JAMDA xxx (2015) 1–5

JAMDA

journal homepage: www.jamda.com

Original Study

Combined Effect of Slow Gait Speed and Depressive Symptoms on Incident Disability in Older Adults

Kota Tsutsumimoto PhD, PT[a,*], Takehiko Doi PhD, PT[a], Hiroyuki Shimada PhD, PT[a], Hyuma Makizako PhD, PT[a], Ryo Hotta PhD[a], Sho Nakakubo MSc, PT[a], Takao Suzuki PhD, MD[b]

[a] *Department of Functioning Activation, Center for Gerontology and Social Science, National Center for Geriatrics and Gerontology, Obu, Japan*
[b] *Research Institute, National Center for Geriatrics and Gerontology, Obu, Japan*

Keywords:
Incident disability
gait speed
depression
older adults

A B S T R A C T

Objectives: To elucidate whether a combination of slow gait speed and depressive symptoms result in higher risk of incident disability in older adults than either symptom individually.
Design: Prospective cohort study.
Setting: Obu City, Aichi Prefecture, Japan.
Participants: Participants were 4038 older adults (48.7% male, mean age = 71 years) who met the study inclusion criteria.
Measurements: Longitudinal data on incident disability were collected up to 33 months [median 31 months (interquartile range 29–32 months)] after baseline. We monitored monthly incident disability, defined as Japanese long-term care insurance certification for personal support or care. Baseline measurements included covariates for incident disability, gait speed, and the Geriatric Depression Scale for assessing depressive symptoms. The associations between slow gait, depressive symptoms, or their co-occurrence, and incident disability were examined.
Results: Control participants were the reference in an adjusted Cox proportional hazard regression model. Participants with co-occurring slow gait and depressive symptoms showed a greater risk of incident disability [hazard ratio (HR) 3.08, confidence interval (CI) 95% 2.00–4.75]. Greater risk was also found for participants with slow gait speed alone (HR 2.44, CI 95% 1.71–3.47) and depressive symptoms alone (HR 1.60, CI 95% 1.01–2.53).
Conclusions: Older adults with both risk factors may require early detection and physical and psychological intervention.

Japan is the fastest aging society in the world—by 2035, 1 in 3 persons will be older than 65 years of age.[1] With this rapidly growing aging population, treating age-related health problems, such as physical and mental frailty or disability, is becoming crucial. From older adults' health promotion and health economics' perspectives, it is important for older adults without disability to maintain functional independence as long as possible. Thus, identifying incident disability risk factors is essential.

Disability onset in older adults is influenced by physiological, psychological, and social factors.[2–4] Of these, gait speed decline is one of the strongest predictors.[5] Age-related declines in gait function may reflect dysfunction of any involved systems, including the musculoskeletal, neurologic, or circulatory systems.[6,7] Thus, assessment of older adults' gait function is useful for detecting incident disability risk. Gait speed is a simple but an important clinical marker of current health and well-being. It is a powerful predictor of health problems including disability in older adults.[6,8–10]

Aside from mobility declines, mental disorders such as depressive symptoms are incident disability risk factors. Depressed individuals often engage in unhealthy lifestyle behaviors, such as smoking and lack of exercise,[11] and report somatic symptoms, such as sleep disturbances and fatigue.[12] These may exacerbate the symptoms of some medical

This work was supported by the Japanese Ministry of Health, Labor, and Welfare (Project for Optimizing Long-Term Care; grant number B-3) and the National Center for Geriatrics and Gerontology (Research Funding for Longevity Sciences; grant number 22-16).

The authors declare no conflicts of interest.

* Address correspondence to Kota Tsutsumimoto, PhD, PT, Department of Functioning Activation, Center for Gerontology and Social Science, National Center for Geriatrics and Gerontology, 7-430 Morioka-machi, Obu City, Aichi Prefecture, 474-8511, Japan.

E-mail address: k-tsutsu@ncgg.go.jp (K. Tsutsumimoto).

http://dx.doi.org/10.1016/j.jamda.2015.08.012
1525-8610/

conditions and ultimately lead to compromised functioning. Furthermore, several prospective studies suggest that late-life depression affects subsequent disability or impedes disability recovery.[13–16]

Slow gait speed and depressive symptoms are highly prevalent in late life and frequently co-occur. Both phenomena are associated with adverse health outcomes such as disability. In addition, there might be bidirectional longitudinal associations between physical function decline (including slow gait speed) and depressive symptoms.[17,18] As such, co-occurring slow gait speed and depressive symptoms for older adults might result in higher incident disability risk than either condition alone; however, it remains unclear whether older adults with these 2 conditions concurrently actually do have a higher risk. Thus, we investigated whether concurrent slow gait speed and depressive symptoms lead to higher incident disability risk in Japanese older adults using longitudinal cohort data.

Methods

Setting and Participants

We used a prospective study design, recruiting participants from the population-based cohort of the Obu Study of Health Promotion for the Elderly (OSHPE), conducted from August 2011 to February 2012 at baseline.[19] OSHPE inclusion criterion was ≥65 years old at examination. Before recruitment, we excluded 1661 people who participated in another study, were hospitalized or in residential care, or had a certified care level of greater than 3 in the Japanese long-term care insurance (LTCI) system. OSHPE recruitment was conducted by letter invitation to 14,313 individuals, of whom 5104 ultimately participated. After baseline assessment, monthly information on participants' health status, including incident disability as assessed by Japanese LTCI, death, or moving away from Obu city, was monitored. The current study included 4038 participants, excluding 1066 participants based on the following criteria: (1) a history of Parkinson disease (n = 23), Alzheimer disease (n = 9), or stroke (n = 528); (2) severe cognitive impairment [Mini-Mental State Examination (MMSE)[20] <19; n = 157]; (3) requiring support or care by the LTCI system at baseline (n = 160); or (4) missing values at baseline assessment (n = 189). The Ethics Committee of the National Center for Geriatrics and Gerontology approved the study protocol. The study's purpose, nature, and potential risks were fully explained to the participants. All gave their written informed consent before study participation.

Measure

Disability assessment

During follow-up, we monitored participants' LTCI certification [median 31 months (interquartile range 29–32 months)]. Incident disability was defined as being certified for any level of LTCI service for the first time. The Japanese Government established the nationally uniform criteria for LTCI certification objectively; certification of care need levels for older adults is determined by the results of municipal committee evaluation (ie, Certification Committee for Long-Term Care Need) using these criteria. The process of determining eligibility for LTCI system certification is as follows. An older adult or his caregiver contacts the municipal government to request official certification of the applicant's care needs. Then, a trained local government official visits the older adult's home to evaluate nursing care needs in terms of current physical and mental status. After this official completes the assessment, the results are entered into a computer to (1) calculate the applicant's standardized physical and mental status scores; (2) estimate the care time required for the older adult; and (3) assign a care-need level based on the total estimated care time. The Care Needs Certification Board reviews the data, which include the applicant's primary physician's report. Finally, the applicant was assigned a level of care need (certified support level of 1–2 or care level of 1–5). Every 6 months, the older adult's eligibility was re-evaluated. In the present study, incident disability was defined as being certified for the first time for support level 1–2 or care level 1–5.

Gait speed

Two markers were used to indicate the start and end of a 2.4-m walking path, with a 2-m section to be traversed before passing the start marker so that participants were walking at a comfortable pace by the time they reached the timed path. Participants were asked to continue walking for an additional 2 m past the end of the path to ensure a consistent walking pace while on the timed path. Those with poor mobility were identified according to a cut-off (<1.0 m/s).[19]

The 15-item Geriatric Depression Scale

The 15-item Geriatric Depression Scale (GDS) was administered by conducting an interview to assess depression symptoms.[21] The GDS is unique in that it was specifically developed for use with geriatric patients and contains fewer somatic items. The participants were

Table 1
Baseline Participant Characteristics by Risk Pattern (Control, Depressive Symptoms, Slow Gait Speed, or Co-occurring)

Variables	All Participants n = 4038	Missing	Control n = 3033	Depressive Symptoms* n = 399	Slow Gait Speed† n = 449	Co-occurring n = 157	*P* Value
Incident disability; n (%)	220 (5.0)	0	86 (2.8)	24 (6.0)	72 (16.0)	38 (24.2)	<.001‡
Sex; n of male (%)	1968 (48.7)	0	1477 (48.7)	197 (48.6)	218 (49.4)	76 (48.4)	.944‡
Age (years); mean ± SD	71.9 ± 2.5	0	71.1 ± 4.7	72.1 ± 5.3	75.8 ± 6.6	77.0 ± 6.4	<.001§
Education (years); mean ± SD	11.4 ± 2.5	0	11.6 ± 2.5	11.0 ± 2.4	10.9 ± 2.7	10.2 ± 2.5	<.001§
Hypertension; n (%)	1851 (45.8)	9	1331 (43.9)	188 (47.1)	240 (53.5)	92 (58.6)	<.001‡
Diabetes mellitus; n (%)	530 (13.1)	15	370 (12.2)	41 (10.3)	91 (20.3)	28 (17.8)	<.001‡
Hyperlipidemia; n (%)	1663 (41.2)	6	1267 (41.8)	167 (41.9)	176 (39.2)	53 (33.8)	<.001‡
Heart disease; n (%)	667 (16.5)	7	469 (15.5)	66 (16.5)	88 (19.6)	44 (28.0)	<.001‡
Osteoarthrosis; n (%)	570 (14.1)	11	384 (12.7)	67 (16.8)	85 (18.9)	34 (21.7)	<.001‡
Medication; mean ± SD	1.9 ± 2.0	7	1.7 ± 1.9	2.3 ± 2.3	2.6 ± 2.4	2.8 ± 2.1	<.001§
Pain; n (%)	1494 (37.0)	46	1006 (33.2)	194 (48.6)	195 (43.4)	99 (63.1)	<.001‡
MMSE score; mean ± SD	26.4 ± 2.5	16	26.6 ± 2.4	26.3 ± 2.6	25.6 ± 2.6	25.1 ± 2.7	<.001§
Physical activity (min/day); mean ± SD	283.2 ± 159.3	17	293.5 ± 158.5	253.9 ± 156.1	259.3 ± 162.2	228.7 ± 147.3	<.001§
Sleeping time (min/day); mean ± SD	461.6 ± 74.2	38	457.4 ± 68.6	457.5 ± 82.4	481.2 ± 75.6	495.4 ± 121.0	<.001§

ANOVA, analysis of variance; SD, standard deviation.
Plus-minus values are means ± SD.
*15 data were missing.
†12 data were missing.
‡$\chi 2$ test.
§ANOVA. Significance set at $P < .05$.