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The five-factor model of personality and physical inactivity: A meta-analysis of 16 samples

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ABSTRACT

A sedentary lifestyle is harmful for health; personality traits may contribute to physical (in)activity. With participant-level data from 16 samples ($N > 125{,}000$), we examined the personality correlates of physical inactivity, frequency of physical activity, and sedentary behavior (in a subset of samples). Lower Neuroticism and higher Conscientiousness were associated with more physical activity and less inactivity and sedentary behavior. Extraversion and Openness were also associated with more physical activity and less inactivity, but these traits were mostly unrelated to specific sedentary behaviors (e.g., TV watching). The results generally did not vary by age or sex. The findings support the notion that the interest, motivational, emotional, and interpersonal processes assessed by five-factor model traits partly shape the individual's engagement in physical activity.

Introduction

The World Health Organization (WHO, 2015) estimates that approximately 31% of the world's population is physically inactive. Physical inactivity, defined as insufficient physical activity or minimal body movements, is the pole of the activity spectrum most detrimental to health (Dietz, 1996; Must & Tybor, 2005; Schmid, Ricci, & Leitzmann, 2015). Those who are classified as insufficiently active fail to reach the recommended 150 min of moderate intensity (or 75 min of vigorous intensity) activity per week. This includes activity accumulated during leisure or work time, active transportation, household chores, sport, play, or regular exercise (WHO, 2010). Such inactivity is associated with increased risk for obesity, cardiovascular disease, type 2 diabetes, breast and colon cancers, and mortality (Healy et al., 2008; Hu, Li, Colditz, Willett, & Manson, 2003; Jakes et al., 2003; Lee et al., 2012). The distinction between frequency of physical activity and the relative absence of physical movements reflects evidence that level of physical activity and time spent inactive are independent predictors of health outcomes (Biswas et al., 2015; Dietz, 1996; Schmid et al., 2015). For example, even among individuals who engage in some physical activity also engaging in activities that are more sedentary, such as time spent sitting or watching television, doubles the risk for cardiovascular mortality and increases risk for all-cause mortality by 50% (Matthews et al., 2012). Many factors contribute to an inactive lifestyle, including psychological, as well as contextual factors (Bauman et al., 2012). A better understanding of the psychological correlates of physical inactivity will inform more effective prevention and intervention programs to increase physical activity.

Among the factors associated with lifestyle behaviors, an individual's characteristic ways of thinking, feeling, and behaving are associated consistently with greater frequency of physical activity (Rhodes & Smith, 2006; Wilson & Dishman, 2015). Several of the traits that define the Five Factor Model of personality (McCrae & Costa, 2008) are routinely implicated in engaging in more physical activity. Individuals who are high in Neuroticism (the tendency to experience negative emotions and stress) tend to avoid physical activity, whereas individuals who are high in Extraversion (the tendency to experience positive emotions and be outgoing) and Conscientiousness (the tendency to be organized and disciplined) tend to engage in more physical activity (Rhodes & Smith, 2006). Trait Openness (the tendency to be open-minded and creative) has recently also been associated with greater physical activity (Wilson & Dishman, 2015). In contrast to the other traits, Agreeableness (the tendency to be cooperative) tends to be unrelated to physical activity. Less is known, however, about the risk of

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physical inactivity and sedentary behavior associated with personality. That is, the personality correlates of physical inactivity may or may not mirror the correlates associated with physical activity.

To that end, we report a meta-analysis of 16 large-scale studies from the US, the UK, Germany, the Netherlands, Australia, and Japan, totaling more than 125,000 participants. None of these samples were included in previous meta-analyses of personality and physical activity. Many large-scale national panel and cohort studies now include brief measures of both personality and physical activity. We address whether it is possible to detect a signal between personality and physical inactivity even with such rudimentary measures. We address the relation between personality and physical (in)activity in three ways. First, we focus on lack of physical activity because of the high worldwide prevalence of inactivity (Hallal et al., 2012). In addition, this group tends to be at the greatest risk for poor health outcomes and has the most to gain by incorporating even light physical activity into their daily routines (Lee et al., 2012; Powell, Paluch, & Blair, 2011). Second, as a point of comparison, we examine the association between personality and amount of physical activity typically engaged in. Third, in a subset of five of the 16 studies, we examine how personality traits are associated with measures of sedentary behavior (e.g., amount of time spent sitting). Across all analyses, we test whether these associations are moderated by sex or age.

1. Method

1.1. Participants and procedure

Participants were drawn from 16 national surveys. The studies included in the analysis were the Health and Retirement Study (HRS), the Midlife in the United States (MIDUS) study, the Wisconsin Longitudinal Study Graduate sample (WLS-G) and Sibling sample (WLS-S), the National Longitudinal Survey of Youth-Children and Young Adult (NLSY-CYA) study, the National Study of Adolescent to Adult Health (Add Health), the National Health, Aging, and Trends Study (NHATS), the Midlife in Japan (MIDJA) study, the British Household Panel Survey (BHPS), the National Child Development Study (NCDS), the English Longitudinal Study of Ageing (ELSA), the German Socio-Economic Panel Survey (GSOEP), the Longitudinal Internet Studies for the Social Sciences (LISS), the Household, Income and Labour Dynamics in Australia (HILDA) study, and the Osaka Center of Excellence (COE) study. In addition to the surveys, additional data come from a large national sample from the United States (US National). Specific information about each study can be found in supplemental material.

Across all cohorts, there were a total of 126,731 participants. See Table 1 for the demographic characteristics of each cohort.

1.2. Measures

1.2.1. Personality

Although the measure of personality varied across the different cohorts, each study included an established measure of the traits that define the Five Factor Model. Personality was measured with the 20-item mini-IPIP scale (Donnellan, Oswald, Baird, & Lucas, 2006) in Add Health, the 50-item IPIP scale (Goldberg et al., 2006) in the NCDS and LISS, the Ten-Item Personality Inventory (TIPI; Gosling, Rentfrow, & Swann, 2003) in NLSY-CYA and COE (Oshio, Abe, & Cutrone, 2012), a 15-item version of the Big Five Inventory (BFI; John & Srivastava, 1999) in the GSOEP and BHPS, a 29-item version in both WLS samples, and the full 44-item version in the US national sample, a version of the Midlife Development Inventory (MIDI; Lachman & Weaver, 1997) in the HRS (26-items), MIDUS (25-items), NHATS (10-item), MIDJA (25-items), and ELSA (26-items), and a 36-item version of Saucier's (Saucier, 1994) adjective list in HILDA. The personality scores were standardized in each sample so that each unit corresponded to one standard deviation. See the online supplementary materials for a full description of the measure of personality traits in each cohort.

1.2.2. Physical activity and inactivity

Participants reported their level of physical activity in several ways across the different cohorts (see supplemental material for the exact item(s) for each cohort). Despite this heterogeneity, all items were anchored on one end with some variation of "Never" or "Almost Never." For each cohort, such responses were recoded as 1 to indicate lack of physical activity and all other responses were recoded as 0 to indicate at least some physical activity (CDC, 2005). We also used the full range of each scale (from the variants of never to frequently) coded in the direction of greater physical activity to examine how personality traits were associated with physical activity.

1.2.3. Sedentary behavior

Five studies (n = 47,753) had items that captured some aspect of sedentary behavior (e.g., time spent sitting, frequency of watching TV). See supplemental material for the exact item(s) for each cohort.

1.3. Statistical approach

To test the association between personality and physical inactivity, logistic regression was used to predict physical inactivity from the five traits in each individual study, controlling for relevant demographic information: age, sex, education, and race (Black vs. white in the US samples). Similar analyses were run for both frequency of physical activity and sedentary behavior, except linear regression was used because the scales were continuous. All analyses were cross-sectional. For all outcomes, the analysis was run separately for each trait and then all traits simultaneously in one analysis. To test whether sex moderated the association between personality and physical activity/inactivity, an interaction between each trait and sex was tested in the individual samples. Similar procedures were followed for age, except we did not include samples with insufficient variability in age (i.e., Add Health, the WLS-G, and the NCDS). These analyses were conducted using SPSS version 21.

The results from each sample were meta-analyzed using the Comprehensive Meta-Analysis software for the analyses of physical inactivity and physical activity. A meta-analysis was not done for the measures of sedentary behavior because the items measuring sedentary behavior varied substantially across the five studies and were thus not easily comparable within a meta-analysis. A random-effects meta-analysis was done based on the odds ratio, confidence interval, and sample size of each cohort for physical inactivity. A random-effects meta-analysis was likewise done based on t-value, p-value, and sample size of each cohort for physical activity. For these outcomes, a meta-analysis was done for each trait when analyzed separately and when all five traits were included in the same model. A meta-analysis was likewise done for the interactions between the traits and sex and age. Finally, a meta-regression was done within the meta-analysis to test whether the associations differed by sample-level age and sex. Heterogeneity was assessed using the Q statistic and I^2.

2. Results

The descriptive statistics for the demographic variables and for physical inactivity are shown in Table 1. Similar to the WHO