we found that strength of association between the physical function measures above and reported elder abuse varied by the specific subtypes of elder abuse. Moreover, decline in physical performance testing, greater impairment in Nagi and Katz ADL scores were associated with increased risk for multiple forms of elder abuse.

Research suggests that there is an incomplete evidence base linking impairment in physical function to elder abuse. Fulmer et al found that lower levels of self-reported functional status was associated with increased risk of elder abuse (10). However, other studies have found that physical dependence was not associated with increased risk of elder abuse (12;14;27). We are aware of one population-based study, that found impairment in eating ability (OR, 3.5(1.2–11.7)) and greater impairment in ADL (OR,1.3(1.1–1.8)) were associated with increased risk of elder abuse (28). A more recent study (2) found that needs for Katz ADL assistance was associated with increased risk for emotional abuse (OR,1.83(1.24–2.71)) and financial exploitation (OR,2.00(1.51–2.64)), but not with physical or sexual abuse or caregiver neglect.

The temporal relations between physical function and elder abuse need further investigation. We considered a series of potential confounders; sociodemographic, socioeconomic characteristic, medical comorbidities, psychological and social wellbeing. However, adjustments for these factors did not significantly influence the relationship between physical function and elder abuse. Even though elder abuse victims had lower levels of physical function at baseline, the decline of physical function was still greater for those with elder abuse. Future longitudinal studies are needed to explore these issues. In addition, we found that decline in physical function was associated with increased risk for subtypes of elder abuse, particularly with caregiver neglect. It is conceivable that those with function impairments have greater dependency and caregiving needs, if not met, may predispose

them to neglect by caregiver. We do not have data on caregiving stress and burden and future studies are needed to quantify these relationship.

It is possible that elder abuse identified through APS is more likely to be those with functional impairments, and may partially explain our stronger association between physical function and elder abuse compared to community based studies. At the same time, many older adults who experience physical function impairment were not referred to social services for elder abuse. Elder abuse is multi-faceted and complex phenomenon, and physical function is likely to be one of many causative agents toward the risk for elder abuse. Future studies are needed to elucidate the temporal relations.

Our study also has a number of limitations. First, elder abuse was identified by the social services agency because someone suspected problems. Future study is needed to uniformly collect elder abuse measures in representative populations to rigorously examine these associations. Second, we had fewer numbers of participants in the specific subtypes of elder abuse cases, which limited our ability to quantify these relations. Future larger studies are needed to systematically examine the relationship between physical function and subtypes of elder abuse. Third, we could not delineate the effect of time in the relationship between decline in physical function and risk for reported elder abuse. Further work is needed to clarify this important issue in representative populations.

This study has important practical and policy implications(29). For health care professionals, screening for elder abuse should occur alongside the screening for physical function. Our data indicate that lowest level tertiles of physical performance testing has the greatest association with elder abuse, as compared with self-reported physical functions. If the clinical setting permits, particular attention for possible elder abuse should be paid to those with greatest decline in physical performance testing. However, even if physical performance testing could not be performed, self-reported functional impairments are also important factors to consider with respect to the risk for elder abuse. For social services agencies, most programs require that physical function screening determine the degree of vulnerability and unmet needs. “Red-flags” for potential elder abuse should be raised for vulnerable functional impaired individuals, especially those without the support needed to meet their most basic day-to-day needs. Moreover, a broad approach incorporating physical as well as psychosocial aspect of health is likely to be the most beneficial approach to understand predisposing risk factors for elder abuse (30).

CONCLUSION

We conclude that decline in physical function is associated with increased risk for elder abuse. However, the potential causal mechanism and temporal relations between decline in physical function and specific subtypes of elder abuse requires longitudinal investigation. Future studies will also be necessary to explore the sociodemographic and racial/ethnic differences in the decline in physical function with specific subtypes of elder abuse in representative populations.

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A:

B

C:

D:

Figure 1. Associations Between Decline in Physical Function Measures and Risk for Elder Abuse
 A–D demonstrates the longitudinal association between change in physical performance testing and self-reported physical function measures (Katz, Nagi and Rosow-Breslau) and risk for elder abuse. Dotted lines signify the 95% confidence intervals associated with the risk for elder abuse. The arrows signify the 90% and 10% of the decline in physical function measures for the population.

Table 1

Decline in Physical Function Measures and Risk of Reported Elder Abuse (EA)

	Odds Ratio (OR), 95% Confidence Intervals for Elder Abuse Outcome					
	Physical Performance Testing			Tandem Stand		
	Model A	Model B	Model C	Model A	Model B	Model C
Age	1.02 (0.99–1.06)	1.01 (0.98–1.05)	1.00 (0.97–1.04)	1.03 (0.99–1.06)	1.01 (0.98–1.05)	1.01 (0.98–1.04)
Men	0.55 (0.36–1.85)	0.48 (0.31–0.76)	0.45 (0.29–0.72)	0.52 (0.34–0.79)	0.45 (0.29–0.69)	0.42 (0.270.65)
Black	6.37 (3.34–12.14)	5.59 (2.91–10.72)	4.99 (2.54–9.79)	5.91 (3.19–10.94)	5.20 (2.79–9.69)	4.62 (2.43–8.77)
Education	0.96 (0.90–1.02)	0.98 (0.92–1.04)	0.98 (0.92–1.05)	0.94 (0.89–0.99)	0.96 (0.90–1.02)	0.97 (0.91–1.03)
Income	0.95(0.87–1.05)	0.94 (0.85–1.04)	0.95 (0.86–1.05)	0.95 (0.87–1.05)	0.95 (0.87–1.04)	0.96 (0.87–1.05)
Medical Conditions		0.91 (0.76–1.09)	0.89 (0.74–1.08)		0.94 (0.79–1.12)	0.93 (0.78–1.11)
Cognitive Function		0.95 (0.91–0.99)	0.95 (0.90–0.99)		0.96 (0.92–0.99)	0.95 (0.91–0.99)
Depressive Symptoms			0.99 (0.90–1.10)			0.99 (0.90–1.08)
Social Network			0.98 (0.95–1.02)			0.98 (0.95–1.01)
Social Engagement			0.89 (0.78–1.01)			0.91 (0.80–1.03)
Outcome: Reported EA	1.09 (1.05–1.14)	1.10 (1.05–1.15)	1.10 (1.05–1.15)	1.13 (1.03–1.24)	1.14 (1.04–1.26)	1.12 (1.02–1.23)

	Odds Ratio (OR), 95% Confidence Intervals for Elder Abuse Outcome					
	Measured Walk			Chair Stand		
	Model A	Model B	Model C	Model A	Model B	Model C
Age	1.03 (0.99–1.06)	1.02 (0.99–1.06)	1.01 (0.98–1.04)	1.03 (0.99–1.06)	1.01 (0.98–1.05)	1.01 (0.97–1.04)
Men	0.51 (0.33–1.77)	0.44 (0.28–0.68)	0.41 (0.26–0.64)	0.54 (0.35–0.84)	0.48 (0.31–0.75)	0.45 (0.28–0.71)
Black	6.19 (3.34–11.46)	5.50 (2.96–10.23)	4.78 (2.52–9.06)	6.23 (3.28–11.85)	5.45 (2.85–10.43)	4.91 (2.51–9.61)
Education	0.94 (0.89–0.99)	0.95 (0.89–1.01)	0.96 (0.89–1.02)	0.96 (0.90–1.02)	0.98 (0.92–1.05)	0.99 (0.92–1.05)
Income	0.95 (0.86–1.03)	0.94 (0.86–1.03)	0.95 (0.86–1.04)	0.94 (0.86–1.04)	0.93 (0.85–1.03)	0.94 (0.85–1.04)
Medical Conditions		0.96 (0.81–1.14)	0.96 (0.81–1.14)		0.92 (0.76–1.10)	0.90 (0.75–1.09)
Cognitive Function		0.97 (0.93–1.00)	0.95 (0.90–0.99)		0.95 (0.91–0.99)	0.95 (0.90–0.99)
Depressive Symptoms			0.99 (0.91–1.08)			0.99 (0.90–1.09)
Social Network			0.98 (0.94–1.01)			0.98 (0.95–1.02)
Social Engagement			0.92 (0.82–1.04)			0.89 (0.79–1.02)

	Odds Ratio (OR), 95% Confidence Intervals for Elder Abuse Outcome			
	Measured Walk		Chair Stand	
	Model A	Model B	Model C	Model D
Outcome: Reported EA	1.16 (1.06–1.28)	1.17 (1.06–1.29)	1.17 (1.06–1.29)	1.15 (1.04–1.27)

	Odds Ratio (OR), 95% Confidence Intervals for Elder Abuse Outcome			
	Katz ADL		Nagi	
	Model A	Model B	Model C	Model D
Age	1.02 (0.99–1.05)	1.01 (0.98–1.04)	1.02 (0.97–1.04)	1.03 (0.99–1.06)
Men	0.52 (0.34–0.78)	0.45 (0.29–0.69)	0.42 (0.27–0.66)	0.44 (0.29–0.68)
Black	6.09 (3.29–11.29)	5.51 (2.96–10.27)	4.91 (2.59–9.34)	5.99 (3.23–11.09)
Education	0.94 (0.89–0.99)	0.95 (0.89–1.01)	0.96 (0.89–1.02)	0.94 (0.89–0.99)
Income	0.97 (0.88–1.06)	0.96 (0.87–1.05)	0.96 (0.87–1.05)	0.95 (0.86–1.04)
Medical Conditions		0.95 (0.79–1.12)	0.95 (0.79–1.13)	0.97 (0.82–1.15)
Cognitive Function		0.97 (0.94–1.01)	0.96 (0.92–1.00)	0.96 (0.92–1.00)
Depressive Symptoms			0.98 (0.89–1.07)	0.99 (0.91–1.09)
Social Network			0.98 (0.95–1.01)	0.98 (0.94–1.01)
Social Engagement			0.94 (0.83–1.06)	0.93 (0.83–1.05)
Outcome: Reported EA	1.26 (1.16–1.37)	1.25 (1.14–1.36)	1.23 (1.12–1.34)	1.17 (1.06–1.29)

	Odds Ratio (OR), 95% Confidence Intervals for Elder Abuse Outcome		
	Rosow Breslau		
	Model A	Model B	Model C
Age	1.03 (0.99–1.06)	1.02 (0.98–1.05)	1.01 (0.97–1.04)
Men	0.52 (0.34–0.79)	0.45 (0.29–0.69)	0.42 (0.27–0.66)
Black	6.83 (3.61–12.91)	6.01 (3.16–11.43)	5.39 (2.77–10.49)
Education	0.94 (0.89–0.99)	0.95 (0.89–1.01)	0.96 (0.90–1.02)
Income	0.97 (0.88–1.06)	0.96 (0.87–1.05)	0.97 (0.88–1.06)
Medical Conditions		0.96 (0.81–1.14)	0.96 (0.80–1.14)
Cognitive Function		0.96 (0.92–1.00)	0.94 (0.90–0.99)
Depressive Symptoms			0.99 (0.90–1.08)
Social Network			0.98 (0.95–1.01)

	Odds Ratio (OR), 95% Confidence Intervals for Elder Abuse Outcome		
	Rosow Breslau		
	Model A	Model B	Model C
Social Engagement			0.93 (0.83–1.05)
Outcome: Reported EA	1.32 (1.14–1.53)	1.32 (1.14–1.53)	1.33 (1.14–1.54)

Note: Decline in physical function is the primary predictor of interest and elder abuse is the primary outcome of interest.

Note: Tandem, measured walk and chair stands are components of the physical performance testing.

Note: Decline in physical function indicate every 1 point worsening in physical function abilities for both directly observed physical performance testing and self-reported physical function scales.

Note: age, sex, race, education, income, medical conditions, cognitive functions, depressive symptoms, social network and social engagement are potential covariates of interest in the relationship between physical function and elder abuse.

Table 2

Levels of Decline in Physical Function Scores and Risk of Elder Abuse (EA)

	Reported EA			Confirmed EA		
	Parameter Estimates, Standard Errors	Odds Ratio (Confidence Interval)	P value	Parameter Estimates, Standard Errors	Odds Ratio (Confidence Interval)	P value
Physical Performance Testing						
High		1.0			1.0	
Middle	0.45, 0.38	1.57 (0.75–3.28)	0.231	0.87, 0.59	2.39 (0.74–7.75)	0.146
Low	1.18, 0.42	3.24 (1.43–7.33)	0.005	1.59, 0.65	4.92 (1.39–17.46)	0.014
Tandem Stand						
High		1.0			1.0	
Middle	–0.46, 0.27	0.63 (0.37–1.06)	0.082	–0.17, 0.41	0.84 (0.38–1.89)	0.674
Low	0.17, 0.32	1.19 (0.63–2.24)	0.597	0.68, 0.47	1.98 (0.79–4.93)	0.142
Measured Walk						
High		1.0			1.0	
Middle	–0.16, 0.23	0.85 (0.54–1.34)	0.489	0.02, 0.32	1.03 (0.54–1.94)	0.119
Low	0.59, 0.27	1.81 (1.07–3.05)	0.026	0.59, 0.38	1.81 (0.86–3.81)	0.935
Chaired Stand						
High		1.0			1.0	
Middle	0.69, 0.34	1.99 (1.03–3.89)	0.042	1.38, 0.59	3.98 (1.23–12.88)	0.021
Low	1.06, 0.41	2.89 (1.29–6.47)	0.009	1.67, 0.68	5.32 (1.42–19.97)	0.013
Katz Impairment						
Low		1.0			1.0	
Middle	0.70, 0.25	2.02 (1.24–3.29)	0.005	1.04, 0.33	2.82 (1.48–5.35)	0.002
High	1.10, 0.23	3.01 (1.92–4.71)	<0.001	1.38, 0.31	3.99 (2.18–7.31)	<0.001
Nagi Impairment						
Low		1.0			1.0	
Middle	–0.18, 0.27	0.83 (0.49–1.41)	0.488	–0.23, 0.38	0.79 (0.38–1.67)	0.538
High	0.62, 0.29	1.85 (1.03–3.32)	0.039	0.86, 0.40	2.37 (1.08–5.23)	0.032

	Reported EA			Confirmed EA		
	Parameter Estimates, Standard Errors	Odds Ratio (Confidence Interval)	P value	Parameter Estimates, Standard Errors	Odds Ratio (Confidence Interval)	P value
Rosow Breslau Impairment						
	Low				1.0	
	Middle	0.59, 0.20	0.003	0.69, 0.28	1.99 (1.14–3.46)	0.015
	High	0.72, 0.28	0.011	1.05, 0.37	2.85 (1.39–5.84)	0.004

Models adjusted for age, sex, race/ethnicity, education, income, hypertension, diabetes, stroke, cancer, shingles, Parkinson’s disease, thyroid disease, coronary artery disease, hip fracture, cognitive function, depressive symptoms, social network and social engagement.

High level of Katz, Nagi, and Rosow Breslau refers to poorer levels of functional ability.

Low levels of physical performance testing (Tandem, Measured Walk and Chair Stands) refers to poorer level of functional ability 1.0 indicates the reference for which other tertiles of physical function are compared with.

Decline in physical function in Table 2 refers to the tertiles of physical function decline for both physical performance testing and self-reported physical function measures.