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Patterns of cumulative continuity and maturity in personality and well-being: Evidence from a large longitudinal sample of adults

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ABSTRACT

Longitudinal studies have shown that, on average, agreeableness and conscientiousness increase and neuroticism decreases in adulthood, a phenomenon dubbed the "maturity principle". The rank-order stability of personality also tends to increase with age, sometimes called the "cumulative continuity principle". It remains unclear, however, whether the rank-order stability and average levels of different types of well-being increase with age. Therefore, using a large longitudinal sample of adults (N > 6,000), the present study aimed to replicate studies of the maturity and cumulative continuity of the Big Five and test whether these developmental trends extend to different types of well-being. The present study demonstrates that, although many types of well-being exhibit developmental trends that are similar to those of the Big Five, distinguishing the general tendency toward all forms of well-being from variation in specific kinds of well-being can illuminate potentially important developmental differences.

Personality and well-being are strongly related both concurrently and prospectively (Anglim & Grant, 2016; DeNeve & Copper, 1998; Grant, Langan-Fox, & Anglim, 2009; Lamers, Westerhof, Kovács, & Bohlmeijer, 2012; Steel, Schmidt, & Shultz 2008; Sun, Kaufman, & Smillie, 2018). Studies of their association have increasingly recognized the importance of considering multiple dimensions of well-being, at different levels of generality and specificity (Diener et al., 2017; Joshanloo, 2017, Joshanloo, Capone, Petrillo, & Caso, 2017). Beyond research focused on concurrent and prospective associations, longitudinal studies have begun to compare and contrast the *developmental course* of personality and well-being (Anusic & Schimmack, 2016; Fujita & Diener, 2005). The present study extends this body of work by examining the development of personality and well-being from early to late adulthood, focusing on normative trends in *rank-order stability* and *mean-level change* and focusing on the question of whether well-being exhibits the same trends that have been previously established for personality.

Rank-order stability or change describes the relative ordering of individuals on a trait dimension over time. High rank-order change indicates that an individual's score on a trait at one occasion only poorly predicts how they will score relative to others at a later occasion. Rank-order stability and change are typically quantified using a correlation coefficient calculated between repeated-measures (i.e. a test-retest correlation), whereby high positive values provide evidence for rank-order stability, and values that are near zero or negative provide evidence for rank-order change. The question of whether individuals change in rank-order, however, is separate from whether groups of people, on average, increase or decrease over time. *Mean-level change* describes whether the average of a group increases or decreases over time, regardless of whether individuals in the group are reordering in rank. Rank-order change may be absent or present while mean-level change is positive or negative. Mean-level change can be quantified by calculating the difference between the averages of a trait measured at two times. Alternatively, mean-level change can be quantified by estimating the average of a random slope, which captures the direction and rate that individuals change over time.

Thus, mean-level change is a group aggregate of *intraindividual or within-individual* change, which describes how an individual changes on a trait over time. Within-individual change is related to but distinct from mean-level and rank-order change, as mean-level and rank-order change necessarily entail (at least some) within-individual change, but the absence of mean-level and rank-order change does not preclude the presence of within-individual change. Put differently, for the group-average of a trait to increase, or for individuals to reorder in rank, some individuals in the group must be increasing or decreasing. However, the average of a group could fail to change because some individuals in the group increase, while others decrease or remain the same. Similarly, individuals in a group may remain stable in terms of rank, while

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individuals differ in the rate and/or direction of within-individual change. Quantifying interindividual differences in within-individual change is typically achieved by estimating a random slope in a mixed effects regression, or by freely estimating the variance of a latent slope in a structural equation model.

Adult personality has been studied extensively from a developmental perspective and longitudinal studies have yielded two key conclusions about change in personality. First, the cumulative continuity principle states that the rank-order stability of personality increases in adulthood (Roberts & DelVecchio, 2000). Second, the maturity principle states that mean-levels of agreeableness and conscientiousness increase and mean-levels of neuroticism decrease with age (Roberts, Walton, & Viechtbauer, 2006). However, the results of recent studies call into question the universality of these principles by suggesting that age trends might be more nuanced. Age-related trends in the rank-order stability of Big Five have been shown to follow an inverted-U and mean-level change is sometimes non-linear as well (Specht, Egloff, Schmukle, 2011). There is also evidence that the cumulative continuity principle extends developmentally downward to childhood and adolescence (Soto & Tackett, 2015). In advanced age there is evidence for high rank-order stability and little to no mean level change in personality (Mõttus, Johnson, & Deary, 2012).

Similar to personality, the rank-order stability of hedonic well-being—i.e. general satisfaction with life and a balance of positive relative to negative affect—tends to increase with age, although rank-order change may be greater for well-being, compared to personality (Anusic & Schimmack 2016). Greater rank-order change for well-being may be particularly true in adolescence and early adulthood (Chen & Page, 2016). Nevertheless, although estimates tend to be lower for well-being compared to personality, there is evidence that the Big Five personality traits, hedonic well-being, and *eudaimonic well-being*, focused on purpose and meaning in life, exhibit moderate to high rank-order stability across adulthood (Fujita & Diener, 2005; Lucas & Donnellan, 2011; Ryff, 2014; Wortman, Lucas & Donnellan, 2012).

Hedonic well-being shows little mean-level change from midlife to late adulthood, mirroring personality (Costa et al., 1987; Roberts, Wood & Caspi, 2008). In fact, some studies have found that mean-levels of hedonic well-being increase into late adulthood (Hansen & Slagsvold, 2012; Jivraj, Nazroo, Vanhoutte, & Chandola, 2014), which has been described as a paradox, as well-being is expected to decline as physical health declines with age. Then again, other studies have found that certain aspects of hedonic well-being decline with age (Gerstorf et al., 2010; Hansen and Slagsvold, 2012). Thus, mean-levels of hedonic well-being do seem to change with age, but the shape and direction of change is difficult to discern (Ulloa, Møller, & Sousa-Poza, 2013). With respect to alternative conceptualizations of well-being, age-group differences have been observed for aspects of eudaimonic well-being, but these differences were small, translating to a one or two-point difference on a 20-point scale (Ryff & Singer, 2008).

Although studies have documented changes in mean levels of eudaimonic well-being in adulthood (Ryff, 2014), less is known about its rank-order stability. Joshanloo (2019) recently examined the direction and strength of prospective relations between eudaimonic and hedonic well-being using three-waves of data from the Study of Midlife Development in the United States (MIDUS). Results of cross-lagged models indicated that eudaimonic well-being predicted future levels of hedonic well-being, but not vice versa. Relevant to the present study, both eudaimonic and hedonic well-being were highly stable, although eudaimonic well-being was slightly more stable. However, these results rely on the assumption that the direction and strength of auto-regressive and cross-lagged associations do not vary from early to middle adulthood (e.g. 25 to 45 years old) and from middle to late adulthood (e.g. 55 to 75 years old). As a result, it remains unclear whether the finding of high rank-order stability will remain unchanged in adulthood or whether cumulative continuity occurs. Joshanloo (2019) also focused on latent well-being factors that capture variance that is common to related measures of well-being. Although there are advantages to analyzing latent factors, like estimating regressions and correlations independent of unsystematic measurement error, latent variables aggregate information across related but distinct variables. Consequently, age-related trends in the stability of individual measures of well-being that focus on more narrow aspects of eudaimonia remain largely unknown.

Importantly, despite being highly correlated, different measures of hedonic well-being (i.e., positive affect, negative affect, and life satisfaction) have been shown to have different predictors and outcomes (Diener et al., 2017), emphasizing the potential importance of examining both aggregate and individual measures of well-being that capture common versus specific aspects of flourishing. However, it remains unclear whether developmental trends in the general tendency to experience higher or lower levels of related measures of well-being mirror developmental trends in individual measures of well-being. Similar to eudaimonic well-being, few studies have examined the development of *social well-being*, which centers on connections to, involvement with, and understanding of one's community, culture, and society at large. Therefore, the goal of the present study was to replicate the cumulative continuity and maturity of the Big Five domains of personality, using three waves of data from MIDUS, and test whether these developmental principles extend to different types of well-being, focusing on different levels of generality and specificity in the measurement of well-being.

1. Method

1.1. Sample

The present study analyzed data from a large longitudinal study of adults in the United States (MIDUS; Ryff & Krueger, 2018). The study is cross-sequential and includes three measurement occasions, including a baseline assessment and follow-up assessments approximately 10 and 20 years later. All study procedures and materials were approved by an ethical review board before data collection. MIDUS is an open access study and data are publicly available. All data and study materials are available on a permanent third-party archive, the 71 Inter-University Consortium for Political and Social Research (ICPSR). Requests to access the data and study materials should be directed to the ICPSR[1].

At the first wave of data collection, the age of participants spanned 20 - 75 years (mean = 46.38 years, SD = 13.00 years). The sample was approximately 48% male and 52% female. Among those who provided valid responses (N = 6210), the self-reported racial/ethnic composition of the sample was 92% white, 6% black, 2% other race/ethnicity. The second wave of data collection took pace approximately 10-years after the first, between 2004-2006 (N = 4963). Longitudinal retention rates from wave 1 to wave 2 were high (~ 70%). At the second wave, the age of participants spanned 28 - 84 years (mean age = 55.43 years, SD = 12.45 years), approximately 47% male and 53% female, and the self-reported racial/ethnic composition of the sample was 90% white, 5% black, and 5% other race/ethnicity.

Finally, the third wave of data collection took place between 2013-2014 (N = 3294). By this time, 210 participants from wave 2 were deceased and an additional 65 had withdrawn from the study due to physical or cognitive impairment. Nevertheless, longitudinal retention rates remained high from wave 2 to wave 3 (~ 66%). At the third wave, the age of participants spanned 39 - 93 years (mean age = 63.64 years, SD = 11.35 years). The sample was approximately 45% male and 55% female, and the self-reported racial/ethnic composition was approximately 89% White, 4% Black, 7% other race/ethnicity.

[1] https://www.icpsr.umich.edu/icpsrweb

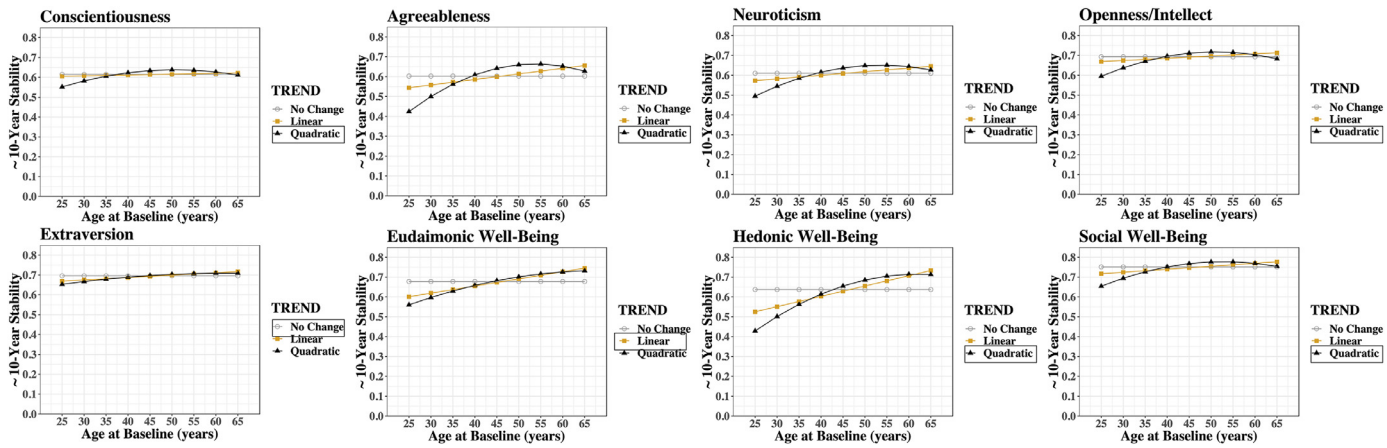

Fig. 1. Model Predicted Trends in Rank-Order Stability of Big Five Domains and Eudaimonic, Hedonic, and Social Well-Being Factors.
Best-fitting trends (according to AIC, BIC & $\Delta\chi^2$) are enclosed in boxes. Parameter estimates, standard errors (SE), and p-values for all trends are reported in supplemental materials.

1.2. Measures

To measure the Big Five domains, participants were asked how well a set of words describes them, rating each word on a 4-point scale (1 = A lot, 2 = Some, 3 = A little, 4 = Not at all). Seven words were used to measure openness/intellect (creative, imaginative, intelligent, curious, broad-minded, sophisticated, and adventurous). Five words were used to measure agreeableness (helpful, warm, caring, softhearted and sympathetic), and another five were used to measure extraversion (outgoing, friendly, lively, active, talkative). Conscientiousness was measured using four words (organized, responsible, hardworking, and careless), as was neuroticism (moody, worrying, nervous and calm). The necessary items were reflected so that higher scores for all items represented higher levels of the Big Five domains. Scale scores for the Big Five domains were constructed by calculating the mean of their respective items.

Different aspects of eudaimonic, hedonic and social well-being were measured. *Eudaimonic well-being* was measured using five abbreviated self-report scales (Ryff. 1989; Ryff & Keyes, 1995), each consisting in three items: (1) *self-acceptance* (e.g. "When I look at the story of my life, I am pleased with how things have turned out so far"), (2) *autonomy* (e.g. "I have confidence in my own opinions, even if they are different from the way most other people think"), (3) *personal growth* (e.g. "For me, life has been a continuous process of learning, changing and growth"), (4) *environmental mastery* (e.g. "In general, I feel I am in charge of the situation in which I live"), and (5) *purpose in life* (e.g. "Some people wander aimlessly through life, but I am not one of them"). All items measuring aspects of eudaimonic well-being were rated on a 7-point scale (1 = Strongly agree; 4 = Don't know; 7 = Strongly disagree). Similar to Big Five personality, items were reverse coded when necessary so that higher scores reflected higher levels of well-being, and scales were constructed by calculating the mean of their respective items.

Hedonic well-being was measured using three scales. (1) The positive affect scale asked participants to rate how often they felt positive emotions (e.g. "cheerful", "extremely happy", "satisfied", "full of life", etc.). (2) The negative affect scale asked participants to rate how often they felt negative emotions (e.g. "so sad nothing could cheer you up", "hopeless", "worthless", etc.). These items were rated on a 5-point scale (1 = All of the time; 3 = Some of the time; 5 = None of the time). (3) The life satisfaction scale had participants rate their overall quality of life, and satisfaction with their work, health, and relationships with their partner and children. These ratings were completed on a 11-point scale (0 = the worst possible; 10 = the best possible). Positive affect, negative affect, and life satisfaction scales were computed by calculating the mean of their respective items.

Social well-being was measured using six scales, each consisting in three items. (1) positive relations with others (e.g. "I have not experienced many warm and trusting relationships with others"), (2) social coherence (a.k.a. meaningfulness of society, e.g. "The world is too complex for me" and "I cannot make sense of what's going on in the world"), (3) social integration (e.g. "My community is a source of comfort" and "I don't feel I belong to anything I'd call a community"), (4) social acceptance (a.k.a. acceptance of others, e.g. "I believe that people are kind"), social contribution (e.g. "I have something valuable to give to the world"), and (6) social actualization (e.g. "Society has stopped making progress" – reverse coded). All items were rated on the same 7-point scale that was used for measures of eudaimonic well-being. The appropriate items were reverse coded so that higher scores reflected higher levels of well-being, and scales were constructed by calculating the average item score.

1.3. Data analytic procedures

Data was prepared for analyses in R version 3.2.2 and exported from R using the 'MplusAutomation' package version 0.7.1 (Hallquist & Wiley, 2018). Inferential analyses were conducted using Mplus version 8.1 (Muthén & Muthén, 1998-2017). Figures were created using the 'ggplot2' package (Wickham, 2016). For all models, missing data across measurement occasion were handled using full-information maximum likelihood (Schafer & Graham, 2002). Using a family identification number as a clustering variable, a sandwich estimator was used to adjust standard errors for the non-independence of observations that result from sibling-pairs and twin-pairs being nested within the same family.

1.4. Rank-order stability

First, after testing for cross-sectional and longitudinal measurement invariance, longitudinal confirmatory factor analysis (CFA) models were used to estimate the stability of latent well-being factors. For Big Five domains and individual measures of well-being, test-retest correlations between observed variables were used to estimate stability. In these models, depicted in the supplemental materials (see Figure S1), identical measures at waves 1 and 2 ($Y1_1 - Y4_1$ & $Y1_2 - Y4_2$) were specified as indicators of a latent factor measured across time ($Y_1 - Y_2$). Factor loadings ($\lambda_1 - \lambda_4$) and intercepts ($bo_1 - bo_4$) were freely estimated but constrained to equality across time to reflect longitudinal scalar invariance (see supplemental materials). Latent factors were scaled on a standardized metric by fixing the mean and variance of the

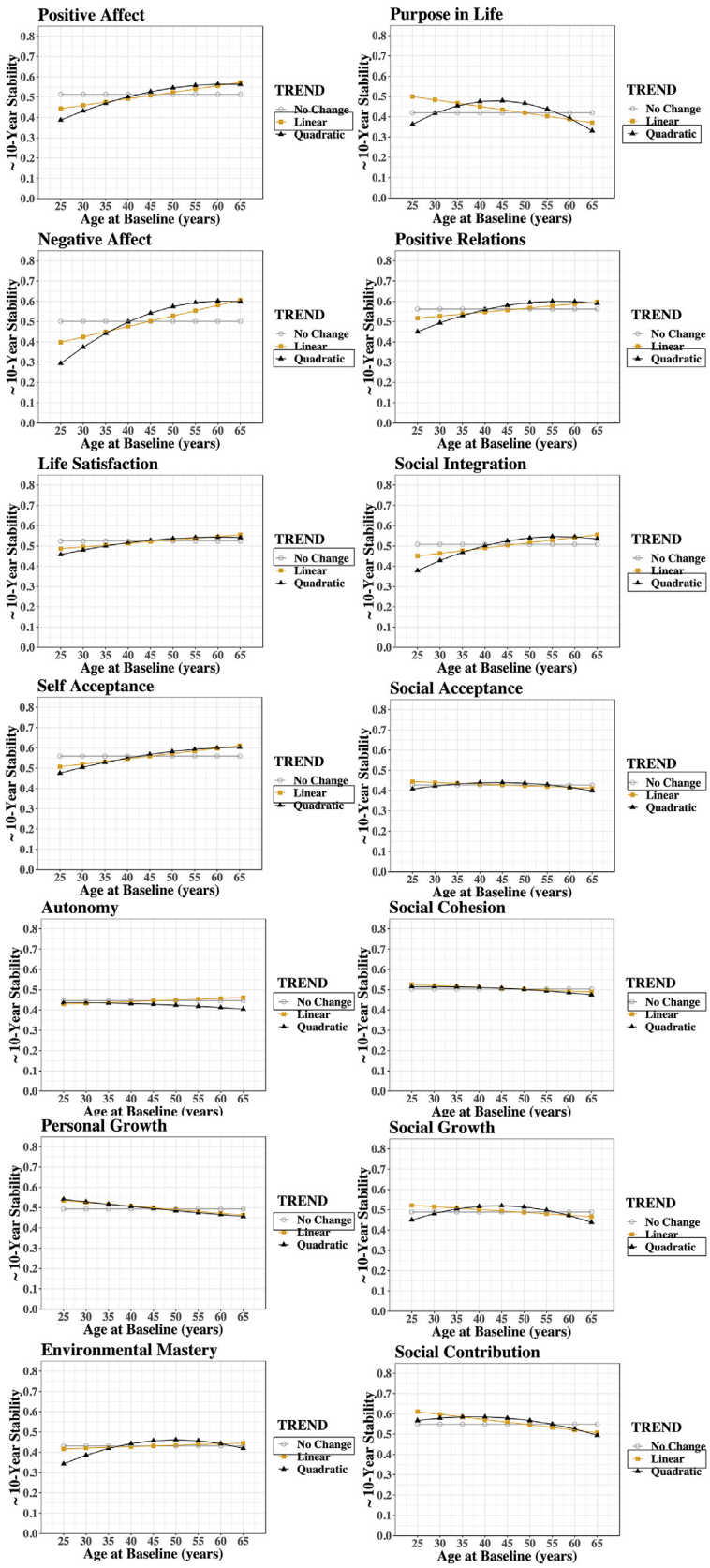

Fig. 2. Model Predicted Trends in the Rank-Order Stability of Individual Indicators of Well-Being
Best-fitting model-implied trends in rank-order stability are enclosed in boxes. Parameter estimates, standard errors (SE), and p-values for all trends are reported in supplemental materials.

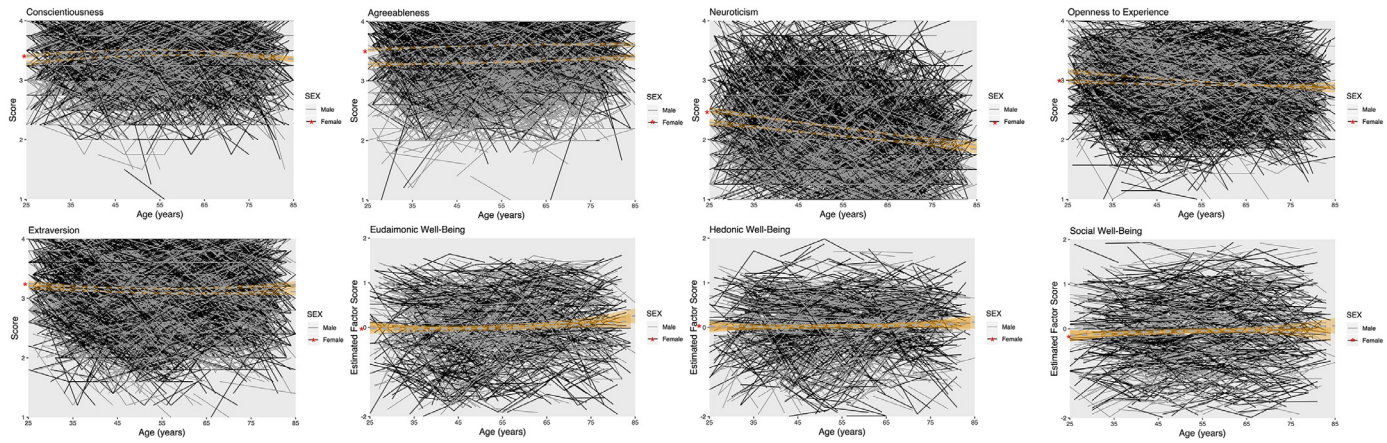

Fig. 3. Individual Trajectory Plots for the Big Five and Eudaimonic, Hedonic, and Social Well-Being Factors. Developmental trajectories are plotted separately for females and males.

factor to zero and one, respectively. To reflect shared method variance, residual correlations between identical measures ($r_{Y1} - r_{Y4}$) were estimated and constrained to equality across time. To estimate stability, the correlation between latent factors (r_{12}) was freely estimated.

Note that participants were different ages at each wave of data collection. From wave 1 to wave 2, some participants were progressing from early to middle adulthood (e.g. 25 to 35 years old) and others from middle to late adulthood (e.g. 65 to 75 years old). To test whether the rank-order stability of common well-being factors were moderated by the age of participants (i.e. to test for cumulative continuity), the same longitudinal CFA models were fit to the data, except test-retest correlations were allowed to vary continuously as a function of either (1) the linear effects of age at the first wave of data collection (centered at 25 years) or (2) the linear and quadratic effects of age (centered at 25 years). Put differently, test-retest correlations were constrained to interact with the age of participants at baseline. These models were compared to models that assume rank-order stability does *not* vary as a function of age. Similar models were then used to test whether the stability of Big Five domains and individual measures of well-being increased with age, except, instead of latent correlations, observed test-retest correlations were constrained to interact with the linear and quadratic effects of age (see Fig. S1).

1.5. Mean-level change

To examine the average rate of change and individual differences in rates of change, a series of multiple-indicator latent growth models (LGMs) with individually varying times of observation were fit to the data (Grimm, Ram, & Estabrook, 2016). These models are capable of capturing heterogeneity in age, as the factor loadings on the latent slope for the first, second, and third measurement occasion vary according to the participants' age at the time of assessment (centered at 25 years). Reflecting the potential for individual differences in initial levels and within-individual changes, the variances of the latent intercepts and slopes were freely estimated. Finally, covariances between intercepts and slopes were estimated to account for within-construct level-change associations. Not only are level-change associations commonly observed in results of LGMs, but level-change associations make sense from a theoretical standpoint when growth is not independent of initial status. This seems particularly fitting with respect to personality and well-being. For example, rate of change in neuroticism and hedonic well-being may be related to how neurotic and happy someone is in the first place. Note, as random coefficients are estimated, the variances of dependent variables differ according to the values of independent variables. Consequently, model chi-squared and derivative fit statistics cannot be calculated for these models. Nevertheless, for each study variable, different LGMs were compared using information criteria (*AIC* & *BIC*) and Satorra–Bentler scaled change in model chi-squared ($\Delta\chi 2$) using the 'SBSDiff' package (Mann, 2018).

First, an intercept only model was fit to the data, which implies there are individual differences in initial levels but no change over time. In this model, the factor loadings onto a latent intercept are fixed to one at each wave, and the variance of the latent intercept is freely estimated. This model served as a baseline for comparing alterative solutions, including linear and quadratic LGMs. In the linear LGM, the factor loadings at the first, second, and third wave are fixed to be equal to the ages of participants at each wave (centered at 25 years). In the quadratic growth model, an additional latent factor is specified with loadings at the first, second, and third wave fixed to be equal to the ages of participants (centered at 25 years) squared. This way, the variance of the latent intercept captures interindividual differences in levels of the Big Five and well-being at age 25, while the mean and variance of the latent slopes capture the average rates of linear and quadratic change from approximately age 25 to 85 years and interindividual differences in rates of change. In linear and quadratic growth models, covariances between latent factors were freely estimated to account for potential intercept-slope associations, and the residual variances of indicators were freely estimated and constrained to equality.

2. Results

First, a series of cross-sectional and longitudinal measurement invariance (MI) models were fit to focal study variables. Cross-sectional MI is important to establish if one intends to make generalizations about latent variables across covariate groups (e.g. biological sex and race/ethnicity), and longitudinal MI is important to establish before making inferences about latent variables over time, otherwise change may be attributed to differences in measurement properties, as opposed to change in the underlying construct of interest. Results MI analyses are reported in supplemental materials (see Tables S1–S6). In sum, there was strong evidence for longitudinal MI, but only mixed evidence for cross-sectional MI. Therefore, to ensure that results were not the artifact of group differences associated with demographic covariates, scale scores for the Big Five domains and well-being were residualized for the cross-sectional effects of biological sex and self-reported Black, Asian, and Other race/ethnicity.

2.1. Rank-order stability

The longitudinal CFA models (range of RMSEA = .000 to .064) were compared to models that allowed stability coefficients to be moderated by age. For the majority of study variables, comparative fit

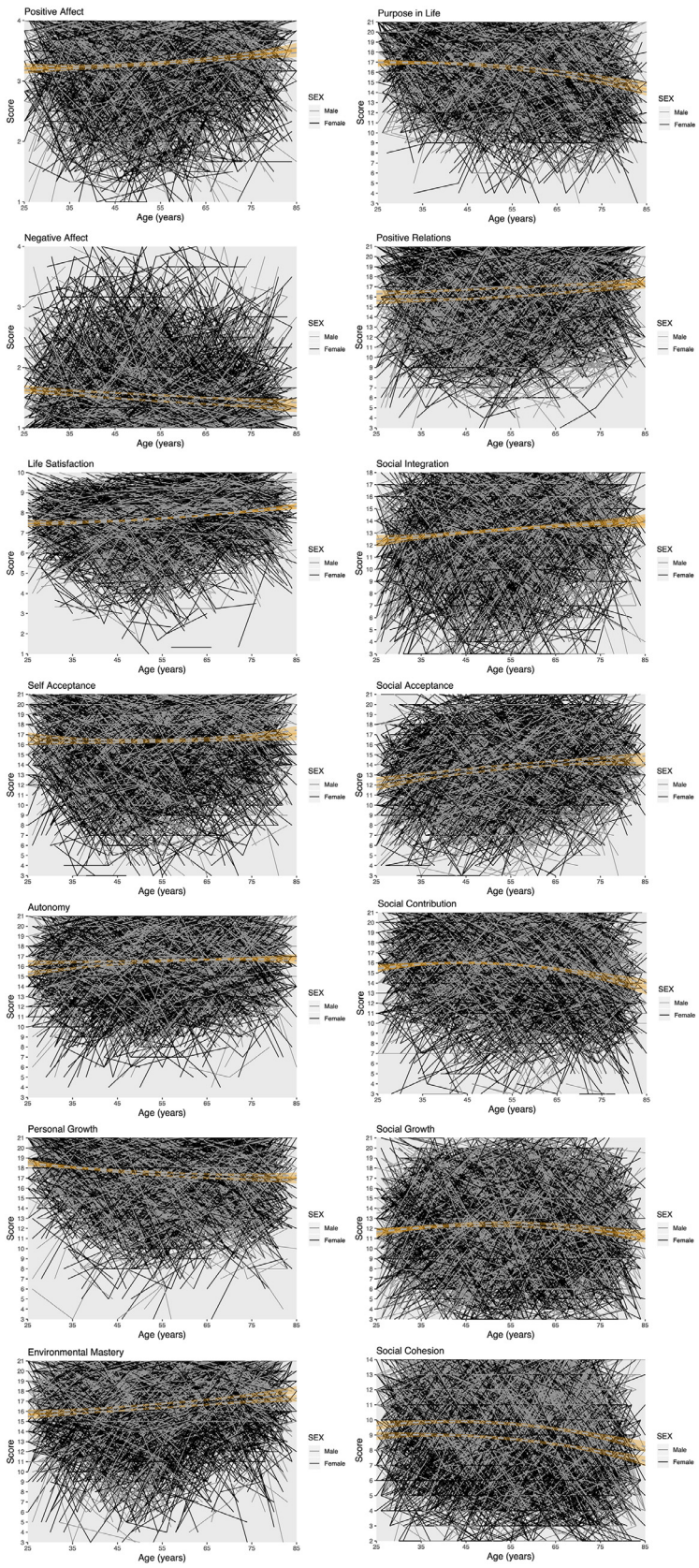

Fig. 4. Individual Trajectory Plots for Indicators of Eudaimonic, Hedonic, and Social Well-Being Factors. Developmental trajectories are plotted separately for females and males.

statistics (reported in Tables S7-S9) indicated that constraining test-retest correlations to equality across age resulted in misfit to the data, providing evidence for age-related trends in rank-order stability. Accordingly, a quadratic trend best captured age-related differences in stability for conscientiousness, agreeableness, neuroticism, openness/intellect, hedonic well-being, and social well-being. A positive linear trend best captured age-related differences in the stability of eudaimonic well-being, while extraversion did not vary as a function of age. In Fig. 1, model-implied test-retest correlations from wave 1 to wave 2 are plotted (y-axis) in relation to the age of participants at baseline (x-axis).

Compared to the Big Five domains and latent well-being factors, which capture variance that is common to related measures of well-being, individual measures of well-being showed more varied age-related trends in stability. Put differently, compared to the general tendency to experience higher or lower levels of related aspects of well-being, more fine-grained aspects of well-being showed greater variation in developmental stability. These results are depicted in Fig. 2. In comparison to the general tendency to experience higher or lower levels of hedonic well-being, which increased as a quadratic function of age, the rank-order stability of positive affect followed a positive linear trend. Quadratic age-related changes in stability were observed for negative affect, and the rank-order stability of life satisfaction remain unchanged.

Compared to the general tendency to experience higher or lower levels of eudaimonic well-being, which increased as a linear function of age, self-acceptance had a similarly shaped trajectory but was less stable. The stability of purpose in life increased as a quadratic function of age, while the stability of autonomy, environmental mastery, and personal growth was lower than the Big Five and common well-being factors and not moderated by age. According to comparative fit statistics, a quadratic trend best captured age-related differences in rank-order stability for positive relations with others, social integration, and social growth. There were no age-related differences in the stability of social acceptance and meaningfulness of society (a.k.a. social cohesion), and the stability of social contribution decreased linearly with age, albeit only slightly. Parameter estimates, standard errors, and p-values from longitudinal CFA models are reported in the supplemental materials (see Table S13).

2.2. Mean-level change

Depicted in Figs. 3 and 4, individual trajectory plots were used to inspect initial levels and within-individual changes in study variables over the three waves. Estimated factor scores for females and males were plotted for common well-being factors, while observed scores were plotted for the Big Five domains and individual measures of well-being. For all study variables, quadratic trends were plotted using the 'geom_smooth'[2] function in the gglot2 package. Despite little average change, individual differences in both initial levels and rates of change were evident. Further, it is clear that participants were different ages at the onset of the study, such that some participants were progressing through early adulthood and other participants were progressing through late adulthood. Finally, mean sex differences were evident for a number of variables, but the shape and rate of growth trajectories were similar for females and males. Therefore, consistent with the longitudinal CFA models, scale scores were residualized for the effects of biological sex and self-reported black, Asian, and other race/ethnicity, and growth models were fit to the full sample including observations from both females and males.

Model fit statistics comparing growth models are reported in the supplemental material (see Tables S10-S12). For all variables, at least two of three fit statistics (*AIC, BIC*, $\Delta\chi^2$) indicated that quadratic growth models were preferred over linear and intercept-only models. Nevertheless, parameter estimates from both linear and quadratic LGMs are reported in Tables S14 and S15. In sum, results corroborate what can be seen in Figs. 3 and 4. Reflecting individual differences in initial levels, there was statistically significant variance (ps $<$ .001) in the latent intercepts of Big Five domains, common well-being factors, and individual measures of well-being. Although small in magnitude, in quadratic LGMs, the mean of the linear slope was negative for neuroticism and positive for agreeableness and conscientiousness. The eudaimonic well-being factor showed little to no mean-level change across adulthood but there was significant variation (ps $<$ .01) in rates of change. Similarly, on average, the hedonic and social well-being factors increased only slightly (*ps* $<$ .05). Moreover, compared to variation in initial-levels, average rates of change were small for the latent well-being factors but there was significant variation in rates of change (*ps* $<$ .01).

With respect to mean-level and within-individual change, a varied pattern of results emerged for individual measures of well-being. Some variables increase slightly, on average (e.g. life satisfaction, environmental mastery, positive relations, social acceptance), while other variables decreased slightly (e.g. negative affect and personal growth). Perhaps most noteworthy, for all study variables, the magnitude of variation in rate of change exceeded average rate of change. This pattern of results highlights the high degree of developmental heterogeneity that exists for both personality and well-being in adulthood. In other words, although mean-level change if often small in adulthood, individual differences in rates of change are common.

3. Discussion

The present study contributes to research on personality and well-being in at least three ways. First, the present study replicated the cumulative continuity of the Big Five in a large sample of adults (N $>$ 6,000). Second, the present study tested whether cumulative continuity extends to different types of well-being, including aspects of eudaimonic, hedonic, and social well-being. Third, the present study focused on well-being at different levels of specificity by examining the development of latent well-being factors that capture variance that is common to related measures of well-being, as well as individual measures of well-being that focus more narrowly on fine-grained aspects of well-being.

Several results are noteworthy. With the exception of extraversion, for which rank-order stability was predicted to remain unchanged, model-implied trends indicated that the stability of the Big Five domains increased as a function of age, such that stability increased initially from early to middle adulthood, before declining slightly in later adulthood. Similar developmental trends were observed for well-being factors that capture common variance among related measures of well-being, with the exception of eudaimonic well-being, for which rank-order stability was predicted to increase linearly across adulthood. Although small in magnitude, mean-level change in the Big Five domains was consistent with the maturity principle, particularly the average decrease in neuroticism. Similarly, in adulthood there was little mean-level change in common well-being factors. However, more fine-grained measures of well-being exhibit greater variation in mean-level change, with some aspects of well-being increasing and others decreasing.

Compared to Big Five domains and latent well-being factors, individual measures of well-being were also less stable and had more varied age-related trends in stability. For example, the rank-order stability of life satisfaction, autonomy, personal growth, and social acceptance did not increase with age, and the stability of social contribution was predicted to decrease with age, albeit only slightly. Then again, the stability of positive affect and self-acceptance was predicted to increase from early to late adulthood. On the other hand, although slightly less stable, negative affect, environmental mastery, purpose in

[2] geom_smooth(method = glm, formula = y ~ x + I(x^2))

life, positive relations with others, social integration, and social growth exhibited model-implied trends in stability that were similar in shape to those observed for the Big Five domains and latent well-being factors.

As with any cross-sequential design, the present study has a number of limitations, including the possibility of cohort effects. In other words, it is possible that developmental trends in personality and well-being might be influenced by or limited to the historical or cultural period in which the observations are inextricably embedded. This possibility is less concerning for the maturity and cumulative continuity of personality, as this developmental trend has already been observed in other cohorts and then replicated in the present study. The finding of more varied developmental trends in well-being, on the other hand, is more novel. Consequently, it is unclear whether these specific trends will replicate in future studies. The present study is also limited by the sole reliance of self-report measures. Conclusions draw from the present study would be bolstered if well-being was measured using multiple informants.

Despite these limitations, the present study demonstrates that, although many types of well-being exhibit developmental trends that are similar to personality, distinguishing variation in individual measures of well-being from variation that is common to related measures of well-being can illuminate potentially important developmental differences. In turn, such developmental differences may have high potential impact for interventions that hope to increase well-being by highlighting the times in adulthood when well-being tends to exhibit normative change, as well as components of well-being that change more than others. Future studies will benefit from testing whether the aspects of well-being that exhibited greater developmental change in adulthood in the present study are also more subject to change as a results of a major life event, such as a therapeutic intervention.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.paid.2019.109737.

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