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Associations of physical activity and depression: Results from the Irish Longitudinal Study on Ageing

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ABSTRACT

Physical activity (PA) can protect against depression, but few studies have assessed whether meeting PA guidelines is sufficient, or if benefits can be derived from greater volumes of PA. The present study examines cross-sectional and prospective associations between different volumes of moderate-to-vigorous PA (MVPA) and walking, and depressive symptoms and status. Participants (n = 4556; 56.7% female) aged ≥ 50 years completed the International PA Questionnaire (IPAQ) at baseline and the Center for Epidemiological Studies Depression Scale at baseline and two years later. Prevalence and incidence of depression were 9.0% (n = 410) and 5.0% (n = 207), respectively. After full adjustment, odds of prevalent depression were: 40% (OR = 0.60, 95%CI: 0.48–0.76) lower among those meeting PA guidelines; 23% (OR = 0.77, 0.49–1.21) and 43% (OR = 0.57, 0.45–0.73) lower among those in moderate and high categories, respectively; and, 22% (OR = 0.78, 0.61–1.01) and 44.0% (OR = 0.56, 0.42–0.74) lower among those in moderate and high walking tertiles, respectively. Odds of incident depression were: 23% (OR = 0.77, 0.58–1.04) lower among those meeting PA guidelines; 37% (OR = 0.63, 0.32–1.22) and 20.0% (OR = 0.80, 0.59–1.09) lower among those in moderate and high categories, respectively; and, 21% (OR = 0.79, 0.56–1.12) and 25% (OR = 0.75, 0.52–1.07) lower among those in moderate and high walking tertiles, respectively. Moderate and high volumes of MVPA were significantly associated with lower odds of concurrent depression, and significantly and non-significantly associated with reduced odds of incident depression, respectively. Meeting recommended levels of MVPA and walking were associated with significantly lower odds of concurrent depression, and non-significantly reduced odds of the development of depression over two years.

1. Introduction

Depression and depressive symptoms are recognized by the World Health Organization (WHO) as one of the greatest contributors to overall global disease burden, affecting over an estimated 300 million people worldwide (WHO, 2017). The 12-month prevalence of major depressive disorder (MDD) is highest among those aged 18–64 years, but approximately 2.3% of people aged ≥ 65 years experience MDD in a 12-month period (Kessler et al., 2012). Among older adults depression is associated with increased risk of frailty (Soysal et al., 2017), morbidity, and suicide (Chapman and Perry, 2008), and decreased physical, social, and cognitive functioning (Blazer, 2003). Moreover, the financial burden associated with depression continues to grow, accounting for at least 1% of the total European economy (Sobocki et al., 2006). As health services continue to adapt and respond to the implications of an ageing population within the European Union, research into health promotion and disease prevention in older populations is required (Rechel et al., 2013).

Despite this, evidence has shown that many people with mood disorders do not seek treatment (Wang et al., 2005b). Studies show that among those that do, delays can range from six to eight years (Wang et al., 2005a), many do not have their needs met by evidence-based treatment (Forsell, 2006), and depression can persist in approximately 67% after first-line treatment (Trivedi et al., 2006) and at least 30% can remain depressed even after four rounds of distinct treatments (Rush et al., 2006). A recent umbrella review examined potential environmental risk factors for depression, finding that, despite the large number of putative risk factors investigated in the literature, few

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associations are supported by robust evidence (Köhler et al., 2018). The factors with the most convincing evidence were largely stressors, such as children exposed to physical abuse, military personnel exposed to combat, recently widowed adults, obese individuals, and people with 4–5 five metabolic risk factors. Thus, there is a critical need to identify both risk factors for depression and the healthful behaviours that may attenuate those risk factors to better inform interventions for prevention and treatment.

A recent meta-analysis reviewed twenty-two prospective cohort studies in older adults that largely support the protective effects of PA on depression, with all except for one (García-Peña et al., 2013) reporting reductions in incident depression (Schuch et al., 2018). However, just six studies used validated instruments to measure PA dose (i.e., a product of PA duration and intensity; Groffen et al., 2013; Joshi et al., 2016; Park et al., 2015; Pasco et al., 2011; Rius-Ottenheim et al., 2013; Tsutsumimoto et al., 2017). Available evidence suggests that meeting WHO recommended PA levels (WHO, 2010) may protect against other mental health outcomes such as generalized anxiety disorder which is highly comorbid with depression (McDowell et al., 2018b) and convey additional benefit for depressive symptoms. For example, depressive symptom reductions following exercise training were significantly larger among chronically-ill patients who were meeting recommended PA levels (Herring et al., 2012) and recent evidence showed significantly larger improvements in depressive symptoms following internet-based cognitive behavioural therapy and usual care among depressed patients engaging in PA levels that corresponded to consensus recommendations for maximizing general health (Hallgren et al., 2016; Herring et al., 2012). Further, people with major depression are less likely to meet recommended levels of PA (Vancampfort et al., 2017) which is a particular worry given that depression is associated with increased risk of cardiovascular disease (CVD) and death from CVD (Correll et al., 2017) and the well-established role of PA in protecting against CVD. Despite this, of the six prospective-cohort studies that measured PA dose, none examined the benefits of meeting WHO guidelines. This information is important for clinical practice and public health recommendations.

Therefore, the present study used data from two waves of The Irish Longitudinal Study of Ageing (TILDA) to examine associations between: 1) meeting PA guidelines, 2) different volumes of MVPA, and 3) weekly minutes spent walking, and prevalent and incident depressive symptoms and status, both within age and sex categories, and across the total population.

2. Methods

This study used STROBE recommendations to guide reporting (Von Elm et al., 2008).

2.1. Study population

TILDA is an ongoing cohort study that contains a nationally representative sample of community dwelling adults aged ≥ 50 years, and their partners of any age, resident in the Republic of Ireland. An initial multi-stage probability sample of addresses was chosen by means of the RANSAM sampling procedure (Whelan, 1979), with District Electoral Divisions selected at the first stage and household addresses selected at the second stage. The response rate was 62.0%. Participants gave full informed consent to participate in the study and ethical approval was obtained from the Trinity College Dublin Faculty of Health Sciences Research Ethics Committee. For the present analyses we report data from Wave 1 (2009–2010) (Barrett et al., 2011) and Wave 2 (2012 − 2013) (Nolan et al., 2014). PA and depression data at Waves 1 and 2 were available for 6977 respondents. Following exclusion of participants with incomplete covariate data (n = 2416), the final sample size for the current study consisted of 4556 individuals (56.7% female). Respondents who reported depression at baseline (n = 415) were excluded from longitudinal analyses, leaving a sample of 4146.

2.2. Study measures

2.2.1. Physical activity

PA was measured using the short-form International Physical Activity Questionnaire (IPAQ-SF) (Craig et al., 2003). Respondents who reported walking or MVPA greater than a combined 16 h/day were excluded (n = 11). The remaining respondents were classified as meeting PA guidelines (i.e., reporting ≥150 min weekly of MVPA, ≥75 min weekly of vigorous PA, ≥600 MET.minutes weekly). Three dose categories, Low (0 to < 600 MET.minutes weekly), Moderate (600 to < 1200 MET.minutes weekly), or High (≥1200 MET.minutes weekly) (WHO, 2010). Weekly minutes of walking were divided into tertiles (i.e., 0–110 min, 120–400 min, 420 + minutes).

2.2.2. Depression

At Waves 1 and 2, depression symptoms were assessed using the Center for Epidemiological Studies Depression Scale (CES-D) (Radloff, 1977). Reliability coefficients of the CES-D are high (0.85–0.91) among older adults (Radloff and Teri, 1986). We used a score of ≥16 to define caseness of depression (Radloff, 1977). Respondents above this cut-off score are referred to as depressed throughout the current manuscript; however, they are at increased risk of depression but do not have clinically diagnosed depression. This cut-score demonstrates 100% sensitivity and 87.6% specificity in older populations (Beekman et al., 1997). Positive predictive values can be low (13.2%) and negative predictive values can be high (99–100%) (Beekman et al., 1997).

2.2.3. Covariates

Age was divided into four categories (i.e., 50–59 years., 60–69 years., 70–79 years., and 80 + years). Waist circumference was classified as low- or increased-risk according to WHO guidelines (i.e., Males: > 94 cm; Females: > 80 cm) (WHO, 2000; Grundy et al., 2005). Social class was defined according to the European Socioeconomic Classification (ESeC) scheme (Rose and Harrison, 2007). The ESeC classifies people into seven categories according to their positions within labour markets and with special attention to their employment relations. In order to improve sample coverage, those who were not in paid employment were allocated to a “Not Working” group (n = 1254). Smoking status was assessed by self-reported current or never/previous smoker. Participants reported whether a doctor had ever told them that they have angina, asthma, cancer/a malignant tumour, diabetes/high blood sugar, hypertension, osteoporosis, or a stroke. The number of these comorbidities was summed.

2.3. Statistical analysis

Statistical analyses were conducted using SPSS Version 22.0 (Armonk, NY: IBM Corp.). Chi-square tests examined differences in meeting PA guidelines, depression, sex, age, waist circumference, social class, and smoking categories between those included and excluded from analyses (i.e., those with complete IPAQ-SF (Wave 1) and CES-D (Waves 1 and 2) data but missing covariate data). Chi-square tests examined differences in sex, age, waist circumference, social class, and smoking categories between those with and without depression. For significant Chi-square tests, Z tests were calculated for column proportions for each row in the Chi-square contingency table and adjusted using a Bonferroni correction (Sharpe, 2015).

2.3.1. Cross-sectional and longitudinal walking, PA guidelines, and dose categories analyses

One-way ANOVAs and Fisher's LSD planned contrasts quantified differences in Waves 1 and 2 depressive symptoms between those meeting and not meeting PA guidelines, dose categories, and walking tertiles. Hedges' g effect sizes and associated 95% confidence intervals