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Stability and Change of Personality Across the Life Course: The Impact of Age and Major Life Events on Mean-Level and Rank-Order Stability of the Big Five

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Stability and Change of Personality Across the Life Course: The Impact of Age and Major Life Events on Mean-Level and Rank-Order Stability of the Big Five

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Abstract

Does personality change across the entire life course, and are those changes due to intrinsic maturation or major life experiences? This longitudinal study investigated changes in the mean levels and rank order of the Big Five personality traits in a heterogeneous sample of 14,718 Germans across all of adulthood. Latent change and latent moderated regression models provided four main findings: First, age had a complex curvilinear influence on mean levels of personality. Second, the rank-order stability of Emotional Stability, Extraversion, Openness, and Agreeableness all followed an inverted U-shaped function, reaching a peak between the ages of 40 and 60, and decreasing afterwards, whereas Conscientiousness showed a continuously increasing rank-order stability across adulthood. Third, personality predicted the occurrence of several objective major life events (selection effects) and changed in reaction to experiencing these events (socialization effects), suggesting that personality can change due to factors other than intrinsic maturation. Fourth, when events were clustered according to their valence, as is commonly done, effects of the environment on changes in personality were either overlooked or overgeneralized. In sum, our analyses show that personality changes throughout the life span, but with more pronounced changes in young and old ages, and that this change is partly attributable to social demands and experiences.

Keywords: personality development, Big Five, life events, stability, adulthood

Stability and Change of Personality Across the Life Course: The Impact of Age and Major Life Events on Mean-Level and Rank-Order Stability of the Big Five

Personality traits are stable patterns in each individual and distinguish him or her from other individuals (Roberts, Wood, & Caspi, 2008). Nevertheless, personality is also subject to change. Several studies have analyzed the extent to which personality changes (e.g., Roberts & DelVecchio, 2000; Roberts, Walton, & Viechtbauer, 2006), whether there are times across the life course during which individuals are specifically susceptible to change (e.g., Costa & McCrae, 1988; Roberts et al., 2006), and whether personality changes because of intrinsic maturation (e.g., McCrae et al., 2000) or because of social demands and experiences (Löckenhoff, Terracciano, Patriciu, Eaton, & Costa, 2009; Roberts & Mroczek, 2008; Roberts, Wood, & Smith, 2005; Scollon & Diener, 2006). This study aims to contribute to these important questions by analyzing stability and change of the Big Five personality dimensions in a large and representative longitudinal sample, covering all of adulthood from adolescence to old age. Specifically, we first analyzed whether and how two measures of change, mean-level changes and rank-order changes, depend on age. Second, we analyzed whether personality predicts the occurrence of specific major life events and whether those experiences, in turn, alter personality or its stability.

Comprehensive sets of data are required to analyze stability and change in personality. Specifically, this means that (a) a large sample size is needed to enable the investigation of even small changes with adequate statistical power; (b) characteristics of the participants, such as their age and education, should be heterogeneous enough to enable the generalization of results to the whole population; and (c) longitudinal data are needed to enable the measurement of changes directly instead of indirectly as is commonly done

within cross-sectional approaches. Data from the Socio-Economic Panel (SOEP; Wagner, Frick, & Schupp, 2007; see also Headey, Muffels, & Wagner; 2010) meet all of these sophisticated requirements. The data are collected from currently approximately 20,000 individuals per year and are representative of the German population. These data provide information of heterogeneous individuals and contain measurements of personality at two time points, allowing for longitudinal analyses. Because of these advantages, the SOEP data are ideally suited for analyses of stability and change in personality, and hence, these data were used in the current study.

Stability of Personality and Age: Does Growing Older Mean Getting More Stable?

Current definitions of personality all focus on the temporal stability of interindividual characteristics with respect to thoughts, feelings, and behavioral dispositions (Roberts et al., 2006; Tellegen, 1988). However, when following individuals for several years, long-term changes have been found (e.g., Bleidorn, Kandler, Riemann, Angleitner, & Spinath, 2009; Roberts & DelVecchio, 2000; Roberts et al., 2006). Although the existence of changes in personality has been generally acknowledged, there is still debate concerning whether and where there is a point in life beyond which personality remains comparatively stable.

Costa and McCrae (1988), for example, argued that most personality changes occur before the age of 30 and that personality remains fairly stable afterwards (Srivastava, John, Gosling, & Potter, 2003, labeled this statement aptly the “hard plaster hypothesis”). By contrast, Scollon and Diener (2006) found similar-sized changes before and after age 30 in both Extraversion and Neuroticism. Roberts and colleagues even found that stability increases until age 50 (Roberts & DelVecchio, 2000), and that considerable changes even

occur afterwards (Field & Millsap, 1991; Roberts & DelVecchio, 2000; Roberts et al., 2006). In their cross-sectional approach, Srivastava et al. (2003) found differences in all personality traits after age 30 as well.

Distinguishing Types of Personality Changes

It is important to clearly specify "change" in this context because multiple indicators of change have been under investigation, and these may lead to different conclusions. We focus on two population indices of change: mean-level changes and rank-order changes.

Mean-level change, also referred to as normative change, reflects shifts of groups of people to higher or lower values on a trait over time. Most studies show an increase in Emotional Stability with increasing age (Bleidorn et al., 2009; Lucas & Donnellan, 2009; Lüdtke, Roberts, Trautwein, & Nagy, in press; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Roberts et al., 2006; Soto, John, Gosling, & Potter, 2011; Terracciano, McCrae, Brant, & Costa, 2005), an increase in Conscientiousness (Lucas & Donnellan, 2009; Lüdtke et al., in press; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Roberts et al., 2006; Soto et al., 2011) in some studies followed by a decrease in advanced old age (Terracciano et al., 2005), and stability or an increase in Agreeableness (Bleidorn et al., 2009; Lucas & Donnellan, 2009; Lüdtke et al., in press; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Roberts et al., 2006, Soto et al., 2011; Terracciano et al., 2005). There have been mixed results for Extraversion, with the facet Social Vitality decreasing and the facet Social Dominance increasing with age (Roberts et al., 2006). The development of Openness has shown a curvilinear pattern, increasing in early adulthood and decreasing in old age (Roberts et al., 2006; cf. for younger individuals, Lüdtke et al., in press, and for older individuals, Terracciano et al., 2005).

Rank-order consistency reflects whether groups of people maintain their relative placement to each other on trait dimensions over time. In their meta-analysis, Roberts and DelVecchio (2000) found that rank-order consistency increased with age (see also Roberts, Helson, & Klohnen, 2002), reaching a peak at about age 50. Ardelt (2000) found a decrease in consistency after this age in her meta-analysis, and Terracciano, Costa, and McCrae (2006) found no evidence that stability declined or increased after age 50. Unfortunately, those studies either did not cover the whole life span (e.g., Terracciano et al., 2006), or else it was not possible to give a differentiated overview of changes in consistency for each personality trait separately (Ardelt, 2000; Roberts & DelVecchio, 2000). Furthermore, there is a paucity of studies that have investigated rank-order consistency in advanced age (Fraley & Roberts, 2005; Roberts & DelVecchio, 2000).

Causes of Stability and Change in Personality

Why do these changes occur, and what are the major causes underlying these processes? Historically, there have been two main ways of thinking: The essentialist perspective focused on genetic factors, and the contextualist perspective focused on environmental factors (Neyer & Asendorpf, 2001). Those two extremes have now been combined into a transactional perspective (model of person-environment transactions; Roberts et al., 2008), which seems to describe personality development most appropriately. Nevertheless, there is still an ongoing debate about how strongly each factor (genes vs. environment) actually influences personality and what kind of environmental characteristics influence personality in which way.

The role of genes has been the focus of a variety of studies, for example, in studies that have used twins (e.g., Bleidorn et al., 2009) and in intercultural studies that have shown

uniformity in the factor structure of the Big Five (McCrae, Costa, Del Pilar, Rolland, & Parker, 1998) and uniformity in age trends (McCrae et al., 1999, 2000). Accordingly, in the Five-Factor Theory of Personality (McCrae & Costa, 2008), developmental changes have been attributed to intrinsic maturation, meaning that "personality development is determined by biological maturation, not by life experience" (p. 167). However, Bleidorn et al. (2009) showed in a longitudinal twin study that changes in personality can be substantially attributed to both genes and environment.

The model of person-environment transactions (Roberts et al., 2008) assumes that stable factors within the person as well as external influences of the environment interact to influence both stability and change in personality due to several specific mechanisms: For example, individuals differ in their preferred environments, their perceptions of their environments, and the ways in which they are perceived by and reacted to by others. Furthermore, individuals change aspects of their environments or their whole environments to better fit their personalities. Whereas the former mechanisms are assumed to contribute mainly to stability, change in personality traits can be triggered, for instance, by the contingencies, expectations, and demands of changing roles, and by self-perceptions and others' feedback of behavioral change.

Thus, contrary to the Five-Factor Theory of Personality, the model of person-environment transactions does not trace changes in personality across the lifespan back to intrinsic maturation, but rather highlights the influence of social roles, normative changes, and major life events (Löckenhoff et al., 2009; Roberts et al., 2005; Scollon & Diener, 2006). In this study, we looked at the impact of the person on his or her environment (we

will refer to this as *selection effects*) as well as the impact of the environment on personality (which we will refer to as *socialization effects*).

The Interplay of Major Life Events and Personality

To disentangle intrinsic maturation and social influences on the development of personality, it is necessary to directly measure the impact of specific major life events on personality. The term major life event includes normative transitions in life (e.g., first job, marriage), meaningful changes (e.g., birth of a child, moving in with a partner), and major individual experiences (e.g., death of a family member, unemployment; Kandler, Bleidorn, Riemann, Angleitner, & Spinath, 2010; Specht, Egloff, & Schmukle, 2011). If changes in personality occur only because of intrinsic maturation, those experiences should have no impact on personality beyond the impact of age. However, if changes in personality are due to major experiences, those life events should influence personality even when controlled for age because not all individuals experience the same major life event at the same age. The events under analysis in the present study were chosen with respect to their intensity (Holmes & Rahe, 1967; Sarason, Johson, & Siegel, 1978) because we assumed that only intense events would impact deep-seated personality. We also aimed to analyze a variety of heterogeneous events, including social as well as occupational events, and according to the typical ages at which these events occur.

The interplay of personality and major life events has been under investigation in a series of studies with mixed results. For example, Magnus, Diener, Fujita, and Pavot (1993; see also Headey & Wearing, 1989; Lüdtke et al., in press; Vaidya, Gray, Haig, & Watson, 2002) found that individuals differ in personality already before experiencing several events, with extraverts having a higher probability of experiencing positive life events, and

individuals high in Neuroticism having a higher probability of experiencing negative life events. By contrast, Löckenhoff et al. (2009) did not find differences among individuals who experienced an extremely aversive life event but reported changes in personality due to these events (mainly an increase in Neuroticism).

In recent years, personality development has been thoroughly studied in the context of social relationships and working experiences. Regarding the former, Lehnart and Neyer (2006), for instance, found that personality did not differ between individuals who will break up in the coming years and those who will continue their relationship, whereas the authors reported that individuals who continued their relationships decreased more strongly in Neuroticism and became more agreeable than those who ended their relationships. In another study, Neyer and Lehnart (2007) showed that singles higher in Sociability and Neuroticism were more likely to start their first romantic relationship and that starting this kind of relationship led to decreases in Neuroticism and increases in Extraversion.

Regarding working experiences, it has been shown that personality has a meaningful impact on work status: Conscientiousness, in particular, plays a prominent role in predicting job satisfaction, income, and occupational status (Judge, Higgins, Thoresen, & Barrick, 1999), meaning that it should be beneficial (and therefore normative) to show an increase in Conscientiousness when entering the job market. Furthermore, Positive and Negative Emotionality in adolescence predicted several work experiences and changed due to those experiences (Roberts, Caspi, & Moffitt, 2003). However, Sutin and Costa (2010)—while also reporting effects of personality on occupational experiences—found no meaningful effects of job experiences on personality.

Other studies (e.g., Kandler et al., 2010; Lüdtke et al., in press) have found both selection and socialization effects in the context of multiple major life events. In sum, then, the status quo of the findings—despite a growing body of studies—cannot be interpreted unequivocally or in a straightforward fashion. These inconsistencies may be caused in part by methodological difficulties such as small sample sizes, the clustering of events, or the consideration of individuals of diverse age ranges in different studies.

Methodological Challenges in Studying the Effects of Age and Life Events on Stability

Most longitudinal studies are based on relatively small samples. Hence, it is not possible to analyze the impact of single major life events on personality and its stability with adequate statistical power. Instead, events are commonly clustered into positive and negative life events (cf. Costa, Herbst, McCrae, & Siegler, 2000; Headey & Wearing, 1989; Lüdtke et al., in press; Magnus et al., 1993; Vaidya et al., 2002). This clustering into valence categories entails several difficulties: Effects of events showing a strong and long-lasting influence on personality may not be visible (i.e., statistically significant) when mixing them with events that do not have much impact on personality. Moreover, events that share the same valence do not necessarily have the same impact on a given personality trait. In mixing events, differentiated effects on specific traits may not be detected, or an effect of one event may be overgeneralized to all of the other events within the same valence category. For this reason, it seems worthwhile to study specific life events separately in order to determine whether single events show unique effects on personality.

To identify potential peaks in stability over the life course, a large number of individuals of different ages is required. In fact, many studies of changes in personality are limited to adolescence and young adulthood (cf. Fraley & Roberts, 2005; Klimstra, Hale,

Raaijmakers, Branje, & Meeus, 2009; Lüdtke et al., in press; McCrae et al., 2002; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Robins, Fraley, Roberts, & Trzesniewski, 2001; Vaidya, Gray, Haig, Mroczek, & Watson, 2008) because the expected effects are stronger than in older individuals. In focusing studies on younger people, however, the generalization of the results to older individuals is not possible. Another restriction stems from the investigation of a disproportionate number of healthy and educated individuals (cf. Costa et al., 2000; Lüdtke et al., in press; Neyer & Lehnart, 2007; Roberts et al., 2002; Robins et al., 2001; Terracciano et al., 2005; Vaidya et al., 2002). As a result, a representative set of individuals of preferably the whole life span should be surveyed to give a complete overview of the impact of age on personality development.

Age differences in mean levels of personality traits can, at least under certain assumptions, be analyzed in cross-sectional studies (cf. Donnellan & Lucas, 2008; Lucas & Donnellan, 2009; McCrae et al. 1999, 2000; Soto et al., 2011). This is not possible when one is interested in the rank-order stability of personality because this requires a longitudinal examination. Clearly, the impact of major life events on personality development can be analyzed only with longitudinal data as well. Optimally, the measurement of personality should be separated from the inquiry of the life events to avoid mutual influences in the assessment setting. Then, potential changes in personality found in subsequent inquiries can be traced back to the experience of the event.

The Present Study

This study used information from almost 15,000 individuals who were tracked across 4 years. In each year, participants were asked whether one or more of a set of specific major life events had occurred since the last interview. At the beginning and at the

end of the 4 years, all of the individuals completed a personality measure. Because of the longitudinal design of the study, we were able to analyze the stability of personality according to mean-level changes and rank-order consistencies. Furthermore, because our sample covered the whole age range of adulthood, we were able to thoroughly analyze whether personality changes in both measures dependent on age. Additionally, the large sample size allowed us to investigate the influence of single major life events on changes in personality with adequate statistical power.

On the basis of previous studies, our research questions can be summarized as the following: (1) People should differ in their mean levels of personality depending on their age: Older individuals should be more emotionally stable, agreeable, and conscientious, but less extraverted and open (e.g., Srivastava et al., 2003). Accordingly, if cross-sectional and longitudinal approaches match, mean levels should change in corresponding ways over the 4 years of investigation. (2) Due to the relatively scarce and moreover mixed results of previous studies, two competing hypotheses can be derived regarding changes in the rank order of individuals on the Big Five: (a) Rank-order stability mainly increases linearly with age until age 50 (Roberts & DelVecchio, 2000), then reaches a plateau (i.e., showing consistent stability after age 50; Terracciano et al., 2006); or (b) rank-order stability follows a quadratic function (inverted U-form) with a peak at age 50 and a decrease afterwards (Ardelt, 2000). To our knowledge, thus far, there has been no study that has investigated rank-order changes across all of adulthood separately for each of the Big Five personality traits. (3) To contribute to the question of whether personality changes because of intrinsic maturation or because of social demands and experiences, we wanted to analyze (a) whether personality predicts the occurrence of specific major life events (selection effects),

(b) whether personality changes due to the experience of those single events (socialization effects), (c) whether men and women change in different ways, especially when faced with events that are associated with gender role stereotypes such as unemployment and birth of a child, and (d) whether the experience of life events influences rank-order stability. (4) To refer to former studies, we additionally wanted to test whether our approach of separately analyzing single events would lead to similar or dissimilar results compared to clustering single events into raw groups of events with the same valence.

Method

Participants

The data used in this study were provided by the German Socio-Economic Panel (SOEP v26) of the German Institute for Economic Research. The SOEP is a large, ongoing longitudinal survey of private households and persons in Germany (see Wagner et al., 2007, for details). The heterogeneous sample comprises individuals with different educational backgrounds (17% without a high school degree and 83% with at least a high school degree), diverse work statuses (53% employed and 47% not employed, including those in school, military or civilian service, or retirement), different marital statuses (25% single, 61% married, 7% divorced, 6% widowed), and diverse religious affiliations (35% Protestant, 29% Catholic, 3% Islamic, 30% nondenominational).

The SOEP aims to collect representative microdata on living conditions, particularly following sociological interests, but with an increasing influence of psychological questions in recent years. All members of chosen households aged 16 years and older were asked to participate in yearly interviews, which have been conducted since 1984. Households were initially chosen using a multistage random sampling technique with regional clustering;

later, some refreshing samples were taken to increase the sample size. All new household members (e.g., growing children or new partners) were interviewed as well, and individuals were followed even in cases of relocation or a split in the household. To avoid attrition, the respondents received a letter before the interviews with a brochure containing some results of the data surveyed before and a monthly nationwide lottery ticket as an unconditional incentive, as well as a small gift after the interview. All in all, the mean stability of the panel (number of participating households in relation to last year) between 2005 and 2009 was above 95%.

In 2005, the overall sample of the SOEP contained 21,105 individuals, and in 2009, the total sample size was 18,587. In both years, one half of the participants were personally interviewed, whereas the other half completed the questionnaire by themselves. However, the BFI-S showed strong robustness across those different assessment methods (Lang, John, Lüdtke, Schupp, & Wagner, in press). All individuals who completed at least two of the three items from each of the five personality traits for both years (2005 and 2009) were included in the analyses. Thus, we had a total sample size in each analysis of 14,718 individuals (7,719 women) with a mean age in 2005 of 47.21 years (SD = 16.28, range = 16 – 96). Because the sample decreased in very old age (Ns < 40 per year), we restricted our analyses to sample members who were not older than age 82 (cf. Donnellan & Lucas, 2008; Lucas & Donnellan, 2009). To test for attrition effects, we compared individuals who answered enough questions in both years (continuers) with those who took part in only the first year (drop-outs). Continuers were older (d = 0.13, p < .001) and more likely to be female, $\chi^2(1) = 6.20$, p = .01. Referring to the personality measures, continuers scored significantly higher on Conscientiousness (d = 0.11), Openness (d = 0.09), Agreeableness

(d = 0.07), and Extraversion (d = 0.05), but there was no difference between continuers and drop-outs in their Emotional Stability (d = .01, p = .44). All in all, although common attrition effects (Lüdtke et al., in press; Sutin, Costa, Wethington, & Eaton, 2010) occurred, they were rather small and reflect only modest selectivity.

Measures

Big Five. The Big Five personality traits (Emotional Stability, Extraversion, Openness, Agreeableness, and Conscientiousness) were measured two times, first in 2005 and then again in 2009, using a short version of the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991; see also John, Naumann, & Soto, 2008, and Lang, Lüdtke, & Asendorpf, 2001, for further information on the scale, the German translation, and evidence for its reliability and validity). The BFI was shortened for use in the SOEP by Gerlitz and Schupp (BFI-S; 2005), who also provided evidence for the validity of this short version. The BFI-S contains 15 items,[1] and participants were asked to indicate their agreement on a scale ranging from 1 (*does not apply at all*) to 7 (*applies perfectly*). Because of economic considerations and the need for short scales due to strict time limitations for such broad surveys, it was not possible to allow for more items, but Donnellan and Lucas (2008) showed a strong correlation between the small and the full versions of the BFI (r > .86 for each trait) as well as a strong correlation with the items of the full version that were not included in the short measure (r > .70 for each trait).

A factor analysis clearly revealed the expected five-factor structure. The five scales showed the following internal consistencies (averaged for the 2 years): Emotional Stability: α = .61; Extraversion: α = .65, Openness: α = .62, Agreeableness: α = .50, and Conscientiousness: α = .61. Because the three items were selected in such a way as to

maximize validity, this necessarily led to such a heterogeneity. The retest reliability across 6 weeks was acceptable (r >.75 for each factor; Lang, 2005). To account for the moderate reliability coefficients, the Big Five were included as latent variables in our models.

Life events. In each year the participants were asked to indicate whether several specific life events occurred within the last year. We extracted information according to several major life events that the persons reported in the years 2006 to 2009, and coded them dichotomously as 0 (*event did not occur*) or 1 (*event did occur*). This time interval ensures that the first personality measure could not be influenced by the experience of the event because personality was already measured before (in 2005). The events we chose cover a wide range of experiences such as changes in the relationship (marriage, separation, and divorce), death of a close family member (death of spouse and death of parent), changes in household size (birth of child, leaving parental home, child leaving home, and moving together with partner), and occupational changes (getting first job, unemployment, and retirement). We also investigated separately whether the first marriage, the first divorce, the birth of the first child, and the last child leaving home had specific effects on the development of personality. Because those four more specific events had largely the same effects on the development of personality as the corresponding general events (e.g., first marriage vs. marriage in general), we reported only the results for the general events.

We chose life events with considerable impact on the life course (Holmes & Rahe, 1967; Sarason et al., 1978) to make sure we investigated only meaningful turning points that could potentially have the power to change personality traits. Furthermore, all events under analysis can be considered largely objective, which means that the statement of

whether an event occurred was not influenced by, for example, personality itself, an effect that has been shown before (Larsen, 1992).

Another consideration we accounted for was the typical age at which a specific event occurred. Table 1 gives an overview of the number of persons who experienced each event, their age, and sex. One can see that the typical occurrence of the events covered a wide age range, which enabled the investigation of effects of events on personality across the whole lifespan.

As noted above, we were interested in the impact of specific life events on the development of personality, rather than the impact of grouped events, which could hinder the detection of relations. These analyses were possible because of our large sample size, which allowed for the analysis of single events with adequate power. Nevertheless, to find results that would be comparable to former studies (Headey & Wearing, 1989; Kandler et al., 2010; Löckenhoff et al., 2009; Magnus et al., 1993; Vaidya et al., 2002), we analyzed also the impact of events that were clustered according to their valence (positive and negative, respectively). In accordance with previous approaches of clustering, we classified the following events as positive: moved in with partner, marriage, birth of child, and first job. Accordingly, the following events were classified as negative: separation from partner, divorce, death of spouse, death of parent, and unemployment. Because former studies have shown that individuals perceive the valence of retirement (Calasanti, 1996; Kim & Moen, 2002; Pinquart & Schindler, 2007), moving out of the parental home (Kins, Beyers, Soenens, & Vansteenkiste, 2009), and a child leaving home (Gorchoff, John, & Helson, 2008; Liu & Guo, 2008) heterogeneously, we decided to exclude those events in the analysis of clustered events.

Statistical Models

As noted above, stability can be measured in several distinct ways, each with different implications. Surely the two most common ways to analyze changes are by examining mean-level differences and rank-order consistencies. To account for both stability measures, we needed two different types of longitudinal structural equation models: (a) a latent change model for analyzing effects on mean-level changes and (b) a latent moderated regression model for analyzing effects on the rank-order stability across 4 years. All of the models analyze changes using latent factors to account for the moderate reliability coefficients and therefore allow for distinguishing structural relationships from random measurement error (Bollen, 1989). When studying change with latent models, it is crucial to ensure that changes on a latent level are not due to changes in the relation between the latent variables and the manifest indicators (Bollen & Curran, 2006). Thus, we first tested our measures for strict factorial invariance.

Household panel studies, such as the SOEP, ask all members of chosen households to participate, which may result in dependencies in the data. Indeed, this study is based on 8,443 households including 14,718 participating individuals, and there may be similarities in personality or experienced life events within interviewed families. This potential nonindependence may affect standard errors, significance levels, and goodness of fit tests. For this reason, we used a statistical approach that corrects for this nonindependence and takes into account our complex sample structure by using the household number as a cluster variable (Muthén & Satorra, 1995).

The models were estimated with Mplus Version 6 (Muthén & Muthén, 1998-2010). Evaluation of model fit was based on the full information maximum likelihood estimator

(FIML), which allows for missing data, and was based on multiple criteria: The χ^2 model test statistic is problematic because the probability of rejecting any model increases with an increase in sample size (Bentler & Bonett, 1980). As a consequence, alternative measures of model fit, so-called fit indices, have been recommended for evaluating model fit. In general, comparative fit indices (CFI) above .90 and a root mean square error of approximation (RMSEA) below .08 reflect an acceptable fit to the data (Marsh, Hau, & Grayson, 2005). A standardized root mean square residual (SRMR) below .08 is an indicator of good model fit (Hu & Bentler, 1998).

Measurement invariance model. The basis for all further models is the measurement model; thus, we made one for each of the five personality dimensions. Because personality was measured twice, we included two correlated latent factors, one for the first measurement in 2005 (t1) and the other one for the second measurement in 2009 (t2). In both years, each trait was measured with three items, resulting in three indicators per year. Furthermore, we built our model in terms of strict factorial invariance, which means that factor loadings, measurement intercepts, and error variances were constrained to be equal (i.e., measurement invariant) across time points (Meredith, 1993). If strict factorial invariance is given, changes in a trait will lead to changes in the latent factors instead of changes in the measurement part of the models. Moreover, we allowed residuals of the manifest items to correlate over time to account for effects not due to the factors of interest (Bollen & Curran, 2006; Marsh & Hau, 1996).

Latent change models. To analyze mean-level changes, we built a latent change model (Duncan, Duncan, & Strycker, 2006; cf. Allemand, Zimprich, & Hertzog, 2007) as depicted in Figure 1 for each personality trait separately. This latent change model was

based on the respective measurement model and additionally included a latent intercept factor (i) and a latent slope factor (s). The latent intercept factor was fixed to 1 at each measurement point (t1 and t2) and reflected individual differences at the first time of measurement. If a variable reaches significance on i, this means that individuals with different values on this variable differed already at time 1, which is before the event under investigation occurred. The latent slope factor was fixed to 0 in the first year (t1) and fixed to 1 in the second year (t2) and reflected the amount of mean-level change. If a variable reaches significance on s, this means that individuals with different values on this variable differed in their normative change from 2005 to 2009.

First, we built a demographic latent change model for each personality trait to analyze the impact of sex and age on the mean level (intercept) and the difference between t1 and t2 (slope). Therein, we included sex, age, age², and age³ as covariates. Sex (coded as 0 = *female* and 1 = *male*) and age were always mean-centered before higher order terms were calculated. Due to parsimony and to avoid exaggerating small effects, we included the impact of age³ on the intercept and slope, respectively, only if its influence was significant at $p < .01$ (we decided in each case for the intercept and slope separately). After eliminating the age³ term from the model (in the case of nonsignificance), we reran the model and continued the same way according to age². Age and sex were included in each model, even if their impacts on the intercept or slope were not significant, to control for them as classical demographic variables, but we will discuss relations only of those that were significant at $p < .05$.

We made two additional models for each trait to analyze the impact of (a) single major life events and (b) clustered events on the mean-level change. Both types of models

were based on the respective demographic latent change model. This ensures being able to compare the changes for individuals who experienced an event with the normative change of an adequate reference group (i.e., individuals with the same age who did not experience this event). We always started with an inclusion of interaction terms of sex and each event or each cluster, respectively, but eliminated them on both the intercept and slope if they had no significant effect ($p < .01$) on either of them. Events were included in each model even if their impact on the intercept or slope was not significant, but we will discuss only those relations that were significant at $p < .01$.

Latent moderated regression models. To analyze rank-order consistencies, we built a latent moderated structural equation model (LMS; Klein & Moosbrugger, 2000) as depicted in Figure 2 for each personality dimension separately. The model was estimated using a maximum likelihood estimator with robust standard errors and a numerical integration algorithm. The demographic latent moderated regression model was based on the respective measurement model with t2 serving as the dependent variable and t1 as the predictor. The standardized effect of t1 on t2 corresponds to the rank-order stability.

To analyze the impact of sex, age, age², and age³ on the rank-order stability, we included them as moderators. This was done by including interaction terms of t1 and each demographic variable, and including the demographic variables as simple predictors as well. A significant effect of one of the interaction terms on t2 indicates that individuals with different values on this variable (i.e., sex, age, age², and age³, respectively) differed in the way they changed in their rank order in personality over time. Again, we kept higher order terms of age only if their effect on the rank-order stability was significant at $p < .01$; both the interaction term and the higher order term itself were eliminated if the higher order term

was not significant. As in the latent change model, we included age and sex in each model even if their impact was not significant, but we will discuss only relations that were significant at $p < .05$.

We made two additional models for each trait to analyze the impact of (a) single major life events and (b) clustered events on the rank-order consistency. Both types of models were based on the respective demographic latent moderated regression model. As before, we also analyzed the interaction of sex and event (or cluster, respectively) on the trait consistency, but eliminated them if the three-way interaction of t1, sex, and event had no significant effect ($p < .01$) on t2. The interaction terms between t1 and each event were included in the final model even if their impact on t2 was not significant, but we will discuss only those relations that were significant at $p < .01$.

Unfortunately, to our knowledge, it is not possible to estimate a model fit for an LMS (Klein & Moosbrugger, 2000; Marsh, Wen, & Hau, 2004). Nevertheless, to report a meaningful estimation of model fit, we decided to rerun the models without the latent interactions, which should result in models with comparable fit to the one described here, and which allowed us to use the FIML-estimator, enabling us to estimate model fit.

Results

First, we will present our findings according to the measurement invariance model, including the latent mean differences and latent correlations in general. Afterwards, we will focus on the latent change model that estimated mean-level changes in personality. Subsequently, we report on the latent regression model that analyzed the rank-order stability of the five traits. In both of the last models, we will refer to the impact of sex, age, the influence of specific major life events, and the influence of clustered life events.

Measurement invariance model. As can be seen in Table 2, all measurement models fit very well (each CFI > .95, RMSEA ≤ .06 and SRMR < .04), indicating that strict measurement invariance was given. The amount of change between the means was calculated as standardized mean-level changes (*d*) from the differences between the means divided by the pooled standard deviation.

All five personality factors showed small mean-level changes across the 4 years under investigation. The normative level of Emotional Stability increased ($d = .10$), whereas the means of the four other personality dimensions decreased over time ($-.17 \leq d \leq -.10$). Table 2 also shows the latent rank-order stability (*r*), calculated as the latent test-retest correlation for each of the Big Five factors. The latent correlation of three factors (Emotional Stability, Extraversion, and Openness) were above .70, whereas Agreeableness and Conscientiousness were less stable over time ($r = .68$ and .64, respectively).

Mean-Level Changes

Demographic latent change model. The impact of sex and age on the mean level (intercept) and the mean-level change (slope), as measured in our latent change models, can be seen in Table 3. The models for each personality factor fit the data well (each CFI > .91, RMSEA < .07, and SRMR < .06). All model parameters (*b*) given in Table 3 were standardized relative to the first measurement (i.e., the mean of the intercept was set to 0 and its variance was set to 1).

Sex had a significant effect on the intercept of each factor, meaning that women scored .465 standard deviations lower on Emotional Stability ($p < .001$) and considerably higher on Agreeableness ($b = -.421$, $p < .001$) and Extraversion ($b = -.259$, $p < .001$). The effects of sex on Conscientiousness ($b = -.079$, $p < .001$) and Openness ($b = -.042$, $p = .04$)

were rather small. To avoid very small values, effects of age are given in 10-year units, meaning that, for example, an increase of 10 years leads to a decrease in the estimation of Extraversion of .03. Figure 3 shows the effects of age on the intercept. The effect of age was largest for Openness (Fig. 3C) and Conscientiousness (Fig. 3E). Openness showed a curvilinear decline with increasing age of the surveyed individuals, with stronger differences in young and old individuals. According to Conscientiousness, individuals aged 30 and younger were considerably less conscientious than older individuals. Agreeableness (Fig. 3D) strongly increased in old age. The decline in Extraversion (Fig. 3B) was linear and smaller in magnitude. Age showed a very small although significant cubic effect on Emotional Stability (Fig. 3A). The results given here reflect the cross-sectional differences in the Big Five over the life course and are similar to the results Donnellan and Lucas (2008) reported for the same data set using an analogous statistical procedure without latent factors.

The mean slope in Table 3 for each personality dimension closely corresponds to mean-level changes given in Table 2, but this time for individuals with mean sex, age, age^2, and age^3.[2] There was no effect of sex on the slope, meaning that men and women did not develop in distinct ways according to their mean-level changes across the 4 years, which is in line with findings of, for example, Terracciano et al. (2005).

The effect of age on the slope is shown in Figure 4. The effect of age was largest for Conscientiousness (Fig. 4E): Individuals aged 30 and younger showed a strong normative increase in Conscientiousness over the 4 years. Between ages 30 and 70, there was a rather stable decrease in Conscientiousness, and individuals aged 70 and older showed an even stronger decline. One can clearly compare this course to the one according to the intercept:

In the cross-sectional analysis, based on the intercept, young individuals were considerably less conscientious than older individuals (Fig. 3E), which corresponds, in a longitudinal examination, to a strong increase (i.e., a positive slope) in Conscientiousness between the two measurements in those young participants (Fig. 4E). If cross-sectional and longitudinal approaches equal each other (i.e., there are no cohort and attrition effects, etc.), then the function of the slope should be approximately the derivative with respect to the function of the intercept, which can be seen in these two figures very clearly.

The mean-level decrease of Extraversion and Openness was stronger for older individuals, following a linear function (Fig. 4B and Fig. 4C, respectively). Age had a curvilinear effect on the changeability of Agreeableness (Fig. 4D): The decline was stronger in individuals between ages 20 and 40 and after age 70. There were no significant effects on the mean-level stability of Emotional Stability (Fig. 4A), meaning that individuals of different ages did not differ in their mean-level change over the 4 years.

The variance of the slope in each demographic latent change model was significant ($.33 < Var < .54$, each $p < .001$) indicating that individuals still differed markedly in their mean-level changes after controlling for sex and age. Hence, we next analyzed whether the experience of major life events could explain part of this variability.

Latent change model including events. The relation between personality and the experience of major life events can be seen in Table 4. The models fit the data well (each CFI > .91, RMSEA < .04, and SRMR < .03). All model parameters (*b*) were standardized relative to the first measurement and were controlled for the demographic variables.

As can be seen in the upper half of Table 4 (the part referring to the "intercept"), there were substantial differences among individuals who experienced an event and those

who did not, even before the event occurred. Highly extraverted individuals were more likely to move in with their partner (b = .179, p < .001). Similarly, agreeable individuals were more likely to get unemployed (b = .120, p = .005). And those starting their first job were less conscientious (b = -.185, p = .01) than their reference group. Furthermore, there was a significant (p =.007) effect of sex on Emotional Stability in soon to be married individuals: Less emotionally stable women (b = -.117, p = .04) were more likely to get married in the next years than their emotionally more stable female counterparts, but there was no effect for men (b = .086, p = .12).

The impact of major life events on mean-level change in personality can be seen in the lower half of Table 4 (the part referring to the "slope"). Figure 5 gives an overview of events with significant (p < .01) effects on the slope. Figure 5A shows that individuals who got married got more introverted after experiencing the event (b = -.126, p = .003) and ended up at a level comparable to the reference group. Openness declined more strongly in individuals who got married (Fig. 5B; b = -.168, p = .001). Individuals who separated from their partner (Fig. 5C) became more agreeable after the event (b = .143, p = .006) reaching a level of agreeableness comparable to the reference group. With respect to Conscientiousness, the following significant effects were observed: Individuals became more conscientious after getting divorced (Fig. 5D; b = .249, p = .003) and less conscientious both after having a baby (Fig. 5E; b = -.130, p = .003) and after retiring (Fig. 5F, b = -.169, p = .002). Individuals were less conscientious before starting their first job (Fig. 5G), but afterwards increased to a considerable extent (b = .194, p = .007).

Furthermore, there was a significant (p = .002) effect of sex and moving out of the parental home on the mean-level change in Emotional Stability (Fig. 6A): Women got more

emotionally stable when moving (b = .266, p = .002), but there was no effect for men (b = -.133, p = .17). Another interaction effect was found for sex and separation from partner on Openness (Fig. 6B, p = .003): Men got considerably more open (b = .197, p = .001), but there was no effect for women (b = -.037, p = .50). The last interaction effect we found was for sex and Conscientiousness when faced with the death of a spouse (Fig. 6C, p = .002): Women decreased in their Conscientiousness (b = -.171, p = .03), whereas men became more conscientious (b = .253, p = .03).[3]

Latent change model including clustered events. Table 5 shows the influence of clustered events (positive and negative, respectively) on changes in mean levels of the Big Five personality traits. The models fit the data well (each CFI > .91, RMSEA < .06, and SRMR < .05). All model parameters (b) were again standardized relative to the first measurement and controlled for the demographic variables. In accordance with previous research (Headey & Wearing, 1989; Kandler, et al., 2010; Magnus et al., 1993; Vaidya et al., 2002), we found that emotionally stable individuals experienced fewer negative life events (b = -.066, p = .003), and extraverted individuals experienced more positive life events (b = .060, p = .005). We found an interaction effect of sex and positive life events on Agreeableness (p = .004): Agreeable men were more likely to experience positive life events (b = .072, p = .001), but there was no effect of Agreeableness for women (b = -.006, p = .74).

According to changes in personality due to the experience of positive or negative events, we found an interesting effect for Extraversion, which, surprisingly showed a stronger decline when the person was faced with positive events (b = -.067, p = .001). Again, we found a significant interaction effect (p = .003) of sex, with women becoming

marginally less open when faced with negative events (b = -.044, p = .09) and men becoming more open (b = .068, p = .02).

Rank-Order Consistencies

Demographic rank-order model. The results concerning our analyses of the influence of sex and age on rank-order consistency are given in Table 6. The models fit the data well as estimated using an analogous model that allowed for the FIML-estimator (each CFI > .91, RMSEA < .07, and SRMR ≤ .05). All model parameters (b) were standardized with respect to the first and second measurement (i.e., the variance of both t1 and t2 were set to 1). Sex had a significant effect on the rank-order consistency of Emotional Stability (b = -.050, p = .006) and Openness (b = -.072, p < .001), meaning that women were more stable in those traits. However, women were less stable on Conscientiousness (b = .058, p = .01). The effects of age on the rank-order consistency are shown in Figure 7. Most interestingly, we found quadratic effects of age on the latent stability of Emotional Stability (Fig. 7A), Extraversion (Fig. 7B), Openness (Fig. 7C), and Agreeableness (Fig. 7D) with a maximum stability in about the 40s and 60s. The effect of age on the rank-order stability of Conscientiousness was linear (Fig. 7E), with older individuals showing more stability.

Rank-order model including events. The impact of specific major life events on rank-order stability can be seen in Table 7. The models fit the data well, again estimated using analogous models that allowed for the FIML-estimator (each CFI > .91, RMSEA ≤ .04, and SRMR < .03). All model parameters (b) were standardized relative to the first and second measurement and controlled for the demographic variables. We found only 2 events with an influence on the rank-order stability of the Big Five traits: If a child leaves home, this results in an increased rank-order stability in Openness in the parents who were left (b

= .093, p = .009), whereas the death of a spouse leads to a decrease in the stability of Agreeableness (b = -.247, p = .001). Men and women did not differ in their rank-order stability as a reaction to any of the events.

Rank-order model including clustered events. The results of our analyses on the influence of clustered life events on rank-order stability are given in Table 8. Again, the fit of the models was estimated using analogous models allowing for the FIML-estimator. The models fit the data well (each CFI > .91, RMSEA < .06, and SRMR < .05). All model parameters (b) were standardized relative to the first and second measurement and controlled for the demographic variables. There was no significant effect (p < .01) for any of the five traits.

Discussion

The goal of this study was to analyze whether and how personality changes with increasing age and due to the experience of major life events. In fact, we found strong evidence of personality change throughout the whole life course regarding both change indicators: mean-level stability and rank-order consistency. Furthermore, personality traits clearly differed in their changeability and their pattern of change with regard to age and to specific events.

Mean-Level Changes in Personality Across the Lifespan

Age effects. Our first research question referred to age differences in mean levels of personality. Specifically, older individuals were expected to be more emotionally stable, agreeable, and conscientious, but less extraverted and open. In fact, in our study, age showed a more complex and differentiated pattern on personality.

Our cross-sectional results showed that age had a cubic effect on Emotional Stability. Emotional Stability first slightly increased in young ages until age 30, which is in line with former research (Lüdtke et al., in press; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007). Afterwards, it decreased until the ages of 60 to 70 and increased again later. However, this effect was very small, which means that Emotional Stability remained comparatively stable across different ages, although we found a consistent rise in Emotional Stability in individuals of all ages in our sample across the 4 years. This corresponds to the kind of maturity commonly found in longitudinal approaches (e.g., Bleidorn et al., 2009; Roberts et al., 2006).

There have been mixed findings with respect to the development of Extraversion, but because the Extraversion Scale we used focused on Social Vitality, which has been found mainly to decrease with age (Roberts et al., 2006), we assumed that we would find this pattern here as well. Indeed, younger people had slightly higher values on Extraversion in our sample than did older people (see also Srivastava et al., 2003). In our longitudinal analysis, we found strong effects of age: Older people tended to show a stronger decrease in Extraversion over the 4 years than did younger people, meaning that older individuals were less stable than younger ones.

Openness showed an interesting curvilinear course with younger individuals (up to age 30) having values above average and older individuals (from age 70) having values below average. This trend is comparable to the one found by Srivastava et al. (2003) and by Roberts et al. (2006) when summarizing longitudinal studies. Longitudinally observed, we found a mean-level decrease in Openness over the 4 years with decreasing stability with increasing age. As predicted, we found higher values for Agreeableness in old individuals

(Bleidorn et al., 2009; Neyer & Lehnart, 2007; Roberts et al., 2006; Srivastava et al., 2003). According to our longitudinal comparison, stability was slightly lower for individuals of ages 30 to 40 and after age 70.

Age had a very complex influence on Conscientiousness. In our cross-sectional comparison, young individuals (up to age 30) were strongly less conscientious than in middle adulthood (which is in line with findings from Bleidorn et al., 2009; Lüdtke et al., in press; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Roberts et al., 2006; Srivastava et al., 2003), but in advanced old age (from about age 70), Conscientiousness seemed to decrease slightly again. Accordingly, we found in our longitudinal analysis that younger individuals showed considerably less stability with strong mean-level increases across the 4 years. Old individuals showed less stability as well, but in this case, with strong mean-level decreases across the 4 years.

Taken together, our results suggest that age has a distinct influence on each of the Big Five personality traits. However, not all cross-sectional findings had equivalent results in the longitudinal approach, which may be due to cohort effects. Individuals changed after age 30 and even in old age, sometimes even more strongly than in younger days, which is not in line with the hypothesis of Costa and McCrae (1988) that personality remains fairly stable after this age.

Interestingly, despite finding—in most cases—marked effects of sex on the mean levels of the Big Five, findings that were in accordance with those reported in the literature (Chapman, Duberstein, Sörensen, & Lyness, 2007; Costa, Terracciano, & McCrae, 2001; Schmitt, Realo, Voracek, & Allik, 2008), there were no effects of sex on the mean-level

changes of personality. In line with results reported by Roberts et al. (2006), this means that men and women change in similar ways with respect to their mean levels.

Selection effects. We found several selection effects in our analyses (i.e., individuals who differed in personality trait values differed also in the probability of experiencing specific major life events). Individuals differed in Extraversion before moving in with their partner, which is similar to the result of Neyer and Lehnart (2007) who showed that Sociability, one aspect of Extraversion, increases the probability of starting one's first romantic relationship as a young adult. Additionally, our results indicate that women lower in Emotional Stability are more likely to get married in the ensuing years, which is also similar to the finding of Neyer and Lehnart (2007): In their study, young singles high in Neuroticism were more likely to start a partnership. Furthermore, we found that Agreeableness and Conscientiousness, which have been identified as relevant factors influencing career success by Judge et al. (1999), differed before becoming unemployed and starting their first job, respectively.

Selection effects were not found for all life events, however, which may be due to the fact that events differed in their controllability, but may also be traced back to the fact that there may be other—potentially stronger—predictors than personality for some events. However, we were rather surprised to find no effect for some specific events. For example, individuals did not differ in whether they will have a baby shortly or not (see Jokela, Kivimäki, Elovainio, & Keltikangas-Järvinen, 2009, for other personality traits not under investigation here that predicted the probability of having a baby in the near future).

Although we chose a very strict alpha level, the three observed selection effects might nevertheless have been significant only by chance because altogether as many as 60

effects on the intercept were tested (five personality traits and 12 independent events). To control for this possibility, we computed the probability of finding three or more significant sex-unspecific selection effects at $p \leq .01$ under the assumption that there were no selection effects in the population. The respective binomial test showed that this was very unlikely ($p = .02$). Taken together, these results clearly demonstrate the above-chance occurrence of selection effects in our sample.

To provide results that would be comparable to previous studies, we examined also whether personality was able to predict whether positive and negative events, respectively, would occur in the near future. Similar to previous studies, we found that emotionally stable individuals tended to experience fewer negative events, and that extraverted individuals tended to experience more positive events (Headey & Wearing, 1989; Kandler et al., 2010; Magnus et al., 1993; Vaidya et al., 2002). However, we would like to point to the fact that (a) these effects are not generalizable to all events within the clusters; for example, although emotionally stable individuals experience fewer negative events, Emotional Stability is not a significant protector for any of the specific negative events under investigation here, although we considered the most stressful events, such as the death of a close family member, divorce, and unemployment; and (b) the clustering technique ignores specific effects found for Agreeableness and Conscientiousness.

Socialization effects. Apart from selection effects, we also found several socialization effects. Individuals developed in distinct ways depending on whether they experienced or did not experience a specific major life event. For example, Conscientiousness increased more strongly in individuals who started their first job and decreased more strongly in individuals who retired. This finding perfectly matches the

findings of Judge et al. (1999) in that Conscientiousness is most relevant for career success, which should mean that social roles force individuals to be more conscientious in times when they are integrated into the job market. Before and after those times, the pressure to be as conscientious as possible should be smaller, resulting in heightened Conscientiousness when entering the job market and lessened Conscientiousness when leaving the job market.

Again, of course not all events had an impact on changes in personality, but as indicated by a binomial test, the observed seven socialization effects were much more than one would expect by chance ($p < .001$). Although we did not find a general effect of sex on the development of the personality traits, men and women differed in their reactions to three events: leaving the parental home, separation, and the death of a spouse. As mentioned above, we expected to find differences between men and women in their reactions to specific major life events. However, we were a bit surprised to find no additional effects of personality on events associated with gender role stereotypes (e.g., unemployment and birth of a child).

Positive and negative events, considered as a whole, barely influenced personality. The only effects we found were for Extraversion, which declined when individuals encountered positive events, and Openness, which changed in different directions in men and women after experiencing negative life events. These finding are interesting because former studies have not presented similar results. These inconsistencies may be due to different approaches to clustering: Apart from the fact that clustering according to valence is rather arbitrary (one could also cluster according to social vs. occupational events or

single vs. collective events, etc.; cf. Sutin et al., 2010), positive and negative events may subsume entirely different events, each with different consequences on life and personality.

Rank-Order Changes in Personality across the Lifespan

Age effects. We believe that one of the major advantages of our study is that the large and heterogeneous longitudinal sample that we used allows for a differentiated examination of several aspects of rank-order stability. We contrasted two competing hypotheses regarding changes in the rank order of individuals on the Big Five: (a) Rank-order stability linearly increases with age (Roberts & DelVecchio, 2000) with consistent stability after age 50 (Terracciano et al., 2006) and (b) rank-order stability follows a quadratic function (inverted U-form) with a peak at age 50 and a decrease afterwards (Ardelt, 2000).

We found that Emotional Stability, Extraversion, Openness, and Agreeableness all showed an inverted U-shaped function of rank-order stability. These results are, on a general level, in line with the hypothesis put forward by Ardelt (2000). There are, however, several important qualifications to that hypothesis. First, Ardelt did not differentiate between traits, and second, she identified age 50 as the turning point, from which point on the former increase in stability changed into a decrease.

Our results, however, show slight but potentially important differences between the traits in their turning points. Extraversion seems to decrease somewhat earlier, between the ages of 40 and 50, whereas Openness and Agreeableness reach their peaks at about 50 years. The rank-order stability of Emotional Stability increases until age 50 to 60 and decreases afterwards.

In contrast to the four other traits of the Big Five, Conscientiousness was the only trait with increasing rank-order stability across all of adulthood. The finding for this trait is in line with Roberts and DelVecchio (2000), who concluded in their meta-analysis that stability increases steadily for all traits. Our results, however, show that this trend may be restricted to Conscientiousness and also holds after age 50.

When comparing changes in the stability of the mean levels and rank order over the lifespan, one can easily see strong differences. For example, although the mean level of Conscientiousness remains fairly stable from age 40 to 60, rank-order stability increases considerably in this age range. This parallel examination once again shows the differences between the change measures and makes clear that they reflect different processes.

Effects of life events. We speculated about whether the experience of life events influences rank-order stability of personality. Our results showed that there were only two instances where single events had an influence on this kind of stability, which was not significantly more than one would expect by chance given altogether 60 possible effects ($p = .12$). Similarly, we found no effect of aggregated positive or negative life events on changes in rank-order stability, which again argues for the fact that this type of stability is not influenced by the major life events under investigation.

Sex effects. Interestingly, whereas sex had no influence on the mean-level changes of the Big Five across the 4 years, we did find effects of sex on the rank-order stability: Women were more stable in their Emotional Stability and Openness, but less stable in their Conscientiousness, although these effects were rather small. This finding is thought-provoking, especially when considering that we found no interaction effect of sex and a major life event on rank-order stability. In other words, although rank-order stability did

not differ between men and women when faced with a major life event, it did differ during the pure maturation process across the 4 years. An interesting question remains as to whether further studies will replicate this finding and whether they will identify other life events that lead to rank-order changes in one sex but not the other and therefore might explain those effects.

Limitations and Future Directions

The study presented here offers several methodological advantages in comparison to former studies, for example, the large sample size, the longitudinal design, the heterogeneity according to age and other characteristics of the participants, the separate analysis of single major life events, and the comparison of two types of changes: mean-level and rank-order changes. Nevertheless, there certainly is room for improvement.

Our retest interval for personality had a moderate length of 4 years. Other studies should analyze differences across longer time periods. By doing so, it will be possible to examine long-term changes and also potential re-developments. For example, it may be that people change only temporarily in their personality as a reaction to a specific major life event and return to their baseline level on a specific personality trait after several years (as has been found, for example, for life satisfaction; Lucas, 2007). Because the SOEP is an ongoing panel study, we hope that further personality inquiries will follow, which will enable the analysis of the just-mentioned research questions.

We showed in our analyses that there are considerable selection and socialization effects, which means that personality predicts the occurrence of future life events and changes due to those experiences. However, our study did not allow us to address in detail the psychological processes that cause such changes. It may be, as assumed in the

Paradoxical Theory of Personality Coherence (Caspi & Moffitt, 1993), that personality is prone to change especially under conditions in which all of the following features are met: (a) transitions into new situations, (b) when there is a strong press to behave, (c) in which previous responses are not warranted and (d) clear information is provided about how to behave adaptively. In contrast—and paradoxically—stability should be favored in conditions when (a) and (b) are coupled with no clear information about how to behave adaptively. In these latter conditions, existing individual differences should determine behavior, leading to personality continuity. Future research should therefore identify mechanisms that underlie these findings, find further moderators, and differentiate life events according to their intensity, ambiguity, and normativity. This, in turn, would specify further important and interesting aspects of the model of person-environment transaction.

Finally, our study was based on a heterogeneous sample of Germans. There are several studies that argue either for intercultural comparability (McCrae et al., 1998, 1999, 2000) or against it (Schmitt et al., 2008). However, the results cannot be inferred to very different populations, such as, for example, collectivist societies, without caution. That is why it would be desirable to compare the results to findings in other cultures as well.

Conclusion

Individuals differ systematically in the changeability of their personality. Here we gave a comprehensive overview of the effect of age and major life events on the development of the Big Five personality traits.

Age had a strong influence on both the mean level and rank order of personality, and we were able to account for these complex relationships in detail. Older individuals differed in their absolute values on the traits, as well as in their stability over time. Our

results show furthermore that individuals change considerably after age 30, in some cases even more strongly than before, which seriously questions the hard plaster hypothesis (Costa & McCrae, 1988). It rather looks as though there is no age at which all personality traits reach their peak of stability, but that there is change throughout the entire life course.

Furthermore, we found several selection and socialization effects, which means that personality predicts the occurrence of specific major life events and changes as a result of experiencing them. This is especially interesting because the events under investigation here were objective, which means that these effects cannot be due to an interpretation bias influenced by personality itself. There must be other, supposedly psychological and behavioral, mechanisms that explain this relationship. Further research should investigate these connections in more detail.

To conclude, personality changes, but changeability differs across the life course—and this change is not due only to intrinsic maturation, but also to social demands and experiences.

References

Allemand, M., Zimprich, D., & Hertzog, C. (2007). Cross-sectional age differences and longitudinal age changes of personality in middle adulthood and old age. *Journal of Personality, 75*, 323-358.

Ardelt, M. (2000). Still stable after all these years? Personality stability theory revisited. *Social Psychology Quarterly, 63*, 391-405.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88,* 588-606.

Bleidorn, W., Kandler, C., Riemann, R., Angleitner, A., & Spinath, F. M. (2009). Patterns and sources of adult personality development: Growth curve analyses of the NEO PI-R Scales in a longitudinal twin study. *Journal of Personality and Social Psychology, 97*, 142-155.

Bollen, K. A. (1989). *Structural equations with latent variables*. New York: Wiley.

Bollen, K. A., & Curran, P. J. (2006). *Latent curve models: A structural equation perspective*. Hoboken, NJ: Wiley.

Calasanti, T. M. (1996). Gender and life satisfaction in retirement: An assessment of the male model. *Journal of Gerontology: Social Sciences, 51B,* 18-29.

Caspi, A., & Moffitt, T. E. (1993). When do individual differences matter? A paradoxical theory of personality coherence. *Psychological Inquiry, 4*, 247-271.

Chapman, B. P., Duberstein, P. R., Sörensen, S., & Lyness, J. M. (2007). Gender differences in Five Factor Model personality traits in an elderly cohort. *Personality and Individual Differences, 43*, 1594-1603.

Costa, P. T., Jr., Herbst, J. H., McCrae, R. R., & Siegler, I. C. (2000). Personality at midlife: Stability, intrinsic maturation, and response to life events. *Assessment, 7*, 365-378.

Costa, P. T., Jr., & McCrae, R. R. (1988). Personality in adulthood: A six-year longitudinal study of self-reports and spouse ratings on the NEO Personality Inventory. *Journal of Personality and Social Psychology, 54*, 853-863.

Costa, P. T., Jr., Terracciano, A., & McCrae, R. R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology, 81*, 322-331.

Donnellan, M. B., & Lucas, R. E. (2008). Age differences in the Big Five across the life span: Evidence from two national samples. *Psychology and Aging, 23*, 558-566.

Duncan, T. E., Duncan, S. C., & Strycker, L. A. (2006). *An introduction to latent variable growth curve modeling: Concepts, issues, and applications*. Mahwah, NJ: Lawrence Erlbaum Associates.

Field, D., & Millsap, R. E. (1991). Personality in advanced old age: Continuity or change? *Journal of Gerontology: Psychological Sciences, 46*, 299-308.

Fraley, R. C., & Roberts, B. W. (2005). Patterns of continuity: A dynamic model for conceptualizing the stability of individual differences in psychological constructs across the life course. *Psychological Bulletin, 112*, 60-74.

Gerlitz, J.-Y., & Schupp, J. (2005, July). *Zur Erhebung der Big-Five-basierten Persönlichkeitsmerkmale im SOEP* [The measurement of the Big Five personality traits in the SOEP]. Berlin: DIW Berlin (DIW Research Note 4/2005).

Gorchoff, S. M., John, O. P., & Helson, R. (2008). Contextualizing change in marital satisfaction during middle age: An 18-year longitudinal study. *Psychological Science, 19*, 1194-1200.

Headey, B., Muffels, R., & Wagner, G. G. (2010). Long-running German panel survey shows that personal and economic choices, not just genes, matter for happiness. *Proceedings of the National Academy of Sciences of the United States of America (PNAS), 107*, 17922-17926.

Headey, B., & Wearing, A. (1989). Personality, life events, and subjective well-being: Toward a dynamic equilibrium model. *Journal of Personality and Social Psychology, 57*, 731-739.

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research, 11*, 213-218.

Hu, L.T., & Bentler, P.M. (1998). Fit indices in covariance structure modeling: sensitivity to underparameterized model misspecification. *Psychological Methods, 3,* 424-453.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory – Versions 4a and 54*. Berkeley: University of California at Berkeley, Institute of Personality and Social Research.

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp.114-158). New York: The Guilford Press.

Jokela, M., Kivimäki, M., Elovainio, M., & Keltikangas-Järvinen, L. (2009). Personality and having children: A two-way relationship. *Journal of Personality and Social Psychology, 96*, 218-230.

Judge, T. A., Higgins, C. A., Thoresen, C. J., & Barrick, M. R. (1999). The Big Five personality traits, general mental ability, and career success across the life span. *Personnel Psychology, 52*, 621-652.

Kandler, C., Bleidorn, W., Riemann, R., Angleitner, A. & Spinath, F. M. (submitted). Life events as environmental states and genetic traits and the role of personality: A longitudinal twin study.

Kim, J. E., & Moen, P. (2002). Retirement transitions, gender, and psychological well-being: A life-course, ecological model. *Journal of Gerontology: Psychological Sciences, 57B*, 212-222.

Kins, E., Beyers, W., Soenens, B., & Vansteenkiste, M. (2009). Patterns of home leaving and subjective well-being in emerging adulthood: The role of motivational processes and parental autonomy support. *Developmental Psychology, 45*, 1416-1429.

Klein, A., & Moosbrugger, H. (2000). Maximum likelihood estimation of latent interaction effects with the LMS method. *Psychometrika, 65*, 457-474.

Klimstra, T. A., Hale, W. W., III, Raaijmakers, Q. A. W., Branje, S. J. T., & Meeus, W. H. J. (2009). Maturation of personality in adolescence. *Journal of Personality and Social Psychology, 96*, 898-912.

Lang, F. R. (2005, December). *Erfassung des kognitiven Leistungspotenzials und der „Big Five“ mit Computer-Assisted-Personal-Interviewing (CAPI): Zur Reliabilität und*

Validität zweier ultrakurzer Tests und des BFI-S [Measuring the cognitive achievement potential and the Big Five with Computer-Assisted-Personal-Interviewing (CAPI): Reliability and validity of two short tests and the BFI-S]. Berlin: DIW Berlin (DIW Research Note 9/2005).

Lang, F. R., John, D., Lüdtke, O., Schupp, J., & Wagner, G. G. (in press). Short assessment of the Big Five: Robust across survey methods except telephone interviewing. *Behavior Research Methods.*

Lang, F. R., Lüdtke, O., & Asendorpf, J. B. (2001). Testgüte und psychometrische Äquivalenz der deutschen Version des Big Five Inventory (BFI) bei jungen, mittelalten und alten Erwachsenen [Psychometric properties and equivalence of the German version of the Big Five Inventory (BFI) for young, middle-aged, and old adults]. *Diagnostica, 47*, 111-121.

Larsen, R. J. (1992). Neuroticism and selective encoding and recall of symptoms: Evidence from a combined concurrent-retrospective study. *Journal of Personality and Social Psychology, 62*, 480-488.

Lehnart, J., & Neyer, F. J. (2006). Should I stay or should I go? Attachment and personality in stable and instable romantic relationships. *European Journal of Personality, 20*, 475-495.

Liu, L.-J., & Guo, Q. (2008). Life satisfaction in a sample of empty-nest elderly: A survey in the rural area of a mountainous county in China. *Quality of Life Research, 17*, 823-830.

Löckenhoff, C. E., Terracciano, A. Patriciu, N. S., Eaton, W. W., & Costa, P.T., Jr. (2009). Self-reported extremely adverse life events and longitudinal changes in five-factor model personality traits in an urban sample. *Journal of Traumatic Stress, 22*, 53-59.

Lucas, R. E. (2007). Adaptation and the set-point-model of subjective well-being: Does happiness change after major life events? *Current Directions in Psychological Science, 16*, 75-79.

Lucas, R. E., & Donnellan, M. B. (2009). Age differences in personality: Evidence from a nationally representative Australian sample. *Developmental Psychology, 45,* 1353-1363.

Lüdtke, O., Roberts, B. W., Trautwein, U., & Nagy, G. (in press). A random walk down university avenue: Life paths, life events, and personality trait change at the transition to university life. *Journal of Personality and Social Psychology.*

Magnus, K., Diener, E., Fujita, F., & Pavot, W. (1993). Extraversion and neuroticism as predictors of objective life events: A longitudinal analysis. *Journal of Personality and Social Psychology, 65,* 1046-1053.

Marsh, H. W., & Hau, K.-T. (1996). Assessing goodness of fit: Is parsimony always desirable? *Journal of Experimental Education, 64*, 364-390.

Marsh, H. W., Hau, K.-T., & Grayson, D. (2005). Goodness of fit evaluation in structural equation modeling. In A. Maydeu-Olivares & J. McCardle (Eds.), *Contemporary psychometrics: A Festschrift to Roderick P. McDonald* (pp. 275-340). Mahwah, NJ: Lawrence Erlbaum Associates.

Marsh, H. W., Wen, Z., & Hau, K.-T. (2004). Structural equation models of latent interactions: Evaluation of alternative estimation strategies and indicator construction. *Psychological Methods, 9,* 275-300.

McCrae, R. R., & Costa, P. T., Jr. (2008). The Five-Factor Theory of Personality. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 159-181). New York: The Guilford Press.

McCrae, R. R., Costa, P.T., Jr., de Lima, M. P., Simões, A., Ostendorf, F., Angleitner, A., et al. (1999). Age differences in personality across the adult life span: Parallels in five cultures. *Developmental Psychology, 35,* 466-477.

McCrae, R. R., Costa, P. T., Jr., Del Pilar, G. H., Rolland, J.-P., & Parker, W. D. (1998). Cross-cultural assessment of the five-factor model: The revised NEO Personality Inventory. *Journal of Cross-Cultural Psychology, 29,* 171-188.

McCrae, R. R., Costa, P. T., Jr., Ostendorf, F., Angleitner, A., Hřebíčková, M., Avia, M. D., et al. (2000). Nature over nurture: Temperament, personality, and life span development. *Journal of Personality and Social Psychology, 78,* 173-186.

McCrae, R. R., Costa, P. T., Jr., Terracciano, A., Parker, W. D., Mills, C. J., De Fruyt, F., & Mervielde, I. (2002). Personality trait development from age 12 to age 18: Longitudinal, cross-sectional, and cross-cultural analyses. *Journal of Personality and Social Psychology, 83,* 1456-1468.

Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika, 58,* 525-543.

Muthén, L. K., & Muthén, B. O. (1998 – 2010). *Mplus user's guide* (6th ed.). Los Angeles, CA: Muthén & Muthén.

Muthén, B. O., & Satorra, A. (1995). Complex sample data in structural equation modeling. *Sociological Methodology, 25*, 267-316.

Neyer, F. J., & Asendorpf, J. B. (2001). Personality-relationship transaction in young adulthood. *Journal of Personality and Social Psychology, 81*, 1190-1204.

Neyer, F. J., & Lehnart, J. (2007). Relationships matter in personality development: Evidence from an 8-year longitudinal study across young adulthood. *Journal of Personality, 75*, 535-568.

Pinquart, M. & Schindler, I. (2007). Changes of life satisfaction in the transition to retirement: A latent-class approach. *Psychology and Aging, 22*, 442-455.

Roberts, B. W., Caspi, A., & Moffitt, T. E. (2003). Work experiences and personality development in young adulthood. *Journal of Personality and Social Psychology, 84*, 582-593.

Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin, 126*, 3-25.

Roberts, B. W., Helson, R., & Klohnen, E. C. (2002). Personality development and growth in women across 30 years: Three perspectives. *Journal of Personality, 71*, 79-102.

Roberts, B. W., & Mroczek, D. (2008). Personality trait change in adulthood. *Current Directions in Psychological Science, 17*, 31-35.

Roberts, B. W., Walton, K. E., & Viechtbauer, W. (2006). Patterns of mean-level change in personality traits across the life course: A meta-analysis of longitudinal studies. *Psychological Bulletin, 132*, 1-25.

Roberts, B. W., Wood, D., & Caspi, A. (2008). The development of personality traits in adulthood. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (3rd ed., pp. 375-398). New York: The Guilford Press.

Roberts, B. W., Wood, D., & Smith, J. L. (2005). Evaluating five factor theory and social investment perspectives on personality trait development. *Journal of Research in Personality, 39*, 166-184.

Robins, R. W., Fraley, R. C., Roberts, B. W., & Trzesniewski, K. H. (2001). A longitudinal study of personality change in young adulthood. *Journal of Personality, 69*, 617-640.

Sarason, I. G., Johnson, J. H., & Siegel, J. M. (1978). Assessing the impact of life changes: Development of the life experiences survey. *Journal of Consulting and Clinical Psychology, 46*, 932-946.

Schmitt, D. P., Realo, A., Voracek, M., & Allik, J. (2008). Why can't a man be more like a woman? Sex differences in Big Five personality traits across 55 cultures. *Journal of Personality and Social Psychology, 94*, 168-182.

Scollon, C. N., & Diener, E. (2006). Love, work, and changes in extraversion and neuroticism over time. *Journal of Personality and Social Psychology, 91*, 1152-1165.

Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big Five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology, 100*, 330-348.

Specht, J., Egloff, B., & Schmukle, S. C. (2011). The benefits of believing in chance or fate: External locus of control as a protective factor for coping with the death of a spouse. *Social Psychological and Personality Science, 2*, 132-137.

Srivastava, S., John, O. P., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology, 84*, 1041-1053.

Sutin, A. R., & Costa, P. T., Jr. (2010). Reciprocal influences of personality and job characteristics across middle adulthood. *Journal of Personality, 78*, 257-288.

Sutin, A. R., Costa, P. T., Jr., Wethington, E., & Eaton, W. (2010). Turning points and lessons learned: Stressful life events and personality trait development across middle adulthood. *Psychology and Aging, 25*, 524-533.

Tellegen, A. (1988). The analysis of consistency in personality assessment. *Journal of Personality, 56*, 621-663.

Terracciano, A., Costa, P. T., Jr., & McCrae, R. R. (2006). Personality plasticity after age 30. *Personality and Social Psychology Bulletin, 32*, 999-1009.

Terracciano, A., McCrae, R. R., Brant, L. J., & Costa, P. T., Jr. (2005). Hierarchical linear modeling analyses of the NEO-PI-R scales in the Baltimore Longitudinal Study of Aging. *Psychology and Aging, 20*, 493-506.

Vaidya, J. G., Gray, E., K., Haig, J. R., Mroczek, D. K., & Watson, D. (2008). Differential stability and individual growth trajectories of Big Five and affective traits during young adulthood. *Journal of Personality, 76*, 267-304.

Vaidya, J. G., Gray, E. K., Haig, J., & Watson, D. (2002). On the temporal stability of personality: Evidence for differential stability and the role of life experiences. *Journal of Personality and Social Psychology*, *83*, 1469-1484.

Wagner, G. G., Frick, J. R., & Schupp, J. (2007). The German Socio-Economic Panel Study (SOEP) - Scope, evolution and enhancements. *Journal of Applied Social Science Studies*, *127*, 139-169.

Footnotes

[1]Emotional Stability was assessed with the BFI Items 9, 19, and 39. Extraversion was assessed with Items 1, 6, and 36. Openness was assessed with Items 5, 20, and 30. Agreeableness was assessed with Items 17, 32, and 37. Conscientiousness was assessed with Items 3, 23, and 33.

[2]Please note that this refers only to a hypothetical person, considering that, apart from obviously not being able to have an "average sex," it is not possible to have an average age and average age^2 and age^3 at the same time either (age was mean-centered before calculating higher order terms).

[3]An anonymous reviewer vividly labeled this finding the "dirty underpants effect": In families with traditional gender roles, the death of the wife suddenly seems to force men to learn how to run a household (and to learn the actual location of the laundry hamper), whereas women don't have that experience.

Table 1

Descriptive Statistics of Individuals Who Experienced a Specific Major Life Event

Life event	Frequency	Age in 2005		% Women
		M	*SD*	
Marriage	664	34.24	10.16	52.11
Moved in with partner	675	30.74	10.73	52.44
Divorce	229	41.64	8.51	56.33
Separation of partner	690	35.57	11.24	55.94
Death of spouse	228	65.94	10.32	71.05
Leaving parental home	302	23.63	6.82	56.62
Child leaves home	1256	49.67	7.74	55.18
Birth of child	993	31.13	6.71	53.78
Death of parent	998	47.77	10.51	51.30
Unemployment	860	35.72	13.47	57.33
Retirement	693	59.15	6.26	54.26
First job	456	21.18	4.94	52.85

Note. *M* = mean age in 2005; *SD* = standard deviation of age in 2005.

Table 2

Measurement Models for Testing Strict Factorial Invariance: Latent Mean-Level Changes and Latent Rank-Order Stabilities for the Big Five across 4 Years

	Model fit				Mean-level change (*d*)	Rank-order stability (*r*)
	χ^2 (*df*)	CFI	RMSEA	SRMR		
Emotional Stability	655 (12)	.953	.060	.029	.10	.73
Extraversion	154 (12)	.992	.028	.029	-.13	.74
Openness	29 (12)	.999	.010	.007	-.17	.72
Agreeableness	177 (12)	.983	.031	.031	-.16	.68
Conscientiousness	204 (12)	.982	.033	.038	-.10	.64

Note. d = (mean of t2 – mean of t1) / pooled standard deviation. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual. All mean-level changes and correlations were statistically significant at $p < .001$.

Table 3

Effects of Demographic Variables on the Mean Level (Intercept) and Mean-Level Change (Slope) of Personality Based on Latent Change Models

	Emotional Stability		Extraversion		Openness		Agreeableness		Conscientiousness	
Model Fit										
χ^2 (*df*)	1106 (30)		532 (20)		1654 (30)		531 (28)		1102 (28)	
CFI	.935		.975		.914		.960		.929	
RMSEA	.049		.042		.061		.035		.051	
SRMR	.028		.032		.046		.031		.051	
	b	*p*	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*
Intercept										
Sex	.465	.000	-.259	.000	-.042	.039	-.421	.000	-.079	.000
Age	-.077	.000	-.030	.000	.004	.765	-.004	.755	-.022	.109
Age²	-.005	.104	-		-.008	.015	.017	.000	-.067	.000
Age³	.007	.000	-		-.015	.000	.006	.003	.019	.000
Slope										
Mean	.104	.000	-.134	.000	-.170	.000	-.179	.000	-.155	.000
Sex	.006	.758	-.023	.161	-.004	.802	.000	.998	-.037	.052
Age	.011	.103	-.027	.000	-.014	.029	.029	.049	-.012	.423
Age²	-		-		-		.001	.752	.020	.000
Age³	-		-		-		-.006	.009	-.011	.000

Note. Model parameters were standardized relative to the first measurement (i.e., the mean of the intercept was set to 0 and the variance was set to 1). Models contain age² and age³ only if those were significant at $p < .01$. Values for age are given in 10-year units. Age and sex are centered. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

Table 4

Effects of Specific Events on the Mean Level (Intercept) and Mean-Level Change (Slope) of Personality Based on Latent Change Models

	Emotional Stab.		Extraversion		Openness		Agreeableness		Conscientiousness	
Model fit										
χ^2 (*df*)	1288 (86)		641 (68)		1802 (82)		624 (76)		1360 (80)	
CFI	.934		.976		.917		.961		.930	
RMSEA	.031		.024		.038		.022		.033	
SRMR	.014		.016		.023		.016		.026	
Intercept	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*
Marriage	-.023	.617	.104	.037	.102	.059	.031	.555	.006	.893
Moved in with partner	.040	.417	.179	.000	.100	.044	.048	.347	.050	.311
Divorce	-.094	.249	.039	.633	.075	.350	-.115	.200	-.144	.083
Separation of partner	-.111	.026	.031	.542	.033	.516	-.136	.011	-.046	.330
Death of spouse	-.083	.307	-.031	.688	-.201	.026	-.086	.288	-.021	.818
Leaving parental home	-.136	.067	.048	.497	.064	.374	.042	.592	-.100	.257
Child leaves home	-.040	.290	.057	.097	-.052	.194	.049	.203	-.014	.703
Birth of child	-.015	.714	-.057	.173	-.044	.319	.065	.138	.046	.288
Death of parent	-.011	.791	-.030	.439	-.007	.863	.006	.884	-.019	.602
Unemployment	-.077	.070	.009	.841	.104	.020	.120	.005	.066	.135
Retirement	.027	.577	.022	.620	.106	.037	.058	.243	.052	.287
First job	-.015	.811	.022	.716	.045	.448	.023	.721	-.185	.010
Sex · Marriage	.238	.007	-		-		-		-	
Sex · Leaving parents	.164	.243	-		-		-		-	
Sex · Separation	-		-		-.166	.060	-		-	
Sex · Death of spouse	-		-		-		-		-.097	.593

(continued)

Table 4. *Effects of Specific Events on the Mean Level (Intercept) and Mean-Level Change (Slope) of Personality Based on Latent Change Models (continued)*

	Emotional Stab.		Extraversion		Openness		Agreeableness		Conscientiousness	
Slope	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*
Mean	.101	.000	-.120	.000	-.166	.000	-.178	.000	-.133	.000
Marriage	-.068	.134	-.126	.003	-.168	.001	-.112	.048	-.102	.051
Moved in with partner	-.054	.296	-.099	.026	.089	.063	.042	.448	-.033	.501
Divorce	.035	.634	-.040	.612	.044	.532	.187	.028	.249	.003
Separation of partner	.070	.141	.066	.151	.082	.075	.143	.006	.061	.203
Death of spouse	.018	.844	.007	.925	-.156	.074	.158	.092	.040	.658
Leaving parental home	.089	.244	-.157	.011	-.150	.034	.018	.811	.003	.974
Child leaves home	-.002	.958	-.015	.625	.063	.064	.001	.973	-.014	.715
Birth of child	.023	.537	.005	.896	-.007	.871	-.076	.102	-.130	.003
Death of parent	-.018	.613	-.025	.453	.032	.383	-.011	.784	-.005	.891
Unemployment	.021	.620	.016	.679	-.080	.069	-.048	.306	-.039	.407
Retirement	-.025	.587	-.011	.789	-.017	.717	.001	.976	-.169	.002
First job	.089	.143	-.035	.534	-.035	.520	.058	.417	.194	.007
Sex · Marriage	-.182	.143	-		-		-		-	
Sex · Leaving parents	-.468	.002	-		-		-		-	
Sex · Separation	-		-		.259	.003	-		-	
Sex · Death of spouse	-		-		-		-		.546	.002

Note. Model parameters were standardized relative to the first measurement (i.e., the mean of the intercept was set to 0 and the variance was set to 1). Interaction terms were included only if they had an influence of $p < .01$ on either the intercept or the slope. Intercept and slope were both controlled for sex, age, age², and age³ (age² and age³ were included only if they were part of the demographic latent change model). Age and sex are centered. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

Table 5

Effects of Clustered Events on the Mean Level (Intercept) and Mean-Level Change (Slope) of Personality Based on Latent Change Models

	Emotional Stability		Extraversion		Openness		Agreeableness		Conscientiousness	
Model Fit										
χ^2 (*df*)	1160 (38)		568 (28)		1680 (42)		562 (40)		1179 (36)	
CFI	.935		.975		.917		.961		.929	
RMSEA	.045		.036		.051		.030		.046	
SRMR	.024		.028		.039		.025		.045	
	b	*p*	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*
Intercept										
Positive events	-.013	.559	.060	.005	.052	.023	.044	.053	.005	.802
Negative events	-.066	.003	.011	.606	.034	.144	-.014	.518	-.013	.547
Sex · Positive events	-		-		-		.110	.004	-	
Sex · Negative events	-		-		-.031	.476	-		-	
Slope										
Mean	.101	.000	-.122	.000	-.163	.000	-.188	.000	-.155	.000
Positive events	-.006	.784	-.067	.001	-.040	.064	-.037	.143	-.059	.011
Negative events	.020	.320	.006	.783	.010	.647	.054	.021	.026	.268
Sex · Positive events	-		-		-		-.068	.113	-	
Sex · Negative events	-		-		.124	.003	-		-	

Note. Model parameters were standardized relative to the first measurement (i.e., the mean of the intercept was set to 0 and the variance was set to 1). Interaction terms were included only if they had an influence of $p < .01$ on either the intercept or the slope. Intercept and slope were both controlled for sex, age, age², and age³ (age² and age³ were only included if they were part of the demographic latent change model). Age and sex are centered. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

Table 6

Effects of Demographic Variables on the Rank-Order Stability of Personality across 4 Years Based on Latent Moderated Regression Models

	Emotional Stability		Extraversion		Openness		Agreeableness		Conscientiousness	
Model Fit[a]										
χ^2 (*df*)	993 (24)		557 (24)		1652 (24)		515 (24)		950 (20)	
CFI	.940		.974		.913		.960		.933	
RMSEA	.052		.039		.068		.037		.056	
SRMR	.028		.030		.045		.031		.050	
	b	*p*	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*
Stability										
Mean	.736	.000	.768	.000	.747	.000	.690	.000	.646	.000
Sex	-.050	.006	.018	.306	-.072	.000	.031	.126	.058	.012
Age	.014	.014	-.005	.392	.008	.218	.008	.211	.024	.002
Age²	-.014	.000	-.016	.000	-.014	.000	-.013	.000	-	
Age³	-		-		-		-		-	

Note. Model parameters were standardized with respect to the first and the second measurement (i.e., the variances for both measurements in time were set to 1). Models contain age² and age³ only if those were significant at $p < .01$. Values for age are given in 10-year units. Age and sex are centered. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

[a]Model fit is based on the respective models without latent interactions.

Table 7

Effects of Specific Events on the Rank-Order Stability of Personality across 4 Years Based on Latent Moderated Regression Models

	Emotional Stab.		Extraversion		Openness		Agreeableness		Conscientiousness	
Model Fit[a]										
χ^2 (*df*)	1156 (72)		651 (72)		1791 (72)		613 (72)		1260 (68)	
CFI	.940		.975		.917		.962		.934	
RMSEA	.032		.023		.040		.023		.035	
SRMR	.015		.015		.023		.015		.025	
	b	*p*	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*
Stability										
Mean	.734	.000	.752	.000	.734	.000	.687	.000	.657	.000
Marriage	-.055	.249	.083	.057	.006	.912	-.033	.542	.052	.371
Moved in with partner	-.016	.740	-.054	.301	-.105	.057	-.117	.055	-.035	.528
Divorce	.097	.172	-.105	.231	.042	.638	-.152	.033	-.174	.028
Separation of partner	.038	.405	.012	.801	.098	.048	.088	.084	-.111	.014
Death of spouse	-.088	.379	-.143	.057	-.083	.384	-.247	.001	-.057	.497
Leaving parental home	-.033	.676	.108	.093	.169	.022	.063	.326	-.022	.778
Child leaves home	-.048	.163	.069	.023	.093	.009	.074	.041	-.018	.702
Birth of child	.025	.486	.023	.576	-.051	.243	.035	.418	.035	.459
Death of parent	.053	.112	.048	.154	.009	.835	-.012	.746	-.053	.300
Unemployment	-.078	.061	-.019	.666	-.084	.060	.036	.431	.012	.790
Retirement	.035	.432	.008	.856	.034	.509	-.093	.030	.095	.161
First job	-.152	.017	.014	.832	-.012	.850	-.109	.068	-.092	.103

Note. Model parameters were standardized with respect to the first and the second measurement (i.e., the variances for both measurements in time were set to 1). Controlled for effects of sex, age, age², and age³ (age² and age³ were included only if they

were part of the demographic rank-order model). Age and sex are centered. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

[a]Model fit is based on the respective models without latent interactions.

Table 8

Effects of Clustered Events on the Rank-Order Stability of Personality across 4 Years Based on Latent Moderated Regression Models

	Emotional Stability		Extraversion		Openness		Agreeableness		Conscientiousness	
Model Fit[a]										
χ^2 (*df*)	1050 (32)		589 (32)		1664 (32)		534 (32)		1047 (28)	
CFI	.940		.975		.916		.961		.934	
RMSEA	.046		.034		.059		.033		.050	
SRMR	.024		.026		.039		.026		.043	
	b	*p*	*b*	*p*	*b*	*p*	*b*	*p*	*b*	*p*
Stability										
Mean	.736	.000	.768	.000	.749	.000	.698	.000	.658	.000
Positive events	-.023	.297	.021	.338	-.036	.127	-.038	.117	-.008	.764
Negative events	.011	.581	-.010	.645	.006	.786	-.016	.462	-.058	.019

Note. Model parameters were standardized with respect to the first and the second measurement (i.e., the variances for both measurements in time were set to 1). Controlled for effects of sex, age, age², and age³ (age² and age³ were included only if they were part of the demographic latent moderated regression model). Age and sex are centered. CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residual.

[a]Model fit is based on the respective models without latent interactions.

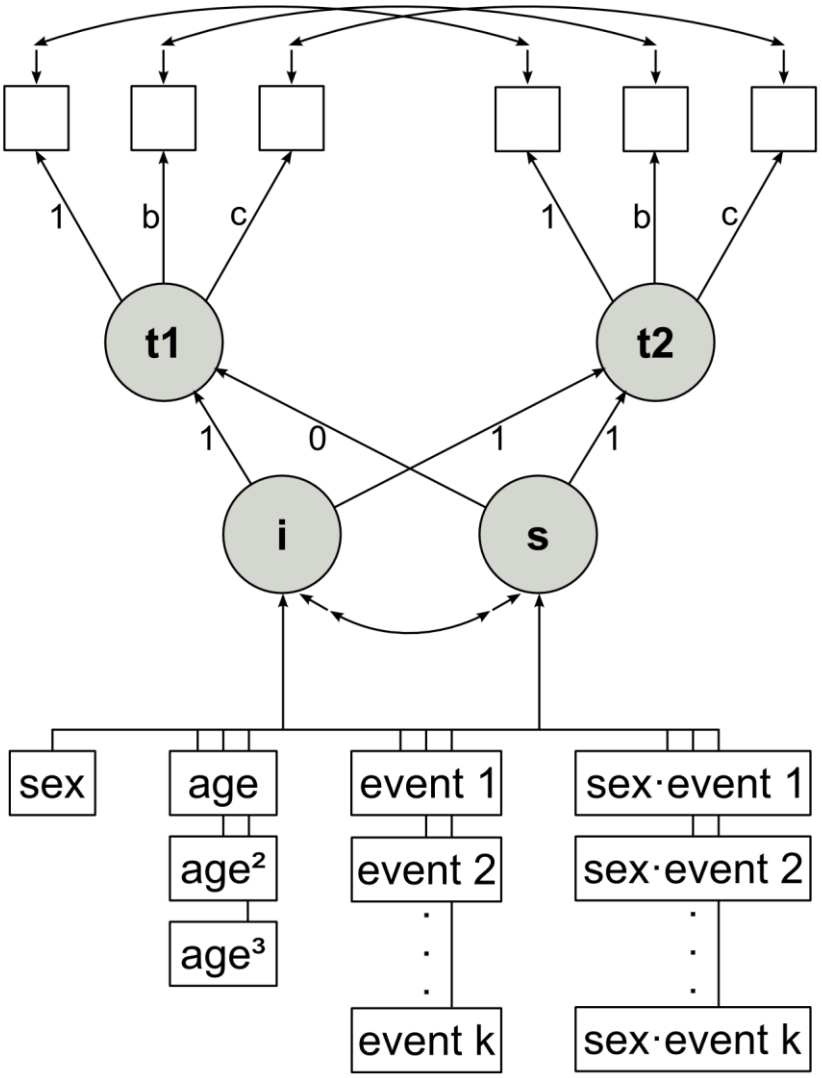

Figure 1. Latent change model that was used for analyzing effects on the mean-level (intercept) and change (slope) for each of the Big Five personality traits. At both time points (t1 and t2), each trait was measured with three items and their residuals were allowed to correlate over time. The latent intercept (i) was fixed to 1 on t1 and t2 and equates to t1. The latent slope (s) was fixed to 0 on t1 and to 1 on t2 and equates to the difference of t2 and t1. Factor loadings (b and c), measurement intercepts, and error variances of the three items were constrained to be equal across time points. First, sex, age, age² and age³ were included as predictors of i and s (for results see Table 3). Afterwards, the effects of single events and clustered events, respectively, and their interactions with sex were included as well (for results see Tables 4 and 5).

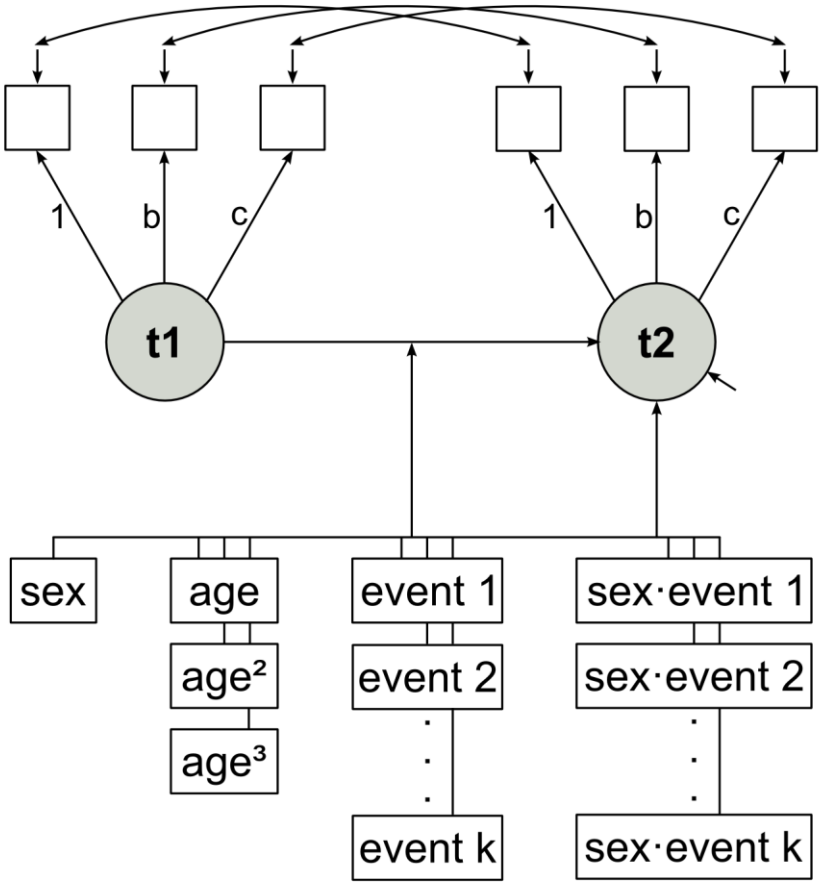

Figure 2. Latent moderated regression model that was used for analyzing effects on the rank-order stability for each of the Big Five personality traits over four years. At both time points (t1 and t2), each trait was measured with three items and their residuals were allowed to correlate over time. Factor loadings (b and c), measurement intercepts, and error variances of the three items were constrained to be equal across time points. Latent stability was assessed as the standardized effect of t1 on t2. To analyze the effects of sex and age on the stability of the Big Five, sex, age, age² and age³ were included as moderators (for results see Table 6). Afterwards, the effects of single events and clustered events, respectively, and their interaction with sex were included as moderators as well (for results see Tables 7 and 8).

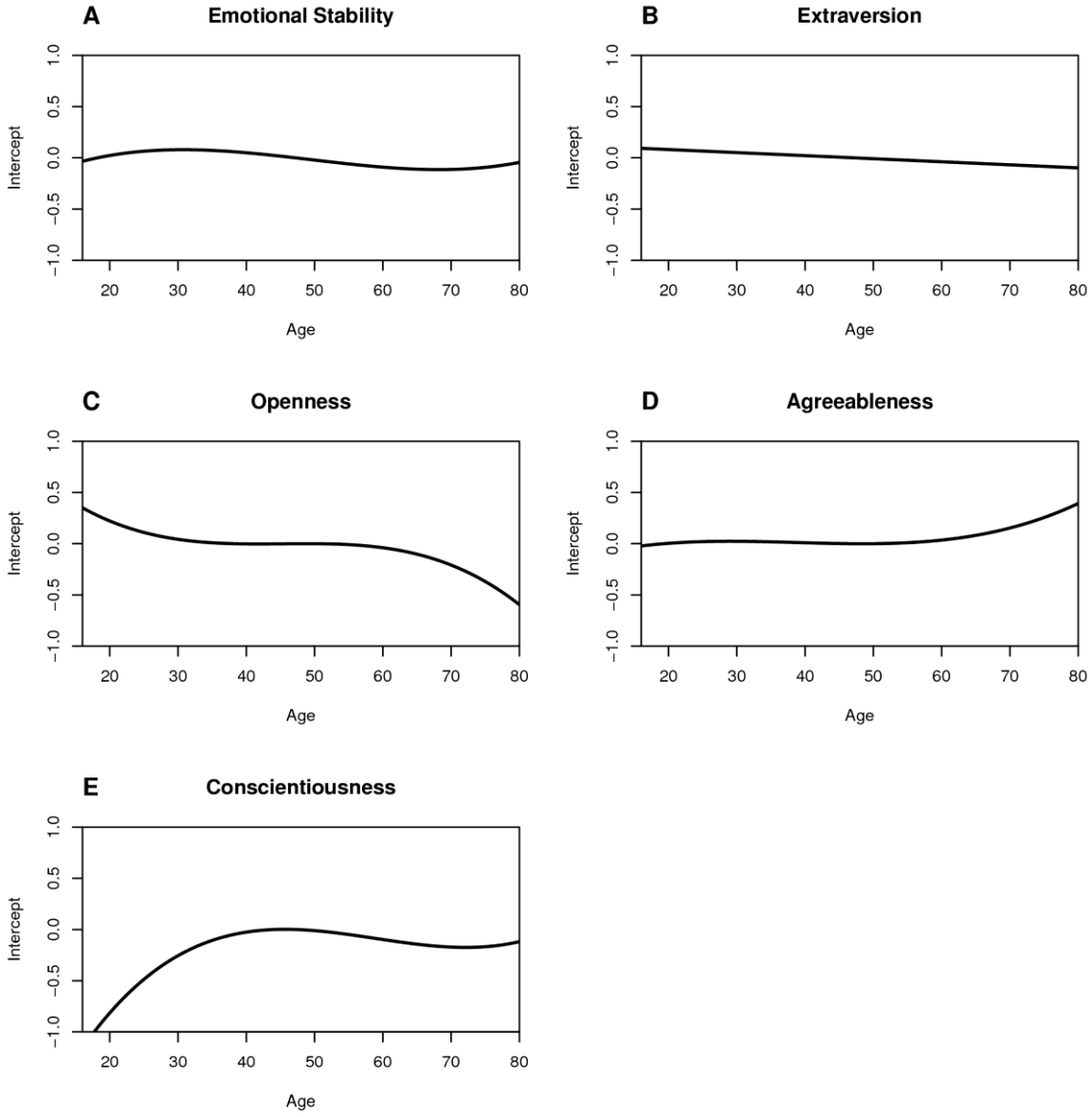

Figure 3. Cross-sectional standardized age differences in the mean-level (intercept) of the latent Big Five personality traits, controlled for sex. Age² and age³ are only included in the models if they had a significant effect on the trait at $p < .01$ (see Figure 1 for further information on the underlying model and Table 3 for the exact values underlying the graphs).

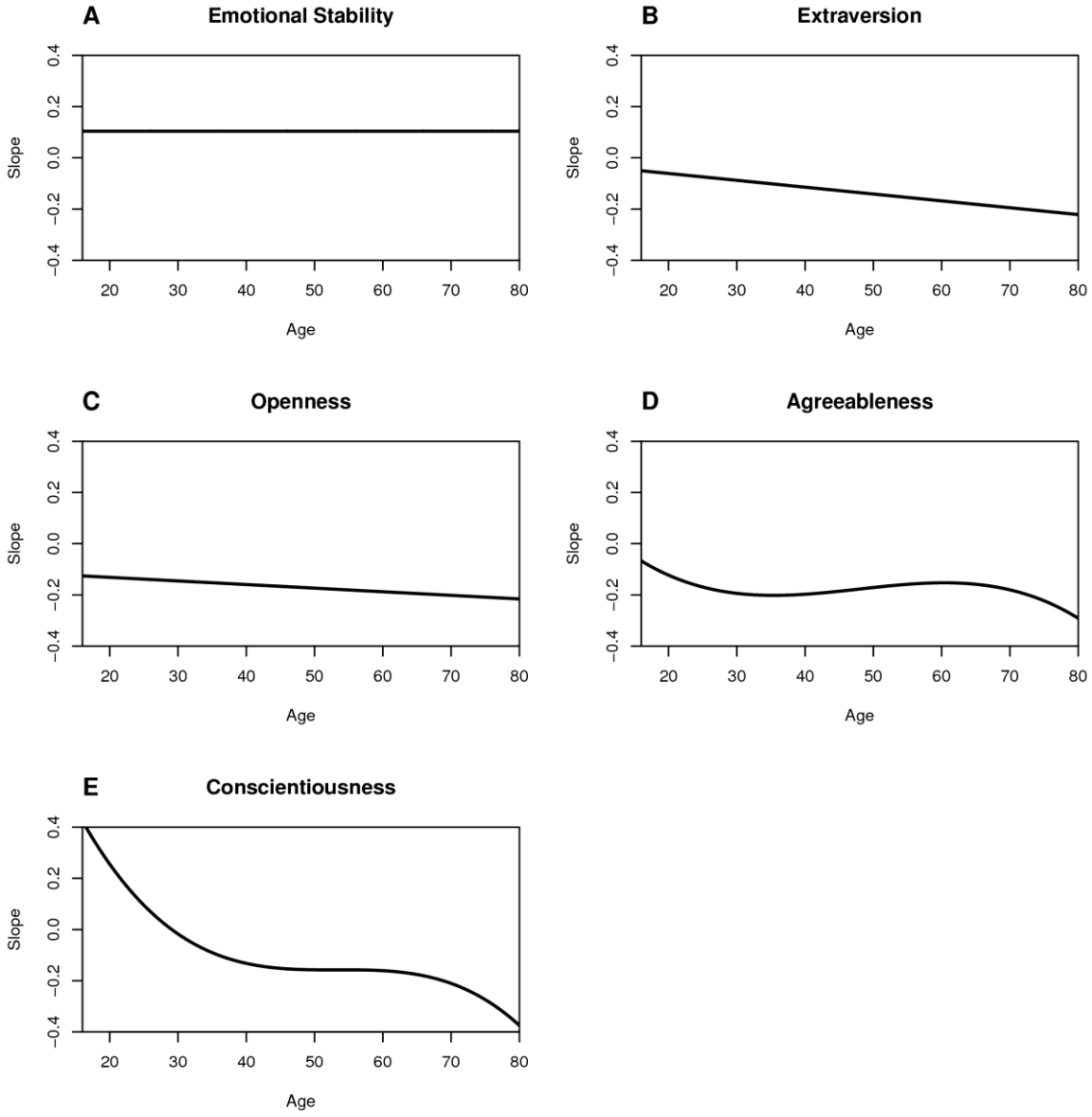

Figure 4. Standardized age differences in the mean-level change (slope) of the latent Big Five personality traits over 4 years, controlled for sex. Positive values indicate mean-level increases from 2005 to 2009, whereas negative values indicate mean-level decreases across the 4 years under investigation. Age was only accounted for in the figure if its influence on the latent slope factor was significant at $p < .05$, age^2 and age^3 are only included in the models if they had a significant effect on the latent slope factor at $p < .01$ (see Figure 1 for further information on the underlying model and Table 3 for the exact values underlying the graphs).

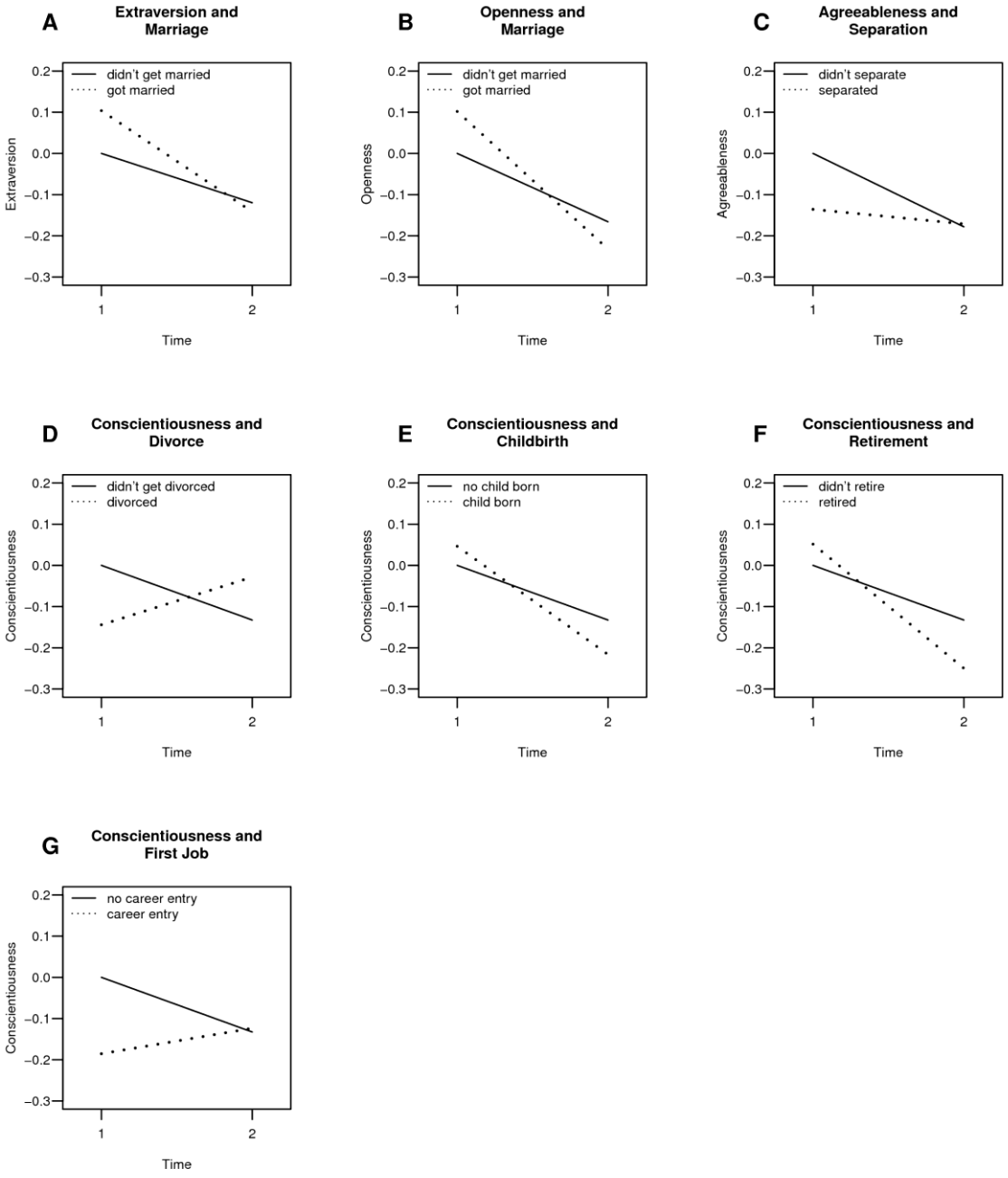

Figure 5. Changes in standardized latent personality traits as a function of experiencing versus not experiencing a specific major life event. Results are controlled for demographic variables (see Figure 1 for further information on the underlying model and Table 4 for the exact values underlying the graphs).

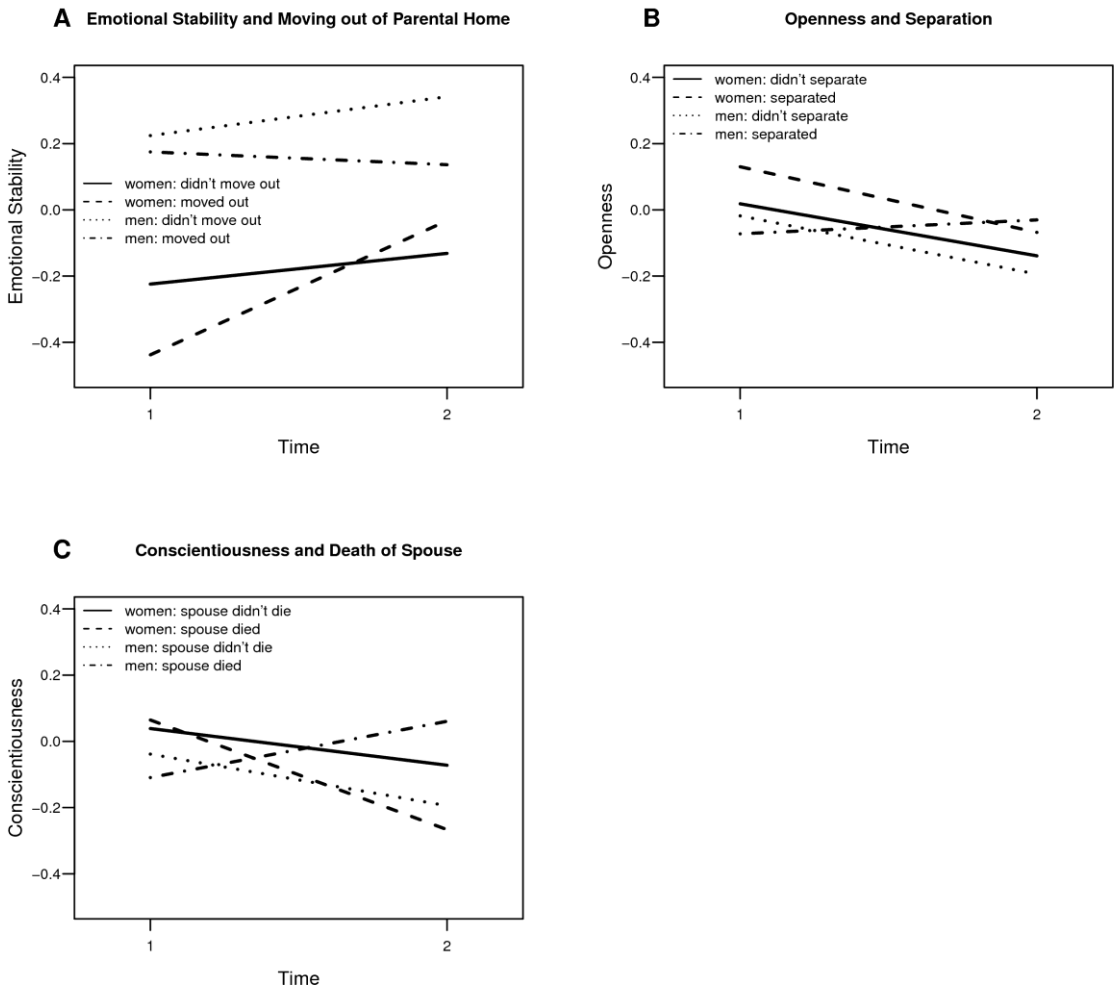

Figure 6. Differences between men and women in their reactions to a specific major life event. Results are controlled for demographic variables (see Figure 1 for further information on the underlying model and Table 4 for the exact values underlying the graphs).

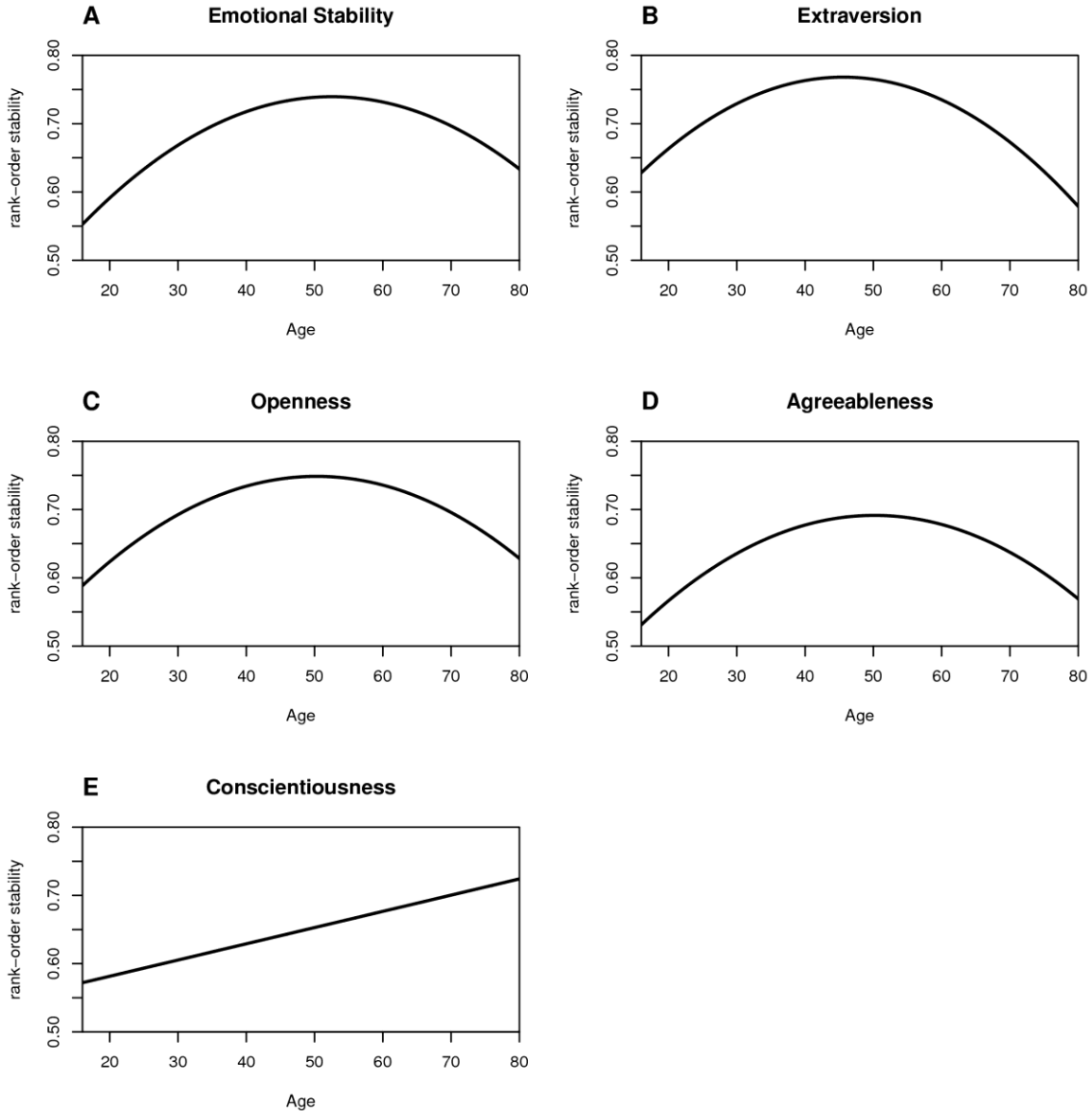

Figure 7. Effects of age on the latent rank-order stability over 4 years for each of the Big Five personality traits (controlled for sex). Age² and age³ were included in the models only if they moderated the rank-order stability significantly at $p < .01$ (see Figure 2 for further information on the underlying model and Table 6 for the exact values underlying the graphs).