**Stability and Change in Personality: Contributions from Long- and Short-Term Approaches**

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## Content



## Appendix

## 0. Summary

Breaking down old barriers, today there is a common consent that personality is marked by both stability and change over time as well as across situations. Provided with this basic understanding, the field of personality psychology has moved from debating whether personality changes at all towards answering more sophisticated questions. That is, recent questions at issue are not whether personality is stable or changes but when, how, and why personality and related constructs change or remain stable over time and across situations.

This dissertation comprises four manuscripts that address a choice of these current questions considering both long-term and short-term approaches to stability and change. The first three manuscripts focus on questions concerning long-term stability and change in personality traits across the life course. My fourth manuscript, on the other hand, attends to issues concerning short-term stability and change in personality states as apparent in the stream of people's daily lives.

Despite the flexible treatment of different aspects and types of personality stability and change, the four studies share one common ground, namely the underlying model of personality. That is, in each of the four studies, personality is considered and assessed in terms of the five-factor model of personality. Thus, beyond their specific contributions to research into personality stability and change, the four studies forming my dissertation also provide some further evidence for the adequacy and usefulness of the Big Five framework to study stability and change in relatively enduring trait-structures as well as in fluctuating state-processes of personality.

My first study (Bleidorn & Ostendorf, 2009) was aimed to examine the psychometric properties of the German version of the Hierarchical Personality Inventory for Children (H*i*PIC, Mervielde & De Fruyt, 1999). The H*i*PIC is a parent-/teacher-report questionnaire that has been explicitly designed to assess the Big Five in children and adolescents. In order to further study its usability as a self-report inventory, we analyzed both parent- and self-reports from children and adolescents aged between 11 and 15 years.

According to the results of our analyses, the German version of the H*i*PIC can be considered a useful self- and parent-report instrument to assess the Big Five with reasonable reliability and structural validity in children and adolescents. Beyond their implications for the H*i*PIC, these results further support the appropriateness of the five-factor model to organize and assess personality in childhood and adolescence. This is an important finding setting the stage for future research aimed at constructing a comprehensive framework of personality development from an all-inclusive life-span perspective.

Turning to adult personality development, the purposes of my second study (Bleidorn, Kandler, Riemann, Angleitner, & Spinath, 2009) were twofold, because we aimed to attain a clearer grasp of both the phenotypic patterns and the etiological sources of stability and change in personality traits. We thus performed phenotypic and biometric growth curve analyses of 10-year stability and change in the five domains and the 30 facets of the Revised NEO Personality Inventory using genetically informative twin data drawn from the Bielefeld Longitudinal Study of Adult Twins (BiLSAT).

As expected on grounds of previous research, our phenotypic growth curve analyses revealed substantial mean-level changes in domain and facet traits suggesting a kind of functional maturation of personality. However, not all facets resembled the change pattern of the domain they define but showed distinct change patterns over the 10-year period. Besides these substantial mean-level changes, we also revealed significant individual differences in change in the majority of domain and facet traits. While there were no significant differences in the change trajectories of men and women, correlations of individual change trajectories with age and initial trait levels suggest that change is less pronounced in older individuals with higher initial trait scores.

Capitalizing on our genetically informative twin design, the second purpose of this study was to examine the genetic and environmental sources of stability and change in personality traits by extending the phenotypic models to biometric growth curve models. According to these models, stability and change in nearly all domain and facet scales were influenced by both genetic and nonshared environmental factors. Moreover, we revealed noticeable differences in the magnitude of genetic and environmental effects on change among domain and facet traits.

In sum, the phenotypic and biometric findings of my second study suggest that the patterns and sources of personality stability and change are more complex than originally assumed on the basis of earlier research. In fact, change is not simply a function of the environment as well as stability is not just the product of genetic processes. Depending on the specific domain or facet trait, stability and change are more or less mediated by both genetic and environmental processes.

Emphasizing that there is more to personality than traits, my third study (Bleidorn, Kandler, Hülsheger, Riemann, Angleitner, & Spinath, in press) focused on the developmental interplay between personality traits and major life goals. Specifically, we examined the genetic and environmental influences on the associations between the Big Five and major life goals in order to provide a critical evaluation of conflicting assumptions on the links between traits and motivational constructs stated in two modern personality theories, namely the five-factor theory (McCrae & Costa, 2008) and the neo-socioanalytic theory (Roberts & Wood, 2006). Phenotypic and biometric analyses were performed using twin data drawn from the third and fourth assessment waves of the

BiLSAT which were approximately five years apart. Thus, we were able to examine the genetic and environmental sources of the interplay between traits and goals both cross-sectionally and over time. The results of our univariate and multivariate biometric analyses provided partial support for assumptions of both of the two seemingly conflicting personality theories. Hence, we suggest integrating our findings in order to adopt a readjusted draft of the structural links between traits and goals.

Switching from long-term to short-term perspectives, my fourth study (Bleidorn, 2009) focused on the within-person changes and between-person differences in personality states. Specifically, I examined the interplay between Big Five personality states, current social role contexts, and major life goals as it unfolds in the stream of people's daily lives. In order to capture the dynamic within-person changes in personality states, I carried out a computer-assisted experience-sampling study in which participants rated their behavior six times per day over a period of 10 days using bipolar adjectives that are usually employed to assess the Big Five as traits. Each time, participants also rated the degree to which different roles predominated their current situational setting.

Multivariate multilevel analyses revealed that at least half of the total variance in Big Five personality states was the result of variation within persons supporting the state quality of the five broad dimensions. Furthermore, the internal consistencies at both the within-person level and the between-person level suggested that the adjective-based state measure proved to be a reliable instrument to discriminate among both occasions and persons.

The large within-person variability in personality states was significantly related to within-person changes in two social role contexts suggesting that social roles are reasonable predictors of within-person changes in personality states. Results further suggest that these within-person effects cannot be considered to be universal but differed substantially among participants. Thus, in line with interactional positions these findings emphasize that how an individual will act is not only a function of the context but also of the person and the unique way the person responds to the perceived contextual demands.

The final question addressed in my experience-sampling study concerned the dispositional elements of the personality system that may help explain the revealed between-person differences in both average levels of personality states and within-person links between states and roles. Emphasizing the agentic and proactive nature of human beings, individuals' major life goals turned out to be significant predictors of the between-person differences in average levels of the Big Five states. However, they did not effectively help to account for the between-person differences in the within-person links between personality states and the two considered role contexts.

Considering the results of the four studies in their entirety, some broader implications can be derived in order to proceed with future research into the patterns, sources, and processes of personality development. In particular, the findings as a whole argue for an integration of long- and short-term approaches to personality stability and change. Adopting an all-inclusive life-span perspective, this merger promises to provide new insights into so far relatively uncharted issues of the effective within-person processes underlying personality development.

"*Every personality develops continually from the stage of infancy until death, and throughout this span it persists even though it changes*" [italics in original] (Allport, 1937, p. 102).

## 1. Introduction

Not only Allport (1937) but also the grand theories by Lewin (1935) and Murray (1938) emphasized the enduring but also dynamic nature of personality. Nonetheless, the question about the degree of consistency and changeability of personality has generated much controversy culminating in one of the big debates that have bothered personality psychology during the second part of the last century. Popularly known as the person-situation debate, the discussion about the degree to which personality is consistent vs. variable across situations had its blooming in the 1960s and 70s (e.g., Mischel, 1968), followed by an increasing and still ongoing rapprochement thereafter (e.g., Kenrick & Funder, 1988; Mischel & Shoda, 1995; Fleeson & Noftle, 2009).

However, on the way to the reconciliation party, an offshoot of this controversy has been renewed in the context of personality development focusing on the issue whether and when personality is stable vs. changeable across the life course (e.g., Roberts & Caspi, 2001; Roberts & Pomerantz, 2004). The classical trait perspective, on the one hand, has argued that personality traits are biologically based "temperaments" which are not susceptible to the influence of the environment and thus do not change over time (e.g., McCrae et al. 2000). The radical contextual perspective, on the other hand, has stated that personality is fluid and changeable, especially during developmental periods characterized by rapid physical, cognitive, and social changes (e.g., Lewis 2001).

Findings of more recent research do not support either of these positions but show that personality is characterized by both stability and change. Existing longitudinal studies and several meta-analyses indicate that, despite its relatively stable nature, personality continues to change in adulthood and often into old age (for reviews, see Roberts & Mroczek, 2008; Roberts, Wood, & Caspi, 2008). Agreeing that there is both stability and change, over time and across situations, most personality researchers consider personality as a relatively stable framework that still provides room for sizeable changes (Fleeson & Noftle, 2009).

Re-equipped with this understanding, the field has moved from debating whether personality changes (or not) towards answering more sophisticated questions. That is, recent questions at issue are when, how, and why personality and related constructs change or remain stable over time and across situations (Roberts et al., 2008).

Before I will outline the specific questions that I have addressed in the four manuscripts constituting my dissertation, I will briefly sketch what is meant by the broad conceptions of stability and change in the context of personality research.

## 2. Personality stability and change as multifaceted conceptions

It is well-established that personality stability and change should not be oversimplified but rather considered as sets of conceptions comprising different types of stability and change that are associated with specific statistical techniques for estimation (Nesselroade & Boker, 1994; Roberts et al., 2008). A basic classification has been already emphasized by Cattell (1966) who has generally distinguished between trait change and state fluctuation. Though this dichotomy is not considered to be comprehensive, the trait-state distinction is a useful scheme for organizing central issues and concepts related to the topics of stability and change in personality research (e.g., Fleeson, 2007; Nesselroade & Boker, 1994). Short-term processes of intraindividual constancy and change are usually studied in terms of personality states. Research into stability and change of relatively enduring interindividual differences dimensions, on the other hand, is usually subsumed under the label of personality trait development.

Researchers interested in the latter, the long-term development of traits, further differentiate among at least five different types of stability and change either applying to the population level or to the individual level (Roberts & Caspi, 2001; Roberts et al., 2008; Robins, Fraley, Roberts, & Trzesniewski, 2001). At the population level, differential or rank-order change describes the degree to which relative differences among individuals remain stable over time. Normative or mean-level change refers to the extent to which the amount of personality trait scores changes over time. Finally, structural change refers to the invariance of correlational patterns among traits over time. Focusing on the individual level, ipsative change describes changes in the relative ordering of traits within an individual over time, whereas individual-level change refers to each person's individual pattern of increasing, decreasing, or not changing on any given trait (Roberts et al., 2008).

These different types of change can be independent of one another both over time and situations. Thus, one important insight emerging from the findings of more recent longitudinal research is that conclusions about personality stability and change largely depend on the specific type of change (or stability) that is assessed. For instance, it is quite possible for a population to demonstrate high rank-order stability but also substantial mean-level changes in certain personality traits (Roberts et al., 2008). In point of fact, the picture drawn from the existing empirical data suggests that personality trait development in adulthood can be roughly characterized by substantial structural stability (e.g., Robins et al., 2001), moderate to large levels of rank-order stability (Roberts & DelVecchio, 2000),

slight but significant mean-level changes (Roberts, Walton, & Viechtbauer, 2006), moderate levels of ipsative stability (e.g., Robins et al., 2001), and significant individual differences in change (e.g., Neyer & Lehnart, 2007; Robins et al., 2001).

As indicated by these findings, conceiving stability and change as multifaceted conceptions opens the door for more specified questions about personality stability and change from both long- and short-term perspectives. Consequently, the field has started to move from asking whether there is consistency vs. change towards its original aims of describing, explaining, and predicting stability and change in personality from childhood to old age, across time, and across situations. In fact, current research into long- and short-term stability and change in personality at both the population level and the individual level mainly centers around three broad issues, namely (1) the degree and patterns of stability and change, (2) the sources of stability and change, and finally, (3) the underlying processes of stability and change.

Though researchers interested in long-term and short-term stability and change are generally involved with the same superordinate questions, there are yet some notable differences regarding the relative weighting and the core themes of the specific questions addressed in the two fields. From a long-term perspective on life-span development, topical questions are (1) how personality traits and related constructs develop from early childhood into old ages in terms of average change patterns, between-person differences, and within-person differences, (2) to what degree genetic and environmental factors affect stability and change, and finally (3) which mechanisms and processes bring about stability and change in different periods of life (Roberts et al., 2008).

From a short-term perspective on personality states, current issues primarily center around (1) the average degree of and the between-person differences in within-person changes in personality states, (2) the identification of contextual and person-related predictors of within-person changes in personality states, and finally, (3) the search for rather enduring dispositional variables accounting for between-person differences in the degree and contingencies of within-person changes in personality states (Fleeson, 2007; Fleeson & Jolley, 2006).

Answering most of the above-mentioned questions about stability and change requires, at the very least, the analysis of multiple-assessments data, collected either in a multi-year longitudinal study or in a daily experience-sampling study. It should be noted, however, that analyzing such data has been quite difficult for a long time due to a lack of suitable statistical methods (Mroczek, Almeida, Spiro, & Pafford, 2006). In recent years, resulting from innovations in statistical techniques and progress in computing, there has been an enormous increase in analytic methods capable of addressing these particular questions (e.g., Bryk & Raudenbush, 1992; Meredith & Tisak, 1990). Most of these

statistical techniques can be grouped within the two broad frameworks of multilevel modeling (MLM) and structural equation modeling (SEM). Although both the MLM and the SEM approach can be flexibly employed to analyze multiple-assessments data, they are yet differentially suited for different applications. The SEM approach is particularly suited for flexibly modeling long-term changes in personality traits assessed in large samples at two or multiple equidistant points in time. The study of intraindividual stability and change in personality states, on the other hand, requires intensive repeated assessments data which is usually gathered from relatively small samples in experience-sampling studies (e.g., Fleeson, 2001; 2007). This kind of data is best modeled by using MLM techniques permitting a flexible handling of missing data and unequal spacing between measurement occasions.

This dissertation comprises four manuscripts in which I utilized these newer but also established statistical approaches in order to examine theoretically founded hypotheses pertaining to a choice of the above-mentioned questions which are dominating research into long- and short-term stability and change in personality. The first three manuscripts address four broad questions concerning the long-term stability and change in personality traits across the life course: (1) How should we construe and assess the personality structure in childhood? (2) How can we plot the course of adult personality development in terms of mean-level and individual-level change? (3) How do genetic and environmental influences affect stability and change of adult personality traits? And finally, (4) how should we construe the developmental interplay between adult personality traits and related constructs of the personality system, such as major life goals?

My fourth manuscript, on the other hand, focuses on short-term stability and change in personality states as apparent in the stream of people's daily lives. Three broad questions guided this research: (1) How should we construe and assess the structure of personality states at the within- and the between-person level? (2) How are contextual variables related to within-person changes in personality states? And finally, (3) how are dispositional personality variables related to between-person differences in both average personality states and within-person links between contextual variables and personality states?

In order to address this wide scope of questions appropriately, I focused on different types of change, studied different samples, used different kinds of research designs, and employed a number of different analytic techniques within the four studies at hand. Despite this flexible treatment of different aspects of personality stability and change, the four studies are all based on the same underlying structure model of personality. That is, in each of the four studies, personality is considered and assessed in terms of the five-factor model of personality that postulates five broad

domains also known as the Big Five: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness (Goldberg, 1993; John, Naumann, & Soto, 2008). Thus, beyond their specific contributions to research into personality stability and change, the present studies also provide some further evidence for the adequacy and usefulness of the Big Five framework to study stability and change in relatively enduring trait-structures as well as in fluctuating state-processes of personality in a systematic way, guided by model-driven hypotheses (John et al., 2008).

In the following sections, I will outline the questions addressed, the hypotheses examined, and the findings revealed within the four studies constituting my dissertation against the background of the existing literature. Thereby, I will first focus on long-term stability and change in personality traits and secondly, on short-term stability and change in personality states. Finally, I will try to integrate the findings of my long- and short-term research in order to derive broader implications for future research into the patterns, sources, and processes of personality development across the life course.

## 3. Contributions to long-term stability and change in personality traits

### 3.1 Organizing and assessing personality in childhood and adolescence

Historically, individual differences in childhood and adulthood have been studied within different research traditions, the first focusing on temperament traits, the latter focusing on personality traits. Temperament traits have been usually considered as emotionally anchored consistencies in behavior that have a strong genetic basis and are mainly relevant in the early childhood years. Research on adults, on the other hand, has mainly focused on personality traits assumed to cover a broader range of individual differences in thoughts, feelings, and behavior (Caspi, Roberts, & Shiner, 2005; Shiner & Caspi, 2003).

Whereas adult personality researchers have moved toward increasing consensus that personality traits can be well organized within the taxonomic framework of the Big Five, developmental research into temperament traits has not been integrated into a coherent taxonomic framework (John et al., 2008). For a long time, this bifurcation and the lack of a common framework have precluded a proper exploration of the patterns and processes through which early temperament differences become elaborated into the adult personality structure (Shiner & Caspi, 2003). However, findings of more recent studies (for reviews, see Caspi et al., 2005; Shiner & Caspi, 2003) have revealed a lot of similarities between temperament and personality traits leading to the conclusion that "temperament and personality traits increasingly appear to be more alike than different" (Caspi et al., 2005, p. 454).

Since the boundaries between childhood and adult personality research have blurred, a number of studies on data from parent-, teacher-, peer-, and self-ratings have shown that the Big Five model may also provide a good approximation of the childhood personality structure (e.g., Asendorpf & van Aken, 2003; De Fruyt, Mervielde, Hoekstra, & Rolland, 2000; Soto, John, Gosling, & Potter, 2008). The possibility of adopting a common Big Five framework for childhood and adult personality has important implications for research into life span development of personality. Of prime importance, the extension of the Big Five model into childhood and adolescence facilitates comparisons across developmental periods and allows for a systematic investigation of the links between childhood and adulthood personality structure (John et al., 2008).

Although there is accumulating evidence for the usefulness of the Big Five model to capture children's and adolescents' personalities appropriately, there is still a scarceness of measurement instruments designed to assess the five broad domains and their defining facets in these age groups (Mervielde & De Fruyt, 2002; Shiner & Caspi, 2003). Whereas some studies have employed Big Five measures that were initially developed for adults to describe individual differences in younger age groups (e.g., Soto et al., 2008), others (e.g., Asendorpf & van Aken, 2003) have reorganized the items of childhood inventories initially developed to operationalize other personality models than the five-factor model. However, it can be argued that the adapted measures resulting from both of these approaches are not well-suited for a fine-grained assessment of childhood personality. The first approach is not capable to capture the specifics of personality expressions during childhood (Shiner & Caspi, 2003), whereas the latter does strongly depend on the theoretical foundation of the original scales (Mervielde & De Fruyt, 2002).

An alternative approach has been pursued by Mervielde and De Fruyt (1999) who aimed to construct an age-appropriate Big Five inventory that is sensitive to the specific personality differences observable in childhood and adolescence. For this purpose, the authors have adopted the lexical approach to personality description to construct a comprehensive child and adolescent personality taxonomy by classification of more than 9.000 parental free personality descriptions of Flemish children aged between 6 and 13 years (Kohnstamm, Halverson, Mervielde, & Havill, 1998). Based on this framework, the Hierarchical Personality Inventory for Children (H*i*PIC, Mervielde & De Fruyt, 1999) has been constructed, a parent-/teacher-report questionnaire representing the content of the parental descriptions in short sentence items. The H*i*PIC spans five broad domains that can be further grouped into 18 facet scales. The five broad domains, labeled Emotional Stability, Extraversion, Imagination, Benevolence, and Conscientiousness, closely mirror the five domains in the adult Big Five model, though there are also some notable differences emphasizing the child-specific character of the instrument (De Fruyt et al., 2000; Mervielde & De Fruyt, 2002). The H*i*PIC factor Benevolence,

for instance, refers to a broader set of subdomains than its adult counterpart Agreeableness. In particular, this factor also contains aspects of the "easy– difficult" child concept described in the temperament literature (Thomas & Chess, 1977).

The H*i*PIC has been employed in a number of studies with clinical and non-clinical samples supporting the structural validity of the inventory (e.g., De Clercq, De Fruyt, Van Leeuwen, & Mervielde, 2006; De Fruyt et al., 2000; Van Leeuwen, Mervielde, De Clercq, & De Fruyt, 2007). Making use of the French (Rossier, Quartier, Enescu, & Iselin, 2007) and the Italian (Di Blas, Serafino, & De Fruyt, 2005) versions of the inventory, there are also studies providing first evidence for the cross-language replicability of the H*i*PIC factor structure. Furthermore, though the questionnaire has been originally developed as a parent- or teacher-report instrument, De Fruyt and colleagues (2000) have shown that the H*i*PIC can also be employed to gather self-reports of children and adolescents aged between 12 and 17 years. To sum up, given its specific construction and focus on childhood and adolescent personality, the H*i*PIC can be considered as a comprehensive personality inventory assessing individual differences in children and adolescents in terms of the Big Five (Mervielde & De Fruyt, 2002).

Regarding the particular lack of German Big Five inventories for children and adolescents, the first study presented in my dissertation (Bleidorn & Ostendorf, 2009) was aimed to examine the psychometric properties of the German self- and parent-report versions of the H*i*PIC in a sample of 223 children and adolescents aged between 11 and 15 years. That is, in this study not only the parents but also the children themselves completed a German translation of this questionnaire to further study its usability as a self-report measure. Furthermore, we also examined the replicability of the factorial structure across judges, languages, and sexes.

According to our analyses of the psychometric properties of the German H*i*PIC, the five domain scales and, with a few exceptions, also the 18 facet scales of both the parent- and the self-report versions showed quite satisfactory reliabilities. In line with previous Big Five research on samples of adolescents and adults (e.g., Costa, Terracciano, & McCrae, 2001), boys and girls showed significant differences in their average trait levels suggesting that girls score higher on Conscientiousness, Benevolence, and Neuroticism. Furthermore, the convergent correlation coefficients between self- and parent-report ratings on the five domain scales as well as on the 18 facet scales were reasonably high supporting the usefulness of the H*i*PIC as a self-report inventory, at least in later childhood and adolescence.

Using both exploratory and confirmatory factor analyses, we could adequately replicate the five-factor structure of the H*i*PIC on data from both parent- and self-reports. The revealed factor-

structure proved also to be largely invariant across the subsamples of boys and girls. Furthermore, we found the German structure matrices of both self- and parent-reports to show high congruence with the structure matrices obtained from the Flemish, the Italian, and the French parent-report versions of the H*i*PIC.

Altogether, our findings suggest that the German H*i*PIC is a valuable instrument to assess the Big Five with reasonable reliability and structural validity in children and adolescents, not only via parent-reports, but also via self-reports. This is especially important, because "youths' self-reports provide a unique and valuable window into psychological development during late childhood and adolescence" (Soto et al., 2008, p. 734) that can notably enrich potentially biased descriptions by parents or teachers.

Our results also provide some interesting insights into the structure of personality in childhood and adolescence that bring up new questions that should be addressed in future studies: The finding that children, as young as age 11, can provide reliable and valid self-reports on their personalities by using the H*i*PIC raises the question of whether even younger children can provide valid self-reports on personality questionnaires. There is one previous study which has shown that even children aged between five and seven years were able to provide reliable and valid Big Five self-reports when these were gathered by using an age-appropriate puppet-interview procedure (Measelle, John, Ablow, Cowan, & Cowan, 2005). With respect to the relatively complex and time-consuming implementation of those interview techniques, continued efforts would be desirable to examine the reliability and validity of verbal and non-verbal Big Five questionnaires that are easy to comprehend but also easy and economically to apply in younger populations (Soto et al., 2008).

Another interesting application for the H*i*PIC concerns longitudinal research. Employing the H*i*PIC in longitudinal studies covering childhood, youth, and early adult years would help to examine when and how early-emerging individual differences in childhood become elaborated into the familiar Big Five personality trait structure (Shiner & Caspi, 2003). This is particularly important as the construction of a coherent theoretical framework for the development of personality from childhood to adulthood into old age requires a detailed examination of the specific processes by which personality traits emerge in the first place (Roberts et al., 2008).

Additionally, the important question of how and when the basic structure of personality traits changes over the course of childhood and adolescence is still unresolved. Though there are some initial results indicating that the periods of late childhood and adolescence are marked by important developmental increases in both the within-domain coherence and the between-domain

differentiation of personality traits (e.g., Soto et al., 2008), further research is necessary to pinpoint the precise timing and to clarify the relevant mechanisms underlying these changes.

Finally, given our finding that both parent- and self-reports on children's personalities show some structural validity, future studies should further examine the external validity of the German H*i*PIC. That is, future studies should employ the parent- and self-report versions of the H*i*PIC to examine and compare their predictive power with regard to relevant criteria, such as academic achievements, social outcomes, or mental health (e.g., Van Leeuwen et al., 2007).

### 3.2 Plotting the patterns of personality stability and change in adulthood

Starting with the issue of how personality traits change with age, the remaining research questions that I have addressed in my dissertation focus on stability and change of personality in adulthood. Referring to the different types of change, the question of how personality changes can be further decomposed into more specific questions (Roberts et al., 2008). In recent years, particularly the research on mean-level change and, to a somewhat lesser degree, also on individual-level change has prospered noticeably (for a review, see Roberts & Mroczek, 2008). This has been certainly due to the fact that these two types of change do most directly reflect increases or decreases in traits at both the population level and at the individual level. Additionally, the increased number of studies focusing on these types of change can be also attributed to the increased availability of statistical techniques suited to model these types of change appropriately (Mroczek et al., 2006).

Changes in mean levels of personality traits have thoroughly been examined in a meta-analysis (Roberts et al., 2006). Converging with results of cross-sectional studies (e.g., McCrae et al., 1999), findings suggest that men in the same way as women tend to increase in Agreeableness, Conscientiousness, Emotional Stability, and Social Dominance (a subdomain of Extraversion) over the life course. These substantial gains in social desirable domains have been interpreted in terms of a functional maturation of personality that might serve to facilitate functioning in the social environment (Roberts et al., 2006; Roberts et al., 2008). With respect to Openness and Social Vitality (a second subdomain of Extraversion), mean levels tend to increase in adolescence but show moderate decreases in later adulthood.

It should be noted that findings on mean-level change largely conceal individual differences in stability and change representing the changes in personality traits that deviate from the population mean-level pattern of change (Mroczek et al., 2006; Roberts & Mroczek, 2008). Though the concept of individual differences in change has always played an important role in life-span developmental theory (Baltes & Nesselroade, 1973), it has long been overlooked by personality psychologists

(Roberts et al., 2008). This has changed since most researchers interested in personality development have acknowledged that a comprehensive understanding of personality development also requires a thorough examination of individual differences in stability and change. Consequently, the number of studies on individual-level change in personality traits has notably increased over the past 10 years (e.g., Helson, Jones, & Kwan, 2002; Mroczek & Spiro, 2003; Neyer & Lehnart, 2007). These studies have shown that there are indeed significant individual differences in personality trait change across young adulthood, middle, and old age indicating that personality change itself can be considered as a reliable individual differences variable (for a review, see Roberts & Mroczek, 2008).

My second study (Bleidorn, Kandler, Riemann, Angleitner, & Spinath, 2009) was aimed to make a further contribution to our understanding of mean-level and individual-level change in personality traits by focusing not only on broad personality dimensions but also on more specific primary traits. In particular, we examined 10-year stability and change in the five domains and the 30 facets of the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) assessed at three equidistant measurement occasions in a sample of 126 monozygotic (MZ) and 61 dizygotic (DZ) twin pairs drawn from the Bielefeld Longitudinal Study of Adult Twins (BiLSAT; e.g., Spinath, Angleitner, Borkenau, Riemann, & Wolf, 2002).

After a first inspection of the rank-order stabilities, we capitalized on our three-wave design and ran a series of latent growth curve analyses (e.g., Duncan, Duncan, Strycker, Li, & Alpert, 1999) for each of the five domain scales and the 30 facet scales of the NEO-PI-R. An important advantage of this SEM-based growth curve approach is the opportunity to model stability and change as latent variables, referred to as level and slope, while controlling for random error that accrues at each measurement occasion. In latent growth curve models, the parameters of mean- and individual-level stability and change are estimated simultaneously. More specifically, the means of level and slope represent average stability and change, respectively. The variances of level and slope, on the other hand, indicate the amount of individual differences in stability and change, respectively.

In line with previous findings (e.g., Roberts & DelVecchio, 2000), we found the size of rank-order stabilities for domain and facet scales to be medium to large within the windows of five to 10 years. Also confirming prior research (e.g., Roberts et al., 2006), mean-level changes in the five domains reflected a kind of functional maturation of personality; although not all facets resembled the change pattern of the domain they define. For instance, we found distinct trends for the Extraversion facets supporting the distinct trends for Social Dominance and Social Vitality revealed in the meta-analysis by Roberts and colleagues (2006). That is, facets indicating Social Vitality tended to decrease, whereas facets indicating Social Dominance tended to increase.

Inspecting the variances of the slopes, we found significant individual differences in change for the majority of the NEO-PI-R domain and facet scales. We considered potential associations of individual change trajectories with sex, age, and initial level of trait. Echoing earlier results (Roberts et al., 2006), there was no evidence for differences in change trajectories of men and women. Age, on the other hand, was significantly related to change in several traits indicating that change is less pronounced in older compared to younger individuals. Furthermore, there were a number of significant associations between initial trait levels and subsequent change. The directions of most of these correlations suggest that individuals with higher initial scores changed less.

In sum, the results of our latent growth curve analyses provide some interesting insights into the structure and development of adult personality traits. Some particularly interesting conclusions concerning the structure of personality can be derived from our findings on stability and change in the facet traits. Specifically, mean-level changes in facets suggest that there is certain heterogeneity in the developmental paths even among the facets defining one and the same domain. This emphasizes a view of the Big Five as complex psychological structures comprising discrete facets with distinct developmental paths. It thus seems fair to believe that the facets do not only serve to refine information provided by the broad domains but rather do themselves provide specific levels of description (e.g., McCrae & Costa, 2008).

The findings on substantial mean-level increases in social desirable traits induce the question why people become more mature with age. What causes the normative changes in personality traits that characterize the developmental trajectories of most people during adulthood? The substantial individual differences in change, on the other hand, motivate the question why some people deviate from the normative change patterns of the population. What causes individual differences in the timing, degree, or even in the direction of personality trait change? As pointed out by our findings, plotting the course of personality development can be considered as a valuable groundwork that paves the way for a new generation of research aimed at identifying the sources and mechanisms of stability and change of personality traits over the adult years.

### 3.3 Identifying the sources of personality stability and change in adulthood

Referring to modern theories of personality (e.g., McCrae & Costa, 2008; Roberts & Wood, 2006), genes, environmental experiences, and other individual differences characteristics, such as life goals or cognitive ability, can be considered more or less promising candidates to explain stability and change in personality traits. Among the most prominent personality theories today ranks the five-factor theory of personality (McCrae & Costa, 2008). This conception defines personality traits as relatively stable, genetically controlled basic tendencies for which the environment merely

constitutes the setting for expressions. Consequently, both stability and systematic change in personality traits should be primarily controlled by genetically based processes.

A different picture of the sources underlying personality development has been sketched out by transactional conceptions drawing on socioanalytic theory (e.g., Roberts & Wood, 2006). These conceptions emphasize the dynamic transactions between personality and environmental factors across the life span. Hence, both stability and change in personality are assumed to result from ongoing transactions between genetic and environmental influences.

There is empirical support for both of these conflicting theoretical conceptions (for reviews, see McCrae & Costa, 2008; Roberts & Wood, 2006). However, genetically informative longitudinal studies are necessary in order to provide a more critical test of the conflicting assumptions about the sources of personality development stated in the two contrasting theories described above.

So far, there are only a few behavior genetic studies that have explicitly addressed personality stability and change over the life span. The majority of these studies have led to the conclusion that genetic factors generally maintain stability, whereas change seems to be rather environmentally mediated (e.g., McGue, Bacon, & Lykken, 1993; Pedersen & Reynolds, 1998). More recent studies have shown that this simple formula might be too narrowly considered, because there can be periods in life in which genes also act to influence change while environmental factors contribute to stability (Blonigen, Carlson, Hicks, Krueger, & Iacono, 2008; Johnson, McGue, & Krueger, 2005).

However, all of these conclusions mainly result from findings on the degree to which genetic and environmental effects on a given personality trait overlap at different points in time. In this regard, it should be noted that the factors influencing personality traits at one or at multiple points in time are not necessarily the factors that influence the patterns of stability and change in personality over time (Krueger, Johnson, & Kling, 2006). That is, as valuable as the findings of these studies are, they do not address the genetic and environmental sources of stability and change directly. A further difficulty common to previous behavior genetic studies on personality stability and change concerns the estimation of nonshared environmental effects. These have been usually measured as residuals reflecting variance not only due to unique effects of the nonshared environment but also due to random error of measurement and method-specific effects.

In view of these difficulties, a further aim of my second study (Bleidorn et al., 2009) was to get a clearer grasp of the genetic and environmental sources of stability and change in personality traits. Hence, we took advantage of our twin design and extended the aforementioned phenotypic growth curve model to a biometric growth curve model (McArdle & Hamagami, 2003). In doing so, we could

directly estimate the genetic and environmental effects on the parameters of stability and change. Because random error was separately modeled from the latent growth curve parameters, our model also permitted the disentanglement of 'true' nonshared environmental variance and error variance.

According to the results of our biometric growth curve analyses, stability of nearly all domain and facet scales of the NEO-PI-R was influenced by both genetic and nonshared environmental factors. Although genetic influences were more pronounced, still 30% to 40% of individual differences in 'true' stability of domains and facets could be attributed to influences of the nonshared environment.

Turning to the sources of personality change, we expectedly found substantial nonshared environmental effects. Nonetheless, findings also suggest significant genetic contributions to change for a number of domain and facet scales. Until now, only a handful studies have pointed to the possibility of genetic influences on personality change (e.g., Blonigen et al., 2008; McGue et al., 1993). The predominance of nonshared environmental effects on change revealed in the majority of previous studies might result from the confounding of true nonshared environmental variance with error variance. Since the effects of random error are by definition uncorrelated over time, nonshared environmental effects on change have been probably overrated in prior studies. By using a biometric growth curve model, we could separate random error from variance due to 'true' change. Thus, we were in a better position to detect genetic effects on change.

These results refer to averaged findings across broad and more specific personality traits but did not apply to each domain and facet scale in the same way. In fact, we revealed noticeable differences in the magnitude of genetic and environmental effects on change among domain and facet traits. Referring to the aforementioned phenotypic results of distinct developmental trends, even among facets defying a common domain, this finding further supports the conception of traits as complex psychological structures that are composed of discrete facets with distinct etiologic sources and specific developmental pathways.

In sum, our biometric findings suggest that the etiologic foundations of stability and change are more complex than originally stated, because change is not simply a function of the environment as well as stability is not just the product of genetic processes. Depending on the specific trait, stability and change are more or less mediated by both genetic and environmental processes. With respect to the two conflicting theoretical conceptions outlined above, these findings rather support transactional theories of personality development (e.g., Roberts & Wood, 2006) that emphasize the dynamic interplay between genetically and environmentally governed processes over the life course. That is, contrary to the five-factor theory of personality (McCrae & Costa, 2008), not only genes but also

environmental factors seem to play an important role in determining both stability and change in personality traits.

At this point, it is essential to note that the presence of gene-environment correlations might have affected our biometric results. For instance, individuals may choose or evoke experiences consistent with their genetic make-up which may in turn have a stabilizing influence on their personality traits. There might be also gene-environment interactions that contribute to stability and / or change in traits. For example, stabilizing effects of genetic factors might only appear on the condition of certain stable environmental settings. Studying gene-environment correlations and interactions appropriately would necessitate models that specify measured environmental moderators and / or measured alleles at specific loci (Purcell, 2002). Thus, the next step to delineate the concrete developmental processes accounting for personality stability and change might be the inclusion of measures of the environment into longitudinal behavior genetic designs.

### 3.4 Inspecting the developmental interplay between personality traits and major life goals

Modern personality theories, like the aforementioned five-factor theory (McCrae & Costa, 2008) or socioanalytic conceptions (Roberts & Wood, 2006), recognize that there is more to personality than traits. Among the mostly mentioned variables one can find goals, skills, interests, habits, and narratives. However, the study of stability and change in other individual difference characteristics than traits is still a relatively unattended issue in personality development research.

Emphasizing that personality comprises more elements than traits, Roberts and Robins (2000) posed the question “what is the conceptual relation between personality traits and goals?” (p. 1286). Interested in the origins, development, and functioning of the constituting units of the personality system, they called for a stronger integration of the classic trait approach with other personality-relevant constructs, such as major life goals. Major life goals can be defined as “a person’s aspirations to shape his or her life context and establish general life structures such as having a career, a family, and a certain kind of lifestyle” (Roberts, O’Donnell, & Robins, 2004, p. 542). In contrast to more contextualized goal units, such as *personal projects* (Little, 1983), major life goals have greater generality, are relatively stable over time, and reflect what people generally strive for in their lives. They are thus often considered to be conceptualized at a breadth that is comparable to those of the Big Five personality traits (Roberts & Robins, 2000; Roberts et al., 2004).

Without doubt, both of the two aforementioned personality theories (McCrae & Costa, 2008; Roberts & Wood, 2006) would agree that personality traits can be embedded in a broader view of the person also encompassing other relevant concepts, such as motivational constructs.

Nonetheless, they differ remarkably with respect to their assumptions about the nature and nurture of the interplay between personality traits and these concepts over the life course.

The five-factor theory (McCrae & Costa, 2008) makes a clear distinction between two classes of elements constituting the personality system, namely basic tendencies and characteristic adaptations. Personality traits are exclusively assigned to the category of basic tendencies representing relatively stable, genetically based dispositions. Stability and change in basic tendencies should be almost exclusively governed by genes, whereas environmental influences should be negligible. Constructs like goals, skills, habits, or attitudes, on the other hand, are assigned to the category of characteristic adaptations. According to McCrae and Costa (2008), characteristic adaptations represent the concrete and more observable manifestations of personality traits that are formed by the interaction of the genetically based basic tendencies and the dynamic demands of the environment. That is, in contrast to traits that are assumed to be insulated from direct effects of the environment, stability and change in characteristic adaptations should be determined by both genetic and environmental factors. Furthermore, genetic effects on characteristic adaptations should be completely accounted for by basic tendencies both cross-sectionally as well as across time. That is, there should be no unique genetic effects on characteristic adaptations independent of those on personality traits.

Drawing on socioanalytic theory, Roberts and Wood (2006) have outlined a different conception of the links between traits and related constructs within the personality system. According to their theoretical approach, there are four units of analysis representing the core components of personality, namely traits, motives, abilities, and narratives. Each of the four domains should be hierarchically organized, entailing broad, mid-level, and narrow constructs. According to this framework, Big Five personality traits and major life goals actually represent two separate but related units that are conceptualized at the same breadth and positioned at the same level of the personality system (Roberts & Robins, 2000). In contrast to the five-factor theory, the neo-socioanalytic approach predicts traits, goals, and also the other units of the personality system to be influenced by both genetic and environmental effects. That is, the genetic effects on goals should not completely be accounted for by traits, but there should also be unique genetic effects on goals that are independent of the genetic effects on traits. Moreover, this conception predicts genetically and environmentally mediated across-time relationships between traits and the other units of the personality system promoting developmental processes.

It is quite obvious that the two outlined theories would come to different answers to the initial question about the conceptual links between personality traits and goals. Previous research into the

phenotypic relations between traits and life goals (e.g., Lüdtke, Trautwein, & Husemann, 2009; Roberts et al., 2004; Roberts & Robins, 2000) has shown that there are significant associations of moderate magnitude both cross-sectionally and across time. Moreover, Lüdtke et al. (2009) have revealed significant effects of prior personality traits on subsequent goal importance but almost no effects of prior goal importance on subsequent personality traits. In sum, these findings draw a first phenotypic picture, but they do not tell us anything about the genetic and environmental sources of the links between traits and goals. However, a critical test of the diverging theoretical assumptions on the structural links between traits and goals requires a thorough examination of the genetic and environmental sources of these links both cross-sectionally and over time.

My third study (Bleidorn, Kandler, Hülsheger, Riemann, Angleitner, & Spinath, in press) aimed at filling this gap. That is, in order to provide a more decisive evaluation of the conflicting assumptions stated in the five-factor theory as opposed to neo-socioanalytic theory, we examined the genetic and environmental influences on the structural links between Big Five personality traits and major life goals. Analyses were performed on data from 217 MZ and 112 DZ twin pairs gathered at the third and fourth assessment waves of the BiLSAT that were approximately five years apart. At these two measurement occasions, participants provided self-reports on the five dimensions of the NEO-PI-R and rated the importance of their life goals along the two broad dimensions of agency and communion by using the questionnaire GOALS (Pöhlmann & Brunstein, 1997). Taking advantage of this multivariate longitudinal-biometric design, we were able to disentangle the genetic and environmental effects on the links between traits and goals both cross-sectionally and across time.

Prior to biometric analyses, we inspected the phenotypic correlations between the Big Five traits and the two life goal categories. As in previous studies (e.g., Roberts & Robins, 2000), we found significant correlations of moderate magnitude suggesting that importance of agency goals was positively related to Extraversion, Openness, and Conscientiousness, and negatively to Agreeableness. Importance of communion goals, on the other hand, was positively related to Extraversion, Openness, and Agreeableness. Also consistent with previous research, there were no significant correlations between Neuroticism and both of the two goal domains.

A further interesting phenotypic finding of our study concerns the rank-order stabilities of traits and goals across the five-year period in our sample of middle-aged adults. As in earlier studies on young adults (e.g., Lüdtke et al., 2009; Roberts et al., 2004), stabilities of life goals were moderate in size. Personality traits, on the other hand, were considerably more stable than goals. The higher stabilities of traits we found for our older sample compared to those revealed in younger samples are in line with the *cumulative continuity principle* (Caspi et al., 2005; Roberts & Wood, 2006). This describes

the tendency for the relative consistency of traits to increase with age until it reaches its peak in later adulthood. According to our findings, however, the *cumulative continuity principle* cannot be applied to life goal importance. That is, while individuals tend to become more consistent in their personality traits, life goal importance seems to show the same degree of consistency at different ages across the life course.

Before we examined the genetic and environmental sources of the associations between traits and life goals, we initially applied a series of univariate biometric models to assess the heritability of life goal importance. We found both agency and communion goals to be primarily influenced by genetic and nonshared environmental effects, whereas shared environmental effects were negligible. However, in line with the five-factor theory, heritabilities of the two goal domains ranged around .30 and were thus notably lower than those usually reported for personality traits (for a review, see Bouchard & Loehlin, 2001).

We then examined the concurrent genetic and environmental overlap between the five NEO-PI-R domains and the two life goal dimensions by fitting multivariate Cholesky decomposition models for both measurement occasions. Though the results of these models point to a considerable genetic overlap between traits and goals, we also revealed significant unique genetic effects on life goals at both measurement occasions. Furthermore, we also found that a substantial amount of the nonshared environmental effects on agency- and communion goals can be accounted for by personality traits. The findings of our cross-sectional multivariate models clearly conflict with the assumptions of the five-factor theory but rather speak for neo-socioanalytic theory considering goals as distinct elements of the personality system that are systematically related to personality traits.

Finally, we capitalized on our multivariate two-wave design and examined the “cross-variable-cross-time” effects by fitting a series of multivariate Cholesky decomposition models. That is, we first examined if there were genetic and / or environmental effects of preceding life goals on subsequent traits. Secondly, we also tested if there were genetic and / or environmental effects unique to preceding traits accounting for subsequent goal variance. The pattern of prospective effects of the Big Five on the two life goal dimensions approximately mirrored the pattern of concurrent phenotypic correlations. More controversial than the cross-time effects of prior traits on later goals was certainly the finding of significant, although small, genetically and environmentally mediated effects of prior life goals on subsequent personality traits. This result supports neo-socioanalytic positions assuming goals to be more than just a conduit for traits. In fact, goals might be rather considered as proxies for anticipated contexts leading people to adapt their personality traits in advance to upcoming social demands (Roberts et al., 2004). A further implication of these results

concerns the FFT assumption of traits to be more “basic” than life goals. Instead of a causal precedence of traits over major life goals, our findings rather speak for a reciprocal interplay between traits and goals over time.

Again, it should be noted that gene-environment correlations and / or gene-environment interactions might have affected our biometric results in terms of obscuring possible differences between underlying subgroups within the data. However, the primary aim of our study was to examine the diverging assumptions of the two conflicting theories at overall population levels. Future studies are desired that formulate and test concrete hypotheses about specific environmental factors (and / or specific genes) likely to affect the genetic-environmental sources of the interplay between traits and goals.

To conclude, the findings of our study provided partial support for both the five-factor theory and socioanalytic conceptions: Though major life goals seem to be more susceptible to environmental influences than personality traits, it seems fair to assume traits and goals to be related but distinct elements of the personality system that are affected by both common and specific genetic and environmental influences. Instead of a causal precedence of traits over goals, both might be better conceptualized as complementary units of the personality system implying that people do not only calibrate their goals in accordance with their personality traits but do also adjust their traits to their major life goals in order to adapt adequately to the demands of their current or anticipated social environment.

Above all, the results of this study put emphasis on a very important point both theoretical conceptions would agree on – namely, that it is worthwhile to study the different components relevant to the personality system together but also in their own right. That is, a comprehensive understanding of the patterns and sources of personality development over the life course requires a detailed consideration of the full range of elements relevant to the personality system in order to exploit their distinct as well as their joint contributions to the way individuals shape their lives.

### 3.5 In a nutshell: What did we learn about long-term stability and change in personality traits?

The first manuscript presented (Bleidorn & Ostendorf, 2009) illustrates the value of the German version of the H*i*PIC as a self- and parent-report instrument to assess the Big Five with reasonable reliability and structural validity in children and adolescents. The expected factor structure could be adequately replicated on data from both parent- and self-reports and proved to be largely invariant across sexes, judges, and languages. Altogether, these results support the appropriateness of the five-factor model to organize and assess personality in later childhood and adolescence facilitating

future research aimed at constructing a comprehensive framework of personality development from an all-inclusive life-span perspective.

Turning to personality development in adulthood, the first purpose of my second study (Bleidorn et al., 2009) was to plot the patterns of mean- and individual-level change in the five domain and 30 facet scales of the NEO-PI-R over a 10- year period using latent growth curve models. Expectedly, mean-level changes in the five domain scales reflected a kind of functional maturation. The revealed differences in the mean-level change patterns among facets defining one and the same domain support a conception of the Big Five as complex psychological structures comprising discrete facets with distinct developmental paths. We also found significant individual differences in change for the majority of the NEO-PI-R domain and facet scales. Correlations with age and initial trait levels suggest that change is less pronounced in older individuals and in individuals with higher initial trait scores.

Capitalizing on our genetically informative twin design, a further aim of my second study (Bleidorn et al., 2009) was to examine the genetic and environmental sources of stability and change in personality traits by extending the phenotypic models to biometric growth curve models. Our findings suggest that the etiologic foundations are more complex than originally assumed, because personality change is not simply a function of the environment as well as stability is not just the product of genetic processes. In fact, depending on the specific trait, stability and change are more or less mediated by both genetic and environmental processes supporting transactional theories of personality development.

With respect to the fact that there is more to personality than traits, my third study (Bleidorn et al., in press) aimed at examining the genetic and environmental influences on the structural links between the Big Five and major life goals. The results of cross-sectional and longitudinal multivariate-biometric models provided partial support for the seemingly conflicting assumptions of both the five-factor theory and the neo-socioanalytic theory. That is, personality traits and major life goals can be considered as distinct but related units of the personality system whereas people do not only calibrate their goals in accordance with their personality traits but do also adjust their traits to their major life goals. in order to adapt adequately to the demands of their current or anticipated social environment.

## 4. Contributions to short-term stability and change in personality states

Up to this point, the focus has been on research into long-term stability and change in personality traits and related dispositional constructs. From this broad life-span perspective, the interesting unit of time is years and the relevant unit of personality is traits. Yet, in contrast to the trait approach

with its emphasis on structure, the process approach to personality examines stability and change in states that occur within much shorter durations, such as weeks, days, or even within a single day. In this short-term approach, change is not assessed in terms of developmental trajectories unfolding over years but rather in terms of dynamic action within persons unfolding in the stream of people's daily lives (Fleeson, 2004; Mroczek al., 2006).

Since the person-situation debate has been past its prime, former boundaries between structure and process approaches to personality have begun to blur. Both sides have widely conceded that within-person variability and between-person stability of personality are not mutually exclusive (e.g., Fleeson, 2004; Mischel, 2004). Hence, it is well-established that structures and processes, although mathematically independent, can be interrelated to produce both consistency and change in personality (e.g., Mroczek et al., 2006).

With my fourth study (Bleidorn, 2009) I aimed at making a further contribution to the desired integration between structure and process approaches to personality. Specifically, employing an experience-sampling design, I examined the within-person changes and between-person differences in Big Five personality states with respect to three central questions. In the following sections I will outline these questions, the research design employed, and the findings obtained in this study.

### 4.1 Organizing and assessing personality states at the within- and between-person level

A promising way to integrate structure and process approaches to personality has been proposed by Fleeson (2001). In his density-distributions approach to personality behavioral manifestations of traits are described as frequency distributions of their corresponding states. Personality states are considered as trait-content manifestations in short-term, continuous, and concrete ways of acting, feeling, and thinking that could be described and even assessed in the same way as traits. For instance, just as individuals can be described by means of their general level in Extraversion, similarly an individual's current behavior can be described as anywhere between low and high Extraversion. That is, though the density distributions approach does not intend to capture specific actions or movements, it is yet an assessment of how the person is behaving, namely with regard to personality trait expression. Personality states are thus characterized by both the relative stability of the corresponding trait as well as the dynamic nature of behavioral acts.

Empirical support for this approach has been obtained from a number of experience-sampling studies (e.g., Fleeson, 2001; 2007) in which participants repeatedly rated their current behavior over a couple of days by means of adjectives commonly used for describing the Big Five as traits. That is, participants were repeatedly asked to describe how they are at the moment rather than what they

are like in general. The findings of these studies consistently suggest that individuals express nearly all levels of all traits in their everyday behavior but are also characterized by unique behavioral frequency distributions for each of the five domains. Despite the sizeable within-person variability in personality states, the means and standard deviations of density distributions turned out to be relative stable individual differences characteristics. Thus, by using adjectives as descriptors of the trait content of behavior, this approach accounts for both changing processes within as well as relatively stable structural differences between individuals.

Though different sets of Big Five relevant adjectives has been employed in previous experience-sampling studies (e.g., Fleeson, 2001; 2007), this does not excuse researchers from inspecting the psychometric quality of their diagnostic method and the appropriateness of their structural model of personality. Thus, the first issue that I have addressed in my study on personality states concerns the appropriateness of the five-factor model of personality to capture the temporal variation in personality states. This topic is closely related to the so far relatively unattended question about the psychometric properties of adjective-based experience-sampling measures employed to assess the daily ups and downs in personality states in terms of the Big Five. At any rate, the scales of the Big Five state measure should reliably differentiate both within and between persons. Furthermore, the intercorrelational structure of the five states at the within-person level should at least approximate the structure obtained at the between-person level.

To address this issue, as well as the further research questions I will discuss in the following sections, I carried out a computer-assisted experience-sampling study on 52 undergraduate psychology students. In an introductory session, participants first completed a set of standard personality questionnaires and received a handheld computer programmed with specific experience-sampling software. During the subsequent experience-sampling period, participants were asked to rate their behavior and the degree to which they occupied different social roles six times per day for 10 consecutive days.

Specifically, participants were asked to rate their behavior on the basis of 30 bipolar adjectives that are usually employed to assess the Big Five as traits by means of a bipolar rating scale. That is, each domain scale of the Big Five state measure was represented by six bipolar items. Besides the 30 adjective pairs, participants also rated the degree to which different roles (student, friend, romantic partner, employee, family member, and club member) predominated their situational setting during the previous hour.

With respect to the nested structure of the experience-sampling data, I used MLM procedures to run a series of multivariate three-level models with the five personality states as multiple dependent

variables (e.g., Raudenbush, Rowan, & Kang, 1991; Snijders & Bosker, 1999). In these models, level 1 represented variation among the item scores within each measurement occasion, level 2 represented variation among occasions within each person, and level 3 referred to the variation among persons. While level 1 served exclusively as a measurement model, levels 2 and 3 can be considered as a multivariate two-level model for the latent true scores of the five personality state scales. The multivariate MLM approach offered some important advantages for the present study (e.g., Snijders & Bosker, 1999), because multivariate analyses (a) allow to investigate the latent state constructs at the within- and between-person levels of analysis simultaneously, (b) avoid the danger of chance capitalization which would arise when separate univariate analyses were performed, (c) exploit the associations between personality states to provide more accurate standard errors and more powerful tests of the within- and between-person effects, and (d) allow to examine the psychometric properties of the Big Five state measure at both the within- and between-person levels simultaneously.

In order to examine the level-specific variability and reliability of the Big Five personality states, I first applied an unconditional three-level model in which no predictors were specified at either level 2 or 3. Estimates of both the within- and between-person variances for each of the five latent personality state scores were significantly different from zero. At least half of the total latent variance was due to variation within persons supporting the state quality of the five broad dimensions. The internal consistencies for the five domain scales also turned out to be quite satisfying at both the within-person level and the between-person level. This suggests that the applied Big Five state measure proved to be a reliable instrument to discriminate among both occasions and persons.

The unconditional three-level model further permitted a simultaneous consideration of the level-specific intercorrelations of the five personality state scales. With a few exceptions, the intercorrelational patterns among the five states obtained at the within- and between-person level closely resembled each other. That is, the structural arrangement of personality states within persons largely parallels the organization of these characteristics when they are conceptualized as generalized individual differences variables.

Providing further support for the density-distribution approach to personality, these results indicate that within-person changes and between-person differences in personality states can be reliably assessed within an experience-sampling design by means of Big Five-relevant adjectives. This finding paved the way for further research aimed at identifying the potential causes likely to trigger the large within-person changes in personality states, on the one hand, and the rather stable factors likely to affect the between-person differences in average personality states, on the other hand.

### 4.2 Inspecting social roles as contextual predictors of within-person changes in personality states

In search of the agents that influence a person's current state, it almost suggests itself to focus on situations setting the stage for our daily behavior. However, examining if and how personality states covary with situations requires identifying the "psychologically active features of situations" (Shoda, Mischel, & Wright, 1994, p. 685) that might trigger personality-relevant behavior on part of the individual.

So far, there is only one experience-sampling study that has explicitly examined whether variation in personality states can be traced back to variation in situations (Fleeson, 2007). Focusing on a wide range of situational features, this study has shown certain situational characteristics, such as task orientation, to be significant predictors of within-person variation in Big Five personality states. Moreover, the findings of this study suggest that these systematic "situation-based contingencies" (Fleeson, 2007, p. 825) are not universal but differ significantly between individuals. However, with regard to its rather exploratory character, this study should be considered as a first effort to enhance our knowledge of the contextual factors relevant to the large within-person changes observable in trait-relevant behavior. That is, further research is needed to examine theoretically driven hypotheses about specific contextual characteristics that may play a functional role in the prediction of personality states.

There are several strategies to link personality with situational features in order to provide a more or less comprehensive picture of the situation-dependent nature of personality (e.g., Bem & Funder, 1978; Denissen & Penke, 2008). However, within my experience-sampling study I did not intend to sample the domain of personality-relevant characteristics of the context comprehensively. In view of the plethora of conceivably relevant contextual predictors, I rather decided to focus on one class of contextual variables that potentially matter to trait-relevant behavior, namely social roles.

A social role can be defined as a "set of behavioral expectations attached to a position in an organized set of social relationships" (Stryker, 2007; p. 1083). That is, social roles refer to positions in society that are associated with specific expectations, goals, and behaviors defining the way an individual relates to his or her environment. There are several features of social roles that qualify them as reasonable predictors of personality states. First, in contrast to specific situational settings, such as 'dorm', 'party' or 'lecture hall', social roles are conceptualized at a breadth that is focused enough to capture important aspects of the situation but not too narrowly defined as it would diminish their predictive power. In fact, inasmuch as social roles prescribe normative behavioral expectations relevant to a given context, they capture psychologically relevant features of various situational settings that individuals encounter in their daily lives (Heller, Perunovic, & Reichman,

2009; Roberts, 2007). Second, in keeping with the first point, the explicit and implicit expectations defining social roles offer a kind of behavioral guidance: As long as people confirm to the given role expectations they will be accepted and rewarded by the relevant social group, while failing to meet these expectations will lead to negative sanctions. Thus, it seems reasonable to assume that individuals adjust their personality states according to the current role expectations in order to increase the adaptiveness of their behavior (Fleeson, 2007). Finally, studies in which participants were asked to rate their personality separately across several roles by means of standard questionnaires suggest that the role-specific personality (e.g., personality at work) can be a better predictor of role-specific criteria (e.g., job satisfaction) than global personality (Heller, Watson, Komar, Min, & Perunovic, 2007).

The second purpose of my experience-sampling study on personality states was thus to examine both the average within-person associations of social roles with personality states as well as the degree of between-person differences in these within-person links. Thereby, I focused on two social roles undergraduates frequently adopt, namely student and friend. These two roles encompass two important arenas in which virtually every student strives and were assumed to differ considerably in how adaptive or appropriate different personality states are. In view of earlier research into the role-specific personality (e.g., Heller et al., 2007), the friend role was expected to be associated with higher values in the states of Extraversion, Agreeableness, and Openness, while the student role was predicted to be primarily related to higher values in the state of Conscientiousness. Furthermore, referring to the study by Fleeson (2007), participants were expected to differ substantially in these within-person links between role contexts and personality states.

To examine these within-person relationships between the Big Five states and the two social role contexts, the unconditional multivariate three-level model was extended by employing the two role categories as predictor variables at the within-person level (level 2). That is, at level 2 each of the five states was simultaneously predicted by the student and friend role scores.

According to this model, there were in fact significant within-person links between the two roles and specific sets of the five personality states. As expected, the student role was primarily related to state Conscientiousness whereas the friend role showed the strongest relations with the states of Extraversion and Agreeableness. That is, individuals showed different sets of personality states in different role contexts, conceivably adapting their trait-relevant behavior to the given role demands. Together, the two role contexts explained between 6% (in Neuroticism) and 41% (in Extraversion) of the within-person variance in the five personality states. Although these findings did not directly attest to the directionality of the effects (i.e., whether roles influence personality states, personality

states influence roles, or if there are mutually influencing processes), it yet seems plausible to conclude that social roles with their immanent expectations are reasonable predictors of within-person changes in personality states.

However, results further suggest that these within-person effects cannot be considered to be universal. That is, the model revealed significant differences among participants suggesting that individuals differ not only in the degree but even in the direction of the within-person links between roles and states. These differences might reflect the differences in how individuals encode, interpret, and evaluate a given role context. Thus, in line with interactional positions (e.g., Magnusson & Endler, 1977), these findings emphasize that it is necessary but not sufficient to know the contextual demands in order to predict an individual's trait-relevant behavior adequately. How an individual will act in a given role context is also a function of the person and the unique way the person responds to the perceived role demands.

### 4.3 Explaining between-person differences in the within-person functioning of personality states

In view of the aforementioned findings, the next compelling question addressed in my experience-sampling study concerns the dispositional elements of the personality system that may help explain the revealed between-person differences in both the average levels of personality states and the within-person links between states and roles. In search of potentially relevant personality variables, I focused on long-term goals emphasizing the agentic and proactive nature of human beings. In fact, as they provide a person's day-to-day activities with structure and meaning, it seems reasonable to assume that goals play a fundamental role in both driving and guiding trait-relevant behavior (for a review, see Austin & Vancouver, 1996).

As in the third study (Bleidorn et al., in press), I examined the class of major life goals assessed by the GOALS (Pöhlmann & Brunstein, 1997) representing a person's relatively stable and broad aspirations to shape his or her life context (Roberts & Robins, 2000). While pursuing these goals, individuals were assumed to adapt their personality states more or less flexibly toward the achievement of the desired status in and across different role contexts. Thus, major life goals were expected to be important determinants of between-person differences in both the average personality states and the within-person links between current roles and states.

I focused on two specific subdomains of the GOALS, namely achievement and affiliation goals, because these categories were assumed to have a differential impact on the five personality states and should be also relevant to the student and friend role contexts. Referring to previous research into the relations between personality traits and major life goals (e.g., Roberts & Robins, 2000), I

expected achievement goals to be positively related to the states of Openness and Conscientiousness. Affiliation goals, on the other hand, should be primarily related to the states of Extraversion and Agreeableness. Furthermore, I also examined if the two life goal domains could at least partly account for the revealed between-person differences in the within-person links between social roles and personality states. That is, I explicitly tested if individuals differ in their role-specific personality state scores as a function of differences in their leading life goals.

To examine the links among personality states, social roles, and major life goals, the aforementioned multivariate three-level model was further extended by employing achievement and affiliation goals as predictor variables at the between-person level (level 3). In doing so, the coefficients estimated at the within-person level (level 2) became the outcomes at the between-person level and were regressed onto the two major life goal domains.

According to the results of this fully conditional multivariate three-level model, participants' strivings for achievement and affiliation actually proved as reasonable predictors of between-person differences in average levels of the Big Five states. As expected on grounds of prior research into personality traits, those individuals striving strongly for affiliation acted in an increased extraverted and agreeable way. Also in line with my hypotheses, individuals scoring high on achievement goals showed high average levels in the states of Openness and Conscientiousness. Beyond, individuals striving strongly for achievement also tended to act in an increased extraverted, agreeable, and emotionally stable way. Together, the two life goals explained between 20% (Openness) and 33% (Conscientiousness) of the between-person variance in the average levels of personality states. Supporting a proactive and future-oriented conception of the person, these findings suggest that long-term aspirations to shape one's life channel individuals' average levels of personality states across different role contexts.

Though achievement and affiliation goals proved to be effective predictors of average personality states, they did not effectively help to account for the between-person differences in the within-person links between personality states and the two considered role contexts. It might be argued that major life goals are conceptualized at a level which is too abstract to explain individual differences in varying within-person contingencies effectively. Future research is thus desired to study goals that are somewhat more specific and contextually embedded in one's life situation, because these might be more effective in moderating dynamic within-person links between states and roles. On the other hand, one should also consider that the detection of cross-level interactions in complex multilevel models requires relatively large sample sizes. Even if the present experience-sampling study exceeds common rules of thumb concerning adequate MLM sample sizes when

interest is primarily in main effects (e.g., Hox, 2002), the number of persons (level-3 units) might have been still too small to detect cross-level interactions with sufficient power. Thus, one should not definitely rule out cross-level interactions between major life goals and the within-person links between social roles and personality states unless further studies have re-examined these effects with larger sample sizes.

### 4.4 In a nutshell: What did we learn about short-term stability and change in personality states?

The experience-sampling design provides an ecologically valid access to study personality functioning in the ongoing stream of people's daily behavior (Heller et al., 2007). Combining this design with advanced MLM procedures offered me the opportunity to study short-term variability in personality states simultaneously at both the within-person level and the between-person level.

Emphasizing the intraindividual changeability of personality, my experience-sampling study revealed a substantial amount of within-person variability in personality states that can be systematically related to varying role contexts. On the other hand, rather stable life goals were suited to predict between-person differences in individuals' average levels of personality states.

This study demonstrates a flexible strategy to investigate intra- and interindividual variation in personality simultaneously. It might encourage further research into the relationships among personality structures and processes which would gradually enhance our understanding of the complex mechanisms underlying personality functioning.

## 5. Toward an integration of state and trait approaches: The "Measurement Burst" design as a valuable tool for future research into personality development

As reflected in the outline of my synopsis, there are two distinct lines of research into personality stability and change – one, with an emphasis on structures, focusing on the long-term development of traits and the other, with an emphasis on processes, focusing on the short-term variability in states. As described above, research into long-term development of personality traits has remarkably proliferated with respect to findings on both the patterns and the sources of stability and change. There is also a maturing literature on the dynamic short-term processes in personality states. However, the two lines of research are still travelling separate paths thereby passing up the chance to benefit from potential synergistic effects which might accelerate both fields of research (Fleeson & Noftle, 2009).

The time seems ripe for an rapprochement, since both camps would agree that structures and processes should not be considered as opposed to each other, but rather as "two interrelated sides

of the same behavior producing system" (Bleidorn, 2009, p. 527). Thus, though short-term variability and long-term changes in personality are mathematically independent, it yet seems worthwhile to explore the conceptual links between states and traits to elucidate the concrete mechanisms underlying personality functioning and development over the life span. In fact, research into short-term variability in personality states usually focuses directly on the interface of person and context – and this is exactly where many theories of personality development locate the processes underlying long-term stability and change in personality traits (e.g., Roberts & Wood, 2006; Roberts, 2009). Thus, bringing together long- and short-term approaches to personality stability and change promises to provide new insights into the so far relatively uncharted issue of the relevant within-person processes underlying personality development.

Roberts and Jackson (2008), for instance, proposed a "sociogenomic model of personality" in which states take on a significant causal and mediational role in personality development, because they should account for the paths through which prolonged environmental effects will change personality traits (Roberts, 2009). Specifically, this model proposes that environmental effects usually act on momentary thoughts, feelings, and behaviors—that is, on states. If these state changes become extended, they may cause changes in traits in a bottom up fashion. This model thus implies that environments will usually not affect personality traits directly but indirectly via their effects on personality states.

This bottom-up approach to personality is also in line with Fleeson's density distribution model of personality. As covered earlier, Fleeson (2001) proposed that traits are best conceptualized as distributions of their corresponding states. It is further assumed that enduring or recurring contextual and / or person-related influences can act to change the frequency, degree, or even the direction of an individual's personality states within and across classes of situations. To that degree to which these changes lead to a reformation of the state's density distribution, these changes should inevitably affect the analogous trait, too (Fleeson & Jolley, 2006).

To give an example of how experiences might shape personality traits mediated by states, imagine a young teacher who has just took up her work at a new school. During the first months, she has been socially rewarded by her students for acting in a structured, creative, and agreeable way. The positive reactions of the students have led her to believe that being structured, creative, and agreeable in the teacher role is adequate and desirable. These role-based experiences may then be generalized to further important domains in her life. That is, the teacher might also act more structured, creative, and agreeable in her roles as a mother, wife, or friend. Over time, the increased frequency of being in

these states might result in rather enduring changes in her general levels of Conscientiousness, Openness, and Agreeableness (Roberts, 2009).

Testing these bottom-up assumptions about personality development appropriately necessitates a merger of trait and state approaches to personality. The next exciting steps for future research into life-span development of personality should thus include the integration of structure and process approaches taking into account long- and short-term views of personality stability and change in the same research paradigm. Nesselroade and Boker (1994) were one of the first who have called for an integrative study of long- and short-term processes in developmental studies. They have proposed the implementation of multiple intensive short-term periods of repeated measurements into longitudinal multi-year studies. In those "measurement burst" designs the periods of intensive repeated assessments should be separated by longer time intervals in order to capture short-term within-person variability, long-term change patterns, and between-person differences in the patterns of short-term and long-term changes. Thereby, long-term change patterns should include both trait variables and the parameters of within-person variability distributions obtained from the bursts of measurements.

This kind of research design combines long- and short-term approaches to personality stability and change thus permitting the analyses of "macro-micro linkages" (Mroczek et al., 2006, p. 173). That is, within this design it becomes possible to examine if and how micro-level change (i.e., short-term variation in states) and macro-level change (long-term changes in traits) are related. Hence, one can examine how structures influence processes and how processes in turn influence structures.

Even more advanced and informative insights could be expected by extending this design to genetically informative data. A biometric measurement burst design would not only reveal the micro-level processes of personality development, but would additionally allow examining the underlying genetic and environmental sources of the relevant mechanisms at work. There is no doubt that such research designs are not only associated with relatively high costs and efforts but also pose a number of statistical difficulties. However, it seems worthwhile to take up these challenges, because integrated research into short- and long-term stability and change in traits and states from an all-inclusive life-span perspective would provide a wealth of interesting insights into so far relatively uncharted territories in the area of personality development. Now is the time to set off to new shores – let's get started!

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# Appendix

## List of manuscripts

1. Bleidorn, W. & Ostendorf, F. (2009). Ein Big Five-Inventar für Kinder und Jugendliche: Die deutsche Version des Hierarchical Personality Inventory for Children (H*i*PIC) [A Big Five inventory for children and adolescents: The German version of the Hierarchical Personality Inventory for Children (H*i*PIC)]. *Diagnostica, 55,* 160-173.
2. 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.
3. Bleidorn, W., Kandler, C., Hülsheger, U. R., Riemann, R., Angleitner, A., & Spinath, F. M. (in press). Nature and Nurture of the Interplay between Personality Traits and Major Life Goals. *Journal of Personality and Social Psychology*.
4. Bleidorn, W. (2009). Linking personality states, current social roles and major life goals. *European Journal of Personality, 23,* 509-530.