Personality change across the lifespan: Insights from a cross-cultural longitudinal study

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Abstract

Objective: Personality traits are characterized by both stability and change across the lifespan. Many of the mechanisms hypothesized to cause personality change (e.g., the timing of various social roles, physical health, and cultural values) differ considerably across culture. Moreover, personality consistency is valued highly in Western societies, but less so in non-Western societies. Few studies have examined how personality changes differently across cultures.

Method: We employed a multi-level modeling approach to examine age-related changes in Big Five personality traits in two large panel studies of Americans (n = 6,259; M_{age} = 46.85; 52.5% Female) and Japanese (n = 1,021; M_{age} = 54.28; 50.9% Female). Participants filled out personality measures twice, over either a 9-year interval (for Americans) or a 4-year period (for Japanese).

Results: Changes in agreeableness and openness to experience did not systematically vary across cultures; changes in extraversion, neuroticism, and conscientiousness did vary across cultures. Further, Japanese show significantly greater fluctuation in the level of all of the traits tested over time than Americans.

Conclusions: The culture-specific social, ecological, and life-course factors that are associated with personality change are discussed.

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Personality change across the lifespan: Insights from a cross-cultural longitudinal study

Researchers have assumed that personality traits are characterized by both stability and change across the lifespan. The primary interpretation of age-related changes in personality is that our personalities change in response to the social roles and responsibilities that we adopt over time (Roberts, Wood, & Smith, 2005). For example, people become more agreeable and conscientious when they invest more in their occupation and less so when they retire (Specht, Egloff, & Schmukle, 2011). People also become more introverted following marriage (Specht et al., 2011). Military personnel decrease in agreeableness following military training (Jackson, Thoemmes, Jonkmann, Ludtke, & Trautwein, 2012). A meta-analysis showed that many personality changes result from the degree to which people invest in social roles in work, family, religion, and volunteering (Lodi-Smith & Roberts, 2007). However, social roles, expectations, and the timing of these events often differ by culture, so the degree to which personality changes may differ accordingly across different cultures and social settings. In the current study, we examined life-course changes in personality from longitudinal data obtained from the United States and Japan. With this analysis, we examined life-course trajectories of different personality traits and how these trajectories might differ between the United States and Japan.

There is a strong consensus among personality psychologists that five broad domains characterize much of human variation in personality (John, Naumann, & Soto, 2008). These five broad, global traits—often referred to as the Big Five—are extraversion (traits like *outgoing* and *lively*), agreeableness (traits like *helpful* and *sympathetic*), neuroticism (traits like *moody* and *worrying*), conscientiousness (traits like *hardworking* and *responsible*), and openness to experience (traits like *imaginative* and *curious*). Examining how these five traits differ across the lifespan has been the subject of many previous studies, both cross-sectionally (e.g., Soto, John,

Gosling, & Potter, 2010; Srivastava, John, Gosling, & Potter, 2003) and longitudinally (e.g., Roberts, Walton, & Viechtbauer, 2006; Terracciano, McCrae, Brant, & Costa, 2005). The preponderance of evidence from these studies shows that neuroticism, extraversion, and openness to experience tend to decline across the lifespan. Agreeableness tends to increase across the lifespan. Conscientiousness often has a curvilinear association with age, such that people become more conscientiousness until about middle age before declining in late life (Lucas & Donnellan, 2011; Terracciano et al., 2005). This late life decline is hypothesized to coincide with rapid declines in health and cognitive ability (Wagner, Ram, Smith, & Gerstorf, 2015).

Will such life course trajectories of personality vary across different cultures? Some researchers have suggested that personality development is relatively *similar* or *universal* across cultures, reflecting changes not in environmental circumstances, but rather in intrinsic, biological systems across life that are present in all cultures (McCrae, 2004; McCrae et al., 1999; McCrae et al., 2000). Moreover, even if personality is not fully determined by intrinsic, biological factors, life course trajectories of personality could be similar across cultures if many of the social roles hypothesized to cause adult personality development are present in most cultures (Roberts et al., 2005). Unlike the biological review, however, the latter social role view implies that there should be substantial cross-cultural variability in personality change to the extent that the timing of family-, education-, and employment-related transitions is cross-culturally variable (Bleidorn et al., 2013).

Previous cross-cultural studies show similar age differences in cultures such as Belgium, Russia, China, the Czech Republic and several more (Bleidorn et al., 2013; McCrae et al., 2004; McCrae et al., 2002; McCrae & Terracciano, 2005) whereas others have found considerable age-

related personality changes and differences across cultures (Donnellan & Lucas, 2008; Lucas & Donnellan, 2009; Wortman, Lucas, & Donnellan, 2012), even among cultures that are relatively similar (e.g., Britain, Germany, and Australia). One important caveat is that many of these studies are cross-sectional in design. Among the few longitudinal studies conducted, they are exclusively focused on personality change in Western cultures (Lucas & Donnellan, 2011; Wortman et al., 2012). With cross-sectional designs, it is impossible to dissociate true personality change from birth cohort effects (McCrae et al., 1999; McCrae et al., 2000). In fact, this consideration is often used to explain why studies of age differences across cultures sometimes yield contradictory findings (Donnellan & Lucas, 2008). With respect to how personality changes over time in non-Western cultures, little data currently exists to examine this question. How does personality change differ among two relatively dissimilar countries, like the United States and Japan? To make progress in this area, it is crucial to have cross-cultural, longitudinal data that cover a wide age range.

Beyond investment and timing in social roles, which have some similarities across cultures, there are at least two important classes of considerations that are relevant to life-course changes in personality. First, cultural variation in *physical health* may have consequences on the life-course trajectory of personality. Longevity varies dramatically across cultures. Among modern industrialized societies, Japan enjoys the highest longevity in the world (Miyagi, Iwama, Kawabata, & Hasegawa, 2003), whereas Americans fare far worse (Benfante, 1992). Much of this difference may be explained by physical health. A recent study using markers of inflammation (interleukin-6 and c-reactive protein) and cardiovascular functioning (systolic blood pressure and heart rate) to assess biological health risk and found that, across a wide age span, Japanese adults are at a substantially lower biological health risk than Americans (Coe et

al., 2011). Health may also prove to be relevant in understanding age-linked changes in personality traits. Two important considerations may follow from this analysis.

To begin, as people age, there may be a decline of physical ability—severely limiting their ability to go out and explore new social relationships or new knowledge (Jokela, Hakulinen, Singh-Manoux, & Kivimaki, 2014; Wagner et al., 2015). Thus, older adults may be less extraverted and less open to new experiences due to health limitations. Support for this possibility can be found in an explanation for the origins of cultural variation in personality from an evolutionary perspective. For example, people living in countries with high disease prevalence rates may be less extraverted and open because their local ecologies shape their interpersonal behavior and social institutions (Schaller & Murray, 2008). However, this decline in extraversion and openness to experience may be buffered if Japanese adults are healthier over longer stretches of time. Moreover, older people may prioritize social emotional goals of "feeling good" over more task-relevant and information-related goals (Carstensen, Isaacowitz, & Charles, 1999), leading them to be both less neurotic and more agreeable. Further, evidence that individuals become less anxious and emotionally mature as they age would also lead to the prediction that neuroticism declines and agreeableness increases (Gross et al., 1997; Srivastava et al., 2003). However, insofar as some degree of good health is required to pursue such goals (Charles & Luong, 2013; Lockenhoff & Carstensen, 2004), both decreases of neuroticism and increases of agreeableness may be more pronounced among healthy populations, namely, among Japanese as compared to Americans.

Second, cultural variation in *values* may have important consequences on the life-course trajectory of personality. A large body of research in cultural psychology (Markus & Kitayama, 1991), comparative sociology (Lincoln & Kalleberg, 1990), and international politics (Norris &

Inglehart, 2011) provides evidence that Western European and North American cultures emphasize independence in general and strong personal agency in particular and, as a consequence, work-related responsibilities may be associated with increased demands for personal agency in Western cultures. This perspective may be most relevant in understanding age-related trajectories of conscientiousness often found in studies of Western populations: The level of conscientiousness (as reflected in characteristics such as "organized" and "hard-working") peaks at the prime of work life (i.e., midlife, around 40-50 years of age). In contrast, many non-Western cultures emphasize interdependence with others in general and social duty and obligation in particular (Markus & Kitayama, 1991; Schweder & Bourne, 1982; Triandis, 1989). In these cultures, individuals must to be attuned to social norms and conform to them regardless of personal agency and, moreover, this need for social adjustment and conformity to work-related norms might be especially strong at the prime of work-life. We thus anticipated that the age-related changes in conscientiousness might be very different in Japan than the U.S. Among Japanese participants, conscientiousness might be particularly low during midlife as individuals emphasize social duty over personal agency.

Relatedly, the cultural difference in endorsement of independence versus interdependence implies that Westerners might be less impacted by various social and contextual events than non-Westerners (Markus & Kitayama, 1991; Oishi, Diener, Napa Scollon, & Biswas-Diener, 2004). Thus, non-Westerners may be influenced by an assortment of environmental events including those that are idiosyncratic to each individual or each cohort. In contrast, Westerners may be influenced primarily by environmental events that are pervasive and overwhelming, namely, those that occur equally strongly over most individuals in a given society. In fact, Westerners have been assumed to strive for personal consistencies to a greater extent than non-Westerners

do (Kanagawa, Cross, & Markus, 2001; Kitayama & Markus, 1999). This would mean that there should be more random fluctuations in personality trajectories among Japanese as compared to among Americans. Because of more random fluctuations in trajectories, we expect less dramatic (i.e., more attenuated) age-related mean-level changes in personality.

In the current study, we used two nationally representative samples from the U.S. and Japan to examine age-related changes in personality across the adult lifespan. Participants filled out personality measures twice over either a 4- or 9/10-year period. We employed a multi-level modeling procedure to examine age-related changes in trajectories of personality development and whether these trajectories were moderated by culture.

Method

Participants and Procedure

Participants were from two large national surveys conducted in parallel in the U.S. (the Midlife Development in the U.S.; MIDUS) and Japan (the Midlife in Japan; MIDJA).

The first wave of the MIDUS study (MIDUS 1; 1995-1996) sampled 7,108 English-speaking adults in the United States, aged 20-75 years. The current sample is based on the 6,259 individuals who had at least one wave of personality data (52.5% Female; *Mage* = 46.85, *SD* = 12.91). Median level of education was some college education (37.6% high school/GED or less, 30.5% some college, 32.0% have at least a bachelor's degree). In the second wave of data collection (MIDUS 2; 2004-2005), approximately 70 percent of the original sample (n = 4,963) were successfully contacted for follow-up assessments. The average follow-up interval was approximately 9 years. Compared to those who did not provide data for wave 2, participants with complete data were lower in agreeableness (d = .06), lower in neuroticism (d = .06), higher in conscientiousness (d = .18), more likely to be female (55.3% of the follow-up sample were

women, compared to 52.5% at wave 1), more highly educated (36% of the follow-up sample had at least a bachelor's degree, compared to 32% at wave 1) and younger on average (d = .14). Compared to the broader American population of midlife adults, MIDUS is comparable with respect to gender (53% Female for our sample and 51% Female for the general midlife population) but slightly oversamples midlife adults (the current sample had 25.9% adults aged 40-49 compared to 20.4% in the American population of midlife adults).

The first wave of the MIDJA study (MIDJA 1; 2008) sampled 1,027 participants randomly selected from the Tokyo metropolitan area, aged 30-79 years. The current sample is based on the 1,021 individuals who had at least one wave of personality data (50.9% Female; *Mage* = 54.28, *SD* = 14.10). Median level of education was some college education (42.8% high school/GED, 25.1% some college, 32.1% have at least a bachelor's degree). In the second wave of data collection (MIDJA 2; 2012), approximately 64 percent of the original sample (n = 657) were successfully contacted for follow-up assessments. The average follow-up interval was approximately 4 years. Compared to those who did not provide data for wave 2, participants with complete data were higher in agreeableness (d = .18) and higher in conscientiousness (d = .18). Those with and without data were otherwise comparable with respect to age, gender, education, and other personality traits. Compared to the broader Japanese population of midlife adults, MIDJA is comparable with respect to gender (51% Female for both our sample and the general population) but slightly oversamples older adults (the current sample had 20.1% adults aged 70-79 compared to 16.9% in the Japanese population of midlife adults).

Measures

Personality traits. Big Five personality traits were assessed using adjective-based measures. Participants were asked the extent to which each of 25 adjectives described them on a

Likert scale ranging from 1(*not at all*) to 4(*a lot*). The groups of adjectives were: moody, worrying, nervous, calm (for neuroticism; α_{MIDUS} = .74, α_{MIDJA} = .51); outgoing, friendly, lively, active, talkative (for extraversion; α_{MIDUS} = .78, α_{MIDJA} = .83); creative, imaginative, intelligent, curious, broad-minded, sophisticated, adventurous (for openness to experience; α_{MIDUS} = .77, α_{MIDJA} = .84); organized, responsible, hardworking, careless, thorough (for conscientiousness; α_{MIDUS} = .58, α_{MIDJA} = .57); helpful, warm, caring, softhearted, sympathetic (for agreeableness; α_{MIDUS} = .80, α_{MIDJA} = .87). These adjective-based measures of personality correlate well with longer measures of personality and have good construct validity (Lachman & Weaver, 1997; Mroczek & Kolarz, 1998; Prenda & Lachman, 2001). Tests for invariance (configural, metric, and scalar) were conducted across cultures and over time for each of the Big Five traits. As seen in Supplementary Table 1, there was no scalar invariance across cultures, limiting our ability to make mean-level comparisons across cultures (all ΔRMSEAs> .05), which is often the case in adjective-based measures of personality (Nye, Roberts, Saucier, & Zhou, 2008). However, there was moderate invariance in each of the Big Five traits *over time* within both MIDUS (Supplementary Table 2) and MIDJA (Supplementary Table 3), allowing us to examine age-related trajectories in each (Nye, personal communication, December 14, 2016).[1] Nevertheless, we acknowledge the lack of scalar invariance across cultures as a limitation of the current report and hope that culturally invariant measures of personality become available in the near future.

Analytic Plan

As noted, a major drawback of the currently available cross-cultural data on life-course trajectory of personality stems from the fact that the majority of these studies are cross-sectional. To overcome this issue, we used a multi-level modeling procedure, drawing on an approach used by Terracciano et al. (2005), that enabled us to combine longitudinal changes over 4-9 years.

These changes over shorter intervals are estimated from individuals of different ages and are pieced together to estimate the overall life-course trajectory of personality. The two cultural samples were combined for the purposes of multi-level analyses. The multi-level modeling allows for flexibility in the number and spacing of measurement observation across people. Even participants who provided one observation can be used to stabilize estimates of means and variances within an assessment wave. Thus, all available data can be used. The use of two data sets constituted a variant of an accelerated longitudinal design, in which members of different birth years were followed over time. Using this design, we were able to estimate age trajectories over a broad age span by using data collected over shorter intervals. In this way, growth curves can be estimated for individuals of different ages and then pieced together to reveal an overall age trajectory (see Terracciano et al., 2005, for a similar approach). Age-specific changes (e.g., multiple groups of individuals aged 20-75 followed over a 9-year period) are often used to approximate developmental changes in personality over longer intervals in the absence of available data for all individuals at every age of the lifespan (e.g., one group of 20-year old individuals followed annually for 55 years; Raudenbush & Chan, 1992).

Multi-level modeling allows for the estimation of both *within* person (e.g., how does personality change over time?) and *between* person (e.g., how do cultures differ in personality?) variation, as well as cross-level products (e.g., does personality change differ between cultures?). Age was grand-mean centered and allowed to vary from wave 1 to wave 2. The linear, quadratic, and cubic functions of age were computed. Prior research suggests that the most complex age-personality relations that can be meaningfully interpreted involve cubic patterns (Chopik, Edelstein, & Fraley, 2013; Terracciano et al., 2005). Age and personality traits were treated as time-varying, and culture (-1: MIDJA, 1 = MIDUS) was treated as a time-invariant moderator of

age-related trends in personality. Because gender and socio-economic status have been shown to not only explain variation in personality but also important life outcomes (Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007; Schmitt, Realo, Voracek, & Allik, 2008), we therefore included them as covariates in all models. Due to the difficulty in creating a common metric of socio-economic status across cultures, we chose educational attainment as a proxy measure for socio-economic status, although we acknowledge the limitations with this approach (Braveman, Cubbin, Egerter, & et al., 2005). Gender (-1: men, 1 = women) and education were treated as time-invariant covariates. All analyses were conducted using the SPSS MIXED procedure (Peugh & Enders, 2005).

Because MIDUS (~9 years) and MIDJA (~4 years) were collected on different time scales, an adjustment was applied to make the personality scores more comparable. To achieve this, we adopted a similar approach to the one used by Jokela and colleagues (2014) to create an equivalent unit of change when comparing panel studies of personality change. Because previous research on personality change suggests that it changes in a linear fashion over shorter (<10 years) intervals of time, we applied an adjustment to change scores to yield new wave 2 values (representing four-year change) for the MIDUS sample (Jokela et al., 2014; Roberts et al., 2006). We began by taking the difference score of each personality trait ($Extraversion_{W2}$ – $Extraversion_{W1}$) in the MIDUS sample. We then multiplied this score by 4/9 to yield a change score that represents the amount of change that would occur within four years. This new change score was then added to the wave 1 score to produce a new wave 2 score, representing a person's standing on each trait allowing four years of change. For example, a MIDUS participant's scores on extraversion at waves 1 and 2 could be 3.00 and 4.00, respectively. The difference between these two scores (1.00) would be multiplied by 4/9 (.44) and then added to his/her wave 1 score.

Thus, the new scores on extraversion at waves 1 and 2 could be 3.00 and 3.44, respectively—capturing the amount of change that would occur within a four-year period, given the knowledge of how he/she changed over a 9-year period, assuming linear change (Jokela et al., 2014).

The purpose of this transformation was to make the data from the two samples more comparable. Importantly, multi-level analyses were also conducted on non-transformed values (as the estimate of age can be interpreted as a one year increase in age); results from these analyses were substantively the same as those presented below.

Results

Preliminary Results

Correlations for age, gender, and personality are presented in Tables 1 (MIDUS) and 2 (MIDJA).

MIDUS. Women were higher in extraversion, agreeableness, neuroticism, and conscientiousness compared to men; men were higher in openness to experience compared to women. People with a bachelor's degree or higher were lower in agreeableness (ts > 6.67, ps < .001, ds < .24) and neuroticism (ts > 6.64, ps < .001, ds < .22), and higher in conscientiousness (ts > 3.52, ps < .001, ds < .16) and openness to experience (ts > 10.30, ps < .001, ds < .35) at both waves compared to those with less than a bachelor's degree. Age was positively correlated with agreeableness and negatively correlated with neuroticism at both waves, such that older adults were more agreeable and less neurotic. These results are consistent with studies of age differences in personality (Soto et al., 2010). Age and conscientiousness were positively correlated at wave 1 but negatively correlated at wave 2, although these correlations are small. Age was also associated with lower openness to experience at wave 1 and higher extraversion at wave 2. Each of the Big Five personality traits were intercorrelated with each other, similar to previous research (Anusic, Schimmack, Pinkus, & Lockwood, 2009). Nine-year test-retest

correlations between the traits among American participants ranged from .61 to .70.

MIDJA. There were fewer consistent gender differences among Japanese participants, as found in previous research (Schmitt et al., 2008). Men were higher in neuroticism and openness to experience compared to women. People with a bachelor's degree or higher were higher in conscientiousness (ts > 4.33, ps < .001, ds < .29) and openness to experience (ts > 2.64, ps < .009, ds < .51) at both waves compared to those with less than a bachelor's degree. Age was negatively correlated with neuroticism and openness to experience at both waves, such that older adults were lower in neuroticism and openness to experience. Age and conscientiousness were positively correlated at both waves, such that older adults were higher in conscientiousness. Age was positively correlated with agreeableness at wave 1, such that older adults were more agreeable; however, age and agreeableness were unrelated at wave 2. Each of the Big Five personality traits were once again intercorrelated with each other, similar to previous research. Four-year test-retest correlations between the traits among Japanese participants ranged from .63 to .74.

Multi-level Analyses

The results from the multi-level models are presented in Table 3 and plotted in Figures 1-5. American participants were higher in each of the Big Five personality traits compared to Japanese participants; however, the magnitude of these differences should be interpreted with caution as the adjective-based measure of personality was not invariant across cultures.

For extraversion, we found that for Americans, extraversion declined across the lifespan, as seen in previous work. Among Japanese, the decline in extraversion was attenuated (see Figure 1). Agreeableness increased across the adult lifespan, and this pattern was consistent for both Americans and Japanese (see Figure 2). As predicted, neuroticism declined among both

Americans and Japanese, but this decline was more pronounced among Japanese (see Figure 3). For conscientiousness, contrasting age trajectories were observed (see Figure 4). Whereas Americans showed a peak in conscientiousness in midlife, Japanese showed the lowest level of conscientiousness in midlife, with substantial increases occurring later in midlife (~50s). For openness, lifespan declines are attenuated among Japanese; however, the interactions between age and culture were not significant (see Figure 5).

We also anticipated greater random fluctuation of personality change in Japanese than in Americans, which is exactly what we observed upon visually inspecting Figures 1-5. This cultural difference was notable in its magnitude. We examined cultural differences in the absolute differences in personality changes (e.g., $|Agreeableness_{T2}\text{-}Agreeableness_{T1}|$)(Human et al., 2013). Comparisons of absolute differences revealed that the fluctuation was much greater among Japanese compared to Americans for extraversion (d = 1.21), agreeableness (d = 1.36), neuroticism (d = .76), conscientiousness (d = 1.36), and openness to experience (d = 1.24).[2]

Discussion

The current study drew on two large, nationally representative samples from the U.S. and Japan to examine cultural differences in Big Five personality changes across adulthood. Largely consistent with previous research conducted on Western populations, American data showed that neuroticism and extraversion declined across the lifespan, agreeableness increased across the lifespan, and conscientiousness increased until middle age before declining in late life (Lucas & Donnellan, 2011; Roberts et al., 2006; Soto et al., 2010; Terracciano et al., 2005). Four of the five traits (extraversion, neuroticism, conscientiousness, and agreeableness) demonstrated systematic cross-cultural differences; although the difference was also apparent in openness to experience, this effect did not reach statistical significance. Previous theorizing in this area

emphasized a general hypothesis that cross-cultural variability in personality change results from cultural differences in the onset of major life events and also changes in response to them (Specht et al., 2011). Indeed, cross-cultural age differences in personality can be partially explained by when life transitions tend to occur (Bleidorn et al., 2013). These cultural differences could stem from cultural differences in social role transitions, health, and values (Jokela et al., 2014; Schweder & Bourne, 1982; Wagner et al., 2015).

Another striking cultural difference we observed relates to how systematic personality changes were (or were not) within a culture. We found that Americans are far more consensual and uniform in their patterns of personality change as compared to Japanese, who showed far more idiosyncratic (i.e., random) changes. At first glance, this cultural difference might be puzzling since Americans appear to be more conforming to the societal norms or standards whereas Japanese appear to ignore such norms or standards. However, as we argued, Japanese might be more likely to be influenced by a variety of environmental factors. Americans might be influenced mostly by factors that are powerful enough to influence nearly everyone in the society at large, although this is our speculation. Moreover, our analysis is consistent with other work showing that Japanese adults show lower cross-situational consistency in emotional states (Oishi et al., 2004).

Some limitations of the current work must be acknowledged. First, the mechanisms giving rise to personality change across the lifespan were not directly tested in our study. This omission is partially attributable to the differences in study designs between MIDUS and MIDJA and the limited number of items/constructs included in each; thus, we *cannot* formally test all the mechanisms that we suggested drive personality change (e.g., endorsement of cultural values). The patterns observed in the current study might also reflect methodological changes in how

people from different cultures use self-report instruments. For example, frame-of-reference effects and response tendencies show cultural differences that could explain some of our findings (Harzing, 2006; Heine, Lehman, Peng, & Greenholtz, 2002), although these cultural differences are unlikely to explain age-related patterns in personality development (Nye, Allemand, Gosling, Potter, & Roberts, 2015). Gender and education differences in personality may also be attributable to non-invariance in personality measures across these groups. The adjective-based personality scales used in MIDUS/MIDJA have received considerable psychometric attention (Zimprich, Allemand, & Lachman, 2012). Although these scale largely show invariance, there are several types of invariance that are not achieved, albeit these violations are small in effect size terms and rarely significantly call in to question general trends across groups (Clark et al., 2016; Nye et al., 2008). Nevertheless, it is worth noting that many of the findings of the current study must be tentative given that the scales often showed some forms of non-invariance, especially conscientiousness and extraversion. Future research can more formally develop measures and methods that partition out variance attributable to methods effects and that are invariant across cultures to isolate patterns of personality change over time.

Further, as there are currently only two assessment waves in MIDUS and MIDJA, we are also prevented from effectively testing and ruling out all the various mechanisms underlying personality development over time. A minimum of three waves is required to test mediating processes in the context of growth curve modeling (MacKinnon, Fairchild, & Fritz, 2007). As both studies add additional assessment waves, future research can examine whether social role transitions (Bleidorn et al., 2013), health (Jokela et al., 2014), or changes in cultural values facilitate personality change over large stretches of time and whether these influences differ across cultures. Relatedly, because each sample had only two assessment points for personality,

which were collected over varying intervals of time between the two cultures, there cannot be perfect one-to-one comparisons between the studies when examining personality changes, and the mechanisms underlying them, over time. We tried to ameliorate this concern by applying a transformation and restricting the focus of our study to mean-level differences in personality, which are not influenced by the length of testing intervals. Importantly, the results reported above were the same when this transformation was not applied. Future research can examine changes in personality with multiple assessment points over longer intervals and test additional predictors of within-person changes across the lifespan. Both of these considerations are important for the study of personality development, as changes in personal characteristics often unfold over long periods of time and are often not linear in nature (Roberts et al., 2006).

Finally, we used data from individuals followed over short periods of time to infer changes over longer periods of time. Thus, there is no one individual followed from age 20 to 80 in our study. Although this study somewhat ameliorates the possibility of cohort differences driving interpretations of the effects, it is nonetheless possible that developmental differences we observed could originate from differences between the cohorts. Future studies can follow multiple cohorts over comparable ages to tease out these effects further (Elder & Giele, 2009).

Documenting cultural differences and similarities in lifespan personality development provides a more nuanced understanding of the role of context in an individual's life. We suspect that there are likely many factors that operate in concert with one another to facilitate personality change. We identified a few of these factors (e.g., social roles, health, goals and values). Future research can examine the exact mechanisms that foster personality change and how these mechanisms are expressed differently across social contexts.

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[1] In the scenarios in which non-invariance was found, two approaches were undertaken to evaluate its effects on the results of the current study. First, we calculated that the effect size of the deviations from non-invariance were small in magnitude (Nye et al., 2008), suggesting that the results reported below would not be significantly jeoparidized by the non-invariance. Second, we re-ran the models with partial invariance constraints (i.e., allowing an occasional item intercept to vary across time). Results from these analyses in which the effects of age were modeled on personality within each culture yielded similar results to those reported below.

[2]One common response to the finding that Japanese showed more variability and less systematic change in personality is that the two samples differed with respect to sample size, so estimates of personality at each age may be less precise. Although this is a concern, our multi-level modeling technique uses all available data observations, increasing statistical power. A robustness check was also performed—a random sample of U.S. adults (15%) was chosen to examine whether changes became less systematic at lower sample sizes. In this reduced sample, Americans still showed more systematic changes than Japanese.

Table 1. *Correlations among primary study variables among MIDUS participants*

			Wave 1						Wave 2				
		Mean (*SD*)	1	2	3	4	5	6	7	8	9	10	11
Wave 1	1. Gender												
	2. Age	46.85 (12.91)	.02										
	3. Extraversion	3.20 (.56)	.06***	-.01									
	4. Agreeableness	3.49 (.49)	.26***	.08***	.53***								
	5. Neuroticism	2.24 (.66)	.11***	-.14***	-.16***	-.05***							
	6. Conscientiousness	3.42 (.44)	.11***	.03*	.28***	.29***	-.20***						
	7. Openness to E.	3.02 (.53)	-.08***	-.07***	.51***	.34***	-.17***	.27***					
Wave 2	8. Extraversion	3.11 (.57)	.08***	.06***	**.70*****	.36***	-.14***	.21***	.37***				
	9. Agreeableness	3.45 (.50)	.28***	.11***	.35***	**.64*****	.05**	.21***	.21***	.50***			
	10. Neuroticism	2.07 (.63)	.12***	-.18***	-.12***	-.05**	**.64*****	-.15***	-.14***	-.20***	-.11***		
	11. Conscientiousness	3.46 (.45)	.09***	-.03*	.18***	.19***	-.15***	**.61*****	.20***	.26***	.28***	-.20***	
	12. Openness to E.	2.90 (.54)	-.05**	-.01	.36***	.22***	-.18***	.23***	**.69*****	.51***	.33***	-.21***	.28***

Note. N = 3850-7019. * $p < .05$ ** $p < .01$ *** $p < .001$. Gender: -1 = male, 1 = female.

Table 2. *Correlations among primary study variables among MIDJA participants*

			Wave 1						Wave 2				
		Mean (*SD*)	1	2	3	4	5	6	7	8	9	10	11
Wave 1	1. Gender												
	2. Age	54.28 (14.10)	-.02										
	3. Extraversion	2.42 (.68)	.06	-.06									
	4. Agreeableness	2.63 (.63)	.01	.06*	.68***								
	5. Neuroticism	2.11 (.56)	-.09**	-.29***	-.10**	-.16***							
	6. Conscientiousness	2.69 (.55)	-.02	.18***	.36***	.55***	-.20***						
	7. Openness to E.	2.19 (.61)	-.13***	-.09**	.64***	.60***	-.02	.43***					
Wave 2	8. Extraversion	2.40 (.66)	.05	-.08	**.74***	.46***	-.11**	.20***	.47***				
	9. Agreeableness	2.60 (.61)	.02	.01	.46***	**.64***	-.12**	.33***	.40***	.67***			
	10. Neuroticism	2.05 (.52)	-.10*	-.26***	-.12**	-.17***	**.66***	-.19***	-.03	-.12**	-.13**		
	11. Conscientiousness	2.68 (.51)	-.01	.12**	.27***	.39***	-.18***	**.63***	.31***	.38***	.53***	-.19***	
	12. Openness to E.	2.14 (.59)	-.09*	-.10*	.46***	.41***	-.05	.28***	**.70***	.64***	.58***	.01	.42***

Note. N = 649-1027. * $p < .05$ ** $p < .01$ *** $p < .001$. Gender: -1 = male, 1 = female.

Table 3. Multilevel models predicting changes in personality

	Extraversion					Agreeableness					Neuroticism				
	b	*SE (b)*	*β*	*t*	*p*	*b*	*SE (b)*	*β*	*t*	*p*	*b*	*SE (b)*	*β*	*t*	*p*
Age	-.0001	.001	-.001	-.08	.93	.005	.001	.07	5.94	< .001	-.01	.001	-.18	-12.21	< .001
Gender	.03	.01	.03	5.17	< .001	.11	.01	.11	19.67	< .001	.05	.01	.05	6.59	< .001
Culture	.35	.01	.35	27.34	< .001	.43	.01	.43	37.86	< .001	.04	.01	.04	3.08	.002
Age × Culture	.002	.001	.03	1.90	.06	-.001	.001	-.01	-.76	.45	.002	.001	.03	2.11	.04
Age^2	.0000002	.0001	.00003	.00	.99	.00003	.0001	.01	.61	.54	.0001	.0001	.02	1.59	.11
Age^2 × Culture	.0001	.0001	.03	2.64	.008	.00002	.0001	.004	.43	.67	-.0001	.0001	-.03	-2.22	.03
Age^3	-.000006	.000002	-.04	-2.94	.003	-.00001	.000002	-.07	-5.30	< .001	.000002	.000002	.01	.78	.44
Age^3 × Culture	-.000005	.000002	-.03	-2.32	.02	.000003	.000002	.02	1.45	.15	.0000001	.000002	.001	.05	.96
Education															
Some College	.02	.02	.02	1.52	.13	-.03	.01	-.03	-2.33	.02	-.12	.02	-.12	-6.67	< .001
BA+	-.004	.02	-.004	-.28	.78	-.05	.01	-.05	-3.46	.001	-.17	.02	-.17	-10.00	< .001

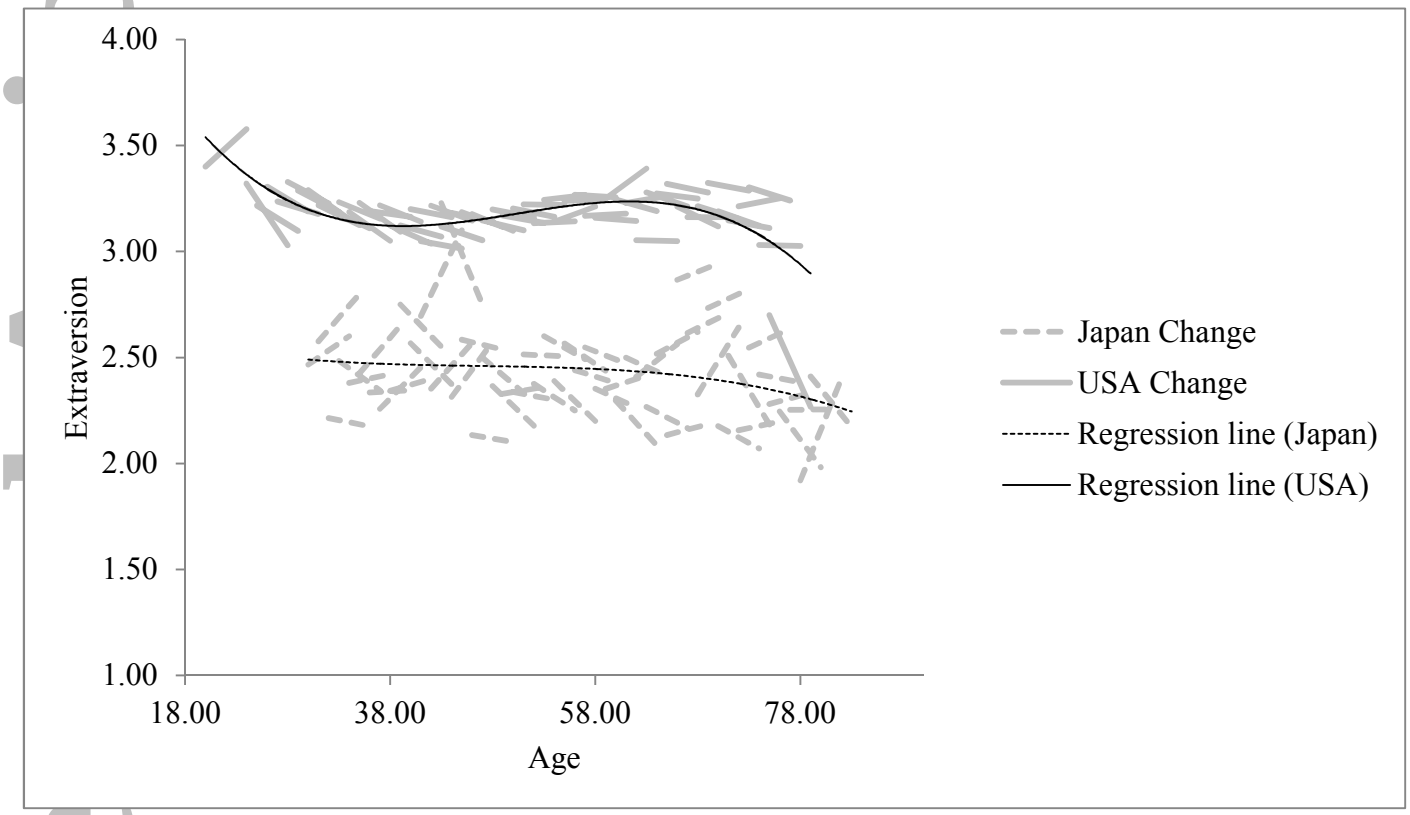
Note. Gender: -1 = male, 1 = female. Reference group for education is a high school education/GED or less.

Table 3. Continued

	Conscientiousness					Openness to Experience				
	b	*SE (b)*	*β*	*t*	*p*	*b*	*SE (b)*	*β*	*t*	*p*
Age	.01	.001	.09	8.33	< .001	-.0004	.001	-.005	-.39	.69
Gender	.05	.01	.05	8.92	< .001	-.03	.01	-.03	-5.55	< .001
Culture	.40	.01	.40	39.77	< .001	.39	.01	.39	33.37	< .001
Age × Culture	-.004	.001	-.05	-4.76	< .001	.001	.001	.01	.80	.43
Age^2	.00004	.00005	.01	.89	.38	.00003	.00005	.01	.61	.54
Age^2 × Culture	-.0001	.00005	-.03	-2.88	.004	.00004	.00005	.01	.75	.45
Age^3	-.00001	.000002	-.06	-5.29	< .001	-.000008	.000002	-.05	-4.12	< .001
Age^3 × Culture	.000006	.000002	.04	3.15	.002	-.000003	.000002	-.02	-1.24	.22
Education										
Some College	.05	.01	.05	3.84	< .001	.17	.01	.17	11.68	< .001
BA+	.13	.01	.13	10.18	< .001	.25	.01	.25	17.41	< .001

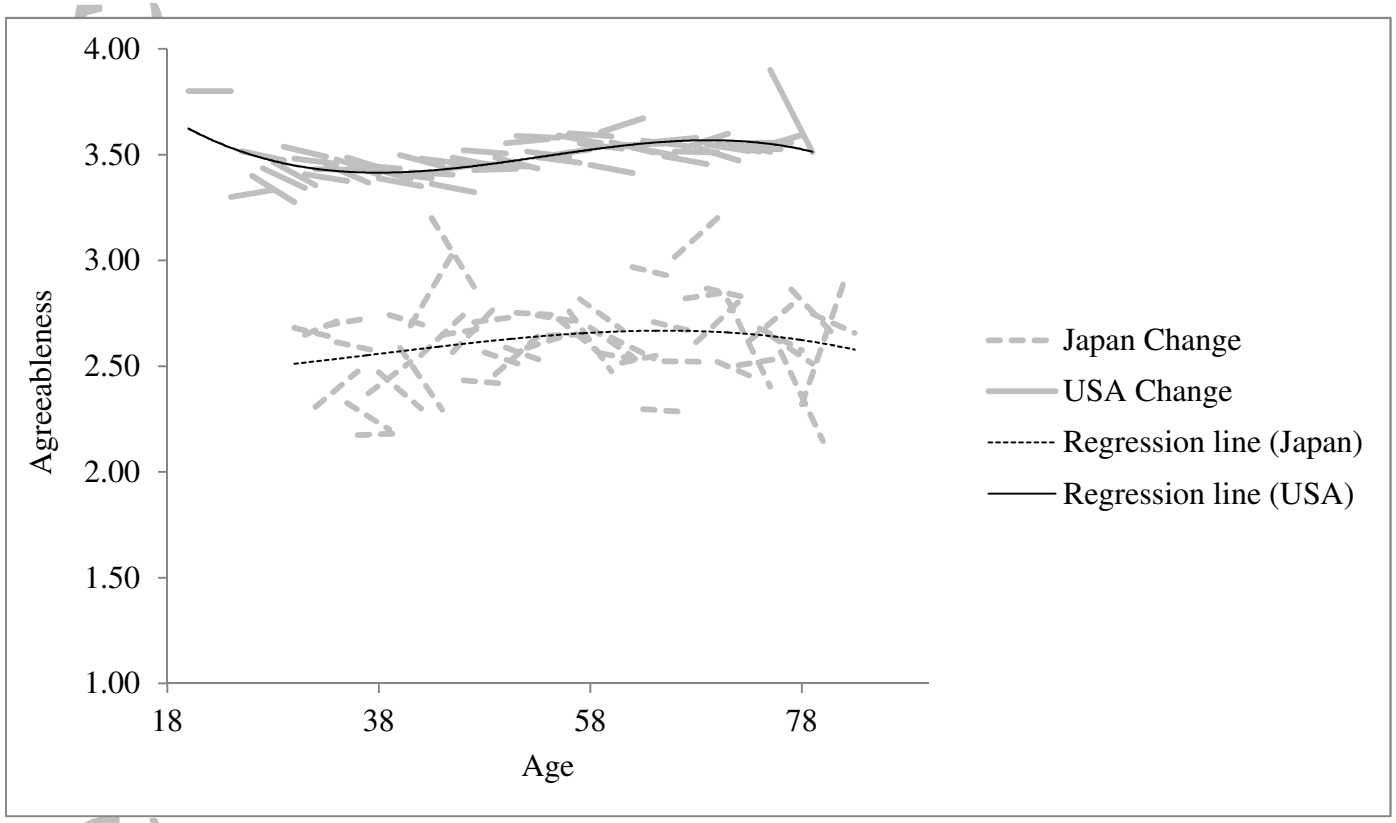
Note. Gender: -1 = male, 1 = female. Reference group for education is a high school education/GED or less.

Figure 1. Age-related changes in extraversion in U.S. and Japan



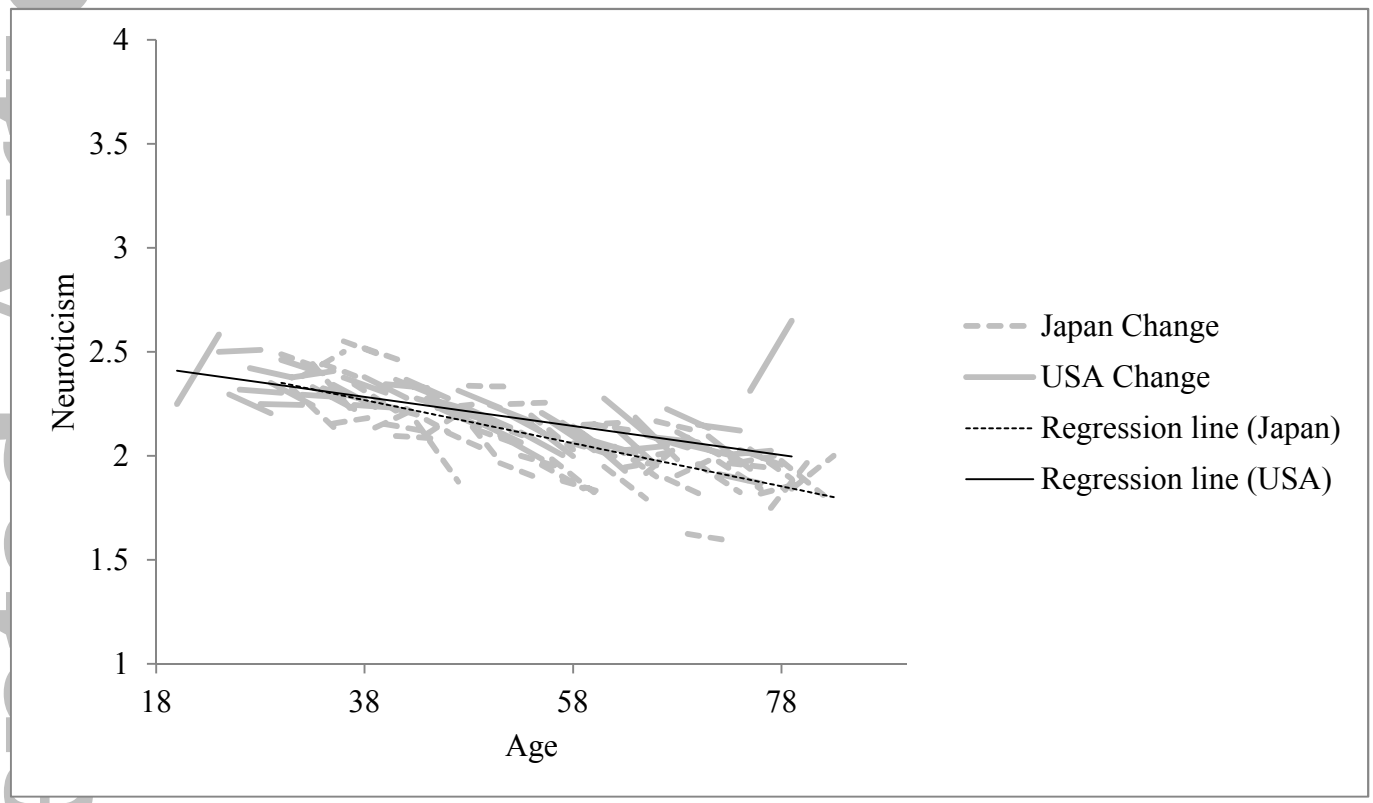
Note. The model-implied regression slope for the relevant age effects across all age observations is plotted. The shorter, faded lines represent the patterns of cohort change over the two assessments within each culture.

Figure 2. Age-related changes in agreeableness in U.S. and Japan



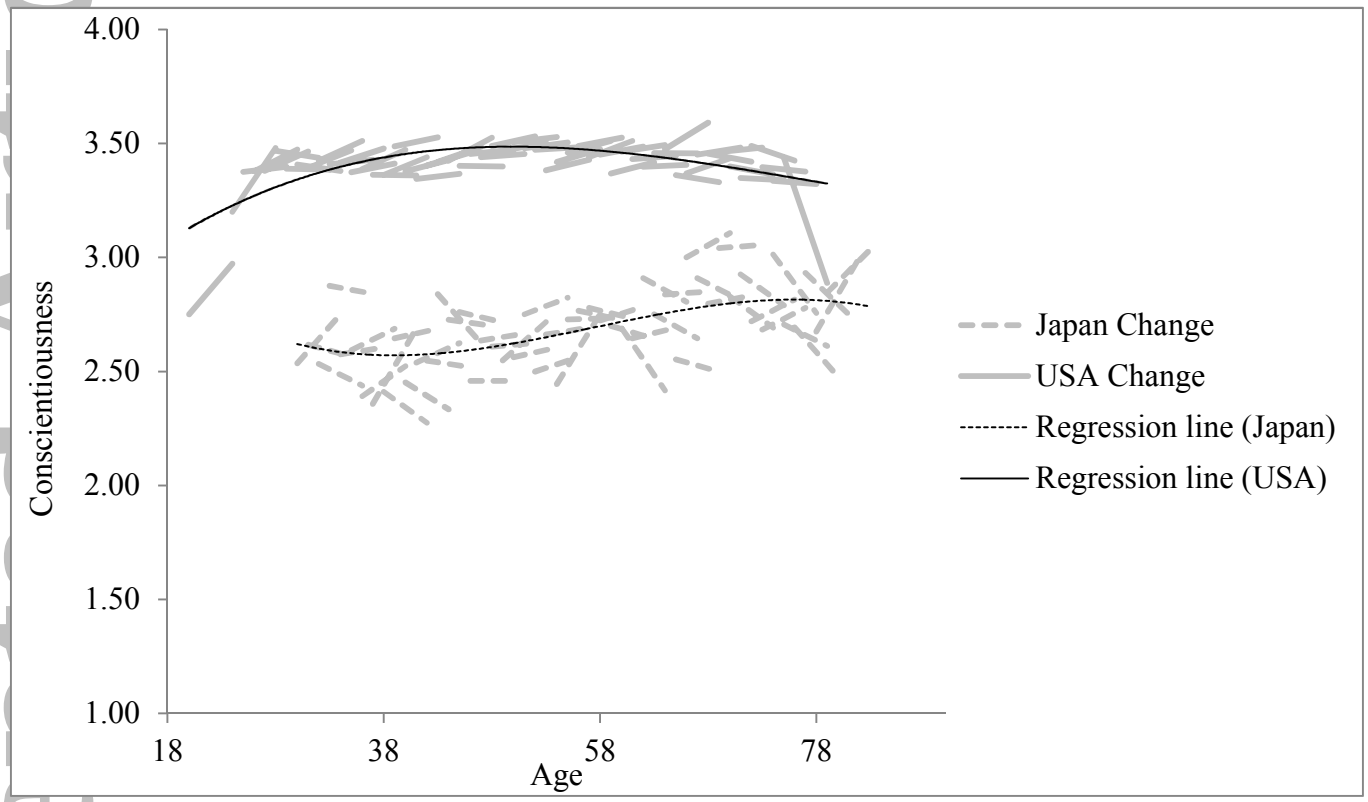
Note. The model-implied regression slope for the relevant age effects across all age observations is plotted. The shorter, faded lines represent the patterns of cohort change over the two assessments within each culture.

Figure 3. Age-related changes in neuroticism in U.S. and Japan



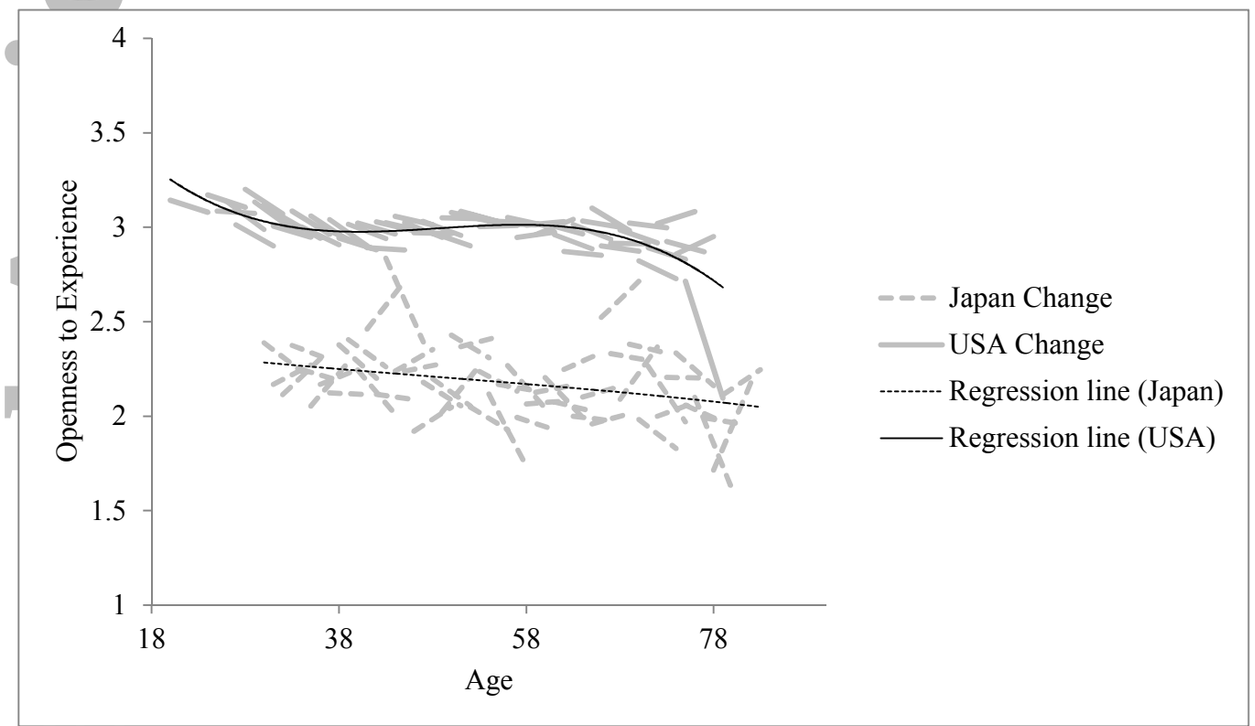
Note. The model-implied regression slope for the relevant age effects across all age observations is plotted. The shorter, faded lines represent the patterns of cohort change over the two assessments within each culture.

Figure 4. Age-related changes in conscientiousness in U.S. and Japan



Note. The model-implied regression slope for the relevant age effects across all age observations is plotted. The shorter, faded lines represent the patterns of cohort change over the two assessments within each culture.

Figure 5. Age-related changes in openness to experience in U.S. and Japan



Note. The model-implied regression slope for the relevant age effects across all age observations is plotted. The shorter, faded lines represent the patterns of cohort change over the two assessments within each culture.

Supplementary Table 1. Invariance Tests across Cultures at Time 1

Agreeableness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	130.19	8	< .001	.990	.047	.989						
Metric	157.66	12	< .001	.988	.042	.987	27.47	4	< .001	.002	.005	.002
Scalar	1575.88	17	< .001	.868	.115	.867	1418.22	5	< .001	.120	.073	.120

The modification indices suggest substantial improvements in fit by allowing the unique variance of the adjectives "softhearted" and "sympathetic" to correlate.

Extraversion

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	137.83	8	< .001	.987	.048	.986						
Metric	316.57	12	< .001	.969	.060	.968	178.74	4	< .001	.018	.012	.018
Scalar	1743.71	17	< .001	.826	.121	.825	1418.22	5	< .001	.143	.061	.143

The modification indices suggest substantial improvements in fit by allowing the unique variance of the adjectives "lively" and "active" to correlate.

Openness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	517.00	26	< .001	.961	.052	.959						
Metric	530.53	32	< .001	.960	.047	.958	15.53	6	.04	.001	.005	.001
Scalar	2143.54	39	< .001	.832	.088	.830	1613.01	7	< .001	.128	.128	.128

The modification indices suggest substantial improvements in fit by allowing the unique variance of the adjectives "creative" and "imaginative" to correlate.

Conscientiousness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	15.78	2	< .001	.995	.032	.995						
Metric	117.09	5	< .001	.961	.057	.960	101.31	3	< .001	.034	.025	.035

Scalar	1507.16	9	< .001	.484	.155	.483	1390.07	4	< .001	.477	.098	.477

The modification indices suggest substantial improvements in fit by allowing the unique variance of the adjectives "organized" and "careless" to correlate.

Neuroticism

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	71.92	4	< .001	.989	.049	.989						
Metric	121.07	7	< .001	.982	.048	.981	49.15	3	< .001	.007	.001	.008
Scalar	674.08	11	< .001	.895	.093	.893	553.01	4	< .001	.087	.045	.088

Supplementary Table 2. Invariance Tests across Time for MIDUS

Agreeableness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	494.38	10	< .001	.968	.071	.967						
Metric	517.28	14	< .001	.966	.061	.965	22.90	4	< .001	.002	.010	.002
Scalar	642.84	19	< .001	.958	.059	.957	125.56	5	< .001	.008	.002	.008

Extraversion

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	759.39	10	< .001	.941	.089	.940						
Metric	766.75	14	< .001	.940	.075	.939	7.36	4	.12	.001	.014	.001
Scalar	957.53	19	< .001	.926	.072	.924	190.78	5	< .001	.014	.003	.015

Openness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	2851.96	28	< .001	.828	.103	.827						
Metric	2857.71	34	< .001	.828	.093	.827	5.75	6	.452	< .001	.01	< .001
Scalar	3023.04	41	< .001	.819	.087	.817	165.33	7	< .001	.009	.006	.010

Conscientiousness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	98.29	4	< .001	.976	.050	.975						
Metric	124.52	7	< .001	.969	.042	.968	26.23	3	< .001	.007	.008	.007
Scalar	302.89	11	< .001	.924	.053	.922	178.37	4	< .001	.045	.011	.046

Neuroticism

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	90.42	4	< .001	.991	.048	.990						

Metric	99.85	7	< .001	.990	.037	.989	9.43	3	.02	.001	.011	.001
Scalar	467.64	11	< .001	.951	.066	.950	367.78	4	< .001	.049	.029	.049

Supplementary Table 3. Invariance Tests across Time for MIDJA

Agreeableness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	147.49	10	< .001	.964	.095	.961						
Metric	149.93	14	< .001	.964	.080	.961	2.44	4	.66	< .001	.015	< .001
Scalar	164.02	19	< .001	.962	.071	.957	14.09	5	.06	.002	.009	.004

Extraversion

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	167.42	10	< .001	.945	.101	.942						
Metric	171.82	14	< .001	.945	.086	.940	4.40	4	.36	< .001	.015	.002
Scalar	176.24	19	< .001	.945	.073	.939	4.43	5	.49	< .001	.013	.001

Openness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	522.33	28	< .001	.870	.107	.865						
Metric	523.50	34	< .001	.872	.097	.864	1.18	6	.98	.002	.010	.001
Scalar	630.68	41	< .001	.872	.088	.862	7.18	7	.41	< .001	.009	.002

Conscientiousness

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	3.84	4	.43	.999	.010	.995						
Metric	4.11	7	.77	.999	.010	.995	.27	3	.97	< .001	< .001	< .001
Scalar	8.08	11	.71	.999	.010	.990	3.97	4	.41	< .001	< .001	.005

Neuroticism

	$\chi2$	df	p	CFI	RMSEA	NFI	$\chi2_{(d)}$	df	p	ΔCFI	ΔRMSEA	ΔNFI
Configural	48.98	4	< .001	.927	.086	.922						

Metric	50.52	7	< .001	.930	.064	.920	1.55	3	.67	.003	.022	.002
Scalar	72.10	11	< .001	.901	.060	.886	21.58	4	< .001	.029	.004	.034