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Does level of leisure time physical activity, in a sample of patients with depression, predict health care utilization over a subsequent 5-year period? Findings from a Finnish cohort study

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ABSTRACT

Objectives: The main aim of this study was to investigate the association between leisure time physical activity (LTPA) and health care utilization (HCU) and furthermore, socio-demographic and clinical factors according to LTPA level among depressed patients based on data drawn from the Finnish Depression and Metabolic Syndrome in Adults (FDMSA) -study (2009–2016).

Methods: 447 depressed patients aged 35–65 from municipalities within the Central Finland Hospital District participated in this study. Depressive symptoms (DS) were determined with the Beck Depression Inventory (≥ 10 points) and the psychiatric diagnosis confirmed with a diagnostic interview (M.I.N.I.). Severity of depression was evaluated using the Montgomery-Åsberg Depression Rating Scale (MADRS). LTPA was assessed using a self-reported questionnaire. Use of health services was counted from participant's health care records.

Results: Of the 447 depressed patients, 25% reported their LTPA level as low, 41% as moderate and 34% as high. Among depressed patients, higher levels of LTPA were linearly associated with lower BDI ($p < 0.001$), MADRS ($p = 0.002$), BMI ($p = 0.005$), triglyceride ($p = 0.025$) and higher HDL ($p = 0.002$) values. LTPA level was not related to health care utilization among depressed patients. The health services most used were physician services.

Conclusions: According to this study, the level of LTPA in baseline does not predict the future use of health care services among depressed patients in Finnish adult population. Although higher levels of LTPA are positively associated with many health-related factors, promoting PA alone is not enough when aiming to manage and modify HCU among depressed patients.

1. Introduction

Depression is the leading cause of disability worldwide (Whiteford et al., 2013) and it has been estimated that it will be the most common illness globally by the year 2030 (Mathers & Loncar, 2006). People suffering from mental illnesses such as depression have over a two-fold higher mortality risk and ten years shorter life expectancy than the general population (Walker, McGee, & Druss, 2015). Depressive symptoms can also predispose to metabolic syndrome (Vanhala, Jokelainen, Keinänen-Kiukaanniemi, Kumpusalo, & Koponen, 2009). Although effective treatments are available, only a minority of people suffering from depression seek and receive appropriate treatment (Hämäläinen, Isometsä, Sihvo, Pirkola, & Kiviruusu, 2008; Kim, Cho, Park, & Park, 2015; Kleinberg, Aluoja, & Vasar, 2013). There are many

Abbreviations: BDI (−21), Beck Depression Inventory; BMI, Body Mass Index; DS, depressive symptoms; FDMSA-study, Finnish Depression and Metabolic Syndrome in Adults-study; GDP, Gross Domestic Product; HCU, heath care utilization; HDL, high-density lipoprotein; LDL, low-density lipoprotein; LTPA, leisure-time physical activity; MADRS, Montgomery-Åsberg Depression Rating Scale; M.I.N.I., Mini-International Neuropsychiatric Interview; mmHg, millimeter of mercury; mmol/l, millimoles per liter; OGTT, Oral Glucose Tolerance Test; PA, physical activity; SD, standard deviation; SPI, Social Progress Index

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reasons for this, including lack of resources, lack of trained health care providers, social stigma associated with mental disorders and inaccurate assessment (World Health Organization, 2015).

Depression is also associated with increased health care utilization. According to Kleinberg et al. (2013), depressed people use health care services from 1.5 to 3 times more often than the non-depressed. Depression has been shown to increase the risk of HCU among people with unhealthy BMI (Atlantis, Goldney, Eckert, Taylor, & Phillips, 2012) and among patients with diabetes (Chan, Lin, Chau, & Chang, 2012), cancer (Lo et al., 2013) and cardiovascular diseases (Chamberlain et al., 2011). Both hereditary and environmental factors are thought to play a role in depression (Sullivan, Neale, & Kendler, 2014). In addition, an unhealthy life style characterized, for example, by physical inactivity (Korniloff, 2013), long-lasting dissatisfaction with life (Rissanen, 2016) and many somatic diseases have been found to be associated with increased risk of depression (Ali, Stone, Peters, Davies, & Khunti, 2006; Korniloff et al., 2010, 2012).

Many recent studies have demostrated that physically active compared to physically in-active people utilize health care services less (Fonseca, Nobre, Pronk, & Santos, 2010; Lordan & Pakrashi, 2014; Vuori, Taimela, & Kujala, 2010) and have lower lifetime net costs of health care and social services (Vuori et al., 2010). Recent studies have also demostrated the usefulness of physical activity and exercise in the treatment and prevention of depression (Gallegos-Carrillo et al., 2013; Korniloff et al., 2012; Sieverdes et al., 2012) and that the positive effects of physical exercise can equal those of other methods of treatment or medication (Cooney, Dwan, & Mead, 2014). Souza, Fillenbaum, and Blay (2015) reported an association of physical inactivity with both higher risk of depression and higher risk of hospitalization, and also with decreased outpatient visits, among older people.

In sum, physical activity (PA) is a cheap and effective way to treat and prevent many diseases and it decreases the use of health care services. However, studies on whether increased physical activity reduces the use of health care services, and therefore health care costs, among depressed patients are lacking. As the primary aim of FDMSA Study was to investigate association between depression and metabolic syndrome, we also have studied relations between leisure time physical activity and depression. Thus, the main aim of this preset study was to investigate the association between HCU and leisure time physical activity (LTPA) and furthermore, socio-demographic and clinical factors, among depressed patients. The study was an exploration of data collected in FDMSA -study.

2. Materials and methods

2.1. Participants

The data used in this study were drawn from the Finnish Depression and Metabolic Syndrome in Adults (FDMSA) study and its 5-year follow-up (2012–2016). The FDMSA -study protocol/design has been reported in some earlier studies (Auvinen et al., 2018; Koponen, Kautiainen, Leppanen, Mantyselka, & Vanhala, 2015a; Koponen, Kautiainen, Leppänen, Mäntyselkä, & Vanhala, 2015b; Korniloff et al., 2017). The study was conducted in municipalities within the Central Finland Hospital District in Finland with catchment area of 274 000 inhabitants. The study population was enrolled from patients (n = 730) with depressive symptoms who scored ≥10 in the 21- item Beck Depression Inventory (BDI-21), were over 35 years of age and were either self-referred or had been referred by general practitioners to depression nurse case managers, who conducted a diagnostic structured interview (M.I.N.I.). Of this study population, 447 received a diagnosis of depression. The study protocol was approved by the Ethics Committee of the Central Finland Hospital District prior to the commencement of the study. All participants signed an informed written consent.

2.2. Data sources

At baseline, all the participants completed a standard self-administered questionnaire that contained questions about their health and health behavior. The questionnaire also contained questions on participants' socio-economic background such as marital status, years of education, household income, employment status, comorbid diseases, smoking habits and LTPA.

LTPA was assessed with the question:" How often do you do physical activity at least for half an hour so that you are out of breath and sweating?" Answers were classified as follows: low (twice per month or less), moderate (once or twice per week), or high (three times per week or more). Self-reported LTPA has shown a high correlation with physical fitness as measured by maximal oxygen uptake (Aires, Selmer, & Thelle, 2003).

Depressive symptoms were captured using the Beck Depression Inventory (BDI) (Beck, Ward, Mendelson, Mock, & Erbaugh, 1961) with a cut-off point of ≥10 (Koponen, Jokelainen, Keinanen-Kiukaanniemi, Kumpusalo, & Vanhala, 2008; Korniloff K et al., 2010; Väänänen, Buunk, Kivimäki, Vahtera, & Koskenvuo, 2008). The psychiatric diagnosis was confirmed with a diagnostic Mini-International Neuropsychiatric Interview (M.I.N.I.) (Sheehan et al., 1998). Severity of depression was evaluated using the Montgomery-Åsberg Depression Rating Scale (MADRS) (Montgomery & Åsberg, 1979).

Fasting blood samples were drawn after 12 h of fasting for glucose and lipid determination (Koponen, Kautiainen, Leppänen, Mäntyselkä, & Vanhala, 2015a). Glucose tolerance was tested using an oral glucose tolerance test (OGTT). The physical examination during the study visit also included measurements of the participants' weight, height, waist circumference and blood pressure. Weight and height were measured with the participant wearing light clothing and was accurate to the nearest 0.5 cm and 0.1 kg, respectively. Waist circumference was measured to the nearest 1.0 cm at the midpoint between the lateral iliac crest and the lowest rib. Blood pressure was measured twice by trained nurses after a 15-min rest time with a mercury sphygmomanometer with the participant in the sitting position.

Data on health care utilization were collected by two research nurses from participants' health care records over a 5-year period and calculated as person years. The frequency of visits and phone call contacts, and days of hospitalization were calculated separately for primary and specialized health care. Health care professionals were categorized as a physician (general, practitioner or specialized physician), psychiatrist, psychologist, depression nurse, substance abuse nurse or other (e.g. social worker, nutritionist).

2.3. Statistical methods

The results were presented as means with standard deviations (SD) or as counts with percentages. Statistical significance for the unadjusted hypothesis of linearity across the LTPA categories were evaluated using the Cochran-Armitage test for trend and analysis of variance with an appropriate contrast. Adjusted hypothesis of linearity (orthogonal polynomial) were evaluated using generalized linear models (e.g. analysis of co-variance and logistic models) with appropriate distribution and link function. Models included age, gender, years of education, marital status, comorbid diseases and household income as covariates. In the case of violation of the assumptions (e.g. non-normality), a bootstrap-type method was used (10 000 replications) to estimate standard errors. The normality of variables was evaluated by the Shapiro-Wilk W test. All analyses were performed using STATA 14.1.

3. Results

At baseline, 25% of the 447 participants with depression reported a low level of LTPA, 41% a moderate level and 34% a high level. A lower level of LTPA was linearly associated with higher BMI (p = 0.005),