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Bidirectional longitudinal relationship between leisure-time physical activity and psychotropic medication usage: A register linked follow-up study

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ABSTRACT

This study aimed to examine the bidirectional relationship between psychotropic medication use and changes in leisure-time physical activity (LTPA) among a population cohort study. Phase 1 data were collected by mail surveys in 2000–2002 among 40–60-year-old employees of the City of Helsinki, Finland, and phase 2 follow up survey was conducted in 2007. Based on self-report, the respondents were classified as inactive and active (≥14.75 MET-hours/week) at the phases 1 and 2. Hazard ratios (HR) were calculated for subsequent (2007–10) psychotropic medication purchasing according to changes in physical activity (phases 1–2). Odds ratios (OR) for physical inactivity at phase 2 were calculated according to the amount of psychotropic medication between phases 1–2. Overall, 5361 respondents were included (mean age 50 years, 80% women). Compared with the persistently active, the persistently inactive, those decreasing and adopting LTPA had an increased risk for psychotropic medication. Only the persistently inactive remained at increased risk for psychotropic medication use, following the adjustment for prior psychotropic medication use. Compared with those having no medication, the risk for physical inactivity increased as the psychotropic medication increased. Our data suggest that physical activity has an important role in maintaining wellbeing and reducing psychotropic medication usage.

1. Introduction

Physical activity has a range of benefits for health and well-being (Penedo and Dahn, 2005). Conversely, physical inactivity is attributed as the fourth leading cause of preventable mortality in the world, largely due to the increased cardiovascular risk profile (Kohl et al., 2012). Recently, interest has begun regarding the beneficial influence of physical activity on promoting good mental health. For instance, Mammen and Faulkner (2013) found in a systematic review that physical activity has a protective effect from future depression. The evidence base for physical activity and good mental health is increasing, with more and more interest developing to see if physical activity can prevent the onset of poor mental health outcomes. Moreover, in those with a pre-existing mental illness, exercise (a structured form of physical activity) has been demonstrated to improve depressive symptoms (Bridle et al., 2012; Rosenbaum et al., 2014; Carter et al., 2015; Schuch et al., 2016) and symptoms of schizophrenia including cognition (Firth et al., 2015, 2016).

While promoting physical activity and exercise are gaining credibility, pharmacotherapy remains the cornerstone for the multidisciplinary treatment of many people with mental health problems. In the past decade, the use of psychotropic medication has substantially increased, partly owing to the regulatory broadening of the indications for several psychotropic medications (Mojtabai and Olfson, 2010; Wu et al., 2013). Psychotropic medication is typically effective in alleviating mental health symptoms but also often has various side effects. In particular antipsychotics and to a lesser extent antidepressants and mood stabilizers, are associated with an increased risk for several

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chronic physical diseases, obesity, diabetes and cardio-metabolic diseases (Correll et al., 2015; Vancampfort et al., 2015a, 2015b). Higher dosages, polypharmacy, and treatment of vulnerable (e.g., old or young) individuals are associated with greater absolute (elderly) and relative (youth) risk. To what degree medication-specific and patient-specific risk factors interact, and how adverse outcomes can be minimized, allowing patients to derive maximum benefits from these psychotropic medications, requires adequate clinical attention and further research (De Hert et al., 2011). For example, since it is known that physical inactivity is an important risk factor for a wide range of chronic diseases and premature mortality (Kodama et al., 2009; Lahti et al., 2014), research is required to investigate whether psychotropic medication is a risk factor for lower physical activity and therefore future increased risk of cardiovascular disease outcomes. Surprisingly, no longitudinal, population cohort studies have considered whether higher levels of physical activity are associated with lower psychotropic medication use and if psychotropic medication is associated with less physical activity in the future. Understanding this relationship may have potential importance for mental health promotion, in addition to help identify if those in receipt of psychotropic medication are at risk of declining physical activity and therefore more at risk of cardio-metabolic diseases.

Given the aforementioned, we set out to explore the bidirectional relationship between (a) changes in leisure-time physical activity and subsequent psychotropic medication use, and (b) psychotropic medication use and subsequent physical inactivity using data from the Helsinki Health Study (Lahelma et al., 2013).

2. Methods

2.1. Study population

The data from the current study were collected as part of the Helsinki Health Study. The Helsinki Health Study cohort was set up to enable longitudinal studies on the social and work related determinants of health and well-being, making use of self-reported as well as objective register data. The target population is the staff of the City of Helsinki, Finland (Lahelma et al., 2013). Follow-up survey data were collected from midlife employees of the City of Helsinki, Finland, at two time points: phase 1 (2000–2002) and phase 2 (2007) (Lahelma et al., 2013). Phase 1 data were collected by postal questionnaire surveys in 2000, 2001 and 2002. Questionnaires were mailed to all employees of the City of Helsinki who reached the age of 40, 45, 50, 55 and 60 during each survey year. The study has been approved by the ethics committees of the Department of Public Health, University of Helsinki and the health authorities of the City of Helsinki.

2.2. Leisure-time physical activity

The respondents were asked about their average weekly hours of leisure-time physical activity (commuting included) within the previous 12 months. Four intensity grades were given: walking, brisk walking, jogging, and running, or their equivalent activities. Approximate metabolic equivalents (MET-hours per week) were calculated for the volume of weekly leisure time physical activity. MET-hours per week were calculated by multiplying the time spent physically active by the estimated MET value of each four intensity grades (Kujala et al., 1998) and adding the four values together (Ainsworth et al., 2000). Respondents were classified as inactive according to the lowest tertile (under 14.75 MET-hours/week) or active when above this threshold (at least 14.75 MET-hours/week (Lahti et al., 2014). These two groups at the phases 1–2 yielded four groups describing persistency and changes over time in leisure-time physical activity.

2.3. Psychotropic medication

The purchases of prescribed psychotropic medication were classified according to the Anatomical Therapeutic Chemical (ATC) classification system (WHO Collaborating Centre for Drug Statistics Methodology, 2009). Any psychotropic medication included ATC codes N05 and N06 except medication for dementia N06D. The follow-up started on the day of returning the phase 1 questionnaire and continued for the entire year 2010. For examining the two separate research questions, psychotropic medication purchases were calculated separately for the period between phases 1–2 and the period after phase 2. For the first period (phases 1–2), the amount of psychotropic medication was calculated as defined daily doses (DDD's) i.e. the assumed medication dose per day used for its main indication. The DDD's were classified into four groups according to tertiles of medication use: 1. No medication, 2. Low < 100 DDD's, 3. Medium=100–700 DDD's and 4. High > 700 DDD's. For the second period, the time to the first purchase was examined.

2.4. Covariates

Covariates included age, gender, socioeconomic position (SEP), smoking, binge drinking, body mass index (BMI) and physical functioning. The information on socioeconomic position (SEP) was taken from the phase 1 survey including four occupational social classes: managers (managerial and administrative work) and professionals (e.g. teachers and doctors), semi-professionals (e.g. nurses and foremen), routine non-manual (e.g. child minders and assistant maids) and manual workers (e.g. transport and cleaning work) (Lahelma et al., 2013). Smoking status change between phases 1 and 2 was classified into four groups: 1. non-smokers, 2. became non-smokers, 3. became smokers and 4. smokers. Similar procedure was applied for binge drinking (≥6 portions of alcohol more than once a month) (Paljärvi et al., 2009), being overweight (BMI ≥25 kg/m^2) (Svärd et al., 2016) and lowered physical functioning (under the maximum score of 100) measured by the physical functioning subscale of the Short-Form (SF-36) health questionnaire (Ware, 2000).

2.5. Statistical methods

For estimating the effect of changes in physical activity (phases 1–2) on the risk of subsequent psychotropic medication use we used Cox regression analysis to calculate hazard ratios (HR) and their 95% confidence intervals (95% CI) for first psychotropic medication purchase during the follow-up period 2007–2010. The persistently active group was used as the reference group. In model 1 age and gender were adjusted for. In model 2 covariates in model 1 and prior psychotropic medication (phases 1–2) were adjusted. In model 3 covariates in model 1 and physical functioning were adjusted. In model 4 covariates in model 2 and physical functioning, socioeconomic position, smoking, binge drinking and body mass index were adjusted. The proportional hazards assumption was confirmed using Schoenfeld residuals (Schoenfeld, 1982).

For estimating the effect of psychotropic medication use (phases 1–2) on the risk for physical inactivity (phase 2) we calculated odds ratios (OR) and their 95% CI's for physical inactivity according to the amount of psychotropic medication purchases. Psychotropic medication purchase groups were compared to those without medication purchases. In model 1 age and gender were adjusted for. In model 2 covariates in model 1 and physical functioning were adjusted for. In model 3 covariates in model 1 and physical inactivity (phase 1) were adjusted. In model 4 covariates in model 1 and socioeconomic position, smoking, binge drinking and body mass index were adjusted for. SPSS 23 statistical package was used.