



Published in final edited form as:

Assessment. 2018 April ; 25(3): 336–347. doi:10.1177/1073191117691844.

Cognitive impairment, dementia, and personality stability among older adults

Antonio Terracciano¹, Yannick Stephan², Martina Luchetti¹, and Angelina R. Sutin¹

¹Florida State University College of Medicine, Tallahassee, FL, USA

²University of Montpellier, Montpellier, France

Abstract

There is contrasting evidence on personality stability in advanced age, and limited knowledge on the impact of cognitive impairment and dementia on trait stability. Group- and individual-level longitudinal analyses of the five major dimensions of personality assessed twice over 4-years ($N = 9,935$) suggest that rank-order stability was progressively lower with advancing age (from $r_{tt} = 0.68$ for age 50–60 to $r_{tt} = 0.58$ for age >80 years). Stability was low in the dementia group ($r_{tt} = 0.43$), and this was not simply due to lower reliability given that internal consistency remained adequate in the dementia group. Among individuals with no cognitive impairment or dementia, there was no association between stability and age ($r_{tt} = 0.70$ even for age >80). These results suggest that the lower personality stability in older adults is not due to age but cognitive impairment and dementia.

Keywords

Personality traits; dementia; cognitive impairment; rank-order stability; profile stability; neuroticism; conscientiousness

Introduction

A defining feature of personality traits is the consistency of individual differences over time. Rank-order stability – the test-retest correlation coefficients over a significant length of time – is usually around $r_{tt} = 0.70$ for most personality scales during adulthood (Ferguson, 2010; Roberts & DelVecchio, 2000; Terracciano, Costa, & McCrae, 2006) and even higher when accounting for measurement error (Chmielewski & Watson, 2009; Ferguson, 2010). Although stability coefficients are higher over short retest intervals (e.g., 1 year), long-term longitudinal studies indicate that personality stability holds even over retest intervals as long as 30 to 40 years (Jones, Livson, & Peskin, 2006; Terracciano et al., 2006).

The relative stability of personality traits, however, does not imply immutability. Trajectories of personality development throughout the lifespan are generally similar across individuals (Mroczek & Spiro, 2003; Small, Hertzog, Hulstsch, & Dixon, 2003; Terracciano, McCrae,

Brant, & Costa, 2005; Wortman, Lucas, & Donnellan, 2012), even from different cultures (McCrae et al., 2005; De Bolle et al., 2015), and changes along these normative trends do not disrupt the rank-order stability of personality. For example, both the rank order and mean level of conscientiousness tend to increase early in life. There is conflicting evidence, however, on whether personality stability declines among older adults (Ardelt, 2000; Lucas & Donnellan, 2011; Roberts & DelVecchio, 2000; Terracciano et al., 2006; Terracciano, McCrae, & Costa, 2010; Wortman et al., 2012). In addition to age, there is growing interest in other factors that moderate the degree of personality stability in adulthood (Stephan, Sutin, & Terracciano, 2014). In this article, we review the literature on personality stability in older adults and test whether stability coefficients are lower in those with advanced age in a large national sample of older Americans. We further examine demographic, personality, and cognitive variables that may moderate the level of personality stability. In particular, this study investigates whether cognitive status, including cognitive impairment and dementia, accounts for the lower stability of personality in the very old.

Personality stability in older adults

At least three meta-analyses have summarized research on age differences in personality stability across the lifespan (Ardelt, 2000; Ferguson, 2010; Roberts & DelVecchio, 2000). While there is strong agreement across studies that rank order stability coefficients are lower in childhood and increase gradually with age during adolescence and early in adulthood, the meta-analyses have reached mixed conclusions on the rank order stability of traits in older adults. Roberts and DelVecchio (2000) found that stability coefficients increase steadily with age and reached a plateau around $r_{tt} = .74$ in the 50 to 73 age group. Ferguson (2010), in contrast, found that stability already plateaued by the late 20s and was thereafter maintained, with $r_{tt} = .73$ for both the 42–62 and 63–83 age groups. And, in contrast again, Ardel (2000) found that stability coefficients peaked around age 50 and then declined with advanced age. Such discrepancies are in part due to the fact that few studies assess personality stability in older adults. For example, the Roberts and DelVecchio (2000) meta-analysis included $k=4$, $n=948$ for the 50–59 age group, $k=6$, $n=1,385$ for the 60–73 age group, and no study had samples older than 73. Ferguson (2010) included $k=2$ and $k=3$ for the two oldest age groups. As such, meta-analytic findings on personality stability in older adulthood were limited by the paucity of longitudinal data included in the meta-analyses.

In addition to age, stability coefficients may differ across samples because of differences in the length and reliability of the questionnaire used, the length of follow-up, and other characteristics of the study design or the sample. These differences can introduce bias in meta-analyses that compare coefficients from different samples. In recent years, data from large national longitudinal studies have provided a stronger test of the association between age and personality stability across the lifespan (Lucas & Donnellan, 2011; Specht, Egloff, & Schmukle, 2011; Wortman et al., 2012). In the large German Socio-Economic Panel (SOEP; $N = 20,434$, including 9,029 adults aged 49 to 84 years), the 4-year rank-order stability followed an inverted U-shaped curve, with stability coefficients highest in the middle age groups and lower in the older groups for all five traits (Lucas & Donnellan, 2011). Analyses of SOEP data by other investigators reached similar findings, except for conscientiousness (Specht et al., 2011). A similar inverted U-shaped curve was found in a

New Zealand sample, except for agreeableness (Milojev & Sibley, 2014). Similar results were also obtained in a large Australian sample ($N = 13,134$), but the pattern of declining stability was less evident for extraversion and conscientiousness compared to the other three traits (Wortman et al., 2012). Results from the German and Australian panel studies are noteworthy because they included the largest samples of older adults to date and raised the question of whether such patterns can be replicated in other samples, including from the United States. Of note, Lucas and Donnellan (2011) discussed the importance of investigating the underlying mechanisms for why rank order stability changes across adulthood and called for more research into the biological, cognitive, and social changes that may explain why stability declines with age among older adults.

Variation in personality stability by demographic, health, and psychosocial factors

Even within studies that used the same personality scale and study design across age cohorts, age is likely to be only one of many factors that differ across the cohorts. Any observed difference could be due to other factors, such as education, health status, or cognitive functioning. In addition to age, there may be other factors that account for variation in the level of rank-order stability. Among demographic factors, for example, age and sex were mostly unrelated to stability coefficients in the East Baltimore Epidemiologic Catchment Area study, but rank order stability was lower on most traits among African-Americans and individuals with lower education (Lockenhoff, Terracciano, Patriciu, Eaton, & Costa, 2009). Similar effects for education and race were also found in two large national samples, the Health and Retirement Study (HRS) and the Midlife in the United States (MIDUS)(Stephan et al., 2014). In addition to demographic characteristics, disease burden and physical inactivity were consistently related with lower personality stability in both the HRS and MIDUS (Stephan et al., 2014). As people age, the number of chronic conditions increase while the level of physical activity declines, and these changes in health and lifestyles were clearly linked to lower personality stability.

Personality itself may also contribute to its stability over time. Higher neuroticism and lower conscientiousness and agreeableness, for example, have been associated with lower stability in samples of adolescents and younger adults (Blonigen, Carlson, Hicks, Krueger, & Iacono, 2008; Donnellan, Conger, & Burzette, 2007; Lönnqvist, Mäkinen, Paunonen, Henriksson, & Verkasalo, 2008; Roberts, Caspi, & Moffitt, 2001). This pattern has been interpreted from a developmental perspective as youth who are more mature (e.g., more conscientious, emotionally stable) may reach stability earlier. From this perspective, it is possible that most people reach a high level of personality stability at some point in life, perhaps by middle adulthood. Alternatively, lower stability may persist throughout the lifespan for individuals who score higher on neuroticism and lower on conscientiousness and agreeableness. Of interest, one study did not find that personality traits are associated with changes in stability (i.e., differences between time 1–2 and 2–3 coefficients) in adults (Terracciano et al., 2010).

Large longitudinal studies have found that the level of rank-order stability was unrelated to major life events, such as becoming a parent, marriage, divorce, death of a spouse, starting a

new job, unemployment, and retirement (Specht et al., 2011; Vaidya, Gray, Haig, & Watson, 2002). These findings challenge the view that changes in social roles have a strong impact on personality development (see also Terracciano, 2014), but demographic and health-related variables have been related to personality stability and may account for the observed decline in stability among the very old.

Personality and Cognition

The primary hypothesis tested in this study is that cognitive impairment and dementia may explain the pattern of declining personality stability with age, especially among the oldest age groups (aged 80 years or older). This hypothesis is plausible because the prevalence of cognitive impairment and dementia increase progressively with age (Alzheimer's, 2015), and the steady increase in the number of impaired individuals may drag down the overall stability coefficients for the older groups. There is robust clinical evidence that dementia has an impact on personality. One criterion for a clinical diagnosis of dementia is "changes in personality, behavior, or compoment" (McKhann et al., 2011). Consistent with this clinical guideline, research with standardized assessments of the five major dimensions of personality have found dramatic change in personality in individuals with dementia (Chatterjee, Strauss, Smyth, & Whitehouse, 1992; Cipriani, Borin, Del Debbio, & Di Fiorino, 2015; Henriques-Calado, Duarte-Silva, & Ferreira, 2016; Pocnet, Rossier, Antonietti, & von Gunten, 2011; Robins Wahlin & Byrne, 2011; Welleford, Harkins, & Taylor, 1995). In such studies, caregivers were asked to fill out the questionnaire to describe their loved one twice, once to rate the current personality and once to rate the personality before the onset of dementia. These studies suggest that there are large mean level increases in neuroticism and declines in the other traits, including a roughly 2 SD decline in conscientiousness. However, most studies have focused on mean level change; less is known about stability coefficients. In our review of the literature we found three studies (Chatterjee et al., 1992; Pocnet et al., 2011; Welleford et al., 1995) that reported the test retest correlation between retrospective premorbid and current personality traits of individuals with mild to moderate dementia (total N = 127 across the three studies). We computed the weighted average (after an r to z transformation) and summarized the stability coefficients as follows: 0.70 for neuroticism, 0.65 for extraversion, 0.84 for openness, 0.85 for agreeableness, and 0.31 for conscientiousness. These coefficients suggest an association of dementia with low personality stability for conscientiousness but not for the other four traits. These studies were based on small samples, used observer ratings, and compared concurrent with retrospective assessments. To our knowledge, there are no prospective studies on the rank-order stability of personality traits using a standardized measure of the five factor model of personality in people with cognitive impairment or dementia.

Even before individuals experience cognitive impairment or dementia, there is evidence for reciprocal relations between personality and cognition (Luchetti, Terracciano, Stephan, & Sutin, 2016). Prospective studies have found consistent evidence that self-report ratings of personality predicts risk of incident Alzheimer's disease (Terracciano et al., 2014). Meta-analyses have found that high neuroticism and low conscientiousness are the strongest personality predictors of cognitive decline and the development of Alzheimer's disease (Luchetti et al., 2016; Terracciano et al., 2014). There is also cross-sectional evidence that

both self-report and informant reports of personality discriminate between healthy aging and early-stage Alzheimer's disease (Duchek, Balota, Storandt, & Larsen, 2007). Another study found that mean level changes in global ratings of personality can be observed even before the onset of dementia (Balsis, Carpenter, & Storandt, 2005), although no mean level change was found in a sample with MCI with repeated self-report assessments of the five factors (Kuzma, Sattler, Toro, Schonknecht, & Schroder, 2011). Again, these previous studies on personality and cognitive performance or impairment have not focused on the potential impact of cognitive impairment on the rank-order stability of personality. Of interest, however, a MIDUS study found that middle-aged individuals who were stable on openness and neuroticism had better inductive reasoning and faster reaction times compared to those who changed (Graham & Lachman, 2012).

The present study

In this study we examined a longitudinal cohort of about 10,000 older Americans to address several questions on personality stability. First, we tested whether rank-order stability declines among older adults. Consistent with other large panel cohorts (Lucas & Donnellan, 2011; Specht et al., 2011; Wortman et al., 2012), we expected stability to be progressively lower with increasing age. Second, we tested whether personality stability was lower among individuals with either dementia or cognitive impairment not dementia (CIND). We expected personality stability to be lower in those with cognitive impairments (either CIND or dementia) than in participants who were cognitively intact. To address whether lower stability was simply due to lower reliability of the ratings in people with impaired cognitive capacities, we examined whether internal consistency coefficients varied by cognitive status. Third, we tested whether cognitive performance, or the classification as CIND or dementia, was associated with lower personality stability and whether it accounted for the decline in personality stability in the older cohorts. We expected that personality stability would be lower in the groups with cognitive impairments. We further expected that when participants with CIND or dementia were excluded from the analyses personality stability would be similar across age groups. Fourth, we examined whether demographic variables (e.g., education) and personality traits moderate the level of personality stability. Studies of younger adults suggest that a more mature personality is related to a high degree of stability. In all analyses we focus on rank-order stability but also examine profile stability. We report the results from group and individual level analyses.

Method

Sample

The HRS is a large national sample of Americans aged 50 years or older. The HRS data are publicly available at <http://hrsonline.isr.umich.edu/>. The University of Michigan Institutional Review Board approved the HRS research protocol and the National Institute on Aging funded the study. Participants with two assessments of personality, measured 4 years apart, were included in this study. A random half of the HRS sample completed the personality inventory in 2006 and again in 2010. The other half completed the personality inventory for the first time in 2008 and again in 2012. The data were combined for the analyses. At

baseline (2006–2008) 14,184 individuals provided complete personality data. Of these, 9,935 completed the personality assessment again at follow up (2010–2012). At baseline, the sample included 59% women, 11% African-American, 7% Hispanic, age ranged from 50 to 96 years ($M = 67.44$, $SD = 9.10$), and the years of education ranged from 0 to 17 years ($M = 12.85$, $SD = 2.93$).

Compared to participants that completed both assessments, those with no personality data at follow-up were older (67.44 vs. 72.08), more likely to be African-American (11% vs. 17%) or Hispanic (7% vs. 10%), had fewer years of education (12.85 vs. 11.95), and scored higher on neuroticism ($d = .11$) and lower on extraversion ($d = .12$), openness ($d = .14$), agreeableness ($d = .08$), and conscientiousness ($d = .27$) ($ps < .05$). Sex was not associated with attrition ($p > .05$). Of the 4,249 individuals with no follow-up personality data, 1,830 (43%) were known deceased as of 2012.

Personality assessment

Personality was assessed using the Midlife Development Inventory (MIDI) (Lachman, Weaver, & Waltham, 1997) a brief self-report measure of the five major dimensions of personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness. The MIDI asked respondents how much 26 adjectives described them on a Likert scale ranging from 1 (not at all) to 4 (a lot). The adjectives are nervous, calm, moody, and worrying (neuroticism); outgoing, lively, friendly, active, and talkative (extraversion); creative, curious, broad minded, sophisticated, imaginative, intelligent, and adventurous (openness); helpful, warm, caring, softhearted, and sympathetic (Agreeableness); and organized, hardworking, thorough, responsible, and careless (conscientiousness). The internal consistency of the five major dimensions assessed by the MIDI are presented in Table 2.

Cognitive assessment

We classified individual's cognitive status using the modified Telephone Interview for Cognitive Status (TICS_m) (Brandt, Spencer, & Folstein, 1988; Crimmins, Kim, Langa, & Weir, 2011). A 27-point TICS_m composite score is computed from performance on three tests: immediate and delayed recall of 10 nouns (0 to 20 points), serial 7 subtraction (0 to 5 points), and backward counting (0 to 2 points). Individuals who scored 6 or less were classified in the dementia group, those who scored 7 to 11 were classified in the cognitive impairment not dementia (CIND) group, and those who scored 12 to 27 were classified in the normal cognitive group (Crimmins et al., 2011). These cut-offs values were validated by comparisons with clinical diagnoses in the Aging, Demographics, and Memory Study (ADAMS), a substudy of the HRS. In the ADAMS, an expert clinician made the diagnosis of CIND or dementia based on a detailed neuropsychological and clinical assessment in accordance with DSM-III-R criteria. Using TICS_m performance scores to predict the ADAMS diagnosis, it was possible to correctly classify 74% of the study participants (Crimmins et al., 2011). This classification of HRS participants has been used in several studies of cognitive aging and dementia (Clark et al., 2013; Crimmins et al., 2011; Davydow, Levine, Zivin, Katon, & Langa, 2015; Langa et al., 2016; Saczynski et al., 2015; Stephan, Sutin, Luchetti, & Terracciano, 2016; Terracciano, Stephan, Luchetti, Albanese, & Sutin,

2017). Other studies also support the validity of TICS and TICS_m (Barber & Stott, 2004; Brandt et al., 1988).

Participants were classified in the 3 groups based on the worse performance at the two waves in which they completed both the TICS_m and the personality questionnaire. That is, they were classified in the “normal” group if they scored in the normal range at both assessment points, otherwise they were classified as either CIND or dementia depending on their worse score at either baseline or follow-up.

Statistical analyses

We computed stability coefficients at both the group and individual level. In addition to the classic group level coefficients, we examined individual level stability coefficients for two reasons. First, grouping variables such as age or education produce a loss of predictive power given that the full distribution of the variable is reduced to a few categories. Second, demographic variables tend to be correlated (for example older cohorts tend to have lower education) and individual level coefficients can be examined in multiple regression analyses that account for the effects of multiple variables in one model. With the individual level analyses, in multiple regression models we examined age, sex, education, race, ethnicity, cognitive scores or categories, and the baseline scores of the five factors as predictors of personality stability.

At group level, we computed the standard Pearson correlation coefficient between baseline and 4-year follow-up scores for each personality trait. We compared stability coefficients in subgroups separated by age (in decades) or by cognitive status (normal, CIND, dementia).

At the individual level, consistent with previous work (Asendorpf, 1992; McCrae, 1993; Stephan et al., 2014; Stephan, Sutin, & Terracciano, 2015; Terracciano et al., 2006; Terracciano et al., 2010), we computed individual stability (IS) coefficients for each participant as follows:

$$IS = 1 - [(z_1 - z_2)^2 / 2],$$

where z_1 and z_2 are the z-standardized personality trait scores for an individual at the first and second assessments. The average of the IS coefficients across all respondents corresponds to the retest correlation at the group level. Thus, the IS coefficient can be interpreted as the individual's contribution to the group rank-order stability coefficient.

Although we focused on rank-order stability, we also examined an index of profile (also known as ipsative) stability, the double entry intra-class correlation (ICC). Profile stability refers to the consistency over time in the configuration of traits. The ICC was calculated for each person as the correlation between the array $N_1, E_1, O_1, A_1, C_1, N_2, E_2, O_2, A_2, C_2$ and the array $N_2, E_2, O_2, A_2, C_2, N_1, E_1, O_1, A_1, C_1$, where N, E, O, A, and C are the scores on neuroticism, extraversion, openness, agreeableness, and conscientiousness, and the subscripts refer to time 1 or 2. The ICC has several advantages compared to other methods to compute profile stability and it is generally more conservative than other approaches (Chan et al., 2012; McCrae, 2008).

Although rank order stability is generally similar across the five major personality dimensions, some clinical studies have found some variability across traits, for example with Neuroticism and Conscientiousness relatively less stable compared to other traits (Hopwood et al., 2013). We therefore examined the stability of each trait separately but also report the average stability across the five traits. Averages were computed after Fisher's r to z ($z=0.5*\text{LN}((1+r)/(1-r))$) transformation, and transformed back to r ($r=(\text{EXP}(2*z)-1)/(\text{EXP}(2*z)+1)$) for reporting. Significance of the difference between correlations was computed from $z=(z_1 - z_2)/\text{SQRT}((1/N_1-3)+(1/N_2-3))$. To examine whether Cronbach alpha coefficients differ between groups we used the Feldt test (1969). The SPSS-IBM software was used for the analyses.

Results

Group-level analyses

The 4-year retest correlations for each of the five traits in the total sample and in each subgroup by decade are reported in Table 1. The average coefficient across the five factors are illustrated in Figure 1. For each trait, the rank order stability was lower with every decade increase in age, ranging from an average $r_{tt} = 0.68$ for individuals in the 50 to 59 age group to $r_{tt} = 0.58$ for individuals aged 80 years or older at baseline ($p < .01$).

Next, we examined differences in personality stability by cognitive status. As reported in Table 2 and illustrated in Figure 1, across the five factors there was a clear pattern of lower stability in the dementia group. The CIND group had an intermediate level of stability.

The lower stability in the older groups (Table 1) was complemented by a pattern of progressively higher prevalence of cognitive impairment in the older groups: The proportion of individuals with CIND or dementia was 15% in the 50–59 age group, 21% in the 60–69 age group, 32% in the 70–79 age group, and 54% in the 80+ age group. We further examined age differences in stability in the subsample with no cognitive impairment. As reported in Table 3 and illustrated in Figure 1, there were essentially no differences between age groups among participants with no cognitive impairment, and the difference between the youngest ($r_{tt} = 0.72$) and oldest ($r_{tt} = 0.70$) groups was non-significant ($p = 0.28$). Of note, the results in Tables 1 to 3 were similar across the five factors and the patterns were also similar across rank-order and profile stability coefficients.

Individual-level analyses

Besides the classic group-level analyses reported above, we addressed the study hypotheses using multivariate regression models. The dependent variables were the individual level stability coefficients for each trait and the average IS across the five factors. We first examined a model with only age as a continuous predictor. Results indicated that an older age was a significant predictor of lower personality stability for all traits except neuroticism (Table 4) and for the average IS ($\beta = -0.07$, $p < 0.01$). The effect of age remained significant ($\beta = -0.06$, $p < 0.01$) when including sex, education, race and ethnicity in the regression model (Table 4). Of interest, higher education was associated with higher personality

stability, while being male, African-American, or race other than White were associated with lower stability.

In a model that included the demographic variables and the TICSm score (Table 4), we found that the TICSm was a strong predictor of personality stability ($\beta = 0.19$, $p < 0.01$), while age was no longer associated with the level of stability ($\beta = 0.01$, $p = 0.93$). The analyses were repeated using the cognitive status categories (dementia, CIND, normal) instead of the continuous TICSm score, along with age and the other demographic variables. We found that the cognitive status variable was again associated with higher stability ($\beta = 0.20$, $p < 0.01$), whereas age was no longer a significant predictor of stability ($\beta = -0.01$, $p = 0.93$). The pattern of associations was similar for the IS on each of the five factors and for the ICC.

Baseline personality as moderator of stability

We examined whether baseline personality scores were associated with the level of personality stability over the 4-year interval. In a regression model with age, sex, education, race, ethnicity, and the baseline five factors entered simultaneously, we found that lower neuroticism ($\beta = -0.08$, $p < 0.01$) and higher agreeableness ($\beta = 0.11$, $p < 0.01$) and conscientiousness ($\beta = 0.06$, $p < 0.01$) were associated with higher average IS stability coefficient (Table 4). Not surprisingly, the baseline score of each trait was the strongest predictor of that trait's stability. For example, baseline agreeableness was the strongest predictor of the stability of agreeableness. For the profile stability, only extraversion was unrelated to the ICC, and somewhat surprisingly higher openness was associated with lower profile stability.

Internal consistency by cognitive status

The lower retest stability coefficients in individuals with cognitive impairment or dementia could be due to impaired capacity in responding to the questionnaire, which in addition to temporal stability may also worsen the scales internal consistency. We therefore examined internal consistency for the five factors by cognitive status at baseline and follow-up. As presented in Table 2, the differences in internal consistency among the groups were generally small. The average across the five factors were 0.75 for the normal, 0.70 for the CIND, and 0.72 for the Dementia group. Compared to the normal group, there was a trend for the Cronbach alpha to be slightly lower in the dementia group (Feldt $W = 0.92$; $p = 0.11$), and it was significantly lower in the CIND group (Feldt $W = 0.86$; $p < 0.01$).

Discussion

In a large sample of Americans 50 years or older, we found evidence for progressively lower personality stability in the oldest participants, a pattern found for all five traits. These findings from the HRS are consistent with those of other large national cohorts (Lucas & Donnellan, 2011; Specht et al., 2011; Wortman et al., 2012), which considerably strengthens the evidence that personality stability is lower in later adulthood. This study further advanced the literature by examining potential mechanisms for the observed pattern of declining stability with advancing age. In analyses that accounted for cognitive status, the

lower stability in the oldest participants could be explained by cognitive impairment and dementia. Indeed, in the group with no cognitive impairment, there was no evidence of a decline in stability with age.

The findings of this study are relevant for developmental theories of personality (e.g., McCrae & Costa, 2003; Roberts & Wood, 2006). The study provides evidence that personality remains relatively stable as long as individuals maintain their cognitive capacities. Aside from the subgroup with probable neurodegenerative disease (i.e., dementia), there is little evidence that changes in social roles, family relations, lifestyle, or other environmental factors (Ardelt, 2000) have a detrimental impact on personality stability in late life. Although there is variability across individuals in the level of personality stability, most individuals free from cognitive impairments maintain a high degree of consistency even in late adulthood. These findings indicate that personality traits remain relatively stable pillars of a person's psychological makeup throughout their adult life.

Cognitive impairment, dementia, and personality stability

The study also provides new evidence on the association between cognitive functioning and personality traits. Previous research has focused primarily on the association between dementia and mean level change by using observer ratings of current and retrospective personality (Robins Wahlin & Byrne, 2011). To complement this literature, we used a prospective study design with a self-report assessment of personality to test the stability of individual differences rather than differences in mean-level change. The findings indicate that the loss of cognitive capacities, and/or the associated neuropathology processes, have a profound impact on a person's core psychological traits. The study provides novel empirical evidence that the impact of dementia is not limited to mean level change by showing that individuals with cognitive impairment or dementia have lower rank-order and profile stability. The lower stability in the dementia group indicates that there is considerable heterogeneity in dementia-related personality change, and such heterogeneity is reflected in the lower stability coefficients. These findings are consistent with clinical observations of change in behaviors and mood in persons with dementia (McKhann et al., 2011), changes that caregivers and clinicians often describe as out of character and unpredictable. The disease may lead to personality-related changes that are uncharacteristic for the person (e.g., a driven person gets lost in a state of apathy) or may lead to an exaggeration of premorbid traits (e.g., an antagonistic person may become even more antagonistic).

Participants in the dementia group had lower stability coefficients uniformly across the five traits. This finding is in contrast with the evidence from observer rating studies that find that only conscientiousness has lower stability (Chatterjee et al., 1992; Pocnet et al., 2011; Welleford et al., 1995). The different results might be due to differences in study design (prospective versus retrospective), the questionnaire used, or the self- versus observer-rating perspective. The three retrospective studies were all small (about 50 individuals or less each), but the results were consistent across the three studies. More research is needed to systematically examine the reasons for such differences.

In contrast to the steep decline in rank-order stability, there was not a correspondingly steep decline in the internal consistency of the five traits. The groups with either CIND or

dementia had somewhat lower internal consistency coefficients, but these differences were small, especially compared to the differences in the test-retest correlations. This pattern suggests that the lower temporal stability is not simply the result of lower reliability or poor quality data due to loss of capacity to understand and respond to the items. Although the reliability of the response may decrease with the advancement of the neurodegenerative process, part of the lower stability observed is likely due to actual change in personality that does not follow the normative trajectory.

Education and personality moderate personality stability

Using individual stability coefficients we were able to account for the effect of sex, race, ethnicity, and education on personality stability. The association between age and stability was essentially unchanged by the inclusion of these covariates. Higher education, however, was a strong predictor of higher stability, as noted in some previous studies (Löckenhoff et al., 2008; Stephan et al., 2014; Stephan et al., 2015). Of note, one study that compared personality stability longitudinally, that is the stability of sequential assessment within-person, found little evidence of declining personality stability with age or any effect of education, but most participants had higher level of education (Terracciano et al., 2010). There are several reasons that education may be associated with personality stability. First, there could be more measurement error and lower data quality among individuals with lower literacy (Sutin, Costa Jr, Evans, & Zonderman, 2013). Second, people with lower education tend to have fewer economic resources, which may lead to more financial stressors and greater challenges to their self-concept. Third, lower education is associated with worse health and vulnerability to cognitive losses, which we found to be associated with lower stability. The exact reasons for this association is another promising area for future investigation.

In the individual-level analyses, higher baseline neuroticism and lower baseline agreeableness and conscientiousness were associated with lower stability. These results are consistent with findings from adolescents and young adult samples (Blonigen et al., 2008; Donnellan et al., 2007; Lönnqvist et al., 2008; Roberts et al., 2001). This pattern suggests that more than a phenomenon of delayed maturity in young adulthood, the association between a vulnerable personality profile and relatively lower personality stability can be observed even in late adulthood. This finding suggests the hypothesis that person-level stability may not change significantly throughout the adult life and is thus more a characteristic of the person. The longitudinal examination of stability in sequential assessments suggest that the level of stability remains relatively unchanged (Terracciano 2010). More research with repeated assessments over the lifespan are needed to further test the hypothesis that beyond the transition from adolescence to young adulthood, adults who score higher on neuroticism or lower on agreeableness or conscientiousness may be characterized by lower personality stability throughout the life course.

Limitations and Conclusions

Among the limitations of this longitudinal study was the attrition, although much of it was due to death of the participants. Individuals who are older, have fewer years of education, and have a more vulnerable personality profile are at greater risk of dementia (Alzheimer's,

2015; Prince, Albanese, Guerchet, & Prina, 2014; Terracciano et al., 2014) and these are the participants who were less likely to be in the longitudinal sample. As such, the study may underestimate the impact of dementia on the stability of personality. Another limitation was the brief assessment of personality and cognition. For personality, a more detailed measure would provide data on the stability of personality facets. Of particular interest would be prospective personality data with both self-report and observer ratings. Especially for the group with cognitive impairment, comparing the stability of self-reports with the stability of ratings from an informant could be valuable given the impact of memory deficits on the ability to update self-image (Rankin, Baldwin, Pace-Savitsky, Kramer, & Miller, 2005). However, contrary to the idea that individuals with dementia may report on their former personality rather than their current personality traits (Rankin et al., 2005), we found that stability was lower in the individual with dementia, suggesting that their self-perception was changing. For cognition, the HRS uses one of the most known and widely used telephone-based cognitive assessment (Brandt et al., 1988; Castanho et al., 2014; Crimmins et al., 2011). While telephone interviews are a cost-effective rapid-screening tool that can reach a larger and more diverse pool of participants (Castanho et al., 2014), it is less reliable than the golden standard of face-to-face evaluation based on a comprehensive cognitive battery and other clinical information. As such, the classification based on TICSM should be interpreted with caution as some participants might have been misclassified. Although more precise estimates could be obtained with more detailed measures, the large sample size helps mitigate the imprecision of brief measures and results were robust across group and individual level analyses. In particular, the differences between the normal, CIND, and dementia groups were corroborated by the results of analyses that used the continuous cognitive scores rather than grouping by cognitive status.

In conclusion, this study supports previous findings that personality is less stable in older adulthood than younger adulthood and indicates that cognitive impairment and dementia, rather than age per se, explain the lower stability. In older adults with intact cognitive function, there was no evidence of progressively lower personality stability with age. By elucidating the role of age and cognition in the consistency of individual differences over time, this study advances knowledge on a defining feature of traits that is relevant for theories of personality and personality development. This study further provides new insights on dementia and personality and raises awareness of the importance of considering cognitive status for the assessment of personality traits among the very old.

Acknowledgments

Funding

This work was supported by the National Institute on Aging Grant R03AG051960. The HRS is supported by the National Institute on Aging grant U01AG009740 awarded to the University of Michigan.

References

- Alzheimer's A. 2015 Alzheimer's disease facts and figures. *Alzheimer's & dementia: the journal of the Alzheimer's Association*. 2015; 11(3):332.
- Ardelt M. Still stable after all these years? Personality stability theory revisited. *Social Psychology Quarterly*. 2000; 63:392–405.

- Asendorpf JB. Beyond stability: Predicting inter-individual differences in intra-individual change. *European Journal of Personality*. 1992; 6:103–117.
- Balsis S, Carpenter BD, Storandt M. Personality change precedes clinical diagnosis of dementia of the Alzheimer type. *Journals of Gerontology Series B-Psychological Sciences and Social Sciences*. 2005; 60(2):P98–P101.
- Barber M, Stott DJ. Validity of the Telephone Interview for Cognitive Status (TICS) in post-stroke subjects. *Int J Geriatr Psychiatry*. 2004; 19(1):75–79. DOI: 10.1002/gps.1041 [PubMed: 14716702]
- Blonigen DM, Carlson MD, Hicks BM, Krueger RF, Iacono WG. Stability and change in personality traits from late adolescence to early adulthood: A longitudinal twin study. *Journal of Personality*. 2008; 76(2):229–266. [PubMed: 18331280]
- Brandt J, Spencer M, Folstein M. The telephone interview for cognitive status. *Cognitive and Behavioral Neurology*. 1988; 1(2):111–118.
- Castanho TC, Amorim L, Zihl J, Palha JA, Sousa N, Santos NC. Telephone-based screening tools for mild cognitive impairment and dementia in aging studies: a review of validated instruments. *Front Aging Neurosci*. 2014; 6:16.doi: 10.3389/fnagi.2014.00016 [PubMed: 24611046]
- Chan W, McCrae RR, De Fruyt F, Jussim L, Lockenhoff CE, De Bolle M, ... Terracciano A. Stereotypes of age differences in personality traits: universal and accurate? *J Pers Soc Psychol*. 2012; 103(6):1050–1066. DOI: 10.1037/a0029712 [PubMed: 23088227]
- Chatterjee A, Strauss ME, Smyth KA, Whitehouse PJ. Personality changes in Alzheimer's disease. *Arch Neurol*. 1992; 49:486–491. [PubMed: 1580810]
- Chmielewski M, Watson D. What Is Being Assessed and Why It Matters: The Impact of Transient Error on Trait Research. *J Pers Soc Psychol*. 2009; 97(1):186–202. [PubMed: 19586248]
- Cipriani G, Borin G, Del Debbio A, Di Fiorino M. Personality and dementia. *J Nerv Ment Dis*. 2015; 203(3):210–214. DOI: 10.1097/nmd.0000000000000264 [PubMed: 25714255]
- Clark DO, Stump TE, Tu W, Miller DK, Langa KM, Unverzagt FW, Callahan CM. Hospital and nursing home use from 2002 to 2008 among U.S. older adults with cognitive impairment, not dementia in 2002. *Alzheimer Dis Assoc Disord*. 2013; 27(4):372–378. DOI: 10.1097/WAD.0b013e318276994e [PubMed: 23151595]
- Crimmins EM, Kim JK, Langa KM, Weir DR. Assessment of cognition using surveys and neuropsychological assessment: the Health and Retirement Study and the Aging, Demographics, and Memory Study. *J Gerontol B Psychol Sci Soc Sci*. 2011; 66(Suppl 1):i162–171. DOI: 10.1093/geronb/ubr048 [PubMed: 21743047]
- Davydov DS, Levine DA, Zivin K, Katon WJ, Langa KM. The association of depression, cognitive impairment without dementia, and dementia with risk of ischemic stroke: a cohort study. *Psychosom Med*. 2015; 77(2):200–208. DOI: 10.1097/psy.0000000000000136 [PubMed: 25647752]
- De Bolle M, De Fruyt F, McCrae RR, Lockenhoff CE, Costa PT, Aguilar-Vafaie ME, ... Terracciano A. The emergence of sex differences in personality traits in early adolescence: A cross-sectional, cross-cultural study. *J Pers Soc Psychol*. 2015; 108(1):171–185. DOI: 10.1037/a0038497 [PubMed: 25603371]
- Donnellan MB, Conger RD, Burzette RG. Personality development from late adolescence to young adulthood: differential stability, normative maturity, and evidence for the maturity-stability hypothesis. *Journal of Personality*. 2007; 75(2):237–263. JOPY438 [pii]. DOI: 10.1111/j.1467-6494.2007.00438.x [PubMed: 17359238]
- Duchek JM, Balota DA, Storandt M, Larsen R. The power of personality in discriminating between healthy aging and early-stage Alzheimer's disease. *J Gerontol B Psychol Sci Soc Sci*. 2007; 62(6):P353–361. 62/6/P353 [pii]. [PubMed: 18079420]
- Feldt LS. A test of the hypothesis that cronbach's alpha or kuder-richardson coefficient twenty is the same for two tests. *Psychometrika*. 1969; 34(3):363–373.
- Ferguson CJ. A meta-analysis of normal and disordered personality across the life span. *J Pers Soc Psychol*. 2010; 98(4):659–667. DOI: 10.1037/a0018770 [PubMed: 20307136]
- Graham EK, Lachman ME. Personality stability is associated with better cognitive performance in adulthood: are the stable more able? *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. 2012; 67(5):545–554.

- Henriques-Calado J, Duarte-Silva ME, Ferreira AS. Personality traits in women with Alzheimer's disease: Comparisons with control groups with the NEO-FFI. *Personality and Individual Differences*. 2016; 101:341–347.
- Hopwood CJ, Morey LC, Donnellan MB, Samuel DB, Grilo CM, McGlashan TH, ... Skodol AE. Ten-year rank-order stability of personality traits and disorders in a clinical sample. *Journal of Personality*. 2013; 81(3):335–344. DOI: 10.1111/j.1467-6494.2012.00801.x [PubMed: 22812532]
- Jones CJ, Livson N, Peskin H. Paths of psychological health: Examination of 40-year trajectories from the Intergenerational Studies. *Journal of Research in Personality*. 2006; 40:56–72.
- Kuzma E, Sattler C, Toro P, Schonknecht P, Schroder J. Premorbid personality traits and their course in mild cognitive impairment: results from a prospective population-based study in Germany. *Dement Geriatr Cogn Disord*. 2011; 32(3):171–177. 000332082 [pii]. DOI: 10.1159/000332082 [PubMed: 22005607]
- Lachman, ME., Weaver, SL., Waltham, MA. The Midlife Development Inventory (MIDI) personality scales: Scale construction and scoring. 1997. Retrieved from
- Langa KM, Larson EB, Crimmins EM, Faul JD, Levine DA, Kabeto MU, Weir DR. A Comparison of the Prevalence of Dementia in the United States in 2000 and 2012. *JAMA Internal Medicine*. 2016
- Löckenhoff CE, Terracciano A, Bievenu OJ, Patriciu NS, Nestadt G, McCrae RR, ... Costa PTJ. Ethnicity, education, and the temporal stability of personality traits in the East Baltimore Epidemiologic Catchment Area Study. *Journal of Research in Personality*. 2008; 42:577–598. [PubMed: 19122849]
- Lockenhoff CE, Terracciano A, Patriciu NS, Eaton WW, Costa PT Jr. Self-reported extremely adverse life events and longitudinal changes in five-factor model personality traits in an urban sample. *J Trauma Stress*. 2009; 22(1):53–59. DOI: 10.1002/jts.20385 [PubMed: 19230009]
- Lönnqvist JE, Mäkinen S, Paunonen SV, Henriksson M, Verkasalo M. Psychosocial functioning in young men predicts their personality stability over 15 years. *Journal of Research in Personality*. 2008; 42:599–621.
- Lucas RE, Donnellan MB. Personality development across the life span: longitudinal analyses with a national sample from Germany. *J Pers Soc Psychol*. 2011; 101(4):847–861. DOI: 10.1037/a0024298 [PubMed: 21707197]
- Luchetti M, Terracciano A, Stephan Y, Sutin AR. Personality and Cognitive Decline in Older Adults: Data From a Longitudinal Sample and Meta-Analysis. *J Gerontol B Psychol Sci Soc Sci*. 2016; 71:591–601. DOI: 10.1093/geronb/gbu184 [PubMed: 25583598]
- McCrae RR. Agreement of personality profiles across observers. *Multivariate Behavioral Research*. 1993; 28:13–28.
- McCrae RR. A note on some measures of profile agreement. *J Pers Assess*. 2008; 90(2):105–109. 790912060 [pii]. DOI: 10.1080/00223890701845104 [PubMed: 18444102]
- McCrae, RR., Costa, PT, Jr. *Personality in adulthood: A Five-Factor Theory perspective*. 2. New York: Guilford Press; 2003.
- McCrae RR, Terracciano A. 78 Members of the Personality Profiles of Cultures Project. Universal features of personality traits from the observer's perspective: Data from 50 cultures. *J Pers Soc Psychol*. 2005; 88:547–561. [PubMed: 15740445]
- McKhann GM, Knopman DS, Chertkow H, Hyman BT, Jack CR Jr, Kawas CH, ... Phelps CH. The diagnosis of dementia due to Alzheimer's disease: recommendations from the National Institute on Aging-Alzheimer's Association workgroups on diagnostic guidelines for Alzheimer's disease. *Alzheimers Dement*. 2011; 7(3):263–269. DOI: 10.1016/j.jalz.2011.03.005 [PubMed: 21514250]
- Milojev P, Sibley CG. The stability of adult personality varies across age: Evidence from a two-year longitudinal sample of adult New Zealanders. *Journal of Research in Personality*. 2014; 51:29–37.
- Mroczek DK, Spiro A. Modeling intraindividual change in personality traits: Findings from the normative aging study. *Journals of Gerontology: Psychological Sciences*. 2003; 58B(3):P153–P165.
- Pocnet C, Rossier J, Antonietti JP, von Gunten A. Personality changes in patients with beginning Alzheimer disease. *Can J Psychiatry*. 2011; 56(7):408–417. [PubMed: 21835104]

- Prince, M., Albanese, E., Guerchet, M., Prina, M. Dementia and risk reduction: an analysis of protective and modifiable factors. Londres: Alzheimers Disease International; 2014. World Alzheimer Report 2014.
- Rankin K, Baldwin E, Pace-Savitsky C, Kramer J, Miller B. Self awareness and personality change in dementia. *Journal of Neurology, Neurosurgery & Psychiatry*. 2005; 76(5):632–639.
- Roberts BW, Caspi A, Moffitt TE. The kids are alright: Growth and stability in personality development from adolescence to adulthood. *J Pers Soc Psychol*. 2001; 81(4):670–683. [PubMed: 11642353]
- Roberts BW, DelVecchio WF. The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychol Bull*. 2000; 126:3–25. [PubMed: 10668348]
- Roberts, BW., Wood, D. Personality Development in the Context of the Neo-Socioanalytic Model of Personality. In: Mroczek, DK., Little, TD., editors. *Handbook of personality development*. Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers; 2006.
- Robins Wahlin TB, Byrne GJ. Personality changes in Alzheimer’s disease: a systematic review. *Int J Geriatr Psychiatry*. 2011; 26(10):1019–1029. DOI: 10.1002/gps.2655 [PubMed: 21905097]
- Saczynski JS, Rosen AB, McCammon RJ, Zivin K, Andrade SE, Langa KM, ... Briesacher BA. Antidepressant Use and Cognitive Decline: The Health and Retirement Study. *American Journal of Medicine*. 2015; 128(7):739–746. DOI: 10.1016/j.amjmed.2015.01.007 [PubMed: 25644319]
- Small BJ, Hertzog C, Hultsch DF, Dixon RL. Stability and change in adult personality over 6 years: Findings from the Victoria Longitudinal Study. *Journal of Gerontology: Psychological Sciences*. 2003; 58B:P166–P176.
- Specht J, Egloff B, Schmukle SC. Stability and change of personality across the life course: the impact of age and major life events on mean-level and rank-order stability of the Big Five. *J Pers Soc Psychol*. 2011; 101(4):862–882. DOI: 10.1037/a0024950 [PubMed: 21859226]
- Stephan Y, Sutin AR, Luchetti M, Terracciano A. Feeling Older and the Development of Cognitive Impairment and Dementia. *J Gerontol B Psychol Sci Soc Sci*. 2016; doi: 10.1093/geronb/gbw085
- Stephan Y, Sutin AR, Terracciano A. Physical activity and personality development across adulthood and old age: Evidence from two longitudinal studies. *Journal of Research in Personality*. 2014; 49:1–7.
- Stephan Y, Sutin AR, Terracciano A. Subjective age and personality development: a 10-year study. *Journal of Personality*. 2015; 83(2):142–154. DOI: 10.1111/jopy.12090 [PubMed: 24471687]
- Sutin AR, Costa PT Jr, Evans MK, Zonderman AB. Personality assessment in a diverse urban sample. *Psychological assessment*. 2013; 25(3):1007. [PubMed: 23815114]
- Terracciano A. Pregnancy, marriage and quitting school nurture personality development? Commentary on Bleidorn and colleagues (2013). *Psychol Sci*. 2014; doi: 10.1177/0956797613515003
- Terracciano A, Costa PT Jr, McCrae RR. Personality plasticity after age 30. *Personality and Social Psychology Bulletin*. 2006; 32:999–1009. [PubMed: 16861305]
- Terracciano A, McCrae RR, Brant LJ, Costa PT Jr. Hierarchical linear modeling analyses of NEO-PI-R scales in the Baltimore Longitudinal Study of Aging. *Psychol Aging*. 2005; 20:493–506. [PubMed: 16248708]
- Terracciano A, McCrae RR, Costa PT Jr. Intra-individual change in personality stability and age. *Journal of Research in Personality*. 2010; 44:31–37. DOI: 10.1016/j.jrp.2009.09.006 [PubMed: 20305728]
- Terracciano A, Sutin AR, An Y, O’Brien RJ, Ferrucci L, Zonderman AB, Resnick SM. Personality and risk of Alzheimer’s disease: New data and meta-analysis. *Alzheimers Dement*. 2014; 10:179–186. DOI: 10.1016/j.jalz.2013.03.002 [PubMed: 23706517]
- Terracciano A, Stephan Y, Luchetti M, Albanese E, Sutin AR. Personality traits and risk of cognitive impairment and dementia. *Journal of Psychiatric Research*. 2017; doi: 10.1016/j.jpsychires.2017.01.011
- Vaidya JG, Gray EK, Haig J, Watson D. On the temporal stability of personality: evidence for differential stability and the role of life experiences. *J Pers Soc Psychol*. 2002; 83(6):1469–1484. [PubMed: 12500825]

Welleford EA, Harkins SW, Taylor JR. Personality change in dementia of the Alzheimer's type: relations to caregiver personality and burden. *Exp Aging Res.* 1995; 21(3):295–314. DOI: 10.1080/03610739508253986 [PubMed: 7493597]

Wortman J, Lucas RE, Donnellan MB. Stability and change in the Big Five personality domains: evidence from a longitudinal study of Australians. *Psychol Aging.* 2012; 27(4):867–874. DOI: 10.1037/a0029322 [PubMed: 22775362]

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

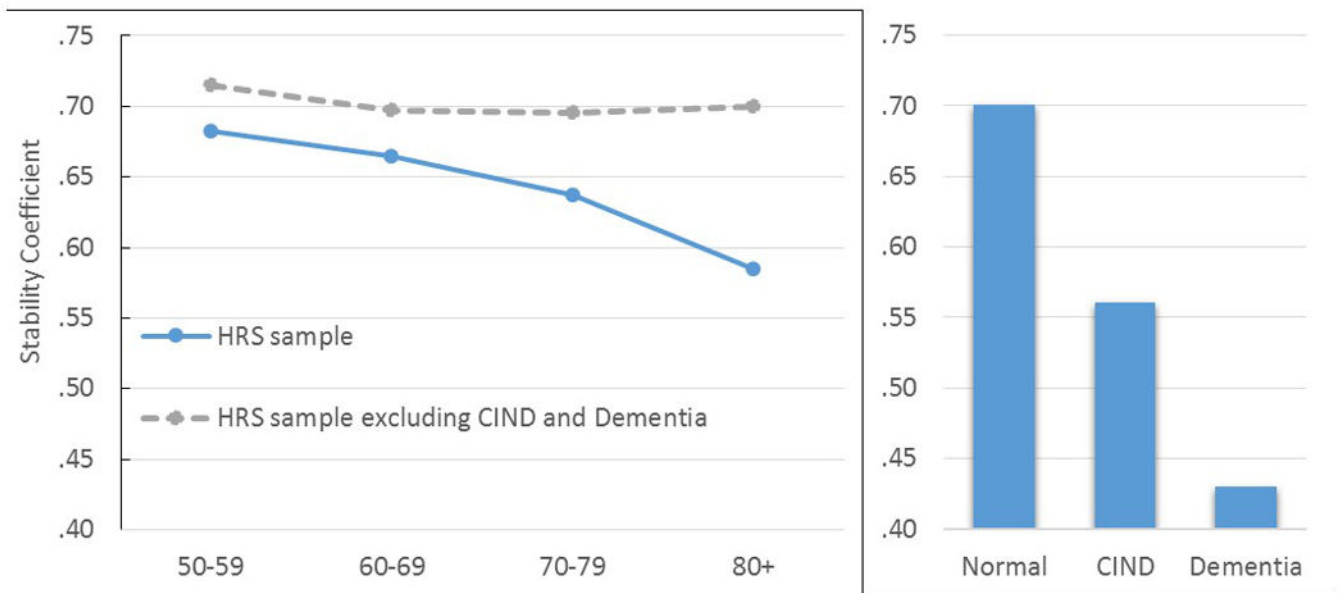


Figure 1. Stability of personality traits by age and cognitive status

Note: Total HRS sample in the analyses $N = 9,935$; Normal $N = 7307$; CIND $N = 1996$; Dementia $N = 454$. Sample size by age are reported in Tables 1 and 3. Stability Coefficients are test-retest Pearson correlations averaged across the five factors.

Table 1

Stability coefficients by age group and in the total sample.

Age groups	Size	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness	Profile Stability
50–59	2313	0.65	0.71	0.70	0.67	0.68	0.72
60–69	3582	0.65	0.71	0.68	0.63	0.65	0.74
70–79	3011	0.62	0.67	0.67	0.61	0.61	0.72
80+	1029	0.57	0.64	0.59	0.57	0.55	0.68
Total	9935	0.64	0.69	0.68	0.62	0.64	0.72

Note. Coefficients for the five traits are test-retest correlations and coefficients for profile stability are intra-class correlations.

Table 2

Retest correlation, profile stability, and internal consistency coefficients by cognitive status group.

Cognitive status	Retest stability						
	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness	Profile Stability (ICC)	Profile Stability (ICC)
Normal	0.67	0.74	0.73	0.67	0.69	0.77	0.77
CIND	0.57	0.61	0.55	0.54	0.53	0.63	0.63
Dementia	0.47	0.41	0.44	0.40	0.43	0.46	0.46
	Internal consistency						
Normal	0.72	0.76	0.79	0.78	0.66	-	-
CIND	0.65	0.72	0.77	0.75	0.60	-	-
Dementia	0.66	0.72	0.78	0.79	0.65	-	-

Note: Normal N = 7307; CIND N = 1996; Dementia N = 454. Internal consistency is the average coefficients from baseline and follow-up. Differences in internal consistency across traits are partly due to the number of items in each scale, which ranged from 4 for neuroticism to 7 for openness. CIND=cognitive impairment not dementia. ICC=intra-class correlation.

Table 3

Stability coefficients by age group in participants with no cognitive impairment.

Age groups	Size	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness	Profile Stability (ICC)
50–59	1957	0.67	0.75	0.74	0.70	0.71	0.75
60–69	2827	0.67	0.74	0.73	0.66	0.68	0.77
70–79	2047	0.66	0.74	0.73	0.66	0.68	0.77
80+	476	0.65	0.75	0.72	0.71	0.66	0.78
Total	7307	0.67	0.74	0.73	0.67	0.69	0.77

Note. Coefficients for the five traits are test-retest correlations and coefficients for profile stability are intra-class correlations.

Beta coefficients for demographic and cognitive variables predicting individual stability coefficients (IS).

Table 4

	Average	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness	ICC
Model 1							
Age	-.07*	-.01	-.04*	-.06*	-.05*	-.08*	-.03*
Model 2							
Age	-.06*	-.00	-.04*	-.05*	-.04*	-.07*	-.01
Sex (female)	.06*	.01	.04*	.02*	.09*	.04*	.10*
Education	.16*	.08*	.10*	.13*	.11*	.12*	.21*
Race, Black	-.10*	-.05*	-.06*	-.08*	-.06*	-.07*	-.05*
Race, other	-.06*	-.02*	-.05*	-.04*	-.04*	-.04*	-.04*
Hispanic	-.01	.01	-.02	-.01	-.02	-.01	-.06*
Model 3							
Age	.00	.03*	.01	-.00	.00	-.03*	.06*
Sex	.04*	-.01	.02*	.01	.08*	.03*	.08*
Education	.09*	.05*	.05*	.07*	.06*	.07*	.13*
Race, Black	-.06*	-.03*	-.03*	-.05*	-.04*	-.04*	-.01
Race, other	-.05*	-.02	-.04*	-.03*	-.03*	-.03*	-.03*
Hispanic	-.00	.02	-.02	.00	-.01	-.00	-.05*
TICSm	.19*	.10*	.13*	.15*	.13*	.14*	.21*
Model 4							
Age	-.07*	-.02	-.05*	-.05*	-.05*	-.07*	-.06*
Sex	.03*	.02	.02	.02	.03*	.02*	.05*
Education	.13*	.07*	.08*	.11*	.09*	.09*	.14*
Race, Black	-.10*	-.06*	-.06*	-.08*	-.06*	-.07*	-.07*
Race, other	-.06*	-.02*	-.05*	-.05*	-.04*	-.04*	-.04*
Hispanic	-.01	.02	-.02	-.00	-.01	-.01	-.03*
N	-.08*	-.13*	-.05*	-.04*	-.04*	-.03*	-.35*
E	.00	-.02	.08*	-.03*	-.01	-.01	.01
O	.01	.01	.00	.03*	-.01	.00	-.08*
A	.11*	.00	.05*	.04*	.22*	.04*	.25*

	Average	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness	ICC
C	.06*	-.00	.03*	.02	.03*	.12*	.17*

N = 9,935.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript