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How sedentary are people with psychosis? A systematic review and meta-analysis

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ABSTRACT

Objective: Sedentary behavior (SB) is an independent risk factor for cardiovascular disease and mortality. We conducted a meta-analysis to investigate SB levels and predictors in people with psychosis.

Method: Major electronic databases were searched from inception till 09/2015 for articles measuring SB with a self-report questionnaire (SRQ) or objective measure (e.g. accelerometer) in people with psychosis, including schizophrenia spectrum and bipolar disorders. A random effects meta-analysis and meta regression analysis were conducted.

Results: Thirteen studies were eligible including 2033 people with psychosis (mean age 41.3 years (range 25.1–60), 63.2% male (range 35–89%), body mass index 28.7 (range 25.9–32.1)). The trim and fill analysis demonstrated people with psychosis spent 660.8 min (95% CI 523.2–798.4, participants = 2033) or 11.0 h (95% CI 8.72–13.3) per day being sedentary. Objective measures of SB recorded significantly higher levels ($p < 0.001$) of SB (12.6 h per day, 95% CI 8.97–16.2, studies = 7, participants = 254) compared to self-report SB (6.85 h per day, 95% CI 4.75–8.96, studies = 6, participants = 1779). People with psychosis engaged in significantly more SB than controls ($g = 1.13$, 95% CI 0.496–1.77, $P < 0.001$, n psychosis = 216, n controls = 159) equating to a mean difference of 2.80 (95% CI 1.47–4.1) hours per day. Multivariate meta-regression confirmed that objective measurement of SB predicted higher levels of sedentariness.

Conclusions: People with psychosis engage in very high levels of sedentary behavior in their waking day and current SRQ may underestimate SB. Given that SB is an independent predictor of cardiovascular disease, future interventions specifically targeting the prevention of SB are warranted.

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1. Introduction

People with psychosis experience a premature mortality gap of between 10 and 20 years from the general population (Walker et al., 2015), largely attributable to cardiovascular disease (Lawrence et al., 2013). The increased prevalence of metabolic syndrome (Vancampfort et al., 2015), type two diabetes (Stubbs et al., 2015b) and cardiovascular disease (Gardner-Sood et al., 2015) in people with psychosis are of great concern. In the general population there is evidence that physical activity and exercise are broadly as effective as pharmacological interventions in preventing cardiovascular disease and mortality (Naci and Ioannidis, 2013). However, people with psychosis experience a range of barriers to engage in physical activity such as negative symptoms,

pain and the side effects of medication (Soundy et al., 2014a; Vancampfort et al., 2012a; Vancampfort et al., 2011).

Recently, interest has developed 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 Behaviour Research, 2012). A large meta-analysis (Biswas et al., 2015) in the general population demonstrated that sedentary behavior is independently associated with an increased risk of developing cardiovascular disease, type two diabetes, cardiovascular and all-cause mortality (all $p < 0.01$). Despite the knowledge that cardiovascular disease is the leading cause of premature mortality in people with psychosis (Lawrence et al., 2013), relatively little attention has been attributed to sedentary behavior in this population. Nonetheless, some recent research has demonstrated that higher levels of sedentariness are associated with increased risk of metabolic syndrome (Vancampfort et al., 2012b) and elevated C-reactive protein levels (CRP) (Stubbs et al., 2015a).

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Given that sedentary behavior is related to cardiovascular disease and modifiable, understanding sedentary behavior levels and predictors among people with psychosis is important. To our knowledge, only one preliminary review has considered sedentary behavior (Soundy et al., 2013) in people with psychosis. Specifically Soundy et al. (2013) focusing only on outpatients with schizophrenia found that across two studies, people with schizophrenia were more sedentary than controls. Since this time, interest has grown in understanding and preventing sedentary behavior and several important questions remain unanswered. For instance, it remains unclear exactly how much time people with psychosis spend being sedentary and what factors may influence sedentary behavior. Moreover, some studies have utilized self-report questionnaires (SRQ) to measure sedentary behavior and other have used objective measures such as accelerometers (the gold standard; (Soundy et al., 2014b; Soundy et al., 2013)). Since there are concerns that SRQ may underestimate sedentary behavior, research is required to investigate if SRQ report lower levels of SB compared to the gold standard objective measurements. In addition, it remains unclear if people with psychosis are more sedentary than controls.

Given the aforementioned, we set out to conduct a systematic review with the following aims 1) establish the mean time of sedentary behavior in people with psychosis per day. 2) Investigate differences in sedentary behavior in SRQ and objective measures. 3) Investigate predictors of sedentary behavior in Meta regression analyses. 4) Investigate differences in sedentary behavior in people with psychosis versus controls.

2. Method

This systematic review adhered to the MOOSE guidelines (Stroup et al., 2000) and PRISMA statement (Moher et al., 2009), following a predetermined published protocol (PROSPERO registration number CRD42015026159).

2.1. Inclusion criteria

We included studies that: (a) Included adult participants with a diagnosis of psychotic illness including schizophrenia spectrum and bipolar disorders according to established criteria (e.g., DSM-IV, (Association, 2000) or ICD-10, (Organisation, 1993)). If we encountered studies conducted including mixed samples of mental illnesses (e.g. anxiety disorders) we attempted to extract the data for those with psychosis. (b) Measured sedentary behavior with either a SRQ (e.g. IPAQ, (Craig et al., 2003)) or objective measure (e.g. accelerometer). Sedentary behavior was defined as a behavior with an energy expenditure ≤ 1.5 metabolic equivalents of task (METs), while in a sitting or reclining posture during waking hours and not simply the absence of physical activity (Sedentary Behaviour Research, 2012). Studies classifying sedentary behavior as lower levels of physical activity and/or lack of physical activity/or physical inactivity were excluded as this is not an adequate measure of sedentary behavior. (c) Were interventional (RCTs, CCTs) and observational (prospective or cross sectional) studies conducted in any setting (inpatients or outpatients). (d) Were published in an international peer-reviewed English language journal.

Exclusion criteria were i) Non quantitative study, ii) did not include people with psychosis, iii) did measure sedentary behavior and iv) not published in English.

2.2. Information sources and searches

Two independent authors searched Academic Search Premier, MEDLINE, Psychology and Behavioral Sciences Collection, PsycINFO, SPORTDiscus, CINAHL Plus and Pubmed without language restrictions from inception till 21st September, using the key words: 'schizophrenia' OR 'psychosis' OR 'bipolar' OR 'depression' OR 'mental illness' OR 'serious mental illness' OR 'severe mental illness AND 'sedent*' OR 'sitting'

OR 'lying' OR 'screen time' OR 'accelerometer' OR 'physical activity'. In addition, reference lists of all eligible articles and related systematic reviews were screened to identify potentially eligible articles (Soundy et al., 2013).

2.3. Study selection

After removal of duplicates, one reviewer screened titles and abstracts of all potentially eligible articles. A second author double checked included studies and a final list of included studies was developed.

2.4. Outcomes

The primary outcome was the mean time (minutes) per day that people with psychosis engaged in sedentary behavior. We also collected data on sedentary behavior among healthy controls where possible.

2.5. Data extraction

One author (BS) extracted data using a predetermined data extraction form, which was subsequently validated by a second author (JW). The data extracted included first author, country, setting, population, type of the study (prospective, controlled or randomized controlled trial), number of studies and participants included in the article (including mean age, % female), details of the intervention (including duration), type and definition of SB (objective or self-report, reference period), and results.

2.6. 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 amount of time spent in sedentary behavior per day (minutes per day) among people with psychosis together with the 95% confidence intervals (CI). Second, we calculated the subgroup differences in sedentary behavior according to the measurement (self-report versus objective measurement) and diagnosis (mixed psychosis, schizophrenia spectrum and bipolar disorder spectrum separately). Third, we investigated potential moderators of sedentary behavior in people with psychosis with Meta regression analyses. The potential moderators of interest were mean age, % of males, sedentary behavior measurement (objective versus self-report), illness duration, BMI and psychiatric symptoms, defined as the symptoms of psychotic disease severity measured with a validated scale. Fourth, we conducted a comparative meta-analysis investigating differences in sedentary behavior among people with psychosis and healthy controls calculating hedges g and the 95% CI as the effect size. In addition, we calculated the mean difference in minutes per day together with the 95% CI in sedentary behavior. Heterogeneity was assessed with the I^2 statistics for each analysis (Higgins et al., 2003). Publication bias was assessed with the Begg-Mazumdar Kendall's tau (Begg and Mazumdar, 1994). For all analyses we calculated the trim and fill adjusted analysis (Duval and Tweedie, 2000) to remove the most extreme small studies from the positive side of the funnel plot, and recalculated the effect size at each iteration, until the funnel plot was symmetric about the (new) effect size.

3. Results

3.1. Study selection

The initial electronic database searches identified 760 non duplicated articles which were considered at the title and abstract level. Ninety eight full texts were reviewed and 85 were excluded with

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