



Physical activity and personality development across adulthood and old age: Evidence from two longitudinal studies



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ARTICLE INFO

Article history:

Available online 21 December 2013

Keywords:

Personality change
Physical activity
Normative development
Stability

ABSTRACT

Personality traits are associated with a number of health-related factors; less is known about how such factors contribute to adult personality development. Based on evidence for the protective role of physical activity for individual functioning, the present study tests whether physical activity contributes to personality stability and change. Using longitudinal data from the Midlife in the United States study ($N = 3758$) and the Health and Retirement Study ($N = 3774$), we found that more physically active individuals declined less on conscientiousness, extraversion, openness and agreeableness, and had higher rank-order stability and profile consistency over time. These findings suggest that physical activity may help preserve personality stability and prevent maladaptive personality changes across adulthood and old age.

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1. Introduction

A physically active lifestyle has a profound influence on individuals' health. Meta-analytic studies indicate that regular participation in physical activity across the lifespan is associated with a 20–40% reduction in risk of all-cause mortality (Kodama et al., 2013; Löllgen, Böckenhoff, & Knapp, 2009; Nocon et al., 2008; Samitz, Egger, & Zwahlen, 2011), and the prevalence of chronic conditions is lower among physically active adults (Brown et al., 2012; Lee et al., 2012). Observational and intervention studies also suggest that a physically active lifestyle promotes better cognitive function (Colcombe & Kramer, 2003; Weuve et al., 2004) and reduces risk of cognitive impairment, dementia and Alzheimer's disease (Kramer, Erickson, & Colcombe, 2006; Scarmeas et al., 2009). A physically active lifestyle has a range of mental health benefits too. Physical activity is protective against depression (Conn, 2010), and, among clinically depressed patients, the effect of physical activity on reduction in depressive symptoms is comparable with that observed in patients on antidepressant medication (Blumenthal et al., 2007, 2012). Physically active adults also report less stress (Rueggeberg, Wrosch, & Miller, 2012) and greater psychological well-being (Netz, Wu, Becker, & Tenenbaum, 2005). Despite strong evidence for the effect of physical activity on

emotional, cognitive and physical functioning across the lifespan, the extent to which an active lifestyle contributes to personality trait development in adulthood is an open question.

Personality traits are associated with participation in physical activity (Hoyt, Rhodes, Hausenblas, & Giacobbi, 2009; Rhodes & Smith, 2006; Stephan, Boiché, Canada, & Terracciano, in press). Cross-sectional and longitudinal research consistently find that, among the major dimensions of personality, extraversion and conscientiousness are the strongest personality correlates of a physically active lifestyle (Gallagher, Yancy, Denissen, Kühnel, & Voils, 2013; Hoyt et al., 2009; Rhodes & Smith, 2006; Stephan et al., in press). Openness also predicts higher frequency of physical activity while neuroticism has an inverse relation (Rhodes & Smith, 2006; Stephan et al., in press); there is no clear evidence for an association between physical activity and agreeableness (Rhodes & Smith, 2006).

There are reasons to expect that the relation between personality and physical activity may not be unidirectional and that a physically active lifestyle may contribute to personality development. Physical activity has implications for a range of psychological, cognitive and health-related variables that have been associated with personality stability and change (Costa, Bagby, Herbst, & McCrae, 2005; Löckenhoff, Terracciano, & Costa, 2009; Pocnet, Rossier, Antonietti, & Von Gunten, 2013; Sutin, Zonderman, Ferrucci, & Terracciano, 2013; Sutin et al., 2013). Specifically, a physically active lifestyle buffers or reduces the risk of several conditions that challenge personality stability in adulthood. Physical activity is associated with lower risk of physical and mental disorders that may decrease conscientiousness, extraversion, openness and

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increase neuroticism over time (Costa et al., 2005; Sutin et al., 2013). It is also associated with lower risk of cognitive decline and dementia, which are related to caregivers' reports of increased neuroticism and decreased extraversion and conscientiousness (Duchek, Balota, Storandt, & Larsen, 2007; Pocnet et al., 2013). Active individuals may also cope better with environmental changes that challenge personality stability, such as adverse life events and social changes (Löckenhoff et al., 2009; Sutin, Costa, Wethington, & Eaton, 2010).

This evidence suggests that physical activity may be informative for personality change and stability over time, but to date no study has examined whether physical activity contributes to personality development. Although the precise pattern of personality development across adulthood is open to debate, declines in neuroticism and increases in conscientiousness during middle adulthood tend to be common across studies (Donnellan & Lucas, 2008; Lucas & Donnellan, 2009, 2011; McCrae, Terracciano, & Members of the Personality Profiles of Cultures Project, 2005; Roberts, Walton, & Viechtbauer, 2006; Soto, John, Gosling, & Potter, 2011; Terracciano, Costa, & McCrae, 2006). Recent findings have also suggested that changes that deviate from normative trajectories (e.g., increases in neuroticism) have negative psychological, cognitive and health-related correlates, including mortality (Graham & Lachman, 2012; Human et al., 2013; Mroczek & Spiro, 2007; Turiano et al., 2012). In contrast, personality stability is considered a resource for individuals' functioning with advancing age (Graham & Lachman, 2012; Human et al., 2013). Therefore, it is critical to identify factors that may accelerate positive changes, prevent maladaptive changes, and preserve stability with aging.

The present study examined whether engagement in physical activity is associated with personality development across adulthood and old age. We took a comprehensive approach to personality development and considered indices of intra-individual rank order stability and profile consistency, in addition to the commonly reported group-level mean change in traits. Mean-level change measures the extent to which individuals increase or decrease on a trait dimension over time, whereas indices of stability focus on the degree to which individual differences on a given trait or on a configuration of traits is maintained over time.

Age-related declines in physical, cognitive, and mental health, as well as environmental changes are associated with maladaptive personality trajectories, such as decreases in conscientiousness, extraversion and openness and increases in neuroticism (Costa et al., 2005; Pocnet et al., 2013; Sutin et al., 2013). Given its relation with reduced risk of chronic conditions, cognitive decline, and lower prevalence of mental disorders and lower receptivity to environmental stressors, we expected physical activity to preserve the stability of personality traits, while a sedentary lifestyle would be associated with changes in non-desirable directions. We hypothesized that a physically active lifestyle would be associated with less mean level change in extraversion, conscientiousness, openness to experience, and lower neuroticism over time. In addition, we hypothesized that physical activity would contribute to higher intra-individual stability of traits and profile consistency. The above hypotheses were tested using data from two large longitudinal surveys that differ in age, time and physical activity assessment, the Midlife in the United States (MIDUS) and the Health and Retirement Study (HRS) surveys.

2. Method

2.1. Participants

2.1.1. MIDUS

Data were drawn from the Midlife in the United States longitudinal survey (MIDUS I and II; Brim, Ryff, & Kessler, 2004). The first

wave of the MIDUS study collected survey data in 1994–1995 from a total of 7108 English-speaking adults in the United States, aged 20–75 years. Participants completed a 30-min telephone interview and a self-administered questionnaire that included the variables of interest of the present study. Of the 7108 participants in MIDUS 1, 4963 adults (~70% of the original sample) were successfully contacted to participate in a second wave of data collection in 2004–2005. We analyzed only individuals who provided complete data for both waves on the variables of interest. The final sample was composed of 3758 individuals aged from 20 to 75 years old at baseline (55% women; Mean age = 47.20; SD = 12.34). Attrition analysis revealed that those with complete data were older, $t(7047) = -5.64$, $p < .001$, $d = 0.13$, more educated, $t(7093) = -13.43$, $p < .001$, $d = 0.32$, had more frequent physical activity, $t(6260) = -6.74$, $p < .001$, $d = 0.17$, lower disease burden, $t(6306) = 3.78$, $p < .001$, $d = 0.10$, lower neuroticism, $t(6263) = 2.52$, $p < .05$, $d = 0.06$, lower agreeableness, $t(6269) = 1.98$, $p < .05$, $d = 0.04$, and higher conscientiousness, $t(6268) = -7.16$, $p < .001$, $d = 0.18$.

2.1.2. HRS

The Health and Retirement study (HRS) is a nationally representative and prospective panel study that surveys Americans aged 50 years and older. Participants in the present study were drawn from the eighth (2006) and tenth (2010) waves. In 2006, participants in the enhanced face-to-face interview received a psychosocial questionnaire that they completed and returned by mail to the University of Michigan. Approximately 7550 participants completed the baseline personality measure. The final sample was composed of 3774 participants (59% women, Mean Age = 69.70, SD = 9.79) who provided complete data at both waves. Participants in the longitudinal sample were younger, $t(7537) = 14.81$, $p < .001$, $d = 0.34$, had lower disease burden, $t(7109) = 9.12$, $p < .001$, $d = 0.21$, had more frequent physical activity, $t(6625) = -15.30$, $p < .001$, $d = 0.38$, and had higher education, $t(7451) = -15.56$, $p < .001$, $d = 0.36$, than the drop out sample. In addition, they were more extraverted, $t(7300) = -2.23$, $p < .05$, $d = 0.05$, open, $t(7154) = -4.34$, $p < .001$, $d = 0.11$, conscientious, $t(7261) = -8.86$, $p < .001$, $d = 0.21$, and less neurotic, $t(7387) = 2.85$, $p < .01$, $d = 0.06$, than those who did not have complete data.

2.2. Measures

2.2.1. Personality

Personality was assessed in both samples using the Midlife Development Inventory (MIDI; Lachman & Weaver, 1997). In the MIDUS, participants were asked how much 25 adjectives that assessed neuroticism, conscientiousness, extraversion, openness, and agreeableness described themselves on a scale ranging from 1 "not at all" to 4 "a lot" (For more details, see Graham & Lachman, 2012). The same scale was used in the HRS, except one additional item was added to the conscientiousness scale. Cronbach alphas for each trait at Wave 1 and Wave 2 respectively were as follows (coefficients for the HRS are in parentheses): .75 (.71) and .74 (.71) for neuroticism, .77 (.74) and .76 (.76) for extraversion, .77 (.78) and .76 (.79) for openness, .56 (.67) and .58 (.69) for conscientiousness, and .81 (.79) and .80 (.80) for agreeableness.

2.2.2. Physical activity

At baseline, participants in the MIDUS sample were asked to report how frequently they participated in vigorous (e.g., running or lifting heavy objects) and moderate leisure physical activity (e.g. slow or light swimming, brisk walking) during both the summer months and the winter months using a scale ranging from 1 (never) to 6 (several times a week or more). The physical exercise score was the mean of summer and winter ratings for each type of activity. In the HRS, participants rated how frequently they

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