

# Big-5 personality traits as predictors of allostatic load in Latino Americans: a longitudinal study

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## Abstract

**Objectives:** Allostatic load (AL) refers to the measure of cumulative wear and tear resulting from chronic stress and life events. AL presents adverse consequences for a diverse range of health conditions, and Latino populations show a high risk for elevated AL. This study aimed to test the Big-5 personality traits as possible predictors of AL in Latinos.

**Methods:** Using data from the Health and Retirement Study, we examined the Big-5 and AL connection through three time points in 8 years (Time 1 = 2006/2008; Time 2 = 2010/2012; Time 3 = 2014/2016). Only self-identified Latinos were included in the analysis sample ( $N=319$ ). Big-5 and demographics were obtained at baseline, and AL scores were computed for each time point.

**Results:** First, separate longitudinal linear mixed-effect models examined the effects of each Big-5 personality trait on AL change over time, then a fully adjusted longitudinal linear mixed-effect model was tested entering the Big-5 personality traits simultaneously. All models controlled for sociodemographic factors. Conscientiousness emerged as the only consistent significant predictor, for the separate and the simultaneous models. In baseline associations, higher conscientiousness was associated with lower AL. For predicting change in AL over time, none of the personality traits had significant associations in any of the models.

**Discussion:** The findings bolster prior evidence that conscientious can be a protective factor against elevated AL. Conscientiousness is a possible protective factor and improving related traits can be a path to achieve better health in Latino Americans.

**Keywords:** Latino/Hispanic older adults, Personality, Health, Longitudinal design/data analysis

Allostatic load (AL) refers to the measure of cumulative wear and tear resulting from chronic stress and life events (Crimmins et al., 2003; McEwen & Stellar, 1993; Seeman et al., 2001). Indices of AL typically aggregate across indicators of multiple physiological systems, and a growing body of empirical evidence has shown adverse consequences for a diverse range of health conditions, such as diabetes, cardiovascular diseases, neurologic disorders, and mortality (Guidi et al., 2021; Parker et al., 2022). AL increases from young adulthood to older adulthood (Crimmins et al., 2003; Moore et al., 2021), and daily stressors are strongly associated with AL among older adults relative to their younger counterparts (Piazza et al., 2019). Prior research documents differences in AL across racial and ethnic groups, where Latinos show a higher risk for elevated AL, relative to their non-Latino white counterparts (Howard & Sparks, 2015; Moore et al., 2021). Given that elevated AL is associated with a higher risk for morbidity and mortality, identifying the factors that may protect against elevated AL among Latinos is critical—especially as demographic

changes in the age structure of the Latino population in the U.S. contribute to a rapid growth in older adults among this population. For instance, in 2019, Latinos comprised 9% of the older population, and by 2060, Latinos are projected to make up 21% of the older population (Administration for Community Living, 2020). To mitigate health inequities that Latinos living in the U.S. face, the identification of risk factors for elevated AL in Latino populations would be valuable to design interventions to decrease AL among this population. While prior research has documented the role of social stressors in shaping AL (Gallo et al., 2019; Niño & Chavez, 2021), the role of personality factors has gone largely understudied.

The Five-Factor Model of personality, also known as the Big-5, has been studied as a possible predictor of AL (McCrae & Costa, 1987; Yoneda et al., 2023). This framework represents the core factors of adult personality, consisting of the following traits: *Openness to Experience*, *Conscientiousness*, *Extraversion*, *Agreeableness*, and *Neuroticism*. A recent meta-analysis reported that higher neuroticism is associated

with higher AL, while higher conscientiousness and openness to experience are associated with lower levels of AL (Yoneda et al., 2023). However, information on how these findings may hold constant or differ for Latinos, who are at higher risk for elevated AL, is limited. Some evidence on this association comes from a study that examines how AL predicts changes in personality. The study found that AL was associated with a steeper decline in conscientiousness and extraversion (Stephan et al., 2016). Yet, it should be noted that these results are drawn from a sample that has only 6.6% of its participants identifying as Hispanic. Additional research among Latinos, with more sufficiently powered sample sizes, is needed to reliably disentangle how distinct personality types are differentially associated with AL. Thus, the current study used data from the Health and Retirement Study (HRS) to extend this prior work and examined how the Big-5 personality traits are associated with AL over time among Latinos. Specifically, the aims of this study are first to test if the connections of neuroticism, conscientiousness, and openness to experience reported in the recent meta-analysis (Yoneda et al., 2023) will replicate for Latinos living in the United States, and second to examine if personality traits predict AL over time. These findings will offer insight into whether the associations between personality and AL follow similar patterns or diverge from those observed in non-Latino populations. This will contribute to refining the theoretical framework of the Big Five by testing the generalizability of previous findings and informing population-level health promotion efforts.

## Method

### Participants

Six waves of data were drawn from the HRS (2006–2016), a longitudinal panel study that provides a nationally representative sample of U.S. men and women aged 50 years and older.

The HRS website provides more information on the design, sampling, and assessment materials (<https://hrsoline.isr.umich.edu>). The HRS sample is randomly divided in half, and biomarker data are available longitudinally every four years. We chose to use the 2006–2016 waves to include the most recently available biomarker data from 2016. To maximize sample size, we created the baseline dataset by combining two subsamples from 2006 and 2008. The follow-ups for these individuals are four (2010/2012) and eight years (2014/2016) later. In other words, individuals with a 2006 (T1) baseline are followed in 2010 (T2) and 2014 (T3). Individuals with a 2008 (T1) baseline are followed in 2012 (T2) and 2016 (T3). The analytic sample included all participants who responded “yes” to the question, “Do you consider yourself Hispanic or Latino?” and thus self-identified as Latino. The final analytic sample consisted of 319 participants, with demographic characteristics presented in Table 1. All participants provided written consent, and the HRS research protocol has been approved by the University of Michigan Institutional Review Board.

## Measures

### Allostatic load

Consistent with prior research (Crimmins et al., 2003; Seeman et al., 2001; Thorpe et al., 2020) seven biomarkers were used to generate the AL score: The biomarkers were hemoglobin A1c (HbA1c), high-density lipoprotein (HDL) cholesterol, total cholesterol, C-reactive protein, cystatin C, pulse rate, and waist circumference (see Table S1 for descriptive for each biomarker).

To calculate the AL score, the high-risk cutoff criterion was used (Crimmins et al., 2003; Geronimus et al., 2006; Seeman et al., 2001; Thorpe et al., 2020). Each biomarker was dichotomized based on values in the high-risk quartile:  $\leq 25$ th percentile for HDL and  $\geq 75$ th percentile for all other biomarkers. For each biomarker, if the participant was in the high-risk quartile, they received 1 point toward their total AL score, while others

**Table 1.** Descriptive characteristics of the HRS Latino population of older age ( $\geq 50$ ).

Variable	Time 1: 2006/2008		Time 2: 2010/2012	Time 3: 2014/2016
	<i>n</i> = 319		<i>n</i> = 195	<i>n</i> = 184
	<i>M</i> ( <i>SD</i> )	%	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )
Age [50–91]	64.90 (8.82)		68.24 (8.27)	70.56 (7.47)
AL [0–6]	1.82 (1.39)		1.83 (1.29)	1.35 (1.35)
Big 5 scores				
Openness [1–4]	2.85 (0.59)		-	-
Conscientiousness [1.8–4]	3.34 (0.48)		-	-
Extroversion [1.6–4]	3.24 (0.54)		-	-
Agreeableness [2–4]	3.57 (0.47)		-	-
Neuroticism [1–4]	2.28 (0.61)		-	-
Years of education	9.34 (4.51)		-	-
Gender				
Male		36.05%	-	-
Female		63.95%	-	-
Nativity				
U.S.-born		44.97%	-	-
Foreign-born		55.03%	-	-
Mean interval between waves (years)	-		4.26 (0.52)	3.67 (0.49)

*Note.* HRS = Health and Retirement Study. As changes in both AL scores and age were assessed for all three time points, means and standard deviations are presented for all three time points. As all other demographic factors were examined at baseline only, Table 1 presents means and frequencies at baseline only. Ranges at baseline are presented in square brackets.

were scored as 0. AL score was calculated by summing the number of values that score in the high-risk category, with a possible score ranging from 0 to 7. Accordingly, AL scores were calculated for participants within each time point (i.e., 2006–2008, 2010–2012, and 2014–2016).

### Personality

Big-5 personality traits were assessed using 26 items from the Midlife Development Inventory (Lachman & Weaver, 1997) and five items from the International Personality Item Pool (Goldberg et al., 2006). On a scale of 1 (A lot) to 4 (Not at all), participants indicated how well each item described themselves. Neuroticism was assessed with four items (e.g., “nervous”;  $\alpha = 0.60$ ), extraversion with five items (e.g., “outgoing”;  $\alpha = 0.68$ ), openness with seven items (e.g., “curious”;  $\alpha = 0.78$ ), agreeableness with five items (e.g., “softhearted”;  $\alpha = 0.80$ ), and conscientiousness with ten items (e.g., “organized”;  $\alpha = 0.61$ ). To compute each trait, scores items were reverse-coded when necessary and means were calculated for each personality trait.

### Covariates

The following sociodemographic characteristics, which could be associated with elevated levels of AL (Honkalampi et al., 2024; Salazar et al., 2016) were captured: age (continuous), gender (0 = male, 1 = female), years of education (continuous), and nativity (0 = U.S. Born, 1 = Foreign Born).

### Analysis plan

Initially, descriptive statistics were calculated to present the sociodemographic characteristics of the study population and to summarize the representation of the sample across the three study waves. We then fitted a series of longitudinal linear mixed-effects models to examine associations between Big-5 personality traits and AL over time.

We estimated two-level linear mixed-effects models, with repeated observations (Level 1) nested within individuals (Level 2). Random intercepts and random slopes for time (modeled as age centered at 65, i.e., age 65) were included at the individual level, using the unique participant identifier (hhidpn) as the grouping variable. This structure accounted for subject-specific variation in both baseline AL and the trajectory of AL over time.

Time was modeled continuously as years since baseline (T1), with the intercept set at age 65, the average age at study entry. To estimate change in AL over time, we included interaction terms between each personality trait and time (c.trait##c.age65), which allowed us to test whether personality traits modified the slope of AL change across time.

First, to examine their sole associations, we tested each Big-5 personality trait separately in individual models, adjusting for gender, education (in years), and birthplace (Table 2). Next, we estimated a fully adjusted model that included all five personality traits simultaneously to assess their independent unique contributions to AL (Table 3).<sup>1</sup> All analyses and data management were conducted using Stata version 17.0.

### Results

The descriptive sample characteristics for Latino adults ages 50 and older in the HRS at baseline are given in Table 1. Since changes in AL between 2006 and 2016 are the primary outcome, AL and age are given for all three time points. Mean levels of AL remained stable between Time 1 and Time 2 but declined by Wave 3. The average age of the sample at the study entry was 65 years. About 64% of the sample was comprised of women, and 55% of the sample was born outside of the U.S. On average, participants had nine years of education. Among participants with follow-up data, the mean interval between waves was 4.26 years ( $SD = 0.52$ ) for those with two waves and 3.67 years ( $SD = 0.49$ ) for those with three waves.

First, we tested a series of longitudinal linear mixed-effect models to examine the effects of each Big-5 personality trait on AL change over time, adjusting for covariates. In total, five separate models were fitted. In baseline associations, of all five personality traits, only conscientiousness showed an association with AL, where higher conscientiousness was associated with lower AL ( $\beta = -0.34$ ,  $p = .023$ ). Yet, none of the Big-5 personality traits were associated with change in AL over time ( $p > .05$ ). The estimates and significance rates for each model are provided in Table 2.

Next, a fully adjusted longitudinal linear mixed-effect model was tested, entering the Big-5 personality traits simultaneously and adjusting for the covariates. In this model, for the five personality traits, both conscientiousness and agreeableness were significantly associated with AL. Individuals with higher

**Table 2.** Linear mixed model estimates of the associations of each personality trait with baseline AL and rate of change in the HRS Latino population of older age ( $\geq 50$ ).

Personality trait model	Baseline		Rate of change	
	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>
Openness	Intercept	1.98 (0.15)		
	Openness	-0.10 (0.12)	<.0001*	0.02 (0.01)
Conscientiousness	Intercept	1.93 (0.15)		
	Conscientiousness	-0.34 (0.15)	.023*	0.02 (0.02)
Extraversion	Intercept	1.97 (0.15)		
	Extraversion	-0.23 (0.13)	.078	0.003 (0.01)
Agreeableness	Intercept	2.02 (0.15)		
	Agreeableness	0.09 (0.15)	.548	0.02 (0.02)
Neuroticism	Intercept	1.99 (0.15)		
	Neuroticism	0.04 (0.11)	.720	-0.01 (0.01)

Note. \* $p < 0.05$ . HRS = Health and retirement study; SE = standard error. Five separate models were tested once for each personality trait. All models were adjusted for the following covariates: gender, age, birthplace, and education.

**Table 3.** Linear mixed model estimates of the associations of all big 5 personality traits with baseline and rate of change in AL in the HRS Latino population of older age ( $\geq 50$ ).

Variable	Baseline		Rate of change	
	Estimate (SE)	<i>p</i>	Estimate (SE)	<i>p</i>
Intercept	1.98 (0.15)	<.0001*	-0.04 (0.02)	.041*
Age (at study entry)	0.05 (0.01)	<.0001*	-0.001 (0.001)	.243
Gender: Female (Ref = male)	-0.18 (0.15)	.234	-0.01 (0.01)	.396
Education (years)	-0.001 (0.02)	.963	-0.0003 (0.002)	.845
Foreign-born (Ref = U.S.-born)	0.09 (0.14)	.532	0.01 (0.01)	.629
Openness	-0.02 (0.16)	.908	0.02 (0.02)	.243
Conscientiousness	-0.48 (0.19)	.012*	0.004 (0.02)	.801
Extraversion	-0.26 (0.18)	.149	-0.02 (0.02)	.319
Agreeableness	0.54 (0.20)	.007*	0.02 (0.02)	.433
Neuroticism	-0.03 (0.11)	.757	-0.01 (0.01)	.542

Note. \* $p < 0.05$ ; HRS = Health and retirement study; SE = standard error.

conscientiousness were found to have lower AL ( $\beta = -0.48$ ,  $p = .012$ ), and individuals with lower agreeableness were associated with lower AL ( $\beta = -0.54$ ,  $p = .007$ ). As before, none of the Big-5 personality traits were significant predictors of change in AL ( $p > .05$ ). The estimates and significance rates for each model are presented in Table 3.

## Discussion

We examined the association between the Big-5 personality traits and trajectories of AL in a sample of Latino older adults (age  $\geq 50$ ) living in the United States. We tested associations of level and change in AL with each and all Big-5 personality traits. In the models where we tested separate models for each personality trait, conscientiousness emerged as the only personality trait to show an association with the level of AL. In the next model, where we simultaneously entered the Big-5 personality traits as predictors to observe the unique associations, agreeableness also showed a significant association with AL alongside conscientiousness. However, considering that agreeableness did not show an association with AL in separate models, this significant association in the simultaneous model could be attributed to a suppression effect, and it may be a statistical artifact rather than a true association. For predicting change in AL, neither the separate models nor the simultaneous model shows any significant predictions of personality traits on AL change. Overall, our findings showed that Latino Americans who are 50 years or older with higher levels of conscientiousness have lower levels of AL. The association between conscientiousness and AL in our work is consistent with the findings of the meta-analysis by Yoneda et al. (2023) and other studies (e.g., Christensen et al., 2019; Milad & Bogg, 2020). Thus, findings from this study bolster prior evidence that conscientiousness can be a protective factor against elevated AL.

The associations between neuroticism and openness identified by Yoneda et al. (2023) were not present in our sample of Latino Americans. These null findings may be partially

attributed to limited statistical power or, for neuroticism, the reliability of the scale not reaching the conventional threshold of 0.70. However, null findings are not uncommon in personality and AL research, and distinct patterns across populations may be a leading factor for the observed null associations. For instance, Milad and Bogg (2020) report an association with extraversion in American middle to older adults, while Christensen et al. (2019) report an association with openness to experience in a Danish sample. As such, these examples and the current study highlight the value of investigating patterns across distinct populations to elucidate whether the associations between specific personality traits and AL are universal or differ for unique groups. Findings from our study suggest that health promotion efforts aimed at fostering health AL levels and healthy aging should use tailored health promotion efforts that focus on conscientiousness rather than the remaining Big-5 personality traits.

Our study also aimed at understanding the association of the Big-5 personality traits with change in AL, yet we did not find any statistically significant results. The prior research on this association is limited, so our lack of findings may be due to the fact that there is no association or due to the limitations of our study that may have led to null results. It is possible that our sample exhibits a healthy survivor effect, which, regardless of the results,<sup>2</sup> cannot be entirely ruled out. The individuals who were able to contribute data to each wave were the ones who survived and therefore were healthier than those who did not continue their engagement in the study. Further, as argued in the literature, there are different ways to compute AL, which can create differences in findings (Yoneda et al., 2023). The high-risk cut-off method used in the study is a widely used approach in AL research and the scientific literature (Carbone et al., 2022). However, in conjunction with the healthy survivor effect, calculating AL at each time point using the cutoff method and comparing only among healthy survivors may have resulted in lower variance than expected.

Identification of specific personality traits, such as conscientiousness, is useful to achieve better health in Latinos who show a higher risk for elevated AL compared to non-Latino whites (Howard & Sparks, 2015; Moore et al., 2021). It is widely assumed that personality traits do not change after the age of 30 (Terracciano et al., 2010), yet it is known that in certain conditions (Bühler et al., 2024; Leszko et al., 2016) or with interventions (Javaras et al., 2019; Roberts et al., 2017) personality changes. Our study identifies conscientiousness as a possible protective factor, and improving related traits (e.g., orderliness) can be a path to achieve better health in Latino Americans. Thus, findings highlight the need to increase conscientiousness to protect healthy aging among Latinos. Our study was conducted among Latino Americans, which limits the generalizability of the findings to this group. Given the dearth of research longitudinally examining AL among this population and far less research examining the role of personality findings that advance the minority aging literature, advance within-group studies (Whitfield et al., 2008), and center aging research on the largest ethnic minoritized group in the United States: Latinos.

To the best of our knowledge, our study is the first to examine the connection between the Big-5 personality traits and AL in middle to older Latino American adults. Future research should focus on replicability of these findings and test possible interventions to examine their effectiveness in reaching better health.

## Author notes

1. The full table of results for each model (with fixed and random effects) is given in the [Supplementary Material](#) along with the variable descriptions (See [Tables S2–S8](#)).
2. A detailed sensitivity analysis of attrition and healthy survivor bias is provided in the [Supplementary Material](#).

## Supplementary material

[Supplementary data](#) are available at *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences* online.

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## Conflict of interest

The authors do not have conflicting interests that are relevant to the content of this article.

## Data availability

The analysis plan for the conducted research was not pre-registered. The study uses a publicly available data set from the HRS, which can be reached at <https://hrsoline.isr.umich.edu>

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