



Reliability and validity of 6MWT for outpatients with schizophrenia: A preliminary study



Eluana Gomes^{a,*}, Tânia Bastos^{b,d}, Michel Probst^c, José Carlos Ribeiro^a, Gustavo Silva^a, Rui Corredeira^a

^a Research Centre in Physical Activity, Health and Leisure (CIAFEL), Faculty of Sport, University of Porto, Porto, Portugal

^b Centre of Research, Education, Innovation and Intervention in Sport (CIFI2D), Faculty of Sport, University of Porto, Porto, Portugal

^c Faculty of Kinesiology and Rehabilitation Sciences, Research Group for Adapted Physical Activity and Psychomotor Rehabilitation, Catholic University of Leuven, Belgium

^d Research Center in Sports Sciences, Health Sciences and Human Development, CIDESD, University Institute of Maia, ISMAI, Portugal

ARTICLE INFO

Article history:

Received 24 February 2015

Received in revised form

1 October 2015

Accepted 27 January 2016

Available online 28 January 2016

Keywords:

Association

Walking

Exercise test

Schizophrenia

ABSTRACT

Although the 6-minute walk test (6MWT) has been widely used in patients with schizophrenia, there is a lack of scientific evidence about its reliability and validity in this population. The first goal of this study was to explore the test–retest reliability of the 6MWT and to identify the associated parameters that contribute to the variability of the distance walked during the 6MWT in outpatients with schizophrenia. The second goal was to assess the criterion validity of the 6MWT in men with schizophrenia. Fifty one outpatients with schizophrenia participated in the study. To test–retest reliability (men=39; women=12), participants performed the 6MWT twice within 3 days interval. To test criterion validity (men=13), peak oxygen uptake (VO_{2peak}) was measured on a treadmill. For the associated parameters with the distance walked ($n=51$), medications use, smoking behavior, body and bone composition, and physical activity levels were analyzed. No significant differences between the means of the two 6MWTs were found. The intraclass correlation coefficient was 0.94 indicating good reliability. 6MWT correlated significantly with VO_{2peak} ($r=0.67$) indicating criterion validity. Height, body fat mass, smoking behavior and minutes of PA/week were significantly associated with the 6MWT. Results suggest that 6MWT shows good reliability for individuals with schizophrenia and good validity for the small sample of male participants in this study.

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1. Introduction

Schizophrenia is a leading cause of disability worldwide (World Health Organization, 2008), which affects about 21 million people (World Health Organization, 2012). For most of these people, the antipsychotic medication is important to control the symptoms of the disease (Tandon et al., 2010). However, the use of this medication has been associated with metabolic disturbances (Newcomer, 2004; Blouin et al., 2009). Individuals with schizophrenia have a higher prevalence of diabetes mellitus (Wani et al., 2015), overweight and metabolic diseases, as well as disease of the cardiovascular and respiratory systems (Leucht et al., 2007; De Hert et al., 2009).

Additionally, many individuals with schizophrenia have an unhealthy lifestyle with an inadequate diet (Stokes and Peet,

2004); substance abuse (Kalman et al., 2005; Winklbaur et al., 2006) and insufficient levels of daily physical activity (PA) for the general health maintenance (Faulkner et al., 2006; Beebe and Harris, 2013). It has also been documented that individuals with schizophrenia have suboptimal levels of cardiovascular fitness (Saha et al., 2007; Vancampfort et al., 2011a). Previous studies (Vancampfort et al., 2011a, 2011c) reported association between low functional exercise capacity and low level of perceived sports competence, perceived physical fitness, and PA participation in individuals with schizophrenia.

Despite the importance of PA in the prevention and reduction of disorders often associated with schizophrenia (e.g., metabolic syndrome, cardiovascular disease, obesity) (Faulkner and Biddle, 1999; Fogarty et al., 2004; Beebe et al., 2005; Richardson et al., 2005; Marzolini et al., 2009; Vittaca et al., 2013) and in the reduction of the specific symptoms (negative and positive) of the disease (Bernard and Ninot, 2012; Vancampfort et al., 2012a) few studies have analyzed the validity and reliability of the instruments that assess the effects of regular PA in individuals with schizophrenia (Vancampfort et al., 2011b, 2014).

* Correspondence to: Faculty of Sport, University of Porto, Rua Dr. Plácido Costa, no. 91, 4200–450 Porto, Portugal.

E-mail address: aeluana@yahoo.com.br (E. Gomes).

In this context, the best measure used to assess the benefits of regular PA is the maximal oxygen consumption (VO_{2max}) determined by ergospirometry. This method measures cardiovascular fitness ($VO_{2max/peak}$) and is conducted in a laboratory using respired gas analysis (American Thoracic Society and American College of Chest Physicians, 2003; Mezzani et al., 2009). Nonetheless, ergospirometry is expensive and not always available in clinical practice (Elmahgoub et al., 2012). Moreover, adults with schizophrenia generally exhibit lower cardiopulmonary fitness (i.e., higher respiratory quotient on submaximal workloads and lower calculated VO_{2max}) than the general population (Nilsson et al., 2012). Therefore, it is difficult to motivate individuals with severe schizophrenia to consistently undertake exhausting exercise (Dodd et al., 2011).

The 6-minute walking test (6MWT) is considered an adequate submaximal test for individuals with schizophrenia (Beebe et al., 2005; Marzolini et al., 2009; Martín-Sierra et al., 2011; Vancampfort et al., 2011a, 2011b, 2012b, 2013; Bernard et al., 2014). It is a self-paced test, it is better tolerated and more reflective of daily activities than other maximal exercise tests (Solway et al., 2001). From a clinical perspective, it has the advantages of practicality and safety; it requires no special equipment or advanced training, and unlike maximal cardiopulmonary exercise testing, it can be performed by patients with severe impairments (American Thoracic Society, 2002; Enright, 2003). This is why the 6MWT is commonly used to measure the functional exercise capacity in individuals with different diseases (i.e., cardiovascular diseases, chronic obstructive pulmonary disease, traumatic brain injury) (Langenfeld et al., 1990; Campo et al., 2006; Roberts et al., 2006; Mossberg and Fortini, 2012).

Although 6MWT has been widely used in individuals with schizophrenia (Beebe et al., 2005; Marzolini et al., 2009; Vittaca et al., 2013; Gomes et al., 2014), to our knowledge only one study had evaluated the test–retest reliability of the 6MWT in this population (Vancampfort et al., 2011b). The authors found high values of test–retest reliability with Intraclass Correlation Coefficient (ICC) between the two 6MWT distances of 0.96 (CI 95% of 0.94–0.98). However, the generalization of this result is limited due to some methodological issues namely: i) focus only in inpatients; ii) focus only in one mental health center; and, iii) lack of information about the amount of the participants' daily exercise (Vancampfort et al., 2011b; Bernard et al., 2014). Lastly, to our knowledge, the association between the 6MWT and maximal exercise tests was never explored in individuals with schizophrenia.

Therefore, the first goal of this study was to explore the test–retest reliability of the 6MWT and to identify the associated parameters that contribute to the variability of the distance walked during the 6MWT in outpatients with schizophrenia. The second goal was to assess the criterion validity of the 6MWT in men with schizophrenia.

2. Methods

2.1. Participants

Over a five-month period, outpatients with a DSM-IV diagnosis of schizophrenia and stable on antipsychotic medication (i.e., using the same dosage for at least four weeks prior to inclusion) were included. Patients were excluded if they had co-morbid substance abuse and evidence of uncontrolled cardiovascular, neuromuscular and endocrine disorders.

The participants were recruited from three psychiatric rehabilitation units from Porto, Portugal and invited to participate by the psychiatrists. Afterwards, the research team had a meeting with the participants to explain the study in detail and to answer

the participants' questions. This study was carried out following the Declaration of Helsinki guidelines for human research. The Faculty Ethics Committee approved this study. All participants gave their written informed consent.

2.2. Sample size analysis

With a minimal expected ICC of 0.80 and the hypothesis that present findings would be consistent with a minimum ICC of 0.90, a minimum sample size of 46 patients was required to achieve a level of significance (α) of 0.05 and power of 0.8 ($\beta=0.2$) (Walter et al., 1998). Consequently, a sample size of 51 participants was pre-specified.

2.3. Medication use

Antipsychotic medication was recorded for each patient and converted into a daily equivalent dosage of chlorpromazine according to Gardner et al. (2010).

2.4. Body and bone composition

Height and weight were measured before testing, with participants wearing shorts and t-shirts only. Height was measured using a Holtain stadiometer (Holtain Ltd., Crymmych, UK) and recorded in centimeters to the nearest millimeter. Weight was measured to the nearest 0.1 kg with a Seca weight scale. Body mass index (BMI) was calculated by the ratio between weight and squared height ($kg\ m^{-2}$). Waist circumference was measured at the level of the navel and hip circumference was measured at the largest circumference of the hips.

Bone mineral density, lean mass and fat mass were assessed through dual energy X-ray scan (Explorer QDR 4500, Hologic, Bedford, MA) with whole body protocol. Participants were placed in a supine position with their arms in extension near the trunk and lower limbs in extension, with a slight abduction of the feet. Participants removed clothes and all metallic objects (earrings, watches, etc.) and wore a gown.

2.5. Level of physical activity

Level of PA was measured using the short form of International Physical Activity Questionnaire (IPAQ-SF) (Craig et al., 2003). This questionnaire asked participants to recall the amount of minutes spent in vigorous and moderate intense activity and walking during the last 7 days. For all categories patients have to define on how many days and how many minutes they spent at a specific activity category. The minutes spent every week on each type of activity are computed separately by multiplying the duration and frequency of activity. A continuous activity score is calculated by multiplying the selected metabolic equivalent (MET) value and weekly minutes of activity, therefore expressing PA as MET-min per week. MET is a measured of energy output equal to the basal metabolic rate of resting subject; assumed to be equal to an oxygen uptake of 3.5 ml for kilograms of body weight per minute, or approximately 1 kcal per kilogram of body weight per hour (Niemann, 1950). Previous research indicated that the IPAQ may be considered a reliable surveillance tool to assess levels of PA in patients with schizophrenia (Faulkner et al., 2006).

2.6. 6MWT

The 6-minute walk test (6MWT) was performed in an indoor corridor with a minimum of external stimuli. Two cones, 25 m apart, indicated the length of the walkway. Participants were instructed to walk back and forth around the cones during six

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