JAMDA xxx (2015) 1–5

JAMDA

journal homepage: www.jamda.com

Original Study

Gait Speed and the Natural Course of Depressive Symptoms in Late Life; An Independent Association With Chronicity?

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Keywords:
Late life depression
gait speed
prognosis
natural course

A B S T R A C T

Introduction: Psychomotor slowing is a core feature of depression in late life, but its prognostic value with respect to course and chronicity is unclear. We investigated whether gait speed can predict chronicity of depressive symptoms. Furthermore, we tested whether (1) cognitive slowing and (risk factors for) vascular diseases, (2) a marker of chronic inflammation, and (3) specific somatic conditions could explain this association.

Methods: In the population-based Longitudinal Aging Study Amsterdam, 271 aged participants with clinically relevant depressive symptoms (Center for Epidemiologic Studies Depression Scale ≥16) were followed during a period of 6 years. With 14 successive Center for Epidemiologic Studies Depression Scale observations, 3 clinical course types of depressive symptoms were defined.

Results: Remission, fluctuating course, and chronic course of depressive symptoms were seen in 21%, 48%, and 30%, respectively. Slowed gait speed at baseline was associated with a chronic course of depressive symptoms using remission as the reference (odds ratio 0.56, 95% confidence interval 0.41−0.77). Processing speed and vascular risk factors explained this association only for 2%. Specific somatic comorbidity (number of chronic diseases, chronic obstructive pulmonary disease, osteoarthritis) or inflammation influenced the odds ratio.

Limitation: Some variables were not measured with as much detail as would be possible in a clinical study setting.

Conclusions: Slowed gait speed is a robust predictor of chronicity of depressive symptoms in late life, independent of somatic comorbidity and partly in concert with a slowed processing speed. Results suggest that slowed gait speed is an integral part of the depressive syndrome, probably a subtype associated with chronic course, independent of somatic comorbidity.

The importance of psychomotor activity in mood disorders is undisputed, and psychomotor slowing in adults with depression may represent a dimension of symptoms that can aid in subtyping the depression and possibly also in choosing appropriate treatment.[1–4] In late life, psychomotor slowing, both cognitive slowing as well as slowing of gait speed, is thought to become more prominent. Lockwood et al[5] demonstrated more pronounced dysexecution and slowing of information processing speed in old adults with major depressive disorder compared with younger adults with major depressive disorder. With regard to clinical relevance in late life depression, dysexecution and slowed processing speed are associated with an unfavorable treatment outcome.[6,7]

To our knowledge, however, little is known about the natural course of late life depressions with psychomotor slowing, except for an earlier study by our group demonstrating that slowed processing speed in late life depression predicts chronicity of depressive symptoms.[8] Gait speed, being one of the features of gross motor activity in mood disorders, can be reliably and easily assessed in older individuals living in the community.[4,9–11] Gait speed is associated with

The Longitudinal Aging Study Amsterdam is largely funded by the Dutch Ministry of Health, Welfare and Sports; furthermore, the first author of this paper was supported by Altrecht, Institute for Mental Health Care, Utrecht, The Netherlands. The funding institutions had no role in the study design, in the collection, analysis, and interpretation of data, in the writing of the report, or in the decision to submit the article for publication.

The authors declare no conflicts of interest.

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http://dx.doi.org/10.1016/j.jamda.2015.11.016
1525-8610/

cognitive decline, falls, institutionalization, and mortality,[11] but to our knowledge, its relevance with regard to the natural course of late life depression has never been explored.

Vascular pathology is believed to play a major role in the proposed concept of vascular depression, which is a subtype of late life depression, characterized by dysexecution with slowed processing speed and a less favorable treatment outcome.[5,6,12] However, the validity of this subtype of depression is still under debate.[13] Furthermore, there is mounting evidence to suggest that chronic low-grade inflammation may contribute to the development of affective, cognitive, and psychomotor symptoms in geriatric depression. This has been well described as the "cytokine hypothesis of depression" that ascribes a central role of inflammation to the pathogenesis of depression.[14] Also, in an earlier study in our cohort, we found evidence of involvement of chronic low-grade inflammation in depression in late life.[15] The role of inflammation in geriatric depression is intriguing as it may provide an explanation for the depression-vascular diseases connection, as chronic low-grade inflammation is involved in the pathogenesis of atherosclerosis and cardiovascular diseases.[16] Therefore, chronic low-grade inflammation could be the final common pathway linking psychomotor slowing and vascular diseases with chronicity of depression. Slowing of gait speed might be an easy to assess marker of the vascular inflammatory depression subtype.

Alternatively, the presence of other nonvascular chronic somatic conditions such as chronic obstructive pulmonary disease (COPD), osteoarthritis, and the total chronic diseases load, may well induce chronicity in late life depression as well as slowed gait. COPD and arthritis are closely associated with depression in late life.[17,18] These conditions are highly prevalent in late life and reduce gait speed.[19,20] Also, total load of chronic diseases in old age can additionally influence chronicity in the mood and mobility association.[21] However, whether these factors confound the presumed association between gait speed on chronicity of depression is unclear.

In the present study, it is hypothesized that slowed gait predicts chronicity of depressive symptoms in a community-based population of old people with depressive symptoms. In terms of furthering our understanding of the prognosis of late life depression, gait speed may be a marker of several underlying pathophysiological factors that contribute to the persistence in late life depression. Factors that will be tested are (1) processing speed and (risk factors for) vascular disease, (2) a marker for low-grade inflammation [C-reactive protein (CRP)], and (3) specific somatic conditions COPD, arthritis, and total number of chronic diseases.

Methods

Sampling and Study Design

This study is a part of the Longitudinal Aging Study Amsterdam, an ongoing study on consequences of ageing in a population based sample in The Netherlands. An age- and sex-stratified representative sample of older persons (aged 55–85 years) was interviewed at baseline in 1992–1993. A total of 3107 respondents (response 82%) took part at baseline and were interviewed face to face every 3 years (see Huisman et al).[22]

To be included in the present study, respondents had to have clinically relevant depressive symptoms (a score of $\geq$16 points on the Center for Epidemiological Studies Depression Scale [CES-D]) at baseline with valid CES-D on at least 2 follow-up measurements and there had to be a valid baseline gait speed measurement.[23,24] Four hundred forty-eight respondents scored above the cut-off score of $\geq$16 points on the CES-D at baseline. These were followed up with postal questionnaires every 5 months during a period of 6 years, resulting in a maximum of 14 observations. Three hundred nine respondents met the criterion of at least 2 follow-up observations after baseline, while the criterion of a baseline gait speed assessment further reduced the sample to 271 respondents. The 271 included respondents were younger, more likely to be female, and suffered less chronic diseases than the 177 respondents who were excluded (mean age 71.4, standard deviation (SD) 8.8 vs mean 74.9, SD 7.9, t = 4.392, df = 403, $P < .001$; female 68% vs 57%, $\chi^2 = 6.4$, df = 1, $P = .01$; chronic diseases median 1, interquartile range [IQR] 1–2 vs median 2, IQR 1–3, $\chi^2 = 5.385$, df = 1, $P = .02$). Baseline levels of depressive symptoms did not differ between groups (median 21, IQR 18–25 vs median 21, IQR 18–27, $\chi^2 = 1.641$, df = 1, $P = .20$).

Depressive Symptoms and Course Types of Depressive Symptoms

Depressive symptoms were measured with the CES-D, a 20-item self-report scale, developed to measure depressive symptoms in the community. It has good psychometric properties in older community samples with similar good psychometric properties for the Dutch translation.[25] The total score on the CES-D ranges between 0 and 60. A cut-off score of 16 or more was used to identify those with clinically relevant depressive symptoms. Data were gathered in face-to-face interviews every 3 years whereas the additional 5 monthly follow-up assessments were collected using postal questionnaires. A mode effect for these assessments was transformed as described previously.[26]

Using successive CES-D observations, 3 clinical course types of depressive symptoms were defined as described previously.[8,26] A remission was defined as a clinically meaningful decline (see below) on the CES-D between measurements, thereby crossing the cut-off score of 16, and the respondent had to remain symptom free (CES-D $<$ 16) throughout the rest of the study.[8,26] A fluctuating course was defined as a remission in which the respondent had a clinically meaningful increase on the CES-D and thereby crossing the cut-off of 16 later on in the study. A clinical relevant change was defined as a change of $\geq$5 points on the CES-D, derived from the SD.[27] A chronic course was defined as 80% or more depressed observations (CES-D $\geq$16).

Gait Speed and Covariates

To assess gait speed, the total time needed to walk 3 meters, to turn around and to walk back 3 meters as quickly as possible was recorded. This gait speed measure was chosen because it can be easily assessed in all sizes of homes of respondents. In a recent meta-analysis, it was demonstrated that associations with health outcomes are comparable across different gait speed measures, including gait speed measures with and without a turn.[28] Gait speed was measured once (see for details www.lasa-vu.nl).[29] Quartiles of gait speed were used because of nonlinearity.

As potential confounders, the following variables were assessed, at baseline: age, gender, educational level (primary vs more than 6 years), household composition (living alone vs not alone), smoking habits (never, former, current), baseline CES-D, number of CES-D observations, use of benzodiazepines, antidepressants, and nonsteroidal anti-inflammatory drugs; medication use was assessed by inspection of medication containers at the respondent's home.[30]

At baseline, a number of potential explanatory variables were assessed. As risk factors for vascular disease were measured: waist circumference which was measured midway between the lower rib margin and the iliac crest following a normal expiration (see for details www.lasa-vu.nl). For cardiac diseases (ischemic heart disease, arrhythmia, congestive heart failure), cerebrovascular accidents (CVAs) and diabetes mellitus (type I and II), the validity of the baseline data was augmented using an algorithm by combining the self-report with medical records or medication (see for details www.lasa-vu.nl).[31]