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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

Table 1
Demographic characteristics of the 16 samples included in the meta-analysis.

Factor	Add Health	NLSY-CYA	MIDUS	HRS	WLS-G	WLS-S	NHATS	US National	BHPS	NCDS	ELSA	GSOEP	LISS	HILDA	MIDJA	COE
Age	29.10	23.73	46.83	68.65	53.21	53.46	79.48	44.60	48.11	–	65.49	48.64	46.12	43.96	54.18	53.20
	(1.75)	(4.80)	(12.90)	(9.90)	(0.63)	(7.35)	(7.52)	(15.25)	(17.57)		(9.01)	(16.77)	(15.92)	(18.03)	(14.09)	(12.81)
Sex (female) (%)	53	50	53	58	53	53	59	50	55	52	54	52	54	53	51	54
Race (African American) (%)	21	33	5	11	–	–	20	19	–	–	–	–	–	–	–	–
Education	5.67	12.23	6.87	12.80	13.71	13.79	5.20	3.54	5.30	2.31	4.32	12.12	3.85	6.29	4.49	3.31
	(2.19)	(2.27)	(2.47)	(2.97)	(2.31)	(2.54)	(2.26)	(1.28)	(2.51)	(1.77)	(2.22)	(2.70)	(1.53)	(2.66)	(2.06)	(0.62)
Inactive (%)	15	11	11	19	51	47	64	47	19	22	7	42	17	11	60	57
Country	USA	USA	USA	USA	USA	USA	USA	USA	UK	UK	UK	Germany	Holland	Australia	Japan	Japan
N	15,590	6055	6102	12,543	6504	3350	2761	5131	11,520	8750	6711	18,586	6485	11,265	1000	4382

Note. Total *N* = 126,731. Add Health = National Longitudinal Study of Adolescent to Adult Health. NLSY-CYA = National Longitudinal Survey of Youth Children and Young Adult sample. MIDJA = Midlife in Japan. BHPS = British Household Panel Survey. NCDS = National Child Development Study. HILDA = Household Income and Labor Dynamics in Australia. GSOEP = German Socio-Economic Panel. ELSA = English Longitudinal Survey of Youth. US National = national sample of US adults. LISS = Longitudinal Internet Studies for the Social sciences. MIDUS = Midlife in the Unites States survey. HRS = Health and Retirement Study. WLS-G = Wisconsin Longitudinal Study-Graduate sample. WLS-S = Wisconsin Longitudinal Study-Sibling sample. NHATS = National Health and Aging Trends Study. COE = Osaka Center of Excellence. Values are means (SDs) or percentages.

estimate, across all samples, 31.44% of participants on average were inactive. There was considerable variability across the samples; however, comparisons across samples were unwarranted given the differences in the question used and the characteristics of the samples. Despite this variability, the pattern of associations between personality and inactivity was quite similar across the 16 samples: participants who scored higher in Neuroticism were at greater risk for physical inactivity, whereas participants who scored higher in Extraversion, Openness, Agreeableness, and Conscientiousness were less likely to be physically inactive (Table 2, Fig. 1, and Tables S1–S5). All associations were in the same direction for each trait across the 16 samples, but there was significant heterogeneity. When the five traits were entered simultaneously, all associations remained significant except for Agreeableness (Table S6).

A similar pattern to physical inactivity emerged when frequency of physical activity was tested as a continuous measure: All five traits were associated with frequency of physical activity (Tables 3 and S7–S11). Specifically, participants who scored higher in Extraversion, Openness, Agreeableness, and Conscientiousness were more physically active, whereas individuals higher in Neuroticism were less active. The pattern of associations was again similar when all traits were entered simultaneously into the model, with the exception of Agreeableness (Table S12).

A slightly different pattern emerged for the measures of sedentary behavior (Table 4). Similar to physical activity/inactivity, higher Neuroticism and lower Conscientiousness were both associated consistently with greater time spent in sedentary behavior. In contrast, the expected association between Extraversion and sedentary behavior was only apparent in one out the five samples. Openness likewise had inconsistent associations and even a positive relation in two of the samples. Agreeableness was primarily unrelated to sedentary behavior.

Finally, there was little evidence that the strength of the associations varied by age or sex. The meta-analysis of the interactions in the individual cohorts indicated that the association between Neuroticism and risk of physical inactivity was stronger among younger than older participants (Table S13); this interaction was not apparent in the meta-analysis of age interactions on physical activity (Table S14). The meta-regression further suggested that the protective effect of Conscientiousness increased with the age of the sample; this effect was not apparent in the meta-regression for physical activity. There was also little indication that the association between personality and physical activity/inactivity was moderated by sex; the associations were similar for men and women (Table S15), both in the meta-analysis of the individual interactions and in the meta-regressions. The one exception was in the meta-analysis of sex interactions on physical activity: the association between Openness and physical activity was slightly stronger among women (Table S16).

3. Discussion

Consistent with previous research on physical activity, the traits that define the Five Factor Model of personality were also associated with an increased risk of a physically inactive lifestyle. The results were remarkably consistent across 16 large national datasets. For every standard deviation difference in the trait, there was up to a 27% increased risk of being physically inactive. Higher Neuroticism and lower Conscientiousness were further associated with more time spent in actual sedentary behaviors. These results are consistent with previous research on the physical activity correlates of personality (Rhodes & Smith, 2006; Wilson & Dishman, 2015) and further suggest that personality increases risk of a less active lifestyle.

Table 2
Random-effects meta-analysis of the personality predictors of physical inactivity.

Trait	Odds ratio	Lower limit	Upper limit	Z-Value	p-Value	Q-value	I^2
Neuroticism	1.177	1.134	1.221	8.612	0.000	91.559**	83.617
Extraversion	0.793	0.746	0.842	−7.580	0.000	252.274**	94.054
Openness	0.812	0.787	0.837	−13.266	0.000	59.324**	74.715
Agreeableness	0.899	0.855	0.945	−4.198	0.000	165.536**	90.939
Conscientiousness	0.818	0.769	0.869	−6.472	0.000	268.123**	94.406

Note. N = 126,731. Coefficients are from a random-effects meta-analysis of each trait predicting physical inactivity controlling for age, sex, race, and education.
** $p < 0.01$.

Consistent with the literature on Conscientiousness and engagement in more frequent physical activity (Rhodes & Smith, 2006; Wilson & Dishman, 2015), the present research indicates that Conscientiousness is not just associated with greater frequency of physical activity but is also protective against physical inactivity, measured as either overall lack of activity or sedentary behavior. Individuals high in Conscientiousness tend to be organized and disciplined, which extends to engagement in physical activity. Their motivations for physical activity tend to come from internal, rather than external, sources (Ingledew & Markland, 2008) and center on concerns about being healthy rather than concerns over appearance or weight (Courneya & Hellsten, 1998). Individuals who score low in Conscientiousness perceive more barriers to exercising (Courneya & Hellsten, 1998) and perceive themselves to be in less control over actually being able to do it (Rhodes, Courneya, & Jones, 2003); the result may be greater inactivity and sedentary behavior.

Similar to low Conscientiousness, individuals high in Neuroticism tend to engage in sedentary activities and are at risk of physical inactivity more generally. Individuals prone to feeling negative emotions do not find physical activity to be enjoyable (Rhodes et al., 2003) and tend to perceive more barriers to being active (Courneya & Hellsten, 1998). Their motivations center on concerns about their appearance and feeling obligated and guilty if they do not exercise (Ingledew & Markland, 2008). Individuals who are higher in Neuroticism tend to hold more avoidance-related goals when it comes to physical activity, with motivations to exercise to avoid looking bad to others (Lochbaum, Litchfield, Podlog, &

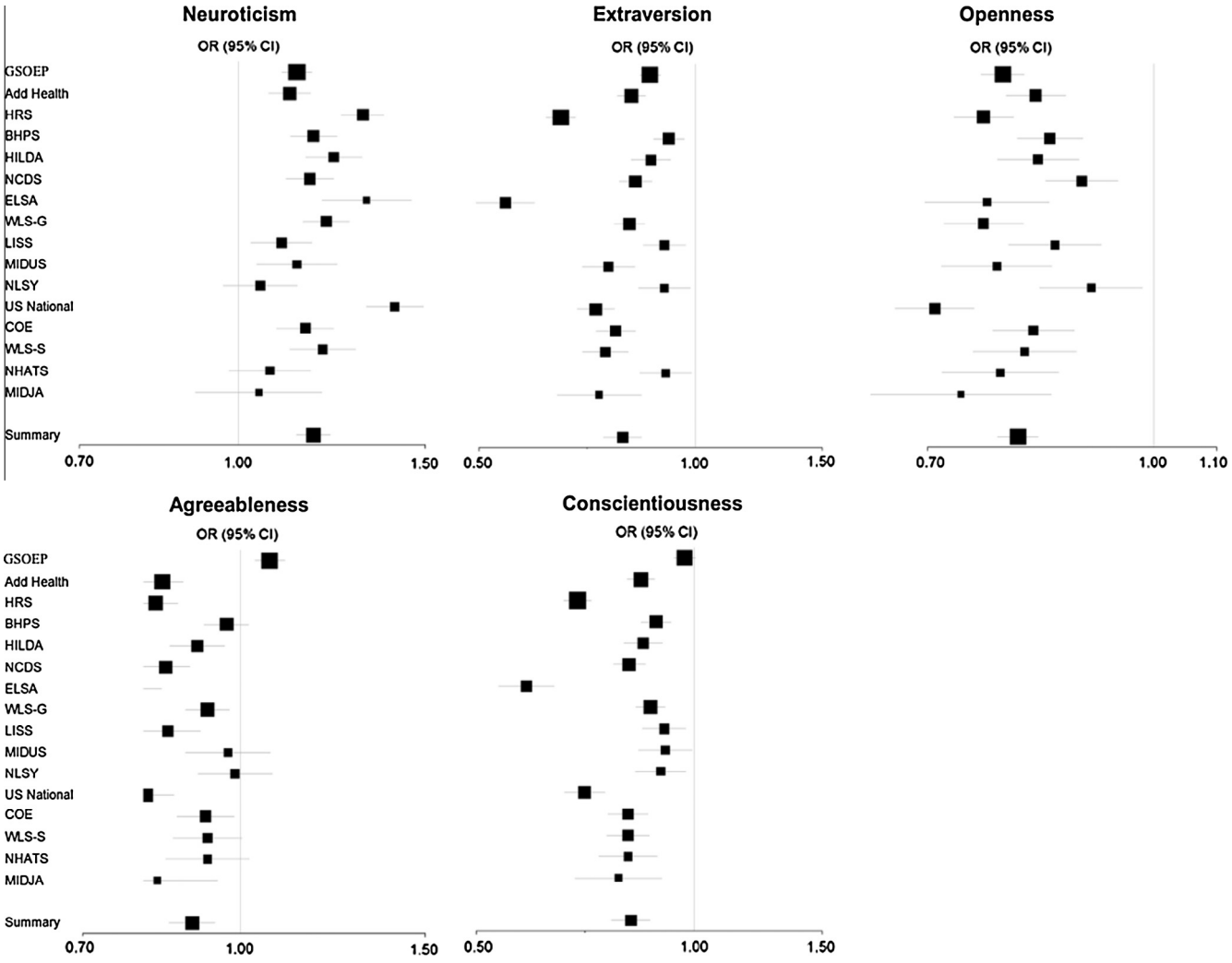

Fig. 1. Association between personality and physical inactivity.

Table 3
Random-effects meta-analysis of the personality predictors of physical activity.

Trait	β	Lower limit	Upper limit	t-Value	p-Value	Q-value	I^2
Neuroticism	−0.07	−0.09	−0.05	−8.629	0.000	114.71**	86.92
Extraversion	0.11	0.08	0.14	7.998	0.000	351.45**	95.73
Openness	0.09	0.08	0.11	11.441	0.000	111.68**	86.57
Agreeableness	0.04	0.03	0.06	5.577	0.000	103.50**	85.51
Conscientiousness	0.10	0.07	0.12	7.840	0.000	267.50**	94.39

Note. N = 126,731. Coefficients are from a random-effects meta-analysis of each trait predicting physical inactivity controlling for age, sex, race, and education.
** $p < 0.01$.

Table 4
Association between personality and sedentary behavior.

Sample	Trait				
	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
Add Health	0.05**	−0.01	0.07**	0.00	−0.10**
US National	0.13**	−0.16**	−0.02	−0.01	−0.08**
ELSA	0.06**	−0.02	−0.02	0.01	−0.07**
LISS	0.07**	0.02	0.03*	−0.03*	−0.06**
GSOEP	0.03**	0.00	−0.04**	0.00	0.01

Note. n = 15,052 for Add Health; n = 5071 for US National. n = 6711 for ELSA; n = 6359 for LISS; n = 14,560 for GSOEP. In the individual samples, beta coefficients are from linear regression predicting physical inactivity from personality controlling for age, sex, race, and education.
* $p < 0.05$.
** $p < 0.01$.

Lutz, 2013). The end result is greater risk of physical inactivity. The present results further suggest that individuals high in Neuroticism tend to spend more time sitting, watching TV, and engaging in other behaviors that do not require much movement of the body. These results for Neuroticism are also consistent with evidence that sedentary behavior is associated with an increased risk of depression (Teychenne, Ball, & Salmon, 2010).

The association between Extraversion and physical inactivity was more complex than for Neuroticism and Conscientiousness. Similar to previous research on physical activity (Rhodes & Smith, 2006; Wilson & Dishman, 2015), Extraversion had the strongest association with inactivity: For every standard deviation increase in this trait, there was a nearly 30% reduced risk of being inactive. Extraversion was likewise consistently associated with greater frequency of physical activity. Individuals who are extraverted may particularly enjoy the increase in positive emotions that occurs after engaging in physical activity (Wichers et al., 2012). Individuals who score lower in Extraversion, in contrast, may not find physical activity as rewarding and thus may not be motivated to engage in it. Extraversion was less consistently related with the measures of sedentary behavior. Of note, Extraversion had a strong negative association with sedentary behavior when it was measured as average time spent sitting per day. This association is consistent with other evidence that extraverts tend to sit for fewer hours total per day than introverts (Ebstrup, Aadahl, Eplov, Pisinger, & Jørgensen, 2013). In contrast, Extraversion was unrelated to sedentary behavior when it was measured as engagement in specific activities, such as TV watching or reading. The generally high activity level and need to seek out stimulation that define Extraversion (Costa & McCrae, 1992) may translate into a more active lifestyle that includes a variety of activities which may or may not be sedentary.

Recent evidence also links Openness to more engagement in physical activity (Wilson & Dishman, 2015). The results of the meta-analysis for both frequency of physical activity and physical inactivity are consistent with this evidence. Similar to Extraversion, however, the results are more complicated when considering sedentary behavior. Those who score higher in the tendency to be creative have many interests and tend to engage in a wide variety of activities, including many that are sedentary (Stephan, Boiché, Canada, & Terracciano, 2013). And, indeed, in the present research, Openness was associated positively with measures of sedentary behavior that were a combination of several activities, such as watching movies and reading books. As such, individuals who score high in Openness may be more likely to engage in a wide variety of activities, some of which are physically demanding and others that are sedentary. Still, open individuals are motivated by health and fitness goals and value the benefits of exercise (Ingledew & Markland, 2008). Interestingly, there is a corresponding growing literature that suggests that Openness is associated with healthier eating patterns (Mõttus et al., 2013; Sutin & Terracciano, in press-b). The physical activity and eating behavior associated with this trait does not, however, extend to actual body weight: Openness tends to be unrelated to body mass index (Sutin & Terracciano, in press-a; Terracciano et al., 2009).

Finally, Agreeableness was the only trait that was not related independently with physical inactivity, frequency of physical activity, or sedentary behavior. Although there was a strong protective effect in the individual analyses, it was reduced to non-significance when all of the traits were entered simultaneously. This pattern is likely due to the content overlap between Agreeableness and Extraversion. This null association is consistent with previous research showing that the tendency to be trusting and helpful is unrelated to motivations for physical activity (Courneya & Hellsten, 1998) and engagement in physical activity (Rhodes & Smith, 2006; Wilson & Dishman, 2015).

There was little evidence that associations between the traits and physical inactivity were moderated by sex or age. That is, the association between personality and inactivity was similar for men and women, measured both by the meta-analysis of the interactions and the meta-regression.

It is of note that the associations between personality and physical inactivity found in the current study with brief self-reported measures of physical activity are the same as those found in a study with a detailed measure of personality and objective measures of physical capacity. In a study that measured oxygen

(VO_2) consumption, those who scored higher in Extraversion, Openness, and Conscientiousness, and lower in Neuroticism had greater aerobic capacity, walked faster, and were more efficient in their energy consumption (i.e., they required less energy per meter walked; Terracciano et al., 2013). Thus, even with short self-report measures of personality and physical activity, the pattern of associations is similar to when using sophisticated objective measurements of physical capacity.

3.1. Strengths, limitations, and future directions

The present research had several strengths, including 16 cohorts that totaled over 125,000 participants, a measure of all five FFM personality traits in each sample, and cohorts from different cultural contexts. None of the cohorts included in this study was part of the previous meta-analyses, and the sample size of this study is larger than previous ones. There are also some limitations that could be addressed with future research. First, although validated measures of personality were used in all samples, the measures were brief. More detailed scales that include measures of facets, as well as the broad domains, will be helpful in identifying which specific aspects of the traits are most strongly associated with inactivity. Second, although the associations between personality and self-reported activity were consistent with objective measures of aerobic capacity, it would be worthwhile to obtain objective physical activity, such as steps per day, moderate-to-vigorous physical activity, and sedentary behavior as measured by an accelerometer (Wilson, DAS, Evans, & Dishman, 2015). Third, more attention could be paid to the cultural context of personality and physical activity and how aspects of the environment may moderate these associations.

Despite these limitations, the results indicate robust associations between personality and a physically inactive and sedentary lifestyle. Although the effects are relatively modest, there are many reasons why someone is physically inactive and any individual factor is likely to only have a small effect. Still, personality traits can be a considerable barrier or facilitator to physical activity. Of particular value for future research is to examine whether interventions aimed at changing personality traits (e.g., reducing Neuroticism) can have an impact on physical inactivity. Similarly, experimental work should examine whether interventions that reduce sedentary behavior change personality. Personality traits can also help in tailoring exercise interventions or the promotion of physical activity programs that best fit individuals' preferences. For example, a group exercise setting may not be ideal for introverts, as they are less likely to engage in activities with other people (Courneya & Hellsten, 1998). Those with high openness have a preference for outdoor exercise (Courneya & Hellsten, 1998), thus an exercise program that takes place outside may be more appropriate for these individuals; individuals low in Openness may be particularly resistant to unfamiliar types of physical activity. Additional research is needed to evaluate whether exercise interventions directed towards specific personality traits increase physical activity and improve exercise adherence, especially in individuals who are at greater risk for physical inactivity.

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Data and documentation are available for public download here: http://www.nhats.org. The US National Study was supported by a planning grant from the Council on Research and Creativity at the Florida State University. BHPS: The support of both the Economic and Social Research Council and the University of Essex is gratefully acknowledged. The work reported in this paper is part of the scientific program of the Institute for Social and Economic Research (incorporating the ESRC Research Centre on Micro-social Change and the UK Longitudinal Studies Centre (ULSC). NCDS: We thank The Centre for Longitudinal Studies, Institute of Education for the use of these data and to the UK Data Archive and Economic and Social Data Service for making them available. ELSA: Funding for the English Longitudinal Study of Ageing is provided by the National Institute on Aging [Grants 2RO1AG7644-01A1 and 2RO1AG017644] and a consortium of UK government departments coordinated by the Office for National Statistics. LISS: The LISS panel data were collected by CentERdata (Tilburg University, The Netherlands) through its MESS project funded by the Netherlands Organization for Scientific Research. HILDA: This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the author and should not be attributed to either FaHCSIA or the Melbourne Institute. MIDJA: The MIDJA study (Midlife in Japan) was supported by a grant from the National Institute on Aging (5R37AG027343).

Appendix A. Supplementary material

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