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Test–retest reliability, feasibility and clinical correlates of the Eurofit test battery in people with bipolar disorder

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ABSTRACT

The physical health of people with bipolar disorder is poorer in comparison to the general population, with an increased prevalence of cardiovascular and metabolic diseases. Due to the established beneficial effects, there is growing interest in the promotion of physical activity and in particular the accurate measurement of physical fitness in this population. Currently, no existing measures of physical fitness used in the general population have been tested for validity and reliability among people with bipolar disorder. Therefore, we examined the reproducibility, feasibility and correlates of the Eurofit test battery in people with bipolar disorder. From 24 men (43.0 ± 13.0 years) and 22 women (43.9 ± 10.2 years) with bipolar disorder two trials of the Eurofit test, administered within three days, were analyzed. All Eurofit items showed good reproducibility with intraclass correlation coefficients ranging from 0.71 for the whole body balance test to 0.98 for the handgrip force test. Significant correlations with Eurofit test items were found with age, illness duration, body mass index, smoking behavior, mean daily lithium dosage, and depressive and lifetime hypomanic symptoms. The current study demonstrates that the Eurofit test can be recommended for evaluating the physical fitness of inpatients with bipolar disorder.

1. Introduction

There are great concerns that the physical health of people with bipolar disorder is significantly poorer in comparison to the general population, leading to a considerably shortened life (Osby et al., 2001, Hoang et al., 2011). Of particular concern is the increased risk for cardiovascular diseases (CVD), with research demonstrating that people with bipolar disorder have a nearly five times increased age-, race-, and gender-adjusted CVD risk (Goldstein et al., 2009). The underlying mechanisms for this increased CVD-risk are multifactorial and include adverse effects of pharmacological treatments (Vancampfort et al., 2013a), poorer access to and quality of physical health care (Mitchell et al., 2009; De Hert et al., 2011) and an unhealthy, sedentary lifestyle exacerbated by psychiatric symptoms (Kilbourne et al., 2009; Vancampfort et al., 2013b).

Low levels of physical fitness is a strong and independent predictor of CVD and all-cause mortality of comparable importance with other CVD risk factors (Wei et al., 1999; Bull and Bauman, 2011). Physical fitness is a multi-factorial concept comprising a set of more or less independent attributes that are related to the ability to perform physical activities. Some of these components are more closely related to health, while others are rather related to performance (Pate, 1998). Health-related physical fitness has been defined as the ability to perform daily activities with vigor and to demonstrate capacities that are associated with a lower risk of premature development of hypokinetic diseases (i.e., those associated with physical inactivity) (Bouchard and Shephard, 1994). Performance-related physical fitness refers to those components that are necessary for optimal work or sport performance (Bouchard and Shephard, 1994). Physical fitness includes several components: cardio-respiratory fitness, muscular endurance, muscular strength, flexibility, coordination, and speed.

To the best of our knowledge, data on the health- and performance related physical fitness in people with bipolar disorder are scare (Vancampfort et al., 2015). To date, only one study assessed the health- and performance related physical fitness in this population and found that patients with bipolar disorder have a reduced

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speed of limb movement (15.8 ± 5.7 versus 11.8 ± 2.2 s; $p < 0.001$), explosive leg muscle strength (134.9 ± 49.0 versus 167.6 ± 32.3 cm; $p = 0.003$) and abdominal muscular endurance (11.5 ± 7.8 versus 18.3 ± 7.6; $p < 0.001$). The current lack of research might, in part, be due to lack of appropriate physical fitness measures in many mental health care settings (De Hert et al., 2010). For example, laboratory-based incremental exercise testing protocols that use breath-by-breath gas analysis and measure the maximum level of oxygen consumption (VO_2max) are considered the gold standard measurement (Vanhees et al., 2005). However, such test protocols only assess cardiorespiratory fitness and no other health-related physical fitness components, are time-consuming, costly and need highly sophisticated equipment (Vanhees et al., 2005), which is often not available or feasible within mental health care settings. Field test batteries assessing all components of physical fitness have been developed (Vanhees et al., 2005). Within mental healthcare studies and programs, the Eurofit test battery for adults (Oja and Tuxworth, 1995) has been used previously (Van de Vliet et al., 2002; Vancampfort et al., 2012). This test battery is designed to assess all components of physical fitness of individuals, communities, subpopulations and populations (Oja and Tuxworth, 1995) including balance, speed, muscular strength and muscular endurance. The reproducibility and feasibility of the Eurofit test battery has however never been assessed in persons with bipolar disorder.

Considering the lack of appropriate measures to assess the physical fitness of people with bipolar disorder, the primary aim of the present study was to investigate the test–retest reliability of the Eurofit test battery in this population. Secondary aims were: (a) to describe the feasibility of the Eurofit in people with bipolar disorder, and (b) to assess clinical and demographic characteristics associated with the performance on the Eurofit.

2. Methods

2.1. Participants

Over an 8-month period, inpatients with a DSM-V diagnosis of bipolar disorder (American Psychiatric Association, 2013) of the bipolar disorder observation unit of the UPC KU Leuven campus Kortenberg in Belgium were invited to participate by their treating psychiatrist in the second week of admission. Reasons for admission were primarily often due to either depressive or manic symptoms thus the individuals were deemed in need of observation within a specialist service. Only patients with a clinical global impression severity scale (Guy, 1976) score of five or less, as assessed by a trained psychiatrist during a semi-structured interview, and who were able to concentrate for at least half an hour were included. Patients admitted to the emergency psychiatric ward were excluded. 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 by a specialized physician. Participants were also requested to refrain from eating, drinking coffee or smoking during a 2-h period prior to the tests. 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. Test–retest of the Eurofit test battery

A test–retest design was applied to test the reproducibility of several Eurofit test battery items (Oja and Tuxworth, 1995). Supervision and measurement of the Eurofit test battery was performed by one trained mental health physical therapist following a standardized procedure. The Eurofit test battery included seven items and involved the assessment of the following measures: whole body balance, speed of limb movement, flexibility, explosive strength, static strength, abdominal muscular endurance and running speed.

Whole body balance (flamingo balance) was measured as the number of trials needed by individuals to achieve a total duration of 30 s in balance on their preferred foot on a flat firm surface. While balancing on the preferred foot (shoes removed), the free leg is flexed at the knee and the foot of this leg held close to the buttocks. Lower flamingo balance scores indicate a better whole body balance.

Speed of limb movement (plate tapping) was assessed using a table on which two discs at 80cm distance had to be touched alternately with the preferred hand as fast as possible, completing 25 cycles. Higher scores indicate lower speed of limb movement.

Flexibility was measured using the sit-and-reach test. Participants sat on the floor with straight legs and reached forward as far as possible (shoes removed). The knees were held in extended position by the investigator throughout the test. The feet were placed against a test box with a ruler placed on the top of the box. The ruler had to be pushed with the fingertips and this in a smooth and slow movement. Higher scores indicate better flexibility.

Explosive strength was measured by a standing broad jump, using a tape measure on a foam mat. Participants were asked to stand behind a line drawn perpendicular to the tape measure and jump forward as far as possible using arm swing and knee bending before jumping. The distance jumped was recorded from the take-off line to the farthest point backward of the participant. Higher scores indicate a better explosive strength.

Handgrip strength was assessed using a handgrip dynamometer (Lafayette Instruments Hand Dynamometer) to be squeezed as forcefully as possible with the preferred arm fully extended slightly away from the body, and palm facing inward. Higher scores indicate better handgrip strength.

Abdominal muscle endurance was measured as the number of correctly completed sit-ups in 30 s. Sit-ups were performed with the hands placed at the side of the head, knees bent at 90°, and the feet secured by the investigator. A full sit-up is defined as touching the knees with the elbows and returning the shoulders to the ground. A higher number of completed sit-ups indicate greater abdominal muscle endurance.

Running speed was assessed using a 10 by 5 m shuttle run. Each participant was required to sprint 10 times between two lines placed 5 m apart over a 1.3 m wide track. The sprint was followed by immediately turning and running back. Lower scores indicate better running speed. Except for the flamingo balance test, the sit-ups test and the shuttle run, each test was done twice and the better score was recorded.

2.3. Anthropometric assessments

Anthropometric measurements included body weight and height. 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.

2.4. 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. It is scored by summing the highest response in each of a set of questions relating to sleep, weight and psychomotor symptoms and then adding the remaining items. Scores range from 0 to 27 with higher scores indicative of higher symptom severity. The QIDS-SR is a standardized measure of depressive symptoms and has demonstrated adequate psychometric validity in people with bipolar disorder (Trivedi et al., 2004).

2.5. Hypomania checklist-32

The HCL-32 (Angst et al., 2005) consists of 32 yes/no statements regarding a period when the patient remembers being 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 including a Belgian sub-sample (Angst et al., 2010).

2.6. Medication use

We recorded the use of antipsychotic medication, antidepressants, mood stabilizers, benzodiazepines and anti-cholinergic, anti-epileptic, sleep 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, antidepressants, benzodiazepines and anti-cholinergic, anti-epileptic, sleep and somatic medication were reported when they were used by at least 10 participants.

2.7. Smoking habits

Smoking behavior was determined at the day of the first test performance. Participants were asked whether they smoked or not, and if so, how many cigarettes they smoke per day on average.