Psychiatry Research 242 (2016) 192–197

Contents lists available at ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Impact of antipsychotic medication on physical activity and physical fitness in adolescents: An exploratory study

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ARTICLE INFO

Article history:
Received 9 February 2016
Received in revised form
26 April 2016
Accepted 29 May 2016
Available online 3 June 2016

Keywords:
Adolescents
Physical activity
Exercise
Physical fitness
Antipsychotics

ABSTRACT

Antipsychotics are used increasingly in adolescents for a range of psychiatric disorders. The aim of the current study was to investigate whether physical activity levels and physical fitness of adolescent inpatients treated with antipsychotic medication, differs from either (i) antipsychotic naïve adolescents with mental health problems and, (ii) healthy controls. All participants completed the Physical Activity Questionnaire for Adolescents, the Positive-and-Negative-Affect-Schedule and performed the Eurofit test battery. Adolescents with mental health problems (irrespective of antipsychotic medication) were significantly ($P < 0.05$) less physically active and had an impaired whole body balance, running speed and cardiovascular endurance compared to healthy controls (n = 15, 8♂, 15.9 ± 1.3 years). Adolescents treated with antipsychotic medication (n = 15, 8♂, 15.5 ± 1.3 years) were less physically active and had an impaired whole body balance compared with antipsychotic naïve adolescents (n = 15, 8♂, 15.7 ± 1.4 years). Given the overwhelming deleterious impact of physical inactivity and low physical fitness on physical and mental health outcomes, interventions specifically targeting physical activity and physical fitness among adolescents experiencing mental illness, both treated with, and not treated with antipsychotic medication are warranted as a priority. Antipsychotic medication should be considered as a risk factor for physical inactivity and poor physical fitness.

1. Introduction

Antipsychotics are used increasingly in adolescents for a wide range of psychiatric disorders (Olfson et al., 2015a, 2015b). Although antipsychotic use in young people had previously been restricted to schizophrenia spectrum disorders, significant data regarding its efficacy have accumulated for non-psychotic disorders, leading to regulatory approval for pediatric bipolar disorders and aggressive behaviors associated with autism (Ogawa et al., 2014; Politte et al., 2014). Antipsychotics are often used off label to control disruptive behaviors of children and adolescents without autism and treat mood problems of children and adolescents without bipolar disorder (Daviss et al., 2016). Antipsychotic use in young people is not without risk. A recent meta-analysis showed that antipsychotic-exposed youth had a cumulative diabetes risk of 2.58 (odds ratio (OR), 95%CI = 1.56–4.24; $P < 0.001$) compared to healthy controls and a cumulative diabetes risk of 2.09 (95%CI = 1.50–2.90; $P < 0.001$) compared to antipsychotic naïve psychiatric controls (Galling et al., 2016).

Physical inactivity and a lower physical fitness are important risk factors for cardiovascular diseases and premature mortality (Kodama et al., 2009), yet to the best of our knowledge, no previous studies have explored the association between antipsychotic medication use, physical activity behavior and physical fitness in adolescents. Research exploring the level of physical activity and physical fitness in adolescents taking antipsychotic medication is important in order to define whether they are a high-risk population warranting targeted intervention. Physical fitness is a multifactorial 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, 1988). 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 et al., 1994). Performance-related physical fitness refers

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http://dx.doi.org/10.1016/j.psychres.2016.05.042
0165-1781/

to those components that are necessary for optimal work or sport performance (Bouchard et al., 1994). Physical fitness includes several components: cardio-respiratory fitness, muscular endurance, muscular strength, flexibility, coordination, and speed.

Studies in adult populations indicate that antipsychotic medication use is associated with lower levels of physical activity and consequently lower levels of physical fitness (Vancampfort et al., 2010). While studies regarding the association between antipsychotic medication use, physical activity behavior and physical fitness in adolescents are lacking, a recent study demonstrated that adolescents with bipolar disorder (16.2 ± 1.5 years) were less likely to meet recommended guidelines for vigorous physical activity (i.e. exercising more than four times in the prior week) than healthy controls without major psychiatric disorders (16.0 ± 1.9 years) (Jewell et al., 2015). No significant difference in regards to incidental physical activity and/or sedentary behavior (as measured by screen time) was found (Jewell et al., 2015). A large-scale population study in almost 7000 adolescents in Finland (Koivukangas et al., 2010) demonstrated that those individuals who developed psychosis were more likely to be physically inactive (OR=3.3; 95%CI=1.4–7.9; adjusted for gender, parental socio-economic status, family structure and parents' physical activity) and to have poor cardiorespiratory fitness (OR=2.2; 95%CI=0.6–7.8; adjusted for parental socio-economic status, family structure and parents' physical activity) compared to those who did not develop psychosis.

The aim of the current study was to investigate whether physical fitness and physical activity levels of adolescents treated with antipsychotic medication differs from (i) age- and gender matched antipsychotic naïve adolescents with mental health problems, and (ii) age- and gender matched healthy controls. A secondary aim was to explore associations between physical fitness and physical activity levels, antipsychotic medication dose, and positive and negative affect in adolescents treated with antipsychotic medication and in antipsychotic naïve adolescents with mental health problems.

2. Methods

2.1. Participants and procedure

All consecutive inpatients of the adolescent treatment section of the University Psychiatric Centre KU Leuven campus Kortenberg in Belgium were invited to participate by their treating psychomotor therapist once they were psychiatrically stable on their current antipsychotic regimen for at least 4 weeks (i.e. in their 4th–6th week of treatment). All adolescents received care as usual including psychomotor therapy (relaxation, body awareness exercises and at least 3 times per week during 45–60 min physical activity). In the evenings all adolescents had free access to sports facilities (e.g., basketball, soccer), although we did not systematically assess the attendance. School activities were maintained during the mornings. Inclusion criteria for the study were: (1) being 14 years or older and younger than 18 years, and (2) psychiatrically stable on current antipsychotic regimen for at least 4 weeks. Somatic exclusion criteria included evidence of significant cardiovascular, neuromuscular and endocrine disorders which, according to the American College of Sports Medicine (ACSM, 2013) might prevent safe participation in the study. Two age- and gender matched control groups were included. The first control group consisted of antipsychotic naïve inpatients with mental health problems from the same adolescent treatment section of the University Psychiatric Centre KU Leuven campus Kortenberg who were invited during their 4th to 6th week of treatment. Inclusion criteria were: (1) 14 years or older and younger than 18 years, (2) never received antipsychotic medication, and (3) at least 4 weeks of inpatient therapy. The second control group was made up of healthy adolescents. Inclusion criteria were: (1) 14 years or older and younger than 18 years, and (2) no major psychiatric diagnoses (including major depressive disorder, bipolar disorder, substance abuse/dependence, or psychosis) (based on parental self-report). Healthy controls were recruited among relatives and acquaintances of the research team. All adolescents completed the Physical Activity Questionnaire for Adolescents (PAQ-A), the Positive-and-Negative-Affect-Schedule (PANAS) and performed the Eurofit test battery (Adam et al., 1988). Questionnaires were interviewer-administered. The study procedure was approved by the Scientific and Ethical Committee of the UPC KU Leuven, Belgium and conducted in accordance with the principles of the Declaration of Helsinki. All adolescent participants and a parent/guardian provided written informed consent. There was no compensation for participation in the study.

2.2. The Eurofit test battery

The Eurofit test battery (Adam et al., 1988) includes 8 items and involves the assessment of the following measures: whole body balance, speed of limb movement, flexibility, explosive strength, static strength, abdominal muscular endurance, running speed and cardiovascular endurance.

Whole body balance (flamingo balance) was measured as the number of trials needed to achieve a total duration of 60 s in balance on the 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 80 cm 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 degrees, 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 indicates 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