Original article

The reciprocal relationship between physical activity and depression: Does age matter?

S. Wassink-Vossen[a,*], R.M. Collard[b], B.W. Penninx[c], S.A. Hiles[d], R.C. Oude Voshaar[e], P. Naarding[a]

[a] Department of Old-Age Psychiatry, GGNet Apeldoorn, Zutphen, The Netherlands
[b] Department of Psychiatry, Radboud University Medical Center, Nijmegen, The Netherlands
[c] Department of Psychiatry and EMGO+ Institute for Health and Care Research, VU University Medical Center, Amsterdam, The Netherlands
[d] School of Medicine and Public Health, Faculty of Health, University of Newcastle, Callaghan, Australia
[e] University of Groningen, University Medical Center Groningen, University Center for Psychiatry, Groningen, Netherlands

A R T I C L E   I N F O

A B S T R A C T

Background: The level of physical activity (PA) and the prevalence of depression both change across the lifespan. We examined whether the association between PA and depression is moderated by age. As sense of mastery and functional limitations have been previously associated with low PA and depression in older adults, we also examined whether these are determinants of the differential effect of age on PA and depression.
Methods: 1079 patients with major depressive disorder (aged 18–88 years) were followed-up after two-years; depression diagnosis and severity as well as PA were re-assessed. Linear and logistic regression analyses were used to test reciprocal prospective associations between PA and depression outcomes. In all models the interaction with age was tested.
Results: PA at baseline predicted remission of depressive disorder at follow-up (OR = 1.43 [95% CI: 1.07–1.93], p = .018). This effect was not moderated by age. PA predicted improvement of depression symptom severity in younger (B = −2.03; SE = .88; p = .022), but not in older adults (B = 2.24; SE = 1.48; p = .128) (p = .015 for the interaction PA by age in the whole sample). The level of PA was relatively stable over time. Depression, sense of mastery and functional limitation were for all ages not associated with PA at follow-up.
Conclusions: Age did not moderate the impact of PA on depressive disorder remission. Only in younger adults, sufficient PA independently predicts improvement of depressive symptom severity after two-year follow-up. Level of PA rarely changed over time, and none of the determinants tested predicted change in PA, independent of age.

© 2018 Elsevier Masson SAS. All rights reserved.

1. Introduction

Physical activity (PA) is an important and potentially modifiable determinant of healthy ageing with positive effects on health-related quality of life [1]. It is often assumed that depression increases with age, but current epidemiological studies point to a lower prevalence of depressive disorder at higher age, compared to younger age patients [2]. Population-based studies have provided strong evidence that PA decreases the risk for depressive symptoms in younger [3] as well as in older adults [4]. As the majority of studies rely on (self-report) depressive symptom scales, it remains unknown whether these findings can be extrapolated to patients experiencing depressive disorder according to DSM-criteria [5,6].

To our knowledge, four longitudinal observational studies on the amount of PA in clinically depressed patients have been conducted in three different samples [7–10]. Low PA as well as less sports activity predict unfavorable outcome of depression in depressed adults over time [7,10], with a reduction in the effect of low PA on depression outcome with increasing age up to 60 years [7]. In younger depressed adults, increasing levels of PA three weeks after admission was associated with decreasing levels of depressive symptoms [9]. Another sample of depressed patients aged 60 years and over, showed a lower level of PA during a depressive episode compared to their non-depressed counterparts

* Corresponding author at: GGNet Department of Old-Age Psychiatry, P.O. Box 2003, 7230 GC, Warnsveld, The Netherlands.
E-mail address: s.wassink@ggnet.nl (S. Wassink-Vossen).

[11]. In this study, no relationship between PA and the course of the depressive disorder was observed over time [8]. These findings suggest there may be a moderating effect of age on the reciprocal association between PA and the course of a depressive disorder.

PA might be useful as an (adjunct) intervention in the treatment of depressive disorder [12]. Meta-analyses on exercise interventions suggest that exercise may have a small, short term antidepressant effect in patients with depressive disorder [13]. However, it is also known that the most important preconditions for successful implementation of such interventions – participating and maintaining – are difficult to achieve, because of the nature of depressive disorder [14]. Interestingly, meta-regression showed that studies restricted to adults over 60 years of age showed a higher efficacy than those with subjects below 60 years [15]. This contrasts with above described results of observational studies in which the association between PA and depression decreases with age [7,8]. This discrepancy might be explained by selection bias. Patients participating in intervention studies may have less functional limitations and a higher sense of mastery compared to patients participating in observational studies. Functional limitations increase [16] and sense of mastery decreases with age [17]. Previous research in the same cohort used in the current study demonstrated that limitations in daily functioning in different life domains and a lower sense of mastery −the understanding that individuals hold about their ability to control the circumstances of their lives- were the only two significant explanatory factors for the difference in PA between depressed and non-depressed older adults among multiple factors [11]. In light of the discrepancy in findings between observational and interventional studies and the less favorable course of depression with increasing age [18,19], it is important to know more about the moderating role of age in the relationship between PA and course of depression. To our knowledge, this has never been studied before across the entire adult lifespan within one study. This knowledge will contribute to determining whether age-specific elements are needed in the development of interventions aimed at increasing PA in patients experiencing depressive disorders.

This study has been designed to examine whether age moderates the reciprocal relationship between PA and the course of depressive disorder over two years in people with depressive disorders at baseline. We expect that the effect of PA on depression outcome after two years and the effect of depression on change in PA diminishes with increasing age. In addition, we will explore whether sense of mastery and functional limitations are potential determinants of an increase in PA at follow-up for all ages.

2. Methods

2.1. Study sample

Data were obtained from the baseline and two-year assessment of the Netherlands Study of Depression and Anxiety (NESDA; participants aged 18–65 years) and the Netherlands Study of Depression in Older Persons (NESDO; participants aged 60–93 years); two ongoing, multi-centre cohort studies with similar methods and infrastructures that examine the natural course, determinants, and consequences of depression [20,21]. Assessments included written questionnaires, interviews, a medical examination, cognitive tests and collection of blood and saliva samples. From 2004 until 2007, the initial NESDA sample was recruited and consisted of 2981 persons with a current depressive and/or anxiety disorder (n = 1701), a remitted depressive and/or anxiety disorder (n = 628), or no lifetime depressive and anxiety disorder (n = 652). Participants were recruited from the general population, primary healthcare, and outpatient mental health care facilities. From 2007 until 2010 the initial NESDO sample was

recruited, and this sample consisted of 510 older adults (60 years and older) with either a current depressive disorder (n = 378) or no lifetime depressive disorder (n = 132), recruited through primary healthcare and out- and inpatient mental healthcare facilities. In both studies, a current psychiatric diagnosis was defined by a recency of 6 months. Exclusion criteria for both cohorts were: insufficient command of the Dutch language or insufficient capability to participate, a primary clinical diagnosis of a psychiatric disorder other than depressive and anxiety disorders, and for NESDO additionally: (clinician-suspected) dementia or a Mini- Mental State Examination (MMSE) score <18 (out of 30) [22]. For the current study, baseline and two-year follow-up data were used and participants were included when the following criteria were met: a current major depressive disorder diagnosis at baseline; a valid scale score for the short form self-report International Physical Activity Questionnaire (IPAQ) and participation at two-year follow-up. This selection resulted in 1079 participants being included in this study (see Fig. 1). Baseline face-to-face assessments were completed at participating centers between 2004 and 2007 for NESDA, and between 2007 and 2010 for NESDO. Ethical approval was obtained by both NESDA and NESDO from all ethical review boards of the participating centers, and all participants provided informed consent.

2.2. Measures

2.2.1. Depression

The data on major depressive disorder diagnosis were obtained from CIDI version 2.1, developed by the World Health Organization (WHO) [23]. The CIDI is a fully structured interview that diagnoses psychiatric disorders in adults according to the criteria of DSM-IV. The WHO field trials found high inter-rater reliability (kappa: 0.97), high test-retest reliability (kappa: 0.66) and high validity for depressive and anxiety disorders [24,25].

The severity of depression was assessed by the 30-item self-rating Inventory of Depressive Symptomatology (IDS) [26]. Each item consists of a series of four statements about the symptom. The
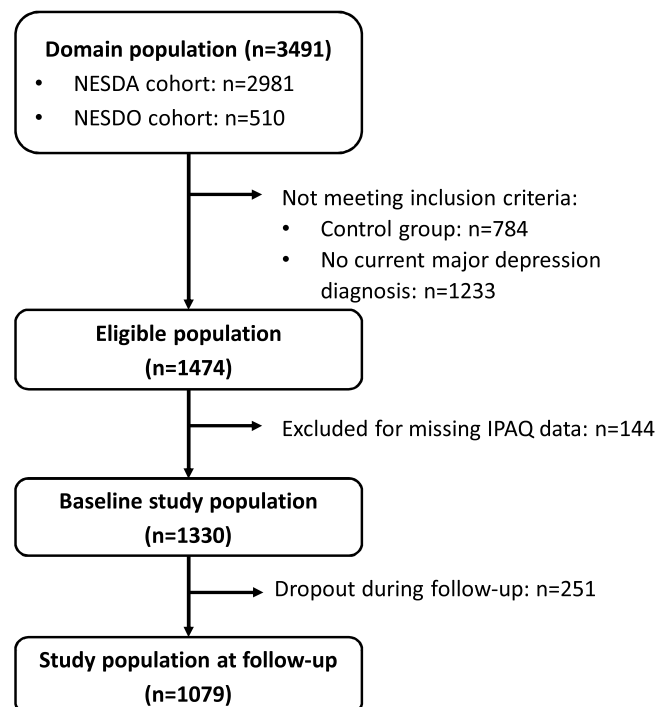
Fig. 1. Flowchart sample population.