Cross-Sectional Age Differences and Longitudinal Age Changes of Personality in Middle Adulthood and Old Age

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ABSTRACT The present study examines different aspects of personality continuity (or change) in middle adulthood and old age both cross-sectionally and longitudinally. The sample comprised 445 middle-aged (42–46 years) and 420 older (60–64 years) participants, reassessed after a 4-year interval. Personality was measured using the NEO-FFI personality inventory. After having established strict factorial invariance, factor covariances were found to be equal for both age groups and at both testing occasions, indicating perfect structural continuity of personality. A number of age differences in personality emerged at both measurement occasions. Longitudinally, in both age groups, an average decline in Neuroticism was observed. Longitudinal stability coefficients were around .80 in middle-aged and old participants, implying high, but not perfect, differential continuity. With respect to continuity of divergence, statistically significant cross-sectional age differences were found for the variance of Openness at both measurement occasions. Eventually, concerning specific versus general continuity, a variety of medium effect-sized correlated changes in the Big Five personality domains across the 4-year period was established, implying that personality changes share a certain amount of commonality.

Many people have the impression that older adults are, in general, more rigid, stubborn, resigned, and conscientious than younger

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adults (cf. Heckhausen, Dixon, & Baltes, 1989). Indeed, a number of behavioral traits are viewed as differing between older and younger adults (e.g., Hummert, 1999; Hummert, Garstka, Shaner & Strahm, 1994). These lay impressions imply that some aspects of personality change as adults grow older. The question of how much personality change emerges across the adult lifespan has received a great deal of interest during the past decade (e.g., Caspi & Roberts, 1999, 2001; Caspi, Roberts, & Shiner, 2005; Costa & McCrae, 1994; Heatherton & Weinberger, 1994; Lewis, 1999, 2001; Mroczek & Little, 2006). Some personality researchers place emphasis on the aspect of continuity of personality in adulthood (e.g., Block, 1993; Costa & McCrae, 1997; McCrae & Costa, 1999, 2002) and suggest that the adult personality is relatively stable over the life course. However, in recent years even continuity theorists (e.g., Costa & McCrae, 1994) have acknowledged that there is some normative personality change (Terracciano, McCrae, Brant, & Costa, 2005) and that nonnormative life events can alter personality in midlife (Costa, Herbst, McCrae, & Siegler, 2000). One mechanism that might facilitate continuity in personality is genetics. McCrae et al. (2000) argued that personality traits are highly heritable and that age-related, mean-level differences are largely due to genetic influences (McCrae et al., 1999; for a fuller discussion of mechanisms of continuity across the lifespan, see Caspi & Roberts, 2001; Roberts & Caspi, 2003; Terracciano et al., 2005).

Other personality researchers and lifespan theorists place emphasis on the potential plasticity of personality as a function of contextual variables and compensatory behavioral changes to biological aging (e.g., Baltes, 1987; Baltes, Staudinger, & Lindenberger, 1999; Caspi & Roberts, 1999, 2001; Roberts & Caspi, 2003) and advocate a change-oriented approach to personality in adulthood (Helson & Srivastava, 2001; Roberts, 1997). In this case, the main argument is that the complex interactions between an individual and his or her environment result in changes in personality that occur throughout a person's life (e.g., Baltes, 1987; Baltes et al., 1999; Caspi, 1998; Helson, Jones, & Kwan, 2002; Helson & Srivastava, 2001; Helson & Stewart, 1994; Roberts, Robins, Caspi, & Trzesniewski, 2003). Even though there is considerable stability in personality, this perspective emphasizes that personality remains susceptible to the pressures of life and the potential socialization effect of life experiences throughout adulthood (cf. Baltes, 1987; Baltes et al., 1999). Caspi and

Roberts (2001; see also Roberts & Caspi, 2003) identified several potential pathways of personality change across the lifespan such as self-insight (i.e., watching oneself) and social learning processes (i.e., watching and listening to others). In addition, social roles, life events, and social environments (e.g., experiences in careers, marriage) may change systematically during the life course and be, in part, responsible for changes in personality (e.g., Roberts, 1997; Robins, Caspi, & Moffitt, 2002; Srivastava, John, Gosling, & Potter, 2003).

Multiple Aspects of Continuity and Change

Any discussion of personality continuity and change across the adult lifespan must take into account changes that may manifest themselves in several ways, both conceptually and empirically (cf. Roberts & Pomerantz, 2004). According to Caspi and Roberts (1999, 2001), five different aspects of personality continuity and change may be distinguished: structural, absolute, differential, ipsative, and coherence. In the present study, we will focus on structural, absolute, and differential continuity, because ipsative continuity and coherence have rarely been examined in adulthood or old age (for details, see Roberts, Caspi, & Moffitt, 2001; Soldz & Vaillant, 1999). Note that although the emphasis is on continuity and change, which would require longitudinal data, the first two aspects (i.e., structural and absolute continuity and change) may also be examined in cross-sectional data, conditional on the assumption that cohort effects do not play a major role.

Structural continuity refers to the degree of continuity in the interrelations among a set of variables over time. Structural continuity is strongly related to the concept of measurement invariance (cf. Bollen, 1989; Horn & McArdle, 1992; Meredith, 1993; Meredith & Horn, 2001). Measurement invariance entails the degree to which a measure behaves equivalently across different groups or testing occasions. Assuming that one has multiple items (or scales) measuring different personality constructs, structural continuity is evaluated by examining the invariance in factor loadings, intercepts, and residual variances from a factor analysis of the personality items or scales. Discontinuity would be manifested in a change in the loadings of personality items or scales on trait factors, or even more major qualitative changes in the dimensionality of the trait factor space. Given evidence of measurement invariance, structural continuity can

be defined as the extent to which personality factors have invariant covariation patterns across age groups or over time (Caspi & Roberts, 1999, 2001). Structural continuity—in its narrower sense and in the way we use this term in the remainder of this article—builds upon measurement invariance because measurement invariance has to be established in order to render comparisons of covariances among personality factors meaningful. Empirically, after having established the property of invariance of a measure with respect to a selection variable (e.g., age group, testing occasion), structural continuity involves investigating the similarity of covariances among personality factors across the values of the selection variable(s).

In a comprehensive review, Costa and McCrae (1997) concluded that cross-sectional personality structure seems to be invariant at different ages. A few studies have also tested the invariance of personality structure across time with longitudinal data (e.g., Caspi & Roberts, 1999; Robins, Fraley, Roberts, & Trzesniewski, 2001; Small, Hertzog, Hultsch, & Dixon, 2003). Robins et al. (2001), for instance, examined the structural continuity of the Big Five personality dimensions using the NEO-Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992) in young adulthood across a 4-year period. Results showed that correlation patterns among the Big Five factors were essentially the same at T1 and T2, implying a high level of continuity in personality structure. Small et al. (2003) reported longitudinal factorial invariance (weak factorial invariance) of personality factors (NEO-PI; Costa & McCrae, 1985, 1992) across a 6-year period in older adults. Moreover, they found factor covariances to be equal longitudinally, indicating that the NEO-PI personality factors demonstrate high structural continuity over time. Taken together, these findings suggest structural continuity in personality traits across age groups.

Absolute continuity refers to the constancy in the quantity or amount of an attribute across different age groups or time. Recently, several cross-sectional and longitudinal studies examining personality continuity in midlife and old age provided evidence for changes in the personality scale means (e.g., Helson et al., 2002; Helson & Kwan, 2000; Jones & Meredith, 1996; McCrae et al., 2000; Mroczek & Spiro, 2003; Roberts & Chapman, 2000; Small et al., 2003; Srivastava et al., 2003). Roberts et al. (2003) reviewed findings from previous cross-sectional and longitudinal research on absolute continuity in personality traits for the so-called Big Five personality traits (e.g., Digman, 1990; John & Srivastava, 1999; McCrae &

Costa, 1999; Norman, 1963: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness). The most consistent patterns across studies were that people become more agreeable, more conscientious, and less neurotic through midlife and into old age. Roberts et al. (2003) found little change in Openness to Experience in older age, whereas Extraversion did not demonstrate a clear and consistent pattern across studies (cf. Mroczek & Spiro, 2003). Taken together, these findings indicate that levels of personality traits continue to change during adulthood.

Differential continuity, also called rank-order continuity, reflects the degree to which the relative ordering of individuals on a given trait is maintained over time. Empirically, this aspect of continuity is most often indexed by the correlation between personality scores across two points in time (i.e., test-retest correlations). Roberts and DelVecchio (2000) analyzed longitudinal correlations from 152 studies that included over 55,000 participants (average longitudinal time span: 6.75 years, ranging from 1 to 53 years). Their meta-analysis yielded average test-retest correlation coefficients in the .51 to .54 range for the Big Five personality traits. Intriguingly, according to this meta-analysis, differential continuity in personality gradually increases across the life span (from .31 in infancy to .70 during old age). Roberts and DelVecchio (2000) concluded that their findings indicate relatively high and increasing levels of differential continuity across the life course. Note, however, that in very old age comparatively low indexes of differential continuity have also been reported (Martin, Long, & Poon, 2002). Moreover, one might argue that observed test-retest correlations for personality are not sufficiently high to warrant the conclusion that no rank-order changes occur in adulthood and old age. Although reliability and stability are inherently confounded in zero-order, test-retest correlations (e.g., Hertzog & Nesselroade, 1987), the average test-retest correlations reported by Roberts and DelVecchio are lower than would be expected, given perfect differential stability, from scales with moderate to high reliability. Taken together, these findings suggest relatively high levels of differential continuity during adulthood.

In sum, the structure of personality appears to remain stable across the life course, whereas findings for absolute continuity seem to be mixed (i.e., some personality factors change across the lifespan, while others remain stable), and results for differential continuity indicate that at least some rank-order personality changes take place

in virtually all longitudinal studies. One can argue that although, on average, there seem to be only small changes in personality across the lifespan, the imperfect differential continuity clearly shows that there is a considerable amount of individual differences in change of personality in adulthood. This individual differences aspect has been underrepresented in previous studies on personality continuity.

Additional Aspects of Continuity and Change

Extending the taxonomy of Caspi and Roberts (1999, 2001), we distinguish two additional aspects of differential continuity: (a) continuity of divergence and (b) specific versus general continuity (see Martin & Zimprich, 2005, pp. 188–189). *Continuity of divergence* refers to the fact that, irrespective of the level of absolute and differential continuity of personality across age and time, the amount of interindividual differences in personality factors might increase, decrease, or remain stable. Empirically, this aspect of continuity of divergence can be examined by comparing personality factor variances cross-sectionally and/or longitudinally. An increase or decrease of personality factor variances would indicate—even under conditions of perfect differential continuity—that the amount of change is different for different persons. To our knowledge, Small et al. (2003) conducted the only study that rigorously tested for continuity of divergence. They reported that the Big Five personality factor variances were equal across a 6-year period in a sample of older adults, implying perfect continuity of divergence over time.

The second additional aspect is *specific versus general continuity*. Is it the case that the same underlying causes of change such as social roles, life events, and social environments (for mechanisms of change, see Caspi & Roberts, 2001; Roberts & Caspi, 2003) operate simultaneously on multiple personality constructs? If so, intraindividual personality changes would be rather general across several personality domains, which, on the interindividual level, should result in sizeable correlations among changes in different personality factors. Note that whereas differential continuity as originally studied in personality research addresses the rank-order of change in a single personality factor, the specific versus general continuity aspect covers the amount of correspondence in rank-orders of change across several personality factors. If personality changes were isolated and specific, one would expect low to moderate correlations in

intraindividual change for different personality factors (e.g., a person with small longitudinal change in Extroversion should also show a small change in the remaining four personality factors, i.e., Neuroticism, Openness to Experience, Agreeableness and Conscientiousness). Conversely, if personality changes were rather general, sharing similar causes, then one would hypothesize high correlations among the intraindividual changes in different personality domains (e.g., a person with a pronounced longitudinal change in Extroversion should also show a pronounced change in the remaining four personality factors). That is, on an individual level, longitudinal changes in the five personality factors should be proportional to each other. On a group level, changes in the personality factors should be then highly correlated. This could suggest that personality works together as a system of traits to produce particular developmental trajectories and outcomes. Empirically, the amount of specific versus general continuity may be addressed by correlating intraindividual longitudinal change scores in different personality factors. Due to unreliability of simple change scores between manifest variables, we decided to utilize latent change models (Hertzog & Nesselroade, 2003; McArdle & Nesselroade, 1994) in order to examine correlated changes on the latent level, which is uncontaminated by measurement error. To our knowledge, empirical research on specific versus general continuity of personality is lacking to date.

To summarize, in the present study we examined five aspects of continuity and change (structural, absolute, differential, continuity of divergence, and specific vs. general continuity) of personality in two age groups (middle-age vs. old) reassessed after a 4-year interval, using measures of the Big Five personality factors from the NEO-Five Factor Inventory (NEO-FFI; Costa & McCrae, 1992). The first three aspects of continuity and change have been examined in previous studies, whereas continuity of divergence and particularly specific versus general continuity offers some clarification of ways in which continuity and change could be studied beyond the means currently available.

METHOD

Sample

This research uses data from the Interdisciplinary Study on Adult Development (ILSE; Martin, Grünendahl, & Martin, 2001), an ongoing

interdisciplinary longitudinal study on the psychological, physical, and social antecedents and consequences of aging in Germany. In ILSE, participants come from two cohorts, one comprised of individuals born before World War II and the other including individuals born shortly after the war (i.e., 1930–1932 versus 1950–1952). The rationale for this sample composition of pre- and postwar generations was to examine possible impacts of different political, economic, and other social factors during adolescence on aging (cf. Martin & Martin, 2000). The present study included persons from the Heidelberg and Leipzig metropolitan regions in Germany, who participated at two measurement occasions (T1: 1994, and T2: 1998) and had complete data records for the variables of interest at both measurement occasions, resulting in a sample size of $N = 875$ (middle-aged: $N = 455$, old: $N = 420$) out of the 1001 participants in the inception sample. Middle-aged participants at baseline were 43.7 years old ($SD = 0.90$ years, 42–46 years), with 46.4% of the sample being female. Old participants at baseline were 62.4 years old ($SD = 0.95$ years, 60–64 years), with 49.3% of the sample being female. On a 5-point Likert-type scale ranging from 1 (*poor*) to 5 (*very good*), mean subjective health ratings were 3.79 ($SD = 0.95$) for middle-aged participants and 3.76 ($SD = 0.96$) for older participants. Years of education were, on average, 11.4 ($SD = 3.52$) for the younger age group and 10.51 ($SD = 3.47$) for the older age group ($t = 3.77$, $df = 873$, $p < .05$). Although statistically significant, with respect to effect size ($R^2 = 1.5\%$), this difference was small.

The NEO-personality inventory was administered at baseline (T1) and again 4 years later (T2). We decided to include only participants who attended both T1 and T2 because only their data provided information about longitudinal change, a central aspect of the present study. Compared to those participants that dropped out after T1, the returning participants did not differ with respect to the five NEO personality dimensions, age, years, formal education, or the proportion of women (all $ps > .05$).

Measures

The Big Five dimensions were measured using the German Revised NEO-Personality Inventory (NEO-FFI; Borkenau & Ostendorf, 1993; Costa & McCrae, 1992). The NEO-FFI contains 60 self-statements that subjects were asked to respond to on a 5-point Likert scale ranging from 0 (*strongly disagree*) to 4 (*strongly agree*). The NEO-FFI yields scores for the following global personality constructs: Neuroticism, Extroversion, Openness to Experience, Agreeableness, and Conscientiousness. Each scale consists of 12 items, which were all scaled in a way so that higher scores indicate higher values in the direction consistent with the construct

label. Mean estimates of internal consistency (Cronbach's α) across both age groups and both measurement occasions were: Neuroticism $\alpha = 0.80$, Extraversion $\alpha = 0.76$, Openness to Experience $\alpha = 0.79$, Agreeableness $\alpha = 0.83$, and Conscientiousness $\alpha = 0.77$.

Overview of Statistical Analyses

Multiple-groups confirmatory factor analyses, including means, were utilized in order to assess the different aspects of personality continuity and change (cf. Bollen, 1989; McDonald, 1985). The models are described in more detail below. First, however, we present two features common to all models, namely parceling and the kind of parameterization used.

Parceling. Instead of directly factoring the NEO-FFI items, we chose to use parceling (cf. Bandalos & Finney, 2001; Little, Cunningham, Shahar, & Widaman, 2002).[1] A parcel is an aggregate-level indicator comprised of the sum (or average) of several single items. In the present study, we used the Item-to-Construct Balance technique to construct parcels as recommended by Little et al. (2002, p. 166). Briefly, the three items with the highest loadings were selected to anchor the three parcels of each personality factor. Subsequently, the three items with the next highest item-to-construct loadings were added to the anchors in an inverted order. This procedure was repeated until all items had been assigned to a parcel. As a result, three parcels consisting of four items each were built for each Big Five factor. Note that, compared to single item factor analysis, parceling offers some potential benefits (cf. Little et al., 2002). Because parcels are more likely to be normally distributed than single items, the assumptions underlying maximum likelihood parameter estimation are more easily met. Moreover, the resulting reduction in the complexity of measurement

1. Saucier (1998) proposed an alternative way of dividing NEO-FFI into content-based subcomponents. With respect to the goals of our study, this approach has two limitations. First, Neuroticism and Agreeableness consist of only two subcomponents. However, for Neuroticism and Agreeableness to be uniquely identified in each group and at each measurement occasion, three subcomponents (manifest indicators) would be needed (Bollen, 1989, p. 244). Second, regarding the number of items, subcomponents are highly imbalanced, e.g., for Agreeableness, subcomponents encompass four versus eight items. These limitations not withstanding, a model with no across-groups and across-time constraints (cf. M_1 in Table 2) corresponding to Saucier's approach was estimated. This model, however, did not achieve an acceptable fit ($\chi^2 = 1984.73$, $df = 508$, $p < .01$, CFI = 0.862, RMSEA = 0.082, 90% CI = 0.078; 0.085), which implies that, in our sample and the German version of the NEO-FFI, Saucier's (1998) way of constructing subcomponents was not corroborated.

models achieved by parceling leads to more precise and stable parameter estimates.

Parameterization. A common approach to parameterize confirmatory factor models is to identify factor variances and means by setting the loading of one manifest reference variable to 1 and the intercept of this reference variable to zero. Then, the factor is scaled like the reference variable, and the factor mean is equal to the intercept of the reference variable. A potential problem of this approach in the context of multiple-groups models is that by fixing one factor loading to 1, it is implicitly assumed that this parameter is invariant across different groups. Moreover, it confounds group differences in factor means and group differences in the intercepts of the manifest indicators used as reference variables (cf. Meredith & Horn, 2001). Therefore, we utilized an alternative parameterization: Common factors were scaled by fixing their variances to 1, and all loadings were estimated freely. Furthermore, we chose to set the factor means to zero and estimate intercepts of all manifest indicators instead. A multiple groups confirmatory factor model including intercepts may then be written as (cf. Bollen, 1989):

$$\mathbf{y}^{(g)} = \boldsymbol{\upsilon}^{(g)} + \boldsymbol{\Lambda}^{(g)}\boldsymbol{\eta}^{(g)} + \boldsymbol{\varepsilon}^{(g)},$$

where g denotes the index for groups, $\mathbf{y}$ denotes a $p \times 1$ vector of manifest indicators, $\boldsymbol{\upsilon}$ denotes $p \times 1$ vector of expected values of $\mathbf{y}$, $\boldsymbol{\Lambda}$ denotes $p \times m$ matrix of factor loadings, $\boldsymbol{\eta}$ denotes $m \times 1$ vector of latent variables (factors), and $\boldsymbol{\varepsilon}$ denotes $p \times 1$ vector of measurement errors for $\mathbf{y}$. With the parameterization used in the present investigation, at T1 $E(\eta) = 0$, i.e., the expected value of $\boldsymbol{\eta}$ is zero, and $\mathrm{diag}(\Psi) = \mathbf{I}$, that is, the variances of the latent variables $\boldsymbol{\eta}$ are 1 for all groups. These constraints, however, were relaxed, depending on the model specified and its identification status. Specifically, after having established strict factorial invariance (see below) across age groups and across measurement occasions, those constraints were retained for one age group at one measurement occasion, the reference group, whereas for the other age group and the other measurement occasion, factor means and factor variances were freely estimated. Note that the estimated factor means and variances then represent relative values that have to be interpreted in comparison with the reference group. Statistical modeling proceeded, considering a sequence of cross-sectional and longitudinal multiple-groups confirmatory factor models.

Measurement invariance. To examine measurement invariance, different degrees of cross-sectional and longitudinal measurement invariance of the NEO-FFI were imposed by constraining parameters to be equal between

age groups or across time (cf. Horn & McArdle, 1992; Meredith & Horn, 2001). Based on the work and terminology of Meredith (1993), we distinguished between three forms of measurement invariance: weak factorial invariance, strong factorial invariance, and strict factorial invariance. *Weak factorial invariance* requires that pattern matrices be fully invariant across age groups (cross-sectional) and measurement occasions (longitudinal). On a conceptual level, weak factorial invariance ensures that the same indicator stimuli (manifest variables) used with different samples of people and with the same people on different measurement occasions do relate to concepts (latent variables) in the same way. *Strong factorial invariance* requires that pattern matrices and intercepts of the manifest indicators be invariant across age groups and measurement occasions. Conceptually, the additional requirement of equal intercepts of the manifest indicators tests whether one age group scores consistently higher (or lower) on some items than other groups for each value of the factor. Third, *strict factorial invariance* requires that pattern matrices, intercepts, and unique variances be invariant across age groups and measurement occasions. Hence, compared to strong factorial invariance, the additional constraint of equal residual variances across groups, implying equal reliabilities of manifest indicators across groups, must hold.

Examining Different Aspects of Continuity

After having established strict factorial invariance, factor covariances were compared between age groups and over time to examine *structural continuity*. Note that we chose to compare factor covariances because, by comparing correlations, one implicitly assumes that factor variances are also equal, an assumption that was tested later in conjunction with continuity of divergence. In order to test for statistically significant differences, equality constraints were imposed on the factor covariances successively (a) across age groups at T1, and (b) across T2, and (c) simultaneously at T1 and T2. The fit of the resulting models was then compared to a previous, less-constrained model. To assess *absolute continuity and change* in personality, cross-sectional and longitudinal factor means were compared. We used different reference groups in order to test statistically for cross-sectional mean differences at T1, cross-sectional mean differences at T2, and longitudinal mean differences in both age groups. *Differential continuity* was investigated by comparing the across-time factor covariances in both age groups. By constraining them to be equal in both age groups, we tested for statistically significant differences in differential continuity by comparing constrained and unconstrained models. To assess *continuity of divergence* in personality, factor variances were compared both cross-sectionally and longitudinally. Again, we used

different reference groups in order to test for cross-sectional variance differences at T1, cross-sectional variance differences at T2, and longitudinal variance differences in both age groups. Finally, specific versus general continuity and change was assessed by correlating the latent change-scores of the Big Five factors (see below).

Latent change models. To assess the amount of specific versus general continuity, we modeled and correlated interindividual differences in intraindividual change in the Big Five personality domains by using latent change models, which involve a reparameterization of the structural part of a longitudinal factor model (McArdle & Nesselroade, 1994; Steyer, Partchev, & Shanahan, 2000). In latent change models, the level of a latent construct and the change of this latent construct over time are estimated (cf. Hertzog & Nesselroade, 2003; Small et al., 2003). More precisely, if the indicators at T1 and T2 load on one latent variable and the unstandardized factor loadings of the indicators are invariant over time and a second latent variable with equal factor loadings is introduced for the indicators at T2, the variance of this second latent variable captures interindividual differences in latent variable change over time. Thus, the second latent variable may be called a latent change factor. It follows that if the variance of the second latent variable is significantly different from 0, the amount of change over time differs across persons, i.e., there are interindividual differences in intraindividual development (cf. Baltes, 1987; Labouvie, 1980; Nesselroade, 1991). Note that by modeling change on the latent level rather than on the manifest level, change is modeled uncontaminated by random measurement error. Figure 1 illustrates this type of model for Neuroticism at Time 1 (N_{T1}) and Time 2 (N_{T2}) as an example. In the present study, a fully developed latent change model included specifying the latent initial level and latent change variables for each of the five personality factors.

All analyses were conducted using MPLUS version 3.0 (Muthén & Muthén, 2004). The absolute goodness of fit of models was evaluated using the χ^2-test and two additional criteria, the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA). Values of the CFI above .90 are considered to be adequate, whereas for the RMSEA, values less than .08 indicate an acceptable model fit (cf. Browne & Cudeck, 1993; Hu & Bentler, 1999). In comparing the relative fit of nested models, we used the χ^2-difference test. Due to its dependency on sample size, the χ^2-difference test provides rather high power for large sample sizes. We therefore complemented it by calculating 90% RMSEA confidence intervals for the models estimated (MacCallum, Browne, & Sugawara, 1996). Since the RMSEA is virtually independent of sample size, the comparison of RMSEA confidence intervals, that is, whether

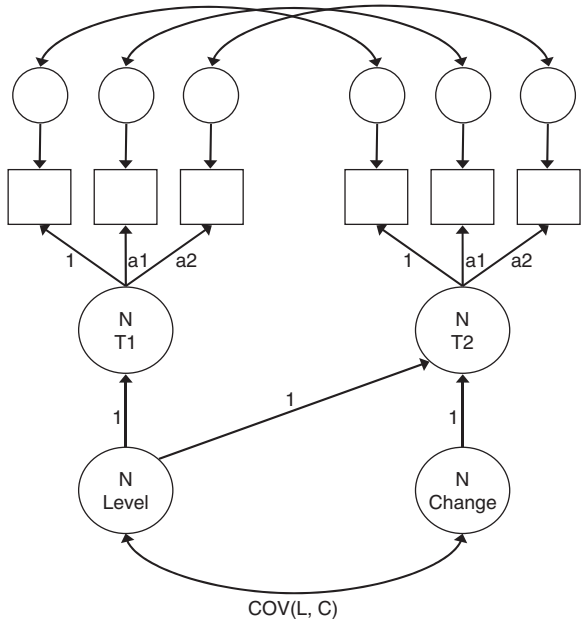

Figure 1
Latent change model for three indicators (parcels) of the latent variable Neuroticism (N), measured at two points in time (T1 and T2). Fixed 1 regression coefficients, involving the latent variables, implicitly define the latent variable of N_{Level} as equal as N at T1 and N_{Change} variable as the difference between N at two measurement occasions (T2–T2). Factor loadings (α_1 and α_2) for the three N indicators are constrained to be equal over time. Correlated residuals of the three indicators across time are allowed to covary across occasions, reflecting continuity in systematic errors over time. COV (L, C) = covariance between initial level and change.

they do or do not overlap, provides an effective, alternative method of assessing relative model fit of nested models. As a measure of effect size for mean differences, we report Cohen's *d* (Cohen, 1988, p. 20).

RESULTS

Table 1 contains descriptive statistics (means and standard deviations) of the five NEO-FFI personality dimensions separately for the middle-age and old participants at baseline (T1: 1994) and 4

Table 1
Personality Scale Scores for the Age Groups on Two Measurement Occasions

	Time 1		Time 2	
Characteristic	Middle-Aged ($N = 455$)	Old ($N = 420$)	Middle-Aged ($N = 455$)	Old ($N = 420$)
Neuroticism				
M	17.76	18.69	16.15	18.04
SD	6.95	6.82	7.08	6.73
Extraversion				
M	28.51	26.64	28.32	26.32
SD	5.67	5.61	5.74	5.44
Openness to Experience				
M	29.68	28.48	29.78	28.31
SD	6.43	5.70	6.36	5.57
Agreeableness				
M	29.83	30.97	30.35	31.27
SD	5.33	5.38	5.50	5.25
Conscientiousness				
M	35.19	35.30	35.12	35.08
SD	5.39	5.08	5.36	5.11

Note: Scale scores ranged from 0 to 48.

years later (T2: 1998). In comparison with the German standardization sample of the NEO-FFI ($N = 2112$, $M = 28.7$ years, $SD = 11.3$; 10% of participants were older than 46 years), participants in the present sample reported slightly lower scores in Neuroticism and Openness to Experience and slightly higher scores in Conscientiousness (cf. Borkenau & Ostendorf, 1993; see also Körner, Geyer, & Brähler, 2002).

Measurement invariance. Our first confirmatory factor analysis of the NEO item parcels (Model 1) specified five factors of personality without any constraints on parameters across groups and time. In order to scale the latent variables, factor variances were fixed to 1 and factor means were fixed to 0. As can be seen from Table 2, the fit indices of the unconstrained model indicated that the solution fit

Table 2
Fit Indices for Multiple Group Models

Model	χ^2	*df*	$\Delta\chi^2$	Δdf	CFI	RMSEA	RMSEA 90% CI
M_1	1456.90*	690			0.944	0.050	0.047; 0.054
M_2	1502.51*	720	45.61*	30	0.943	0.050	0.046; 0.053
M_3	1650.09*	750	147.58*	30	0.934	0.052	0.049; 0.056
M_4	1749.52*	795	99.43*	45	0.930	0.052	0.049; 0.056
M_5	1765.03*	805	15.51	10	0.930	0.052	0.049; 0.056
M_6	1779.01*	815	13.98	10	0.929	0.052	0.049; 0.055
M_7	1791.87*	825	12.86	10	0.929	0.052	0.049; 0.055

Note: χ^2 = Chi-square, *df* = Degrees of Freedom, $\Delta\chi^2$ = Chi-square Difference, Δdf = Degrees of Freedom Difference, CFI = Comparative Fit Index, RMSEA = ″′ Root Mean Square Error of Approximation; 90% CI = 90% confidence interval, M_1 = Unconstrained model, M_2 = Model of weak factorial invariance, M_3 = Model of strong factorial invariance, M_4 = Model of strict factorial invariance, M_5 = Model in which factor covariances are constrained to be equal across age groups at T1, M_6 = Model in which factor covariances are constrained to be equal across age groups at T2, M_7 = Model in which factor covariances are constrained to be equal across age groups and measurement occasions.
*$p < .05$.

relatively well. Subsequently, in Model 2, the factor loadings were constrained to be equal across groups and measurement occasions. At the same time, factor variances were freely estimated for the older group and for the middle-aged at T2. Thus, middle-aged adults at T1 were used as a reference group. Model 2 evinced an acceptable fit (see Table 2). Compared to Model 1, Model 2 produced a statistically significant reduction in relative model fit. However, because the 90% confidence intervals of the RMSEA of Model 1 and Model 2 overlapped, we concluded that the hypothesis of *weak factorial invariance* should not be rejected. In Model 3, the intercepts of the manifest indicators were constrained to be equal across groups and measurement occasions. Given identification requirements for factor means, these equality constraints on intercepts allowed us to relax the constraint of zero means of factors in the older group at T1 and for both age groups at T2. These freely estimated factor means were therefore scaled as factor mean differences from the reference group of middle-aged adults' factor means at T1. Model 3 also achieved an acceptable fit (see Table 2). Although, in comparison to Model 2, Model 3 produced a significant loss of fit, the RMSEA confidence

intervals again showed substantial overlap, suggesting that the hypothesis of strong factorial invariance might not be rejected Model 3, thus, implies that *strong factorial invariance* holds cross-sectionally and longitudinally in the present study. Finally, in Model 4, residual variances were constrained to be equal across age groups and measurement occasions. Model 4 evinced an acceptable fit (see Table 2). Compared to Model 3, Model 4 yielded a significant loss in fit. However, the RMSEA confidence intervals were virtually the same, indicating that the hypothesis of strict factorial invariance should not be rejected. Hence, Model 4 implies that *strict factorial invariance* holds across the two age groups and across time with respect to the Big Five personality factors in the present study.

Parameter estimates based on Model 4 are shown in Table 3. On average, in Model 4, the amount of explained variance in the manifest indicators was 57% in the middle-aged (ranging from 36% for the first parcel of Extraversion at T1 to 70% for the first parcel of Agreeableness at T2). In the older group, the average amount of explained variance was 54% (ranging from 33% for the first parcel of Extraversion at T2 to 69% for the first parcel of Agreeableness at T1). Taken together, the measurement properties of the NEO-FFI appear to be constant across the middle-aged and the old participants both cross-sectionally (19 years difference) and longitudinally (4 years) in the sense that the NEO-FFI is unbiased with respect to age group and testing occasion in the present study. These results suggest that other comparisons of types of change that rely on weak factorial invariance (e.g., testing equality of covariances) can be interpreted unambiguously (Meredith & Horn, 2001).

Structural continuity. In order to test for structural continuity at the first measurement occasion, factor covariances at T1 for the middle-aged and older groups were constrained to be equal. The resulting Model 5 achieved an acceptable fit (see Table 2). Compared to Model 4 (the model of strict factorial invariance), this model did not result in a statistically significant loss in fit ($p > .11$). Thus, at baseline, the relations between the Big Five personality factors were taken to be equal in middle-aged and old participants. Next, factor covariances at T2 were also constrained to be equal across age groups. The resulting model also evinced an acceptable fit (see Table 2). The difference in fit from the previous model was not statistically significant ($p > .17$). This implies that in the present study,

Table 3
Parameter Estimates of Model 4 (Strict Factorial Invariance)

			Middle-Aged ($N = 455$)		Old ($N = 420$)	
	Factor Loadings	Latent Intercepts	R^2 Time 1	R^2 Time 2	R^2 Time 1	R^2 Time 2
NEURO1	2.056	5.411	0.629	0.641	0.621	0.615
NEURO2	2.047	5.602	0.571	0.584	0.563	0.556
NEURO3	2.083	6.828	0.527	0.540	0.519	0.512
EXTRA1	1.348	8.951	0.356	0.370	0.354	0.330
EXTRA2	1.492	9.392	0.495	0.510	0.493	0.466
EXTRA3	2.050	10.018	0.671	0.684	0.669	0.645
OPEN1	2.190	9.145	0.680	0.672	0.608	0.594
OPEN2	1.931	10.332	0.596	0.587	0.519	0.504
OPEN3	1.678	10.275	0.488	0.478	0.410	0.396
AGRE1	1.752	9.875	0.683	0.696	0.688	0.675
AGRE2	1.571	9.036	0.574	0.588	0.579	0.565
AGRE3	1.535	10.905	0.596	0.610	0.602	0.587
CONS1	1.705	11.591	0.569	0.560	0.523	0.530
CONS2	1.710	10.793	0.530	0.520	0.483	0.491
CONS3	1.363	12.812	0.534	0.525	0.487	0.495

Note: Parcels of Neuroticism: NEURO1 to NEURO3, parcels of Extraversion: EXTRA1 to EXTRA3, parcels of Openness to Experience: OPEN1 to Open3, parcels of Agreeableness: AGRE1 to AGRE3, and parcels of Conscientiousness: CONS1 to CONS3. Factor loadings are unstandardized.

personality structure also was equal in both age groups at the second measurement occasion. The next model constrained the factor covariances to be equal across measurement occasions, in addition to the group constraints already specified. The resulting model still yielded an acceptable fit (see Table 2), and the small loss of fit compared to the previous model was not statistically significant ($p > .23$). Hence, personality factor covariances may be considered stable both across age groups and time in the present study.

These results indicate that there is a high degree of structural continuity of the Big Five personality dimensions both across age groups and measurement occasions. Factor correlations at T1 are shown in Table 4, separately for the two age groups. In both age groups, Neuroticism was negatively correlated with all other

Table 4
Estimated Correlations Between the Latent Personality Factors (T1 and Changes Scores)

Characteristic	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Neuroticism (T1)	—	− 0.45*	− 0.17*	− 0.31*	− 0.36*	− 0.29*	0.08	0.06	0.09	0.11
(2) Extraversion (T1)	− 0.51*	—	0.28*	0.18*	0.42*	0.14*	− 0.25*	0.08	− 0.03	− 0.18*
(3) Openness (T1)	− 0.36*	0.31*	—	0.17*	− 0.01	0.01	0.05	− 0.30*	− 0.01	0.02
(4) Agreeableness (T1)	− 0.39*	0.30*	0.10	—	0.28*	0.09	0.00	− 0.13	− 0.32*	− 0.03
(5) Conscientiousness (T1)	− 0.40*	0.34*	0.09	0.27*	—	0.09	− 0.11	− 0.19*	− 0.10	− 0.30*
(6) ΔNeuroticism	− 0.25*	0.17	0.16	0.17	0.08	—	− 0.63*	− 0.22*	− 0.50*	− 0.53*
(7) ΔExtraversion	0.02	− 0.35*	− 0.14	− 0.06	0.13	− 0.50*	—	0.32*	0.31*	0.61*
(8) ΔOpenness	0.06	− 0.07	− 0.41*	− 0.07	− 0.07	− 0.32*	0.30*	—	0.10	0.22*
(9) ΔAgreeableness	0.05	− 0.02	0.09	− 0.43*	− 0.11	− 0.36*	0.01	0.03	—	0.24*
(10) ΔConscientiousness	− 0.05	0.00	0.01	− 0.06	− 0.28*	− 0.57*	0.49*	0.31*	0.31*	—

Note: Intercorrelations for the middle-aged participants ($N = 455$) are reported above the main diagonal and intercorrelations for the older participants ($N = 420$) are reported below the main diagonal.
*$p < .05$.

personality domains, with the highest correlation emerging between Neuroticism and Extraversion ($rs = -.45, -.51$, for middle-aged participants and older participants, respectively) and effect sizes being in the medium to large range (cf. Cohen, 1988, p. 80). Thus, participants who were less neurotic were, on average, more extraverted, open to experience, agreeable, and more conscientious. Extraversion was also significantly related to all other NEO-FFI factors in both age groups (see Table 4). Hence, participants who were more extraverted were, on average, less neurotic, more open to experience, more agreeable and more conscientious.

Absolute continuity. To assess absolute continuity, we compared factor means. Table 5 contains cross-sectional and longitudinal differences in factor means, using middle-aged participants at T1 as the reference group. Hence, factor means were scaled as differences from the reference group. At T1, middle-aged participants differed significantly from older participants in Extraversion ($\Delta M = -0.313$, $SE = 0.077$, $d = -0.31$), Openness ($\Delta M = -0.238$, $SE = 0.071$, $d = -0.27$), and Agreeableness ($\Delta M = 0.240$, $SE = 0.075$, $d = 0.24$). Thus, at T1, middle-aged participants were, on average, more extraverted, more open to experience, and less agreeable than old participants. Note, however, that effect sizes were comparatively small, using standards suggested by Cohen (1988).

Middle-aged participants showed a significant longitudinal decrease from T1 to T2 in Neuroticism ($\Delta M = -0.266$, $SE = 0.044$, $d = -0.26$). In addition, middle-aged participants increased in agreeableness ($\Delta M = 0.106$, $SE = 0.042$, $d = 0.10$). Hence, across the 4-year period, middle-aged participants, on average, become less neurotic and more agreeable. Older participants also decreased significantly in Neuroticism ($\Delta M = -0.105$, $SE = 0.037$, $d = -0.11$). Compared to the middle-aged participants, however, old participants showed significantly less decrease in Neuroticism, as confirmed by the loss of fit of a model constraining the two corresponding factor means to be equal ($\Delta\chi^2 = 12.62$, $\Delta df = 1$, $p < .05$).

In sum, results indicate a number of cross-sectional age differences in personality in terms of factor means. However, effect sizes were comparatively small, indicating modest changes in personality. Longitudinally, results showed that, in both age groups, participants' Neuroticism declined slightly, with older participants being subject to a smaller average decrease than younger participants.

Table 5
Factor Means, Variances, and Stability Correlations

	Time 1		Time 2	
Characteristic	Middle-Aged ($N = 455$)	Old ($N = 420$)	Middle-Aged ($N = 455$)	Old ($N = 420$)
Neuroticism				
M	0+	0.127	− 0.266 AB	0.022 BC
Var	1+	0.968	1.054	0.942
R			0.788 =	0.900 =
Extraversion				
M	0+	− 0.313 A	− 0.032 B	− 0.379 AC
Var	1+	0.991	1.063	0.809
R			0.827 =	0.868 =
Openness to Experience				
M	0+	− 0.238 A	0.021 B	− 0.264 AC
Var	1+	0.730 A	0.964 B	0.689 AC
R			0.853≠	0.713≠
Agreeableness				
M	0+	0.240 A	0.106 A	0.308 AC
Var	1+	1.023	1.060	0.965
R			0.747 =	0.689 =
Conscientiousness				
M	0+	0.024	− 0.011	− 0.025
Var	1+	0.829	0.962	0.854
R			0.787 =	0.821 =

Note: + = Fixed parameter, A = Significantly different ($p < .05$) from middle-aged at T1, B = Significantly different ($p < .05$) from old at T1, C = Significantly different ($p < .05$) from middle-aged at T2. = Stability coefficients between the age groups are not different, ≠Significant age group differences in stability (see text). All estimated parameters are relatively scaled with the middle-aged participants at T1 being the reference group.

Differential continuity. To assess differential continuity, factor test-retest correlations were estimated. Table 5 contains correlation coefficients between T1 and T2 of the NEO-FFI personality factors for both age groups, which for all five domains of personality were above .70. For the middle-aged participants, Openness (.85) and Extraversion (.83) showed the highest index of differential

continuity, whereas Agreeableness showed the lowest index of differential continuity (.75). In older participants, the highest index emerged for Neuroticism (.90), while the lowest differential continuity indexes were found in Openness (.71) and in Agreeableness (.69). Older participants showed significantly lower across-time correlations in Openness ($\Delta\chi^2 = 13.93$, $\Delta df = 1$, $p < .001$), implying that older participants did change more in rank-order in Openness over the 4-year period.

In general, longitudinal correlations revealed high levels of continuity in the two age groups, which, at the same time, were not perfect. This implies that some individual differences in differential change of personality exist. Moreover, results indicated significant differences between middle-aged and older participants in differential continuity in Openness to Experience, with middle-aged participants showing higher rank-order continuity.

Additional Aspects of Continuity and Change

Continuity of divergence. To assess continuity of divergence, we compared factor variances both cross-sectionally and longitudinally. Table 5 shows cross-sectional and longitudinal differences in the factor variances, which, again, were scaled with the middle-aged participants at T1 being the reference group. At T1, middle-aged participants showed greater variance in Openness than older participants ($\Delta\chi^2 = 6.81$, $\Delta df = 1$, $p < .05$). At T2, the Openness variance of middle-aged participants also differed from that of older participants ($\Delta\chi^2 = 7.57$, $\Delta df = 1$, $p < .05$). Thus, younger participants showed consistently higher factor variances in Openness to Experience than their older counterparts. None of the other four personality factors demonstrated reliable group differences in factor variance. The present study also yielded no significant longitudinal changes in factor variances in the NEO-FFI personality domains in both age groups across the 4-year period.

Specific versus general continuity. In order to examine correlated changes in personality dimensions, latent change models were utilized. The analysis started with a latent change model that specified the latent initial level and latent change factors over the 4-year period for each factor of the NEO-FFI personality domains. All latent initial and change factors were allowed to covary. The overall fit

Table 6
Change Variances and Standard Errors of the Personality Factors

	Middle-Aged ($N = 455$)		Old ($N = 420$)	
Characteristic	ΔVar	SE	ΔVar	SE
Neuroticism	0.435	0.062	0.191	0.045
Extraversion	0.358	0.057	0.250	0.052
Openness for Experiences	0.289	0.064	0.407	0.058
Agreeableness	0.522	0.064	0.619	0.081
Conscientiousness	0.418	0.059	0.301	0.057

of the model, which exactly mirrored the fit of the strict factorial invariance model, was acceptable ($\chi^2 = 1749.52$, $p < 001$, $df = 795$, CFI = 0.930, RMSEA = 0.052, 90% CI 0.049; 0.056). The latent T2–T1 change variances and standard errors of the Big Five factors for middle-aged and older participants are shown in Table 6. In middle-aged participants, all latent change variances were statistically significant, with the highest change variances in Agreeableness, Neuroticism, and Conscientiousness, implying that in these personality domains, interindividual differences in intra-individual change were most pronounced.

In addition, we estimated the covariances among the latent change-scores of the NEO-FFI. Table 4 reports three kinds of latent correlations. First, the correlations between the initial levels of the Big Five factors are shown in the upper-left partition of the correlation matrix (see above, structural continuity). Second, the correlations between initial levels and changes for the five personality factors are depicted in the upper-right partition (middle-aged participants) and in the lower-left partition (old participants) of the correlation matrix in Table 4. Within personality domains, all of the respective level-change correlations were statistically significant and negative in both age groups (diagonals of the upper-right and lower-left partitions, respectively). These correlations indicate that, in both age groups, participants with higher T1 scores, for example, in Extraversion, tend to show less pronounced changes across time. Effect sizes (*r*s, cf. Cohen, 1988, p. 77) were in the medium range.

In the group of middle-aged participants, across-domain, level-change correlations were found for Extraversion at T1 and changes in Neuroticism and Conscientiousness, implying that middle-aged participants with high initial Extraversion tended to show a slightly more pronounced decrease in Neuroticism and a somewhat less pronounced change in Conscientiousness. Moreover, initial Conscientiousness was significantly related to change in Openness, indicating that middle-aged participants with higher baseline scores in Conscientiousness were less likely to increase in Openness to Experience (Table 4).

With respect to specific versus general continuity in personality, the correlations between the latent change scores of the NEO-FFI factors are summarized in Table 4 (lower- right partition). Changes in Neuroticism were significantly and negatively correlated with changes in all other personality domains in both age groups. In the younger group, changes in Neuroticism (ΔN) were negatively related to changes in Extraversion, Openness, Agreeableness, and Conscientiousness. Note that negative correlations indicated that participants with an increase in Neuroticism tended to decrease in the other personality dimensions. Further, in the younger group, changes in Extraversion were positively related to changes in Openness, Agreeableness, and Conscientiousness.

Older participants produced substantial latent change scores correlations between Neuroticism and the other Big Five factors as well. Older participants also showed significant correlations between changes in Extraversion and changes in Openness and Conscientiousness, but not in Agreeableness. Hence, in both age groups, participants who exhibited higher latent changes in Openness or Agreeableness also showed higher changes-scores in Conscientiousness. In both age groups, effect sizes for the change correlations were in the medium to large range.

In sum, the present data provide evidence for interindividual differences in intraindividual change in all Big Five personality dimensions. Differences in change were most pronounced for Agreeableness in both age groups. Furthermore, in both subsamples and within personality domains, interindividual differences in initial level were negatively correlated with the amount of intraindividual change. Eventually, a number of statistically significant change correlations emerged, implying that there is commonality in personality change across the 4-year period.

DISCUSSION

Continuity and change in personality across the adult lifespan have been addressed by a number of researchers (cf. Caspi & Roberts, 1999, 2001; Caspi et al., 2005; Costa & McCrae, 1994; Heatherton & Weinberger, 1994; Mroczek & Little, 2006). Results from the present study show that both continuity and change are manifest during adult personality development. Indeed, what may be most fascinating about the present results is that we find a surprising degree of structural continuity and continuity of divergence in personality in midlife, while at the same time detecting evidence of mean personality change and individual differences in personality change.

With respect to structural continuity, we established strict factorial invariance, which warranted unbiasedness of the NEO-FFI across age groups and measurement occasions. Moreover, factor covariances were found to be equal in both age groups and at both testing occasions, indicating perfect structural continuity of personality. Pertaining to differential continuity, results revealed relatively high levels of longitudinal stability coefficients in both age groups. With respect to continuity of divergence, statistically significant cross-sectional age differences were found for the variance of Openness at both measurement occasions, but we detected no longitudinal changes in personality variances in either age group. In other words, although we detected evidence of individual differences in change (as have others, e.g., Helson et al., 2002; Terracciano et al., 2005), what may be most striking about the present results is that these changes occur in a context of virtually perfect structural equilibrium, such that individual differences in change do not alter the relations among personality variables. In what follows, results regarding the multiple aspects of continuity and change of personality will be discussed in turn.

In previous studies examining *structural continuity* of personality, the issue of measurement invariance with respect to a selection variable (e.g., age or time) has not always been addressed (e.g., Costa & McCrae, 1997; Robins et al., 2001; but see Small et al., 2003). However, as Meredith (1993; Meredith & Horn, 2001) and others (e.g., Hertzog & Nesselroade, 2003; Horn & McArdle, 1992; Labouvie, 1980) have argued, measurement invariance represents a necessary prerequisite in order to render comparisons of factor models across selection variables meaningful. We found strict factorial invariance to hold across age groups and measurement occasions for the

five-factor personality model specified in the present study. That is, factor loadings, intercepts of the manifest indicators, and residual variances could be constrained equal in middle-aged and old participants at baseline and follow-up with only a small loss of fit. Hence, cross-sectional and longitudinal comparisons of factor means, variances, and covariances were deemed interpretable as quantitative shifts in invariant measures. Taking into account the severity of restrictions that must obtain, the finding of strict factorial invariance with respect to age and testing occasions appears remarkable. However, our inferences about invariance are tempered by the fact that we did not evaluate invariance across intact personality facet scales. The present study administered the short form of the NEO personality inventory (NEO-FFI). Hence, we were unable to model the so-called facets of each of the five global domains of personality (Costa & McCrae, 1985, 1992; McCrae et al., 1999). Instead, we utilized the Item-to-Construct Balance parceling technique in order to build three manifest indicators for each personality factor (Bandalos & Finney, 2001; Little et al., 2002; but see Saucier, 1998, for an alternative way of dividing NEO-FFI into content-based subcomponents). In this respect, we specified a less complex measurement model than others (e.g., Small et al., 2003), which probably contributed to the feasibility of finding strict factorial invariance. Notwithstanding this issue, considering the relatively large sample size, the number of cross-sectional and longitudinal constraints imposed, and the fact that across personality domains a fully fledged, five-factor measurement model was maintained, the finding of strict factorial invariance was both important and somewhat unexpected.

Structural continuity of personality was assessed by constraining factor covariances to be equal across age and time. Results indicate that, in our study, the five-factor personality structure was perfectly stable, demonstrating invariant covariation patterns across age groups and over time. The estimated factor correlations ranged from small (Agreeableness and Openness) to large in magnitude (Neuroticism and Extraversion), contrasting the assumption of orthogonal NEO factors (McCrae, Zonderman, Costa, Bond, & Paunonen, 1996). Factor correlations were somewhat elevated compared to the scale correlations in the German standardization sample of the NEO-FFI (cf. Borkenau & Ostendorf, 1993). However, correcting the standardization data's scale correlations for unreliability resulted in similar factor correlations to those found in the present

study, with one exception. In our study, the correlation between Neuroticism and Openness was substantial and negative in both age groups. Körner et al. (2002) reported NEO-FFI factor correlations for a large, representative sample of the German population that closely resemble our results, again, however, except for the correlation of Neuroticism and Openness (but see Becker, 2004, for a negative correlation). The reasons for this finding are unclear because even in the study by Small et al. (2003), which covered a more comparable age range, Neuroticism and Openness were unrelated.

Regarding *absolute continuity*, older participants in this study were, on average, slightly more neurotic, less extraverted, less open to experience, and more agreeable than middle-aged participants. Previous cross-sectional studies also have reported lower levels of Extraversion and Openness to Experience and higher levels of Agreeableness in older adults, whereas results concerning age differences in Neuroticism are less consistent (e.g., Borkenau & Ostendorf, 1993; Helson & Kwan, 2000; Körner et al., 2002; McCrae et al., 1999; Roberts et al., 2003). Longitudinally, our findings demonstrated evidence for a small, but significant, mean level decrease in Neuroticism across the 4-year period in both age groups (cf. Roberts et al., 2001; Robins et al., 2001). Comparable results were reported by Costa et al. (2000), who found a decrease in Neuroticism after 6 to 9 years in middle-aged adults, and Small et al. (2003), who observed a small, but statistically not significant, decline in Neuroticism across a 6-year period in older adults. These findings are also consistent with reports of reductions in depressive affect in older adults using depression screening measures or clinical interview methods (e.g., Newmann, 1989; Rothermund & Brandtstädter, 2003).

Differential continuity was examined by estimating the across-time covariances between the five NEO personality dimensions. Stability estimates were about .80 in both age groups, indicating relatively high persistence of individual differences between T1 and T2. These correlations closely correspond to the longitudinal stability coefficients reported in previous longitudinal studies (e.g., Roberts & DelVecchio, 2000; Small et al., 2003; see also Costa et al., 2000; Costa & McCrae, 1997). Age differences in differential continuity were found for Openness, with middle-aged participants showing higher rank-order continuity, which represented an unexpected result in light of the age-related increases in differential continuity emanating from meta-analytic studies (Roberts & DelVecchio, 2000). Although

stability coefficients were high, this does not imply that there are no reliable individual differences in personality change. Note that stability was modeled on the latent level, that is, estimates were uncontaminated by measurement error. In this case, stability coefficients less than 1 necessarily entail interindividual differences in intraindividual change (Nesselroade, 1991).

Extending previous research on continuity and change in personality, we examined continuity of divergence, that is, continuity of the amount of interindividual differences in personality factors across age groups and time. Cross-sectional and longitudinal comparisons showed that the Openness variance in middle-aged participants was significantly larger than in older participants. Hence, the sample of older participants was more homogeneous with respect to the propensity to be creative, complex, and open to new ideas.

Correlated Change in Personality

Adopting a perspective of interindividual differences in intraindividual change (Nesselroade, 1991) and utilizing latent change models (e.g., McArdle & Nesselroade, 1994), a number of statistically significant and medium to large personality change correlations emerged. Individuals increasing in Neuroticism tended to decrease in all other personality dimensions, indicating that, on the individual level, becoming more neurotic raises the probability of becoming less sociable, original, trusting, and self-controlled. It is possible that neurotic middle-aged and older individuals are more at risk for overreacting to interpersonal difficulties or to experiencing adjustment issues associated with elevated anxiety about the negative consequences of aging (e.g., Costa & McCrae, 1987; Cutler & Hodgson, 2003; Lynch, 2000). Increases in Extraversion were associated with increases in Openness, Agreeableness (only in middle-aged adults), and Conscientiousness. It is possible that individuals who are disposed toward social engagement are more likely to experience benefits on integration to a larger social network with concomitant benefits for behavioral interaction patterns and adaptive recruitment of resources for a functional life style (e.g., Lang, 2001; Lang, Staudinger, & Carstensen, 1998). Such findings show that not only are individual differences in different personality dimensions related (cf. Borkenau & Ostendorf, 1993; Körner et al., 2002; Small et al., 2003),

but also that there are interindividual differences in intraindividual change in different personality domains (cf. Nesselroade, 1991).

To our knowledge, the present study is the first to report correlated latent changes among the NEO personality factors in adulthood. Note that these correlated changes were modeled on the latent level, i.e., uncontaminated by measurement error, and for all change factors, statistically significant variances were found, indicating reliable interindividual differences in intraindividual change (Hertzog & Nesselroade, 2003; McArdle & Nesselroade, 1994; Steyer et al., 2000; see also Mroczek & Spiro, 2003). An interesting feature of the correlations among personality level and change factors from our latent change models was that correlations among 4-year latent changes in personality were of comparable size to correlations among personality dimensions at baseline. Individual differences in personality at baseline shared similarly high commonalities as did individual differences in changes between baseline and follow-up. In that sense, the correlated changes in personality might reflect a ''dynamic'' variant of the ''static'' personality interrelations at baseline. Note, however, that because in our study the longitudinal time period encompassed only 4 years, other studies using data from longer time spans might yield different results. Moreover, in future studies, the inclusion of more than two measurement occasions would allow for more complex models of personality change, including the capability of modeling individual differences (random effects) in nonlinear trajectories (e.g., McArdle & Bell, 2000).

The novel finding of correlated change between personality factors adds further evidence that personality does change systematically within individuals over time. Although developmental processes, environmental change, and person-environment interactions may affect personality dimensions differently during the life course (cf. Baltes et al., 1999; Caspi & Roberts, 1999, 2001; Costa et al., 2000; Roberts, 1997; Roberts & Robins, 2004), leading to independent patterns of personality change, the present findings suggest that personality changes are interrelated, perhaps due to causes that affect entire behavioral repertoires. Hence, it seems unlikely that those processes triggering personality changes influence single personality dimensions in isolation. Indeed, one can argue that the Big Five personality dimensions work together as a dynamic, integrated system, notably in the case of personality change (cf. Robins & Tracy, 2003).

The present results of intercorrelations in personality factors might also be reflected with respect to different levels of analysis such as higher- and lower-order personality constructs (Roberts & Pomerantz, 2004).[2] The focus on different levels of the same phenomena may provide partially overlapping but still unique information about persons. For example, in analyzing the patterns of correlations of the Big Five's in several studies, Digman (1997) demonstrated the emergence of two consistent higher-order factors. Digman found that the first factor involves the common aspects of Emotional Stability (vs. Neuroticism), Agreeableness, and Conscientiousness and suggested that this might conceivably be regarded as a social desirability factor, in the sense that socialization processes would shape socially acceptable levels of personality traits. Moreover, DeYoung, Peterson, and Higgins (2002) pointed out that these three personality dimensions appear to reflect stability in emotional, social, and motivational domains. By contrast, the second higher-order factor consisting of Extraversion and Openness might be interpreted as a factor of personal growth, which appears to reflect the tendency to explore or to engage voluntarily with novelty and may, in consequence, be associated with plasticity or flexibility in behavior and cognition (cf. DeYoung et al., 2002). In line with these suggestions, one can argue that personality development is characterized by both maintaining emotional, social, and motivational stability and adapting to novelty and change. Empirically testing this surmise, however, was beyond the scope of the present investigation.

How should we think about this pattern of results? It appears that although there are individual differences in personality change, these changes do not alter the population-level relations among variables. Indeed, it is interesting to note that the personality latent change correlations were actually similar to the cross-sectional correlations. This pattern is not at all obligatory, given relatively high differential continuity. Indeed, psychologists studying cognitive change in adulthood have repeatedly found that correlations among ability factors increase

2. A reviewer pointed out that the level-change intercorrelations might be consistent with an underlying higher-order factor of socially desirable traits (i.e., –Neuroticism, +Extraversion, +Openness, +Agreeableness, +Conscientiousness), implying that those with more desirable traits change less than those who do. Well-adjusted people perhaps have more continuity in their traits. However, empirically testing this surmise was beyond the scope of the present investigation.

in late life, a phenomenon known as de-differentiation (e.g., Hultsch, Hertzog, Dixon, & Small, 1998; Schaie, Maitland, Willis, & Intrieri, 1998). Moreover, these shifts in factor structure appear to be due to patterns of strong latent change correlations among many ability constructs (Hertzog, Dixon, Hultsch, & MacDonald, 2003; Zimprich & Martin, 2002). For example, changes in working memory, reasoning, and episodic memory are highly correlated, whereas changes in verbal ability correlate weakly with changes in other abilities. Both cognition and personality show substantial differential continuity in midlife to old age (e.g., Conley, 1984; Roberts & DelVecchio, 2000), but the present results suggest that the individual differences in change that do exist are more highly intercorrelated for cognition than for personality. Thus, the structural equilibrium we have observed in this study may be specific to the personality domain in mid-life to early old age.

Terracciano et al. (2005) recently argued that modest normative mean changes are predominantly biological in origin, whereas more profound personality change may be associated with nonnormative events such as Alzheimer's Disease (Balsis, Carpenter, & Storandt, 2005) or the types of age-graded life events (e.g., divorce, widowhood) alluded to earlier. The profound structural continuity we have observed, even in the face of mean personality change, is consistent with the idea that normative change in personality is modest in magnitude and acts to preserve, not to alter, the structure of personality. Such a pattern is consistent with either the biological hypothesis of Terracciano et al. or an argument that whatever nonnormative changes are occurring are insufficient fundamentally to alter the structure of personality.

To conclude, our study provides evidence for both cross-sectional and longitudinal continuity and change of personality in adulthood. Continuity was found for the structure of personality across age and time. Perhaps more intriguing from a substantive point of view of personality development in adulthood, all other possible forms of continuity (absolute, differential, continuity of divergence, specific versus general) were characterized by at least some degree of change (cf. Baltes et al., 1999; Caspi, 1998; Helson & Srivastava, 2001; Roberts et al., 2003). Continuity, then, can be understood as a natural form of behavioral inertia. Individuals remain, more or less, who they are, and their behavioral dispositions are resistant to change because of habits and heuristics that promote adaptive functioning (Gigerenzer & Todd, 1999). However, the potential for

change, perhaps as dynamic adaptation to life circumstances, life events, developmental tasks, and other influences, is both real and realized. What remains to be understood is whether populations undergoing a higher base-rate of nonnormative life change would also manifest changes in personality structure. We suggest that, now that the field is coalescing around a shared perspective that there are mean changes in personality and individual differences in personality change, more attention should now be paid to structural continuity and continuity of divergence to determine what the consequences of the observed changes are for personality structure and organization.

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