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Sedentary behavior and psychiatric symptoms in overweight and obese adults with schizophrenia and schizoaffective disorders (WAIST Study)

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ABSTRACT

Objective: Examine the association between sedentary behavior and psychiatric symptoms among overweight and obese adults with schizophrenia or schizoaffective disorders (SZO/SA).
Design: Randomized clinical trial; Weight Assessment and Intervention in Schizophrenia Treatment (WAIST) Study: baseline data collected 2005–2008.
Setting: University of Pittsburgh Medical Center, Pittsburgh, PA, USA.
Participants: Community-dwelling adults diagnosed with SZO/SA, with mild symptom severity [Positive and Negative Syndrome Scale (PANSS)<90], who were interested in losing weight, age 18–70 years, BMI>27 kg/m^2.
Measurements: Objectively measured sedentary behavior by accelerometry, and psychopathology assessed by PANSS. Participants wore the actigraphs for 7 consecutive days during their waking hours. Sedentary behavior was defined as ≤100 counts per minute during wear-time and excluded sleep and non-wear time.
Results: On average, 81% of the participant's monitoring time or 756 min/day was classified as sedentary behavior using accelerometry. No association was observed between sedentary behaviors and PANSS psychiatric symptoms [total ($p \geq 0.75$), positive ($p \geq 0.81$), negative ($p \geq 0.59$) and general psychopathology ($p \geq 0.65$) subscales]. No association was observed between sedentary behaviors and age, race, gender and BMI.
Conclusion: From a clinical and public health perspective, the amount of time (approximately 13 h) and percentage of time (81% excluding non-wear time associated with sleeping) engaged in sedentary behavior among overweight and obese adults in this population is alarming, and points to an urgent need for interventions to decrease sedentary behaviors. The lack of associations between sedentary behavior and psychiatric symptoms may be due to a ceiling effect for sedentary behavior.

1. Introduction

Sedentary behavior, independent of moderate-vigorous physical activity, has been shown to be an independent risk factor for mortality (Katzmarzyk et al., 2009; Dunstan et al., 2010; Patel et al., 2010; Koster et al., 2012; van der Ploeg et al., 2012), cardiovascular health (Katzmarzyk et al., 2009; Dunstan et al., 2010; Patel et al., 2010; Healy et al., 2011), diabetes (Helmerhorst et al., 2009; Henderson et al., 2012), metabolic syndrome (Ford et al., 2005; Healy et al., 2008; Bankoski et al., 2011; Hsu et al., 2011) and obesity (Levine et al., 2005) in the general population. Little is known about objectively measured sedentary behavior in adults with schizophrenia and schizoaffective disorders (SZO/SA), a population at higher risk for medical co-morbidities than the general population (Faulkner, 2005; Joukamaa et al., 2006; Van Gaal, 2006; Barnett et al., 2007). Based on subjective measures of sedentary behavior, in-patients with schizophrenia self-reported more sitting time (approximately 2.3 h/day, $p = 0.001$) than age-, gender-, and BMI-matched healthy controls (Vancampfort et al., 2012a). Since adults with SZO/SA engage in little, if any, moderate-vigorous activities (Gothelf et al., 2002; Faulkner et al., 2006; Sharpe et al., 2006; Roick et al., 2007; Lindamer et al., 2008; Vancampfort et al., 2012b), interventions to decrease sedentary time may be more effective than those that promote physical activity in this population. Feasibly, sedentary behavior may be one factor increasing the risk of these common co-morbidities in adults with schizophrenia or schizoaffective disorder. In addition, factors that may influence objectively measured sedentary behavior in adults with schizophrenia and schizoaffective disorders are not known. Of

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particular interest is whether objectively measured sedentary behavior differs by the type and severity of the psychiatric symptoms in this population.

Sedentary behavior has been defined as sitting, reclining, or lying down during waking hours and expending less than 1.5 times the metabolic rate (Matthews et al., 2008; Pate et al., 2008; Owen et al., 2011). Common sedentary behaviors would include watching television, using the computer, playing electronic games, hand crafts, riding a bus, driving, and eating meals. However, these sedentary behaviors have been difficult to measure subjectively and prone to considerable reporting error. With the recent interest in sedentary behaviors, researchers have begun objectively measuring sedentary time using accelerometers (Pate et al., 2008). In one study of a representative sample of US adults, the average time spent in sedentary behavior ranged from 7.3 to 9.3 h per day depending on age and gender (Matthews et al., 2008). Sedentary behavior, defined as <760 cpm and including non-wear time for sleeping, was significantly greater among male (~40 min/day, $p \leq 0.05$) but not female users of mental health services compared to male and female non-users of mental health services, respectively (Janney et al., 2008).

The Weight Assessment and Intervention in Schizophrenia Treatment Study (WAIST) study was a randomized, parallel group, clinical trial designed to assess the efficacy of a group-based behavioral treatment for weight reduction compared to social skills training or usual care in overweight or obese (BMI > 27 kg/m^2) adults with SZO/SA. Baseline data from the WAIST Study participants provided a unique opportunity to measure sedentary behavior objectively in overweight and obese adults SZO/SA. The aim of this report is to investigate the association between objectively measured sedentary behavior and psychiatric symptoms in overweight and obese adults with SZO/SA.

2. Methods

WAIST study participants were individuals with a diagnosis of schizophrenia or schizoaffective disorder who were in outpatient treatment. Inclusion was limited to those with a body mass index (BMI) greater than 27 kg/m^2, and who expressed a desire to lose weight. Participants were recruited from ambulatory psychiatric clinics in Pittsburgh and surrounding communities. Recruitment was accomplished by the following methods: investigators and research team members made presentations to staff in the ambulatory clinics; distributed posters and flyers (approved by the IRB), which allowed subjects to contact the research team if they were interested in participating; we also screened an IRB-approved hospital research registry for participants who might meet the inclusion criteria. Recruitment occurred between 2004 and 2008. The study was approved by the University of Pittsburgh Biomedical Institutional Review Board (IRB), and informed consent was obtained from all participants.

This report is restricted to the baseline screening assessments that occurred prior to randomization. Eligibility criteria for enrollment in the study included: age 18–70 years, DSM-IV-TR schizophrenia or schizoaffective disorder (verified by at least 2 out of 3 study psychiatrists using data from a modified Structured Clinical Interview for DSM-IV (SCID) (First et al., 1996), medical charts, and corroborating information from reliable informants). Subjects were accepted if treated with novel or conventional antipsychotic medications, Positive and Negative Symptom Scale (PANSS) score <90, no psychiatric hospitalization in the 30 days prior to enrollment, and no medical contraindication to participation in weight reduction/exercise program. Female subjects, of child-bearing potential, were enrolled if they said they were using a medically accepted means of contraception. Study exclusion criteria included: inability to give informed consent, moderate mental retardation, currently enrolled in another weight management program, or currently being treated with medication to reduce weight. We also excluded individuals with unstable medical illnesses that may have affected body weight or make study procedures hazardous for participants, including history of myocardial infarction or unstable coronary heart disease, end-stage renal disease, or unstable thyroid disease as determined by an internist consulting to the study.

Only a subsample of the WAIST Study participants was offered actigraphy monitoring. Due to initially low compliance with actigraphy monitoring, only participants who had a rating of 5 or greater on the Observer Related Compliance Rating (ORCR) *and* the staff considered psychiatrically compliant with appointments to the outpatient clinic and under "regular" care with a psychiatrists/therapist (being seen more often than once every 3 months) were considered eligible for actigraphy monitoring.

The ActiGraph AM-7164 monitoring device (ActiGraph, Ft. Walton Beach, FL) (Department of Health and Human Services Center for Disease Control and Prevention, 2006) was used to objectively measure physical activity. The ActiGraphs were set to measure the duration and intensity of uniaxial movement within one-minute epochs. Participants were instructed to clip the accelerometer over their right hip and wear the device for seven consecutive days during their waking hours only. If there were no activity counts for ≥60 min, the accelerometer was considered not worn for that interval of time. For this report, analyses were restricted to those participants who wore the accelerometers for at least 10 h a day for three or more days (actigraphy cohort). Each minute epoch was assigned an activity level based on the number of counts per minute (cpm); sedentary (≤100 cpm), light (101–1951 cpm), moderate/vigorous (≥1952 cpm) and physically active (≥101 cpm). Daily totals of sedentary behavior and activity levels (minutes/day) were averaged. Percentage of monitoring time for sedentary behavior and physical activity was calculated by dividing the minutes engaged in each category by the total monitoring minutes for each participant. The various actigraphy measures exclude non-wear time including sleep time.

Physical activity was subjectively assessed using a very modified, past week version of the Modifiable Activity Questionnaire (MAQ), an interviewer administered questionnaire (Kriska et al., 1990; Kriska and Casperson, 1997; Janney, 2012). Graded exercise stress testing (GXT) was optional and has been previously described and summarized by Strassnig and associate (Strassnig et al., 2011). Participants with VO_2max below the twentieth percentile for normative values for VO_2max (mL/kg/min) by age and sex were considered unfit, and participants with VO_2max above or equal to the twentieth percentile for normative values for VO_2max (mL/kg/min) by age and sex were considered fit (American College of Sports Medicine, 2010).

The PANSS (Kay et al., 1987) was used to assess psychopathology in the study participants for the previous week. The PANSS is administered as a clinician interview or semi-structured interview by a trained rater and takes approximately 30 to 40 min to complete. Based on a 7-point scale (1 = absent, 2 = minimal, 3 = mild, 4 = moderate, 5 = moderate severe, 6 = severe, 7 = extreme), the clinician rates the patient on 30 items; 7 positive symptoms (delusions, conceptual disorganization, hallucinatory behavior, excitement, grandiosity, suspiciousness/persecution, and hostility), 7 negative symptoms (blunted affect, emotional withdrawal, poor rapport, passive/apathetic social withdrawal, difficulty in abstract thinking, lack of spontaneity and flow of conversation, and stereotyped thinking), and 16 general psychopathology (somatic concern, anxiety, guilt feelings, tensions, mannerisms and posturing, depression, motor retardation, uncooperativeness, unusual thought content, disorientation, poor attention, lack of judgment and insight, disturbance of volition, poor impulse control, preoccupation, and active social avoidance). The scores from the 30 items are summed to obtain the PANSS score that can range from 30 to 210. In addition, the 3 PANSS subscales were calculated corresponding to the 7 positive symptoms, 7 negative symptoms, and 16 general psychopathology symptoms.

Clinicians subjectively rated the severity of the participant's mental illness (1 = not ill, 2 = very mild, 3 = mild, 4 = moderate, 5 = severe, 7 = extremely severe) at the time of the assessment compared to the clinician's experience with previous patients with the same diagnosis