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Beyond the big five: a 10-year longitudinal study of personality traits predicting leisure-time physical activity among adults

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ABSTRACT

The purpose of this study was to compare and contrast the Big Five model of personality with Tellegen's Multidimensional Personality Questionnaire (MPQ) to investigate how they predict light intensity, moderate intensity and vigorous intensity leisure-time physical activity (LTPA) using population-based secondary longitudinal data. The Tellegen facet harm avoidance predicted a decrease in moderate and vigorous LTPA. From the Big Five, extraversion predicted increased moderate and vigorous LTPA and, additionally, openness predicted increased vigorous LTPA. This comparison reveals the complementary nature of both personality models to better understand how multiple aspects of personality predict LTPA and shows that leisure studies scholars may want to consider alternatives to the Big Five when considering intrapersonal predictors of physically active leisure.

RÉSUMÉ

L'objectif de cette étude était de comparer et d'opposer le modèle des « Big five » de la personnalité au questionnaire multidimensionnel de la personnalité (MPQ) de Tellegen afin d'étudier comment ils prédisent l'activité physique de loisir (APL) d'intensité légère, modérée et vigoureuse en utilisant des données longitudinales secondaires fondées sur la population. La facette d'évitement de Tellegen prédit une diminution de l'APL modérée et vigoureuse. Dans le cadre du modèle des « Big five », l'extraversion a permis de prédire une augmentation de l'activité physique de loisir modérée et vigoureuse et, en outre, l'ouverture a permis de prédire une augmentation de l'APL vigoureuse. Cette comparaison révèle la nature complémentaire des deux modèles de personnalité pour mieux comprendre comment les multiples aspects de la personnalité prédisent l'APL et montre que les spécialistes des études sur les loisirs pourraient envisager des alternatives au modèle des « Big five » lorsqu'ils étudient les prédicteurs intrapersonnels de l'activité physique de loisir.

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Introduction

Although participating in leisure-time physical activity (LTPA) has positive consequences for physical and mental health (Warburton, 2006), the vast majority of adults tend to be sedentary (Silva et al., 2023). Using both traditional research definitions (Iso-Ahola, 1979; Kelly, 1972) and everyday understandings, leisure is typically thought of as something volitional and relatively enjoyable (Shaw, 1985). The volitional nature of leisure means that intraindividual characteristics are likely to have an impact on selection into particular forms of leisure (Jackson, 2005). Personality is a key intraindividual factor that has been shown to shape leisure preferences in general and physically active leisure participation in particular (Diener et al., 1984; Wilson & Dishman, 2015). Much of the research on personality and leisure participation has focused on Costa and McCrae's Big Five model (McCrae & Costa, 2008) but other measures exist that offer a fuller understanding of how personality has an impact on physically active leisure. Thus, we compare the Big Five with another personality measure, that is, the Multidimensional Personality Questionnaire (MPQ; Patrick et al., 2002) and draw on longitudinal data to examine causal links between personality and LTPA.

The Five Factor Model (FFM) of personality, otherwise known as the Big Five personality model, indicates that some personality traits play a role in accounting for the inherent differences in physical activity among individuals (McCrae & Costa, 2008). To be sure, other theories show the biological and genetic factors of personality (Gray, 1991; Zuckerman, 2003), and the expression of these traits being influenced by cultural factors (Eysenck, 1970).

Previous research shows that extraversion, openness, conscientiousness and agreeableness are positively associated with LTPA, and neuroticism is negatively associated with LTPA (Wilson & Dishman, 2015). In one recent study (Tian et al., 2023), the researchers examined the impact of personality on LTPA in a leisure context. Specifically, the researchers used the Big Five personality model and found that extraversion, agreeableness and conscientiousness significantly contributed to specialization in cycling, consistent with a meta-analysis that showed the association between personality and LTPA in various contexts and settings (Wilson & Dishman, 2015). Additionally, Sato et al. (2018) investigated the role personality plays in another leisure context. The researchers examined the extent to which leisure involvement contributed to life satisfaction when considering the role of personality. They found that personality traits such as conscientiousness and openness had a positive effect on running involvement, which subsequently enhanced life satisfaction (Sato et al., 2018). The inverse association was found in a meta-analysis of links between personality and physical inactivity, such that neuroticism is positively and extraversion and

openness are negatively associated with physical inactivity (Sutin et al., 2016). Further, research with twin data suggests that neuroticism and extraversion have the most phenotypic association with physical activity compared to the other three facets (Butković et al., 2017).

Beyond the Big Five, other personality models and facets may capture aspects of personality relevant to leisure such as Tellegen's three-factor model of personality (Patrick et al., 2002). Tellegen's three-factor model of personality is organized into three higher-order dimensions: positive emotionality (e.g., achievement, social closeness), negative emotionality (e.g., alienation, aggression) and constraint (e.g., control, harm avoidance, traditionalism). Although psychometric analysis of the Big Five and the MPQ shows that they are closely related to each other, their original approach to development was different, with the Big Five based on everyday understandings of personality and the MPQ on psychological concepts (Patrick et al., 2002). It is also possible that some facets of the MPQ, in particular harm avoidance (as the inverse of risk-seeking), are directly relevant for the consideration of more vigorous forms of physically active leisure participation (Minkwitz et al., 2016).

In sum, leisure participation in general and participation in physically active leisure in particular is often considered volitional and likely motivated by intrapersonal factors (Jackson, 2005). Personality is one such intrapersonal factor that has an impact on leisure participation (Diener et al., 1984; Wilson & Dishman, 2015). Predominantly, the Big Five personality inventory has used to assess links between personality and leisure participation, but other measures such as the MPQ offer the opportunity to investigate other personality factors perhaps even more closely suited to the risk taking required for more vigorous forms of physically active leisure.

Thus, for the present study, we begin with a comparison of the Big Five with the MPQ and then examine the predictive ability of aspects of both inventories with low level, moderate, and vigorous physical activity. The MPQ was chosen to be compared with the Big Five because of the MPQ's unique ability to assess aspects of personality not captured by the Big Five that may be important for physically active leisure such as control and harm avoidance. This makes the MPQ a useful comparison to the Big Five in terms of better understanding the relationship between intrapersonal factors such as personality and how it predicts LTPA.

To be specific, from the Big Five, we focus our attention on neuroticism, extraversion and openness due to their consistent links with physically active leisure (Butković et al., 2017; Sutin et al., 2016). After examining the associations between the Big Five factors neuroticism, extraversion and openness and the MPQ, we proceed with longitudinal analysis of those MPQ factors that were most distinct (i.e., differentiated from neuroticism, extraversion and openness) to examine their ability to predict change in physically active leisure above and beyond neuroticism, extraversion and openness.

Method

The data were drawn from Wave 2 (n = 5,555) and Wave 3 (n = 3,683) of the Midlife Development in the United States (MIDUS; Ryff et al., 2006), which is a longitudinal survey (30-min phone interview followed by two self-reported surveys) conducted in the United States among English-speaking adults aged 25–74. MIDUS's main purpose was to understand the factors that contributed to achieving psychological wellbeing and health in adulthood. They specifically sought to examine the development of biomedical, psychological and social factors over the course of midlife. The full MIDUS sample includes twin and sibling data, which are not included here. After accounting for the missing information, the sample size is reduced to 1,227.

Measures

Demographics. Demographic variables included baseline (Wave 2) age (measured rationally), gender (1 = male, 2 = female), marital status (1 = married, 0 = unmarried (i.e., separated/divorced, widowed, never married)), education was originally assessed at four levels (e.g., less than high school, some college, etc.) but was recoded for the present analyses to high school or less (0) or education beyond high school (1). The last demographic variable used was participant income, which was assessed using the participant's total household income, measured rationally. Income greater than $300,000 was recorded as $300,000 within the MIDUS.

The big five model of personality

The Midlife Development Inventory Big Five scales were used to assess personality. For each facet, respondents were asked to assess the degree to which adjectives associated with particular personality facets described them on a 4-point scale from not at all (1) to a lot. These adjectives included worrying, moody, calm (reverse scored) and nervous (Neuroticism, α =.73), lively, outgoing, friendly, talkative (Extraversion, α =.77); and creative, sophisticated, imaginative, intelligent, curious, broadminded, adventurous (Openness, α =.76).

Tellegen's three-factor model

Tellegen's three-factor model encompasses over-arching dimensions of personality, namely positive emotionality, negative emotionality and constraint or reverse impulsivity. To measure these personality facets, a shortened version of the MPQ was used, which was validated by previous researchers (Patrick et al., 2002). On a scale from 1 to 4 (1 = true, 2 = somewhat true, 3 = somewhat false, 4 = false), respondents

rated the degree to which certain statements best described them (reverse scored for the present analyses). Positive emotionality included the facets *wellbeing* (three items, e.g., 'I usually find a way to liven up my day,' α =.74), *social potency* (four items, e.g., 'I am quite effective at talking people into things,' α =.72), *achievement* (four items, e.g., 'I often go on working on a problem long after others would have given up,' α =.68) and *social closeness* (four items, e.g., 'I usually like to spend my leisure time with friends rather than alone,' α =.71), negative emotionality is reflected in the facet stress *reactivity* (three items, e.g., 'My mood often goes up and down' (α =.73), *aggression* (four items, e.g., 'When I get angry I am often ready to hit someone,' α =.65) and *alienation* (three items, e.g., 'People often try to take advantage of me,' α =.62). Constraint included the facets of *control* (three items, e.g., 'I like to stop and think things over before I do them' α =.61), *traditionalism* (three items, e.g., 'People should observe moral laws more strictly than they do,' α =.60). We calculated the sum of the values of the items in each sub-scale to construct all of the scales. The last facet of the MPQ, *harm avoidance*, was assessed by giving respondents two scenarios, a follow-up to each scenario, in addition to two statements. The respondents had to decide which of the two statements (i.e., 'riding a long stretch of rapids in a canoe,' or "waiting for someone who's late) they dislike more. They were then asked how much they disliked the situation they chose. This was then recoded on a 4-point scale, with definitely disliking the potentially more harmful situation being a 4 and somewhat disliking the less harmful situation being a 1. This was then summed together with two reverse coded statements (e.g., fun learning to walk tightrope) to construct the *harm avoidance* facet with four items (α =.66).

Leisure-time physical activity (LTPA)

Respondents were asked to rate how often they engaged in the different intensities of LTPA (light, moderate, vigorous) with response options ranging from never (6) to several times a week (1), these options were reverse coded, so higher values reflect more activity. MIDUS characterized the different intensities based on ease. Light was described as activities that required little physical effort (e.g., easy walking). Moderate was described as not being physically exhausting but increased the participant's heart rate slightly (e.g., brisk walking). Lastly, vigorous were described as activities that cause the participant's heart rate to increase rapidly and work up a sweat (e.g., running). Respondents were also asked how often they engaged in the different intensities of LTPA separately by season (winter or summer). Due to seasonal variations in LTPA, only activities done in summer were used for the present analyses.

Analysis

Analyses began with the calculation of descriptive statistics for all study variables. Next, correlation analyses were conducted to examine the association of neuroticism, extraversion and openness with MPQ facets. Since it has been shown that there are some consistent relationships between the Big Five and MPQ, we will draw on the correlation analysis to identify aspects of MPQ that are less strongly and consistently associated with neuroticism, extraversion and neuroticism and focus on those for the remainder of the analyses (Patrick et al., 2002). Multivariate analyses were carried out with regression models using SPSS 29.0. Regression analysis allows for the examination of the unique contribution of additional variables of interest after controlling for other factors relevant to the study. For each dependent variable (light, moderate and vigorous physically active leisure), the regression analysis began with demographic characteristics at baseline as well as the baseline measure for the dependent variable to examine changes in the dependent variable over time (Cronbach & Furby, 1970). Next, MPQ factors (at baseline) found to be distinct from neuroticism, extraversion and openness were added to the model, followed by neuroticism, extraversion and openness. This allows for a direct comparison of aspects of the MPQ with Big Five facets to determine whether or not each approach to measuring personality makes a unique contribution to predicting changes in physically active leisure participation over time.

Moreover, we included both the MPQ facets and the Big Five personality traits in the regression models in order to confirm any potential contribution of the MPQ as an interpersonal predictor of LTPA above and beyond the Big Five. While the Big Five provides a broad overview of personality traits and is likely the most often used personality measure drawn on in leisure studies, the MPQ provides specific personality facets not fully captured by the Big Five that may be particularly relevant for LTPA such as control and harm avoidance. Integrating both models can result in a more comprehensive understanding of which personality traits and facets predict LTPA.

Results

The descriptive statistics of demographic characteristics showed that the average age of participants was roughly 56 and just over half (52%) of the participants identified as female (Table 1) Approximately 70% of the participants were married and had an education greater than high school. Lastly, the average household income was roughly $75,000. Skewness and Kurtosis analysis were conducted for all study variables and fell well within acceptable ranges (i.e., between −2 and 2 for skew and −7 and +7 for Kurtosis).

Table 1. Descriptive characteristics for demographics, tellegen's personality facets, big five personality traits and physically active leisure.

Variables	*M/Percent*	*SD*
Demographics (M2)		
Age	55.69	11.41
Gender (% female)	52%	-
Marital Status (% Married)	70%	-
Greater Than High School	72%	-
Income	75,949.61	64,223.64
Tellegen's Personality Facets (M2)		
Control	9.73	1.53
Traditional	8.11	2.22
Harm avoidance	11.85	2.93
The Big Five Personality (M2)		
Neuroticism	2.06	0.62
Extraversion	3.13	0.56
Openness	2.96	0.52
LTPA (M2)		
Light	5.16	1.41
Moderate	4.35	1.80
Vigorous	3.56	1.96
LTPA (M3)		
Light	5.07	1.50
Moderate	4.20	1.87
Vigorous	3.46	2.02

Correlation analysis

Correlation analyses were conducted to determine which aspects of the MPQ were relatively distinct from the Big Five facets we focus on for the present study. Extraversion, neuroticism and openness were each found to be consistently correlated with the MPQ subscales under Positive Emotionality (e.g., wellbeing, social potency, social closeness) and Negative Emotionality (e.g., reactivity, aggression, alienation) with all correlations being statistically significant and ranging in magnitude from.11 to.65 (results not shown). However, these same Big Five facets were much less consistently associated with the subscales corresponding to the MPQ dimension control (control, traditionalism and harm avoidance). To be specific, neuroticism was correlated with control ($r = -.07$, $p < .01$) but not traditionalism or harm avoidance, extraversion was correlated with traditionalism ($r = .07$, $p < .05$) but not control or harm avoidance. Openness was more consistently associated with control, traditionalism and harm avoidance ($r = .08$, $p < .05$; $r = -.19$, $p < .05$; $r = -.15$, $p < .05$; respectively), but not nearly as strongly as it was with the positive and negative emotionality dimensions of the MPQ (e.g., correlations up to $r = .52$). Thus, for regression analyses, we focus on the MPQ subscales reflected in the dimension control, namely, control, traditionalism and harm avoidance.

Regression results

Light LTPA

The older the participants were, the more they decreased their participation in light LTPA, and women (vs. men) and those with greater income increased their light LTPA over time (Table 2, Model 1). Neither the MPQ subscales of control, traditionalism, or harm avoidance, nor the Big Five facets of neuroticism, extraversion or harm avoidance predicted change in light LTPA participation (Table 2, Models 2 and 3). The R Square Change analysis showed no significant difference in the R Square value between Model 2 and Model 3 and tests for collinearity showed that VIF values were close to 1, suggesting no collinearity for variables in any models.

Moderate LTPA

Being older and women (vs. men) predicted decreased participation in moderate LTPA over time, but greater income predicted increased participation (Table 3, Model 1). For the MPQ subscales, the more harm-avoidant participants were, the less they engaged in moderate physically active leisure over time, and this was held after the addition of the Big Five factors to the model (Table 3, Models 2 and 3). Examining the Big Five factors, the more extroverted participants were, the more they engaged in moderate physically active leisure (Table 3, Model 3). The R Square Change analysis showed a significant difference in R Square value between Model 2 and Model 3 (F (3, 1205) = 3.07, $p < .05$), and tests for collinearity showed that VIF values were close to 1, suggesting no collinearity for variables in any models.

Table 2. Unstandardized regression coefficients for regression models examining the association of light LTPA with demographic variables, Tellegen's three-factor model and big five model of personality (NEO).

	Model 1			Model 2			Model 3		
Independent Variables	coeff.		SE	coeff.		SE	coeff.		SE
Light LTPA M3	4.10	***	.30	4.06	***	.43	3.95	***	.53
Control Variables									
Age	−0.02	***	.00	−0.02	***	.00	−0.02	***	.00
Female	0.18	*	.08	0.20	*	.09	0.21	*	.09
Married	0.05		.09	0.07		.09	0.08		.09
More Than High School	0.15		.09	0.13		.10	0.13		.10
Income	0.00	**	.00	0.00	*	.00	0.00	*	.00
Light LTPA M2	0.28	***	.03	0.28	***	.03	0.28	***	.03
Tellegen's Personality Facets									
Control M2				0.02		.03	0.02		.03
Traditional M2				−0.02		.02	−0.02		.02
Harm avoidance M2				−0.00		.02	−0.00		.02
Big 5 Personality Variables									
Neuroticism M2							−0.08		.07
Extraversion M2							0.06		.08
Openness M2							0.06		.09
Adjusted R^2	0.12			0.12			0.12		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 3. Unstandardized regression coefficients for regression models examining the association of demographic variables, Tellegen's Personality Facets, Big Five Model of Personality and moderate LTPA.

	Model 1			Model 2			Model 3		
Independent Variables	coeff.		SE	coeff.		SE	coeff.		SE
Moderate LTPA M3	4.62	***	.37	4.79	***	.49	4.03	***	.65
Control Variables									
Age	−0.03	***	.00	−0.03	***	.01	−0.03	***	.01
Female	−0.25	**	.10	−0.16		.10	−0.19		.11
Married	−0.03		.11	0.00		.12	0.03		.12
More Than High School	0.19		.12	0.15		.12	0.17		.12
Household Income	0.00	***	.00	0.00	***	.00	0.00	***	.00
Moderate LTPA M2	0.28	***	.03	0.27	***	.03	0.26	***	.03
Tellegen's Personality Facets									
Control M2				0.04		.03	0.04		.03
Traditional M2				−0.03		.02	−0.03		.02
Harm avoidance M2				−0.04	*	.02	−0.04	*	.02
Big 5 Personality Variables									
Neuroticism M2							−0.02		.08
Extraversion M2							0.26	*	.10
Openness M2							0.06		.12
Adjusted R^2	0.16			0.17			0.17		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Vigorous LTPA

Older participants and women (vs. men) decreased their vigorous LTPA over time, and greater income predicted increased participation (Table 4, Model 1). As for the MPQ subscales, the more harm-avoidant participants were, the less they participated in vigorous LTPA, even after controlling for the Big Five factors (Table 4, Models 2 and 3). Finally, the Big Five factors of extraversion and openness predicted increased participation in vigorous LTPA (Table 4, Model 3). The R Square Change analysis showed a significant difference in R Square value between Model 2 and Model 3 (F (3, 1217) = 8.71, $p < .01$), and tests for collinearity showed that VIF values were close to 1, suggesting no collinearity for variables in any models.

Discussion

Physically active leisure participation contributes to physical health and wellbeing (Warburton, 2006), and personality is a key intrapersonal motivating factor (Diener et al., 1984; Wilson & Dishman, 2015). Although the Big Five model of personality dominates much of the research on personality and LTPA (Sato et al., 2018; Wilson & Dishman, 2015), alternative models like the MPQ (Patrick et al., 2002) offer additional personality factors that may be relevant. For the present study, we drew on longitudinal data to test the predictive power of aspects of the MPQ likely to make a contribution to physically active leisure participation above and beyond the Big Five. In particular, we found that the MPQ domain control was least closely associated with neuroticism, extraversion and openness from the Big

Table 4. Unstandardized regression coefficients for regression models examining the association of demographic variables, Tellegen's Personality Facets, Big Five Model of Personality and vigorous LTPA.

	Model 1			Model 2			Model 3		
Independent Variables	coeff.		SE	coeff.		SE	coeff.		SE
Vigorous LTPA M3	4.22	***	.39	4.68	***	.52	2.79	***	.67
Control Variables									
Age	−0.04	***	.01	−0.03	***	.01	−0.03	***	.01
Female	−0.28	**	.10	−0.20		.11	−0.26	*	.11
Married	0.01		.12	0.03		.12	0.08		.12
More Than High School	0.09		.12	0.06		.12	0.09		.12
Household Income	0.00	***	.00	0.00	***	.00	0.00	***	.00
Vigorous LTPA M2	0.35	***	.03	0.34	***	.03	0.33	***	.03
Tellegen's Personality Facets									
Control M2				−0.01		.03	−0.01		.03
Traditional M2				−0.00		.02	0.00		.03
Harm avoidance M2				−0.05	*	.02	−0.04	*	.02
Big 5 Personality Variables									
Neuroticism M2							0.15		.09
Extraversion M2							0.30	**	.11
Openness M2							0.26	*	.11
Adjusted R^2	0.23			0.23			0.25		

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Five, so our analyses focused on a comparison of the potential contribution of the Control domain and those three aspects of the Big Five to light, moderate and vigorous physically active leisure participation.

For light LTPA, none of the personality measures, whether MPQ or Big Five, predicted a change in participation over time. To some extent, this non-finding is interesting since it suggests that less challenging or easier forms of physically active leisure require less motivation by intrapersonal predispositions to encourage participation. However, the more effortful moderate and vigorous forms of physically active leisure were influenced by both aspects of the MPQ and Big Five. To be specific, the more harm-avoidant participants were (from the MPQ Control domain), the less they participated in moderate and vigorous physically active leisure, and this effect was held after the addition of Big Five personality factors to the model. In addition, extraversion predicted increased moderate and vigorous physically active leisure participation. Additionally, openness predicted greater vigorous LTPA. These findings with Big Five facets are consistent with previous findings (Wilson & Dishman, 2015), but the effect of aspects of the MPQ on physically active leisure participation has been under-investigated.

We believe this study is one of the first to show the predictive power of the MPQ facet of harm avoidance on physically active leisure participation above and beyond the Big Five model. The lack of findings for light LTPA suggests that efforts to encourage light activity (e.g., vs. inactivity) perhaps do not have to focus on messages tailored to internal predispositions or concerns about harm. However, for more intense

forms of physically active leisure, the findings suggest that concerns about potential harm are a barrier to participation. Thus, although some people may be more or less predisposed to be concerned about harm, leisure practitioners and programmers may want to take into account ways to educate participants about ways to manage and reduce risk involved with moderate and vigorous forms of physically active leisure. These findings underscore the importance of taking into account alternative personality models in the Big Five to gain a comprehensive understanding of some of these intrapersonal predictors of LTPA. The findings also suggest that when considering the contribution of personality to leisure participation in general and physically active leisure in particular, it is worthwhile considering scales and measures beyond the Big Five.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Ethics statement

Ethics clearance is not required with secondary de-identified data.

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