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Research report

Health-related physical fitness in patients with bipolar disorder vs. healthy controls: An exploratory study

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ABSTRACT

Background: Low physical fitness has been recognized as a prominent behavioral risk factor for cardiovascular diseases and an independent risk factor for all-cause mortality. To date, no studies have systematically assessed physical fitness in patients with bipolar disorder. The aim of the current study was to assess and compare the physical fitness in patients with bipolar disorder against healthy controls.
Methods: Thirty patients with bipolar disorder (16♂, 40.8 ± 11.6 years) and 30 age-, gender- and body mass index (BMI)-matched healthy controls were included. All participants performed the Eurofit test battery and the International Physical Activity Questionnaire. Patients were screened for psychiatric symptoms using the Quick Inventory of Depressive Symptomatology and Hypomania Checklist-32.
Results: Patients with bipolar disorder had a reduced speed of limb movement (15.8 ± 5.7 vs. 11.8 ± 2.2 s; $p < 0.001$), explosive leg muscle strength (134.9 ± 49.0 vs. 167.6 ± 32.3 cm; $p = 0.003$) and abdominal muscular endurance (11.5 ± 7.8 vs. 18.3 ± 7.6; $p < 0.001$). Backward regression analyses demonstrated that longer illness duration, higher body mass index, higher levels of depression and a lower physical activity level explained the variance in physical fitness.
Limitations: Our data are cross-sectional and cannot establish cause and effect.
Conclusions: The current findings suggest that a lower physical fitness is emerging as an eminent modifiable risk factor for somatic co-morbidity in people with bipolar disorder. In particular less physically active persons, those with a longer illness duration and those with higher levels of depression might benefit from specific rehabilitation interventions aimed at increasing physical fitness.

1. Introduction

Increased rates of cardio-vascular diseases (CVD) (Goldstein et al., 2009; Prieto et al., 2014) and associated premature mortality (Fiedorowicz et al., 2014) have recently become a major concern in patients with bipolar disorder. Underlying reasons for the development of CVD in patients with bipolar disorder are complex and consist of genetic risk (Ellingrod et al., 2012), cardio-metabolic side-effects of antipsychotic treatment (Vancampfort et al., 2013a) and an unhealthy lifestyle (Cerimele and Katon, 2013). Unhealthy lifestyle factors include a sedentary lifestyle (Janney et al., 2014), higher prevalence of smoking, and high rates of substance abuse (Waxmonsky et al., 2005). To compound this, patients with bipolar disorder have limited access to general somatic health care (Mitchell et al., 2009; De Hert et al., 2011).

In the general population low physical fitness is established as a prominent risk factor for CVD and an independent risk factor for all-cause mortality (Wei et al., 1999). Physical fitness can be defined as a set of independent attributes that are related to the ability to perform physical activities. Some of these components (including cardio-respiratory fitness, muscular endurance, muscular strength and flexibility) are more closely related to health, while others (such as coordination and whole body balance) are more related to performance (Pate, 1998).

To date, research on the physical fitness in patients with bipolar disorder is lacking. In addition, it still needs to be established if and to what extent the recently observed lack of physical activity participation in patients with bipolar disorder (Janney et al., 2014; Vancampfort et al., 2013b) is associated with a reduced health and

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performance related physical fitness. Identifying which health and performance related physical fitness components are impaired in patients with bipolar disorder may assist in developing physical rehabilitation strategies to prevent or reduce the increased risk for somatic co-morbidities. Research is required to investigate the physical fitness of patients with bipolar disorder to disentangle these relationships.

The primary objective of this study therefore was to examine differences in health and performance related physical fitness between patients with bipolar disorder and healthy controls matched for age, gender and body mass index (BMI). Secondary objectives were to assess associations of physical fitness components and physical activity levels and psychiatric symptoms.

2. Methods

2.1. Participants and procedure

Over a 6-month period, inpatients with a DSM-V diagnosis of bipolar disorder (American Psychiatric Association, 2013) of the UPC KU Leuven campus Kortenberg in Belgium were invited to participate. Since severe substance abuse might impair the physical fitness test performances (Herbsleb et al., 2013), participants were excluded if they had a co-morbid DSM-V diagnosis of substance abuse during the previous 6 months. The somatic exclusion criteria included evidence of significant cardiovascular, neuromuscular and endocrine disorders which, according to the American College of Sports Medicine (2013), might prevent safe participation in the study. All participants received a physical examination and baseline electrocardiogram before testing. Healthy control subjects were recruited among the personnel of the participating centers. All control subjects were volunteers who received a general physical examination in the previous year and reported to be free of significant cardiovascular, neuromuscular and endocrine disorders that might hinder safe participation (16). An independent statistician blinded for the physical activity and physical fitness outcomes performed the matching for age, gender and body mass index (BMI). All participants completed the International Physical Activity Questionnaire (Craig et al., 2003) and performed the Eurofit test battery (Oja and Tuxworth, 1995). Participants were requested to refrain from eating, drinking coffee or smoking during a two-hour period prior to the tests. Participants with bipolar disorder additionally completed the Quick Inventory of Depressive Symptomatology self-report (Rush et al., 2003) and the Hypomania Checklist-32 (Angst et al., 2005).

The study procedure was approved by the Scientific and Ethical Committee of the UPC KU Leuven, campus Kortenberg, Belgium and conducted in accordance with the principles of the Declaration of Helsinki. All participants gave their informed written consent. There was no compensation for participation in the study.

2.2. The Eurofit test battery

Supervision and measurement of the Eurofit test battery (Oja and Tuxworth, 1995) were performed by one trained mental health physical therapist. The Eurofit test battery included the assessment of the following measures: whole body balance, speed of limb movement, flexibility, explosive strength, static strength, abdominal muscular endurance and running speed. The procedure has been described more in detail elsewhere (Vancampfort et al., 2012a).

2.3. International Physical Activity Questionnaire (IPAQ)-long version

A structured format (Craig et al., 2003) that asked participants to recall activities for each of the last seven preceding days in morning, afternoon, and evening time periods was used. On the basis of what activities participants self-reported, the interviewer clarified the perceived intensity of that specific activity. A continuous indicator was calculated as a sum of weekly metabolic equivalent (MET)-minutes per week of physical activity. The MET energy expenditure was estimated by weighting the reported minutes per week within each activity category by a MET energy expenditure estimate assigned to each category of activity. The weighted MET-minutes per week were calculated as duration × frequency per week × MET intensity, which were then summed across activity domains to produce a weighted estimate of total physical activity from all reported activities per week.

2.4. Smoking behavior

Participants were asked whether they smoked or not, and if so, how many cigarettes they smoke per day on average.

2.5. Quick Inventory of Depressive Symptomatology self-report (QIDS-SR)

QIDS-SR (Rush et al., 2003) consists of 16 items each ranging from 0 to 3. Scores range from 0 to 27 with higher scores indicative for higher symptom severity. The QIDS-SR is a standardized measure of depressive symptoms and has demonstrated adequate psychometric validity in patients with bipolar disorder (Trivedi et al., 2004).

2.6. Hypomania Checklist-32

The HCL-32 (Angst et al., 2005) consists of 32 yes/no statements regarding a period when the patient remembers he was in a “high” mood. Items ask whether specific behaviors (e.g., “I spend more money/too much money”), thoughts (e.g., “I think faster”), or emotions (e.g., “my mood is significantly better”) were present in such a state. Scores range from 0 to 32. Higher scores reflect more severe hypomanic states. The HCL-32 has been cross-culturally validated; also in a Belgian subsample (Angst et al., 2010).

2.7. Anthropometric measurements

Body weight was measured in light clothing to the nearest 0.1 kg using a SECA beam balance scale, and height to the nearest 0.1 cm using a wall-mounted stadiometer.

2.8. Medication use

We recorded the use of antipsychotic medication, antidepressants, mood stabilizers, benzodiazepines, anti-cholinergic, and somatic medication. Antipsychotic medication was recorded and converted into a daily equivalent dosage of chlorpromazine according to the consensus of Gardner et al. (2010). Mean dosages of specific mood stabilizers and antidepressants were reported when they were used by at least 10 participants.

2.9. Statistical analyses

Data were assessed for normality using the Shapiro–Wilk test and found to have a normal distribution. Descriptive statistics are therefore presented as mean ± standard deviation (SD). Unpaired *t*-tests with post-hoc Bonferroni correction for continuous variables and Fisher exact tests for categorical variables (gender) ($p < 0.05$) were used to examine differences in characteristics between patients and healthy controls. Relationships between variables were calculated when data were available for all participants by using Pearson correlation coefficients. In order to correct