Journal of Affective Disorders 210 (2017) 139–150

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Review article

Physical activity and sedentary behavior in people with major depressive disorder: A systematic review and meta-analysis

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ARTICLE INFO

Keywords:
Physical activity
Exercise
Sedentary behavior
Depression
Major depression
Depressive symptoms
Psychiatry

ABSTRACT

Background: Low levels of physical activity (PA) and sedentary behavior (SB) are independent risk factors for cardiovascular disease and premature mortality in people with major depressive disorder (MDD).
Aims: Investigate levels of PA and SB and their predictors in people with MDD.
Methods: Electronic databases were searched from inception till 04/2016 for articles measuring PA and SB with a self-report questionnaire (SRQ) or objective measure (e.g. accelerometer) in people with MDD. Random-effects meta-analyses and meta-regression analyses were conducted.
Results: Twenty-four eligible studies were identified including 2901 people with MDD (78.4% female, mean age=54 years; range: 21–77 years). People with MDD spent 126.0 min (95%CI=91.9–160.1) per day engaging in all types of PA and spent 8.5 hours (95%CI=7.51–9.62) during their waking day being sedentary. Compared to controls, people with MDD spent less time in total PA (SMD=−0.25, 95%CI=−0.03 to 0.15) and moderate to vigorous PA (SMD=−0.30, 95%CI=−0.40 to 0.21) and engaged in higher levels of SB (SMD=0.09, 95%CI=0.01–0.18). The proportion of people with MDD not meeting the recommended PA guidelines was 67.8% (n=13 studies), which was higher in studies relying on objective versus self-report measures (85.7% v 62.1%, p=0.04). People with MDD were less likely than controls to meet recommended PA guidelines (OR=−1.50, 95%CI=−1.10 to −2.10).
Limitations: Heterogeneity was evident in most analyses.
Conclusions: Adults with MDD engage in low levels of PA and high levels of SB. PA and SB are independent predictors of mortality, therefore, future lifestyle interventions targeting both the prevention of SB and adoption and maintenance of PA are warranted.

1. Introduction

People with major depressive disorder (MDD) are at increased risk of premature mortality (Cuijpers et al., 2014) with 10 year lower life expectancy compared to the general population (Laursen et al., 2016). Recent research suggests that cardiovascular and metabolic disease are major factors contributing to this premature mortality (Charlson et al., 2013). In the general population, there is good evidence that physical activity and exercise can attenuate rates of cardiovascular disease and mortality (Naci and Ioannidis, 2013). However, people with MDD experience a range of barriers to engaging in physical activity such as depressive symptoms, higher body mass index, physical co-morbidity

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http://dx.doi.org/10.1016/j.jad.2016.10.050
Received 18 August 2016; Received in revised form 16 October 2016; Accepted 23 October 2016
Available online 29 November 2016

and lower self-efficacy (Vancampfort et al., 2015c).

The relationship between physical activity and depression seems to be bidirectional. Depressed people are typically less active (De Moor et al., 2006), whilst lower levels of physical activity increase the risk of depression (Mammen and Faulkner, 2013). In addition, physical activity and exercise (i.e. structured physical activity) can improve depressive symptoms (Schuch et al., 2016a) and quality of life among people with depression (Schuch et al., 2016b, 2015). Despite the benefits of physical activity for people with depression, it remains unclear how much physical activity people with depression engage in and what influences physical activity participation. While public health physical activity recommendations exist, such as achieving 150 min of moderate to vigorous PA (MVPA) per week (O'Donovan et al., 2010), it remains unclear how many people with MDD achieve this target.

Recently, interest has grown in the importance of preventing prolonged periods of sedentary behavior in order to tackle cardiovascular disease and mortality. Sedentary behavior is defined as an energy expenditure ≤1.5 metabolic equivalents of task (METs), while in a sitting or reclining posture during waking hours (Sedentary Behavior Research, 2012). A large meta-analysis in the general population demonstrated that sedentary behavior is associated with an increased risk of developing cardiovascular disease, type 2 diabetes, cardiovascular and all-cause mortality (Biswas et al., 2015). People with depression are known to experience high levels of diabetes (Vancampfort et al., 2016a, 2015b). However, it remains unclear exactly how much sedentary behavior people with depression engage in.

When considering physical activity and sedentary behavior levels, many studies appear to have relied on self-report questionnaires (SRQ) rather than relying on objective measures such as accelerometers, which provide more accurate measurements (Soundy et al., 2014). Previous meta-analyses in schizophrenia (Stubbs et al., 2016a, 2016b) and bipolar disorder (Vancampfort et al., 2016b) have suggested that significant differences in physical activity and sedentary behavior levels exist between self-report and objective measures. It remains unclear if this extends to people with depression. A number of previous narrative reviews have examined the relationship between physical activity and sedentary behavior among people with depression (Hallgren et al., 2016; Lopresti et al., 2013; Teychenne et al., 2008). However, a comprehensive systematic review and meta-analysis of PA and sedentary behavior levels and predictors among people with MDD is lacking.

The aims of the present systematic review were to: (1), establish the mean amount of physical activity and sedentary behavior per day among people with MDD, (2) investigate predictors of physical activity and sedentary behavior through meta-regression analyses, (3) establish the proportion of people with MDD that meet the guideline recommendation of 150 min of MVPA per week (4) explore differences in physical activity and sedentary behavior in people with MDD versus age- and gender matched healthy controls. (5) evaluate differences between physical activity and sedentary behavior measured using SRQs and objective measures..

2. Methods

This systematic review was conducted according the MOOSE guidelines (Stroup et al., 2000) and the PRISMA statement (Moher et al., 2009).

2.1. Inclusion criteria

We included studies that: (1) involved adult participants with a diagnosis of MDD according to established criteria (e.g., DSM-IV (American Psychiatric Association, 2013), or ICD-10 (Organization, 1993). (2) Measured physical activity and sedentary behavior with either a validated SRQ (e.g. IPAQ, (Craig et al., 2003)) or objective measure (e.g. accelerometer). Physical activity was defined as any bodily movement produced by skeletal muscles which requires energy expenditure (Caspersen et al., 1985) while sedentary behavior is defined as an energy expenditure ≤1.5 metabolic equivalents of task (METs), while in a sitting or reclining posture during waking hours (Cart, 2012). (3) Were interventional (RCTs, CCTs) and observational (prospective or cross sectional) studies conducted in any setting (inpatients or outpatients). (4) Were published in an international peer-reviewed journal. If we encountered studies that included samples with MDD and other mental illness or with people with depressive symptoms (with a formal diagnosis of MDD), we contact the authors four times over a one month period to acquire the relevant data for our analyses.

2.2. Exclusion criteria

Exclusion criteria were: (1) non-quantitative studies, (2) studies not including people with MDD or not reporting the data for those with MDD in mixed sample studies, (3) no valid measure of physical activity or sedentary behavior (i.e. no mean time (minutes) per day/week engaged in physical activity) or sedentary behavior.

2.3. Search strategy

Four independent authors (FS, RB, NB, TR) searched PubMed, PsycINFO, SPORTDiscus, and EMBASE without language restrictions from inception till April 1st 2016, using the following keywords: 'Physical activity[MESH]' OR exercise[MESH] OR 'leisure time' OR 'sitting OR 'lying' OR 'screen time') AND (Depression[MESH] 'OR Major depressive disorder[MESH]' OR 'depressive disorder').

2.4. Study selection

After removal of duplicates, one author screened titles (FS) and abstracts of all potentially eligible articles. Three other authors (RB, NB, TR) reviewed the included studies to develop a final list.

2.5. Outcomes

The primary outcome was the mean time (minutes) per day that people with MDD engaged in physical activity (total, light, moderate, moderate to vigorous or vigorous) or were sedentary. If possible, we collected separate data for light, moderate and high intensity physical activity. Wherever possible, we collected data on physical activity behavior among healthy controls. Finally, we collected any reported data on the proportion of people with MDD that achieved the recommendation of 150 minutes of PA per week.

2.6. Data extraction

One author (FS) extracted data using a predetermined data extraction form, which was subsequently validated by a second author (BS). The data extracted included first author, country, setting, population, number of studies and participants included in the article (including mean age, % female), physical activity and sedentary behavior assessment method (objective or self-report), and the primary outcomes. If the study did not indicate the mean and SD values of PA or sedentary behavior levels, and the authors did not reply our emails, we attempted to extract the data from figures using the software Digizelt version 2.2.2.

2.7. Meta-analysis

Due to the anticipated heterogeneity across studies, we conducted a random effects meta-analysis with Comprehensive Meta-Analysis software (CMA, Version 3). The meta-analysis was conducted in the following sequence. First, we calculated the mean number of minutes