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Latent Profile Analyses in Two Large-Scale Panel Studies

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Abstract

Consistency and change in personality were analyzed by examining personality types across adulthood and old age using data from two nationally representative panel studies from Germany (N = 14,718; 16 – 82 years) and Australia (N = 8,315; 15 – 79 years). In both samples, the Big Five personality traits were measured twice across a period of 4 years. Latent profile analyses and latent profile transition analyses revealed four main findings: First, solutions with 3 (in the German sample) or 4 (in the Australian sample) personality types were found to be most interpretable. Second, measurement invariance tests revealed that these personality types were consistent across all age groups but differed slightly between men and women. Third, age was related to the number of individuals classified within each personality type. Namely, there were more resilients and fewer undercontrollers in older compared with younger age groups. Fourth, there was strong consistency of personality type membership across a period of 4 years in both genders and most age cohorts. Comparatively less consistency across time was found for undercontrollers and individuals in old age. Taken together, these findings show that in the two nations studied here, personality types were highly consistent across gender, age, and time.

Keywords: personality types, adulthood, latent profile analysis, longitudinal study, personality development

Personality is, by definition, temporarily stable, but there are nevertheless gradual changes over time (for overviews, see Roberts, Wood, & Caspi, 2008; Specht, Bleidorn, et al., 2013). Several studies have analyzed the consistency of personality in terms of mean-level stability (Roberts, Walton, & Viechtbauer, 2006) and rank-order stability (Roberts & DelVecchio, 2000) and have concluded that personality is susceptible to changes across the entire life span (Allemand, Zimprich, & Hertzog, 2007; Ardelt, 2000; Lucas & Donnellan, 2011; Specht, Egloff, & Schmukle, 2011; Wortman, Lucas, & Donnellan, 2012; for an overview, see Hutteman, Hennecke, Orth, Reitz, & Specht, 2013). In past studies, mean and rank-order stability were typically assessed separately for different personality traits. However, in order to achieve a complete understanding of consistency and change in personality, personality needs to be conceptualized as an interrelated system of several traits. Thus, it is necessary to complement analyses on mean-level and rank-order changes of individual traits with holistic, multivariate approaches that focus on the configuration of several traits within individuals (Donnellan & Robins, 2010). Surprisingly, there is still a paucity of studies that have analyzed personality in ways that go beyond the analysis of isolated personality traits (cf. Asendorpf, in press), even though the essential relevance of the "dynamic organization within the individual" (Allport, 1937, p. 48) was recognized as early as the 1930s.

In this study, we analyzed the consistency of personality types across adulthood and old age. Specifically, we examined (a) the number and characteristics of personality types in adulthood, (b) the consistency of these personality types across gender and age groups, (c) how the number of individuals classified into each personality type may differ across adulthood and old age, and (d) the extent to which longitudinal transitions between

personality type classifications vary across different age groups. To this end, we used data from two large and nationally representative German and Australian panel studies that repeatedly assessed the Big Five personality traits. With the two sets of data combined, we analyzed data from more than 23,000 individuals across the entire adult life span using latent profile analysis (LPA) and latent profile transition analysis (LPTA).

The Typological Approach

The typological approach offers information about individual differences in the configuration of personality traits by grouping individuals with similar values on several personality traits together into one personality type (Asendorpf, in press). Individuals within the same personality type therefore have similar personality profiles and at the same time potentially very different profiles compared to individuals who belong to a different personality type. The aim of the typological approach is to identify a preferably parsimonious number of personality types that allow for broad categorizations of individuals. As personality traits are not isolated in real life but rather exist as dynamic systems of several traits that define the individual, this approach offers an important complement to trait approaches that consider each personality dimension separately (Donnellan & Robins, 2010; for a discussion on the comparability of trait and type-approaches see also Meehl, 1992, and Cooper & Richardson, 1986).

Personality types can be understood in terms of the classic work on the data box (for an overview, see Cattell, 1988). This three-dimensional matrix (individuals × traits × occasions) provides a framework for disentangling different perspectives in the study of personality. Within this framework, personality types can be described as a view of several traits (i.e., personality profiles) of several individuals on one occasion. The temporal

consistency of personality types can be described as viewing several traits of several individuals on more than one occasion. Ozer (1986) differentiated 12 basic ways of measuring consistency based on an extension of the data box that resulted in a four-dimensional matrix including individuals, response classes, situations, and time. He pointed out that the temporal consistency of such personality profiles is "the best index for assessing change and stability in an individual's personality over time" (Ozer, 1986, p. 41). This is true because this approach is not limited to single personality traits and is thus able to adequately account for personality structure.

Resilients, Overcontrollers, and Undercontrollers

Across multiple samples, statistical methods, and personality indicators, the three most commonly found personality types are resilients, overcontrollers, and undercontrollers. These types were first identified by Robins, John, Caspi, Moffitt, and Stouthamer-Loeber (1996) and labeled with reference to the terminology of ego-resiliency and ego-control (Block & Block, 1980). Using data from adolescent boys, Robins et al. found that resilients were self-confident, self-directed, emotionally stable, and full of energy. Undercontrollers were stubborn, physically active, disobedient, and impulsive. By contrast, overcontrollers were characterized by being emotionally brittle, sensitive, introverted, tense, and dependable.

Later on, personality types were analyzed using the Big Five personality traits (see Table 1 for an overview). Typically, resilients were found to have high scores on all of the Big Five personality traits. Specifically, they were found to be comparatively emotionally stable, extraverted, open to experience, agreeable, and conscientious. Undercontrollers were

found to be particularly low on conscientiousness and agreeableness. Overcontrollers were found to be particularly introverted, neurotic, and less open.

As can be seen in Table 1, most previous studies of personality types were restricted to a specific age group (e.g., adolescents) and rarely used data of adults older than 30 thus impeding comparisons across age groups. It is not yet known whether the tripartite structure of personality types holds for individuals across the entire life span, whether some of the three types are more prevalent in some periods of life than in others, and how stable adult type classifications are over time. To address these open questions, personality types need to be analyzed with large samples that cover a wide age range. To circumvent biased results due to lack of adequate heterogeneity (Vermunt & Magidson, 2002; see also Boehm, Asendorpf, & Avia, 2002; Chapman & Goldberg, 2011), we used nationally representative data in the present paper.

Personality Types and Age

The vast majority of studies analyzing personality types have focused on childhood, adolescence, and early adulthood (cf. Table 1). In this period of life, individuals tend to mature such that the number of resilients increases and the number of over- and undercontrollers decreases with age (Meeus, van de Schoot, Klimstra, & Branje, 2011).

Studies that have analyzed personality types in individuals aged 30 or older are scarce. McCrae, Terracciano, Costa, and Ozer (2006) did not find the common three personality types using Q-sorts (California Adult Q-Set; Block 1961) in adults. In Q-sorts, items are sorted in a fixed distribution with regard to how characteristic these items are for the personality of the subject. Q-sorts and cluster-analytic approaches can therefore not be compared directly. McCrae et al.'s (2006) findings suggest that the structure of personality

is consistent across adulthood; however, their rather small sample size for such a wide age range limited their power to detect differences across the life span.

Rammstedt, Riemann, Angleitner, and Borkenau (2004) used cluster analysis to identify personality types in adult twins. In self-reports, the three common personality types were found. However, personality structure was not compared between individuals of different ages and genders. Furthermore, twin samples are vulnerable to distorted results in this context because of the strong similarity of twin pairs and the resulting lack of national representativeness (cf. de Fruyt, Mervielde, & van Leeuwen, 2002).

Costa, Herbst, McCrae, Samuels, and Ozer (2002) used cluster analysis to examine personality structure in four adult samples. They found the expected three types in a probability sample but not in the three nonrepresentative samples, which argues for the need of representativeness to avoid biased results. Again, differences in personality structure across different age groups and gender were not analyzed in this study.

In a study focusing on old age (65-95 years), Steca, Alessandri, and Caprara (2010) used cluster analysis to identify three personality types. These types differed in some aspects from the three types found in studies on younger adults (cf. Table 1). However, age groups could not be compared in this study due to the restricted age range.

In conclusion, none of these studies has provided comprehensive evidence for whether personality is structured in a similar way throughout adulthood, that is, whether there is measurement invariance (MI) in personality profiles across age. Also, previous studies have not addressed whether the personality maturation observed in adolescence continues in adulthood and old age.

Personality Types and Gender

Only a few studies have tested whether the number and shape of personality types are similar for men and women. In addition, results have tended to be rather inconsistent. Some studies have found differences in personality structure as a function of gender (e.g., Avdeyeva & Church, 2005; Pulkkinen 1996), whereas others have not (e.g., Asendorpf & van Aken, 1999; Weir & Gjerde, 2002). However, either these studies did not statistically test for comparability (i.e., MI) between genders, or sample sizes of subgroups were very small, thus limiting their statistical power to detect gender differences in personality types.

With respect to gender differences in the frequencies of different personality types, some studies have found that males, rather than females, might be more likely to be categorized as undercontrollers, and females, rather than males, might be more likely to be categorized as overcontrollers (Asendorpf, Borkenau, Ostendorf, & van Aken, 2001; Asendorpf & van Aken, 1999; Dubas, Gerris, Janssens, & Vermulst, 2002; Meeus et al., 2011; Scholte, van Lieshout, de Wit, & van Aken, 2005). However, there are also studies that have found no or other effects of gender (e.g., Hart, Hofmann, Edelstein, & Keller, 1997; Schnabel, Asendorpf, & Ostendorf, 2002). Overall, previous research on gender differences in personality types is inconclusive and, again, large sample sizes are needed to provide meaningful and robust information about differences in personality structure between men and women.

The Present Study

Previous research on the consistency of personality types across age, gender, and time has provided rather mixed findings. The present study is the first to examine the configuration of the Big Five personality traits in individuals across adulthood and old age

using two large representative samples from Germany and Australia. In the present study, we explored the following four issues:

(1) We explored how many personality types are suitable to represent differences in personality structure and how these personality types can be characterized in terms of the Big Five personality traits. Despite rather mixed findings in previous studies (cf. Table 1), we expected to find three personality types, commonly labeled as resilients, overcontrollers, and undercontrollers.

(2) Furthermore, we tested whether the typology showed MI across gender and age. We expected to find high comparability in personality structure (i.e., the configuration of traits) between genders. Regarding age, three different results were plausible: First, type structure might be stable in adulthood due to a fully developed personality (McCrae et al., 2006). Second, the typological structure might differentiate with increasing age, continuing a process observed in young ages (Tackett et al., 2012). Finally, personality structure might be less differentiated in old age than in young age due to normative cognitive declines (Roberts et al., 2008).

(3) To investigate how personality develops across adulthood, we tested whether the prevalence of different personality types varied in different age groups. Based on research on adolescents, we expected maturational processes to be reflected in a different prevalence of personality types across age groups; specifically, we expected a higher number of resilients and a lower number of over- and particularly undercontrollers in older compared with younger age groups (Meeus et al., 2011).

(4) To examine the consistency of personality type membership across time, we analyzed transitions between personality types using two-wave longitudinal data with a

time interval of 4 years. We also tested whether there were systematic differences in consistency depending on the gender and age of the individuals. Given the strong predictive validity of personality types (Chapman & Goldberg, 2011), we expected to find high stability in type membership in general. We furthermore expected that there might be comparatively less stability in young adulthood as well as in old age compared with middle adulthood (Specht, Bleidorn, et al., 2013).

Method

The German Sample

Participants. The German data used in this study came from the Socio-Economic Panel (SOEP) study, a large and ongoing longitudinal survey of private households and persons conducted by the German Institute for Economic Research (see Wagner, Frick, & Schupp, 2007, for details). Households were initially chosen using multistage probability sampling with regional clustering. All individuals from the selected households aged 16 and older were asked to participate and responded in either annual face-to-face-interviews or to questionnaires via mail. As some subpopulations were oversampled (e.g., individuals with migration backgrounds and those with high incomes), all models used sampling weights from the first year of measurement. Thus, the resulting data were representative of adult residents in Germany.

The attrition in the SOEP was very low with more than 93% of the households remaining in the SOEP from one year to the next in the time period relevant for these analyses (Kroh, 2012). Altogether, 72% of participants who met our criteria for study inclusion in 2005 remained in the sample in 2009 and only information of these was used in our analyses. The sample was restricted to individuals aged 82 or younger in 2005 because

of the small sample sizes beyond that age (less than 40 individuals for each year of birth). Individuals with no more than one missing item (i.e., at least two items answered) on each of the Big Five personality traits in each assessment year were included in the analyses. In the final sample, the participants consisted of 14,718 residents of Germany (52% women) with an age range of 16 to 82 at the first measurement occasion (M = 47.21, SD = 16.28).

Some selection effects due to panel attrition were found. Compared with individuals who took part in only the first assessment year, continuers were older, d = 0.12, p < .001, and more likely to be female (52% of the continuers but only 50% of the drop-outs were female), $\chi^2(1, N = 20{,}563) = 6.20$, p = .01., φ=.02. For the Big Five personality traits, continuers had higher values on conscientiousness, d = 0.11, openness, d = 0.09, agreeableness, d = 0.07, and extraversion, d = 0.05, each p < .001, but did not differ significantly in emotional stability. However, these effects were rather small and therefore reflect only modest selectivity.

Measures. The Big Five personality traits were measured first in 2005 and again in 2009 using a short form of the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991). The BFI is a widely used personality inventory that has demonstrated reliability and validity (John, Naumann, & Soto, 2008) and has been shortened for use in the SOEP (BFI-S; Gerlitz & Schupp, 2005). The BFI-S is strongly correlated with the full version of the BFI (all rs > .88; Soto & Luhmann, 2013) and shows acceptable levels of reliability and validity (Hahn, Gottschling, & Spinath, 2012). It consists of 15 items (i.e., each trait was measured with three items), and participants were asked to indicate their agreement with several short phrases (all beginning with "*I see myself as someone who…*") on a scale ranging from 1 (*does not apply to me at all*) to 7 (*applies to me perfectly*).

The internal consistencies of the five factors (averaged between the two waves) were: emotional stability, α = .61; extraversion, α = .65; openness, α = .62; agreeableness, α = .50; and conscientiousness, α = .61. Test-retest correlations indicated considerable stability of individual differences across a period of six weeks (all *r*s > .75; Lang, 2005). Descriptive statistics can be found in Table 2.

The Australian Sample

Participants. The Australian data used in this study were provided by the Household Income and Labour Dynamics in Australia (HILDA) survey, an ongoing household-based longitudinal study conducted by the Melbourne Institute of Applied Economic and Social Research (see Summerfield et al., 2011, for details). The HILDA is based on a large national probability sample of private households in Australia including all of its residents older than 15 years. Participants are interviewed annually. Sampling weights from the first year of measurement were used in all models, and thus the resulting data are representative of adult residents in Australia.

The attrition in the HILDA study is very low with more than 95% of households remaining in the survey from one year to the next in the time period relevant here (Summerfield et al., 2011). Altogether, 77% of participants who met our criteria for study inclusion in 2005 remained in the sample in 2009 and only information of these was used in our analyses. The sample was restricted to individuals aged 79 or younger in 2005 (due to small sample sizes beyond that age with less than 30 individuals for each year of birth). Individuals were included in the analyses if they had no more than two missing items (i.e., at least four items answered) on each of the Big Five personality traits in each assessment

year. The final sample consisted of 8,315 individuals (54% women) with age in 2005 ranging from 15 to 79 (M = 43.74, SD = 16.45).

Attrition analyses revealed the commonly found modest selectivity effects. Specifically, continuers were older, d = 0.24, p < .001, and more likely to be female (54% of the continuers but only 50% of the drop-outs were female), $\chi^2(1, N = 10{,}864) = 15.57$, $p < .001$, φ=.04. For the Big Five personality traits, continuers had higher values on emotional stability, d = 0.13, agreeableness, d = 0.10, and conscientiousness, d = 0.15, each p < .001, but did not differ significantly on extraversion and openness.

Measures. The Big Five personality traits were measured in 2005 and 2009 using an adjectives scale very similar to Saucier's (1994) Mini-Markers. This questionnaire is a short form of the adjective check list introduced by Goldberg (1992). It consists of 31 items of the 40-item questionnaire by Saucier plus five additional items. Participants were asked to respond to the question "*How well do the following words describe you?*" on a scale ranging from 1 (*does not describe me at all*) to 7 (*describes me very well*).

Soto and Luhmann (2013) reported strong correlations between the HILDA items and the full-length Mini-Marker scales as well as acceptable retest correlations over a 2-month period (all rs > .70). In the present study, one item was excluded from the analyses because of inadequate psychometric properties (factor loadings < .06 in both assessment years for one openness item that was not part of the original Mini-Markers). The internal consistencies of the five factors (averaged between the two waves) were: emotional stability (seven items), α = .79; extraversion (eight items), α = .78; openness (six items), α = .74; agreeableness (seven items), α = .78; conscientiousness (seven items), α = .80. Descriptive statistics can be found in Table 3.

Data Analytic Strategy

Latent profile analyses. To identify and examine the structure and consistency of the personality types, we conducted LPA for cross-sectional data and LPTA for longitudinal data in Mplus (L. K. Muthén & Muthén, 1998–2012). The basic idea of LPA (Vermunt & Magidson, 2002; see also Pastor, Barron, Miller, & Davis, 2007) is to introduce a categorical latent variable to explain the associations between continuous observed indicators (here: Big Five scale scores).

In contrast to confirmatory factor analysis and structural equation modeling, and similar to classical latent class analysis, the values on the latent variable in LPA are discrete groups (latent types) rather than continuous latent scores. LPA differs from classical latent class analysis (Lazarsfeld & Henry, 1968) in that latent class analysis uses categorical indicators, whereas LPA uses continuous indicators. LPA can also be distinguished from cluster analysis, which has frequently been used in previous research on personality typologies (cf. Table 1), and from other forms of profile analyses (e.g., Davison, Kim, & Close, 2009) in that it treats the type variable as latent and therefore explicitly takes measurement error into account.

The goal of LPA is to identify different subgroups (here: personality types) whose members are similar to each other and different from members of other subgroups. The subgroups can then be described in terms of proportional size (i.e., relative number of individuals assigned to each type) as well as in terms of group-specific profiles on the observed indicators (i.e., type-specific mean levels of the Big Five personality traits). Individuals can be assigned to subgroups based on their most likely membership, which is determined based on their pattern of scores on the observed indicators.

We conducted our analyses in multiple steps separately for the two samples: We (a) identified the number and characteristics of personality types, (b) tested for MI across gender and age groups in multiple group LPAs, (c) investigated the relation between age and the number of individuals classified into each personality type, and (d) examined the longitudinal consistency of type membership using LPTA. Within each of our samples, the Big Five variables were standardized using the 2005 means and standard deviations. This transformation facilitates the interpretation of the resulting profiles both within and across nations. Also, mean level differences can be interpreted directly in terms of Cohen's *d* (Cohen, 1988).

Identification of personality types. We examined whether the commonly found tripartite structure of personality types could be found in our data sets as well. The number of latent types to be extracted can be either fixed a priori or determined empirically. In the present study, we chose the latter approach and considered models with different numbers of types (other than just the theoretically expected three). This was done in order to ensure that we would not miss any relevant additional types that may not have been detected in other studies due to small sample sizes. This approach requires estimating a series of models that differ in the number of types and comparing the fit of these models. The fit index most commonly used for this purpose is the Bayesian information criterion (BIC; Schwarz, 1978) with smaller values indicating better fit (Nylund, Asparouhov, & Muthén, 2007). Unfortunately, the BIC does not always provide an empirically sound or theoretically plausible solution, particularly in large samples such as ours. Among other issues, the use of the BIC can lead to an overextraction of classes. Therefore, other criteria

were considered as well, such as the theoretical appropriateness, interpretability, and parsimony of the solution (Marsh, Lüdtke, Trautwein, & Morin, 2009; Meeus et al., 2011).

In this study, we examined LPA solutions with two to six types separately for each data set. Apart from the BIC, we considered additional substantive criteria as proposed by Marsh et al. (2009) and Meeus et al. (2011). The solution should reflect differences between individuals in the level and shape of their personality profiles. Also, additional types should be allowed only if they reflect more than mere variations of types that are already present in solutions with fewer classes.

Measurement invariance of personality types. After deciding on the number of types to retain, we tested whether the LPA solutions demonstrated MI across gender and age groups. MI in latent class models refers to whether profiles have the same shape across groups (Eid, Langeheine, & Diener, 2003).[1] In the case of LPA, MI refers to whether different groups show the same class-specific means on the indicator variables based on which the latent profiles are defined. A failure to establish MI may indicate that the indicators measure different latent types in different subgroups, which could make comparisons of types across these groups more difficult. To test for MI, we conducted a series of multiple-group LPAs with 12 groups for each data set, consisting of six age groups (< 30 years, 31-40 years, 41-50 years, 51-60 years, 61-70 years, > 70 years) as well as two gender groups. The relative fit of models in which specific model parameters were selectively constrained or freed were then compared using the BIC.

[1] Note that MI for latent class models is defined differently from MI for confirmatory factor models.

Model 1 was the most restrictive model, in which the type-specific means (i.e., the personality profiles) were held equal across all 12 groups. In Models 2a and 2b, the profiles were allowed to differ for some of the groups. Specifically, Model 2a constrained the profiles to be equal across age groups but allowed different profiles for each gender (MI across age, but no MI between genders). Model 2b constrained the profiles to be equal between genders but allowed profiles to differ across age groups (MI between genders, but no MI across age). Finally, Model 3 allowed different profiles for all 12 groups (no MI across any of the groups).

Age and type sizes. We examined whether age was related to membership in the identified personality types to investigate cross-sectional age differences in personality type membership. For this purpose, we compared the proportion of individuals within each personality type for the six age groups using multiple group models.

Longitudinal stability of type membership. Consistency of type membership across time was examined using LPTA, an extension of LPA to multiple measurement occasions. Here, personality types are estimated simultaneously at both time points. Stability in type membership over time is modeled in terms of so-called latent transition probabilities that connect the Time 1 and Time 2 latent variable.

First, we tested the LPTA models for MI across time. This was important in order to examine whether the profiles remained the same across the 4-year period or whether they changed in structure. MI testing was done by conducting 12 multiple-group LPTAs for each data set (for each age group within each gender). We assumed that MI was tenable if models that constrained the type-specific profiles to invariance across time had lower BICs than models without this constraint.

We then assessed the consistency of type membership over time by examining the latent transition probabilities from the Time 1 types to the Time 2 types. The latent transition probabilities indicate an individual's likelihood of staying in the same latent personality type over time (i.e., high consistency) or of moving to one of the other latent types (i.e., low consistency). Furthermore, by examining whether latent transition probabilities differed across the six age groups, we were able to gain information about whether the consistency of personality type membership was higher or lower in different phases of adulthood.

Results

Identification of Personality Types

We first examined whether the commonly found three personality types would be found in the present data sets. First, we ran models with two to six types and compared BICs to identify the optimal number of personality types. We found that the BIC decreased with each additional personality type, even beyond six classes (see Table S1 in the supplemental material). This result is rather common in LPA, especially in large samples (e.g., Marsh et al., 2009). Given the inconclusive BIC results, we relied more on the theoretical appropriateness, interpretability, and parsimony of type solutions as described above. Using these criteria, we identified a 3-type solution for the German data and a 4-type solution for the Australian data as the best-fitting models (profile plots for all of the discussed models are provided in Figures S1 and S2 in the supplemental material). Below, we explain our rationale for choosing these solutions in detail.

German data. In the SOEP, the 2-type solution resulted in one profile with high values and one with low values on all of the Big Five personality traits with no additional

differences in profile shape. This solution therefore provided insufficient information with respect to typological differences. The 3-type solution resulted in three distinct profiles that differed both in level and shape and therefore provided meaningful information on the configuration of personality traits. The 4- and 5-type solutions reproduced the same profiles as the 3-type solution plus additional smaller subtypes (proportional type size less than 6%) with very low values on most or all personality traits. The 6-type solution again reproduced the previously found types plus one normative profile (i.e., average values on all traits). As a result, we selected the 3-type solution as the best-fitting model because it was the most parsimonious solution that provided meaningful, distinct profiles (see also Figure 1).

The three personality types were similar to the personality types found in previous research (cf. Table 1). One type, identified as resilients, had high values on all of the Big Five personality traits and comprised more than half of the sample (56%). A second type, identified as undercontrollers, was characterized by individuals with comparatively low values on agreeableness and conscientiousness and comprised 22% of the sample. The third type, the overcontrollers (23% of the sample), had particularly low values on extraversion and openness and, compared to the other two types, also slightly lower values on emotional stability.

Australian data. In the HILDA, the 2-type solution again resulted in one profile with high values and one with low values with no additional differences in shape. Similarly, the 3-type solution resulted in three profiles that differed only in mean levels but not in shape. Specifically, one type was characterized by high levels, one type by average levels, and one type by low levels for all variables except openness (for which the types did not differ). These solutions thus did not satisfy our demands for distinct profile shapes. The 4-

type solution resulted in four distinct profiles that differed not only in mean levels but also in the particular configurations. In particular, the types here differed on all five personality traits. Hence, the 4-type solution met our criteria for a meaningful type solution. The 5- and 6-type solutions reproduced the same profiles as the 4-type solution plus small subtypes (proportional type size less than 4%) that were characterized by extremely low values on some or all personality traits. As a result, we selected the 4-type solution as the best-fitting model for the Australian sample because it was the most parsimonious solution that provided meaningful, distinct profiles (see also Figure 2).

As in previous research (cf. Table 1), we found one personality type, identified as resilients, with high values on all of the Big Five personality traits (except for openness, where values were average). This type comprised about one third of the sample (36%). A second type, identified as undercontrollers, was characterized by individuals with comparatively low values on agreeableness, conscientiousness, and emotional stability and comprised 13% of the sample. The third type was an average type with values on all of the Big Five personality traits close to the overall mean levels. The average type comprised a large proportion of 41% of the sample. The fourth type was characterized by low values on emotional stability and high values on openness. Thus, it showed some similarities with the commonly found overcontroller type (i.e., low emotional stability) but also notable differences (i.e., high openness; cf. Table 1). Despite this difference, we labeled this personality type as overcontrollers. Ten percent of the sample could be allocated to this last personality type.

Measurement Invariance of Personality Types

To examine whether the identified personality types were similar across adulthood and old age for men and women, we tested for MI across age and gender. For both the German and Australian data, the BIC was lowest for a model that assumed MI of profiles across age groups but not between genders (see Table S2, Model 2a in the supplemental material). As can be seen in Figures 1 and 2, the profiles showed some differences between genders within each of the two data sets, but the overall patterns of personality profiles were very similar for men and women.

German data. As can be seen in Table 4, the prototypical female profiles in the German data had lower values on emotional stability and higher values on agreeableness in all of the three personality types compared to the respective male profiles. These differences in the levels of specific traits are consistent with the large gender differences on these traits found in general (cf. Table 2). However, as can be seen in Figure 1, the overall shape of the personality profiles was similar for men and women, thus leading to a similar interpretation of the personality types between genders.

Australian data. In the Australian data, there were no general differences between men and women in their levels of specific personality traits (see Table 5). However, the prototypical female profiles appeared to be somewhat more differentiated compared to the prototypical male profiles. Specifically, male overcontrollers did not differ significantly in emotional stability compared to undercontrollers nor did they differ in extraversion from those of the average type. Also, resilient males did not differ significantly from undercontrollers with regard to their openness. By contrast, all of those comparisons were more pronounced and statistically significant among females. Despite these differences,

visual inspection of Figure 2 suggests that type solutions for men and women are still rather similar, resulting in similar interpretations of the personality types overall.

In conclusion, our multiple-group analyses of both datasets suggest that MI can be assumed across the six age groups, but not strictly between genders, even though conceptually similar types were consistently found for both men and women. We therefore examined men and women separately in all subsequent analyses. Note that MI across age does not mean that all types had the same prevalence in each age group, but only that the mean profiles did not differ as a function of age. The effect of age on the probability of being assigned to a specific type is examined in the following section.

Age and Type Sizes

To examine cross-sectional age differences in personality type membership, we tested whether the probability of being categorized in each of the personality types differed across age groups.

German data. The cross-sectional relation between type membership and age was very similar for both men and women in the German data set (see Figure 3). The number of individuals identified as resilient was slightly lower in young (≤ 30 years; men: 41%; women: 51%), compared to middle adulthood (31 to 60 years; men: between 45 and 54%; women: between 58 and 62%). In older age groups (> 60 years), the probability of being identified as resilient partly decreased again (men: between 44 and 54%; women: between 46 and 57%). The probability of being categorized as an undercontroller was comparatively high in young adulthood (≤ 30 years; men: 45%; women: 38%) and remained at rather low levels in age groups older than 30 (men: between 14% and 20%; women: between 16% and 20%). On the contrary, the probability of being categorized as an overcontroller was

comparatively low in young adulthood (≤ 30 years; men: 14%; women: 12%) but higher in middle and old age (men: between 29% and 36%; women: between 22% and 38%).

Australian data. In the HILDA, the absolute number of female resilients exceeded the number of male resilients throughout all of adulthood (see Figure 4). However, for both genders, the probability of being identified as resilient was higher in the oldest (men: 49%; women: 63%) compared to younger age groups (men: between 13 and 43%; women: between 26 and 57%). The probability of being categorized as an undercontroller was higher for men compared to women in general and lower in the oldest (men: 6%; women: 1%) compared to younger age groups (men: between 14 and 26%; women: between 4 and 15%). There were only small effects of age on the probability of being categorized as the average type, with slightly higher prevalence in young compared to old age in men (youngest age group: 51%; oldest age group: 37%) and the opposite pattern for women (youngest age group: 21%; oldest age group: 36%). The probability of being categorized as an overcontroller was very low in all age groups for men (between 5% and 12%) but showed a strong effect of age for women with a higher prevalence in younger (youngest age group: 38%) compared to older age groups (oldest age group: 1%).

Longitudinal Consistency of Type Membership

To complement the cross-sectional findings based on age groups with more short-term longitudinal findings, we analyzed the consistency of type membership for the same individuals across a period of 4 years. To gain longitudinal information on the consistency of personality type membership, we estimated LPTA models separately for different gender and age groups. LPTA provides estimates of latent transition probabilities that indicate the likelihood of staying in the same type over time versus moving to a different type. They

furthermore indicate whether there are differences in the longitudinal consistency of type membership with respect to different age groups.

First, we tested for MI across time. In the German data set, comparisons of model fit revealed lower BICs in almost all models that assumed MI compared to models without this constraint. However, there were four subgroups (males: 41 to 50 and 51 to 60 years; females: 41 to 50 and 61 to 70 years) with marginally higher BICs in the models that assumed MI across time compared with the respective models without this constraint (see Table S3 in the supplemental material). We inspected all personality profiles and found that the groups with lower BIC values for the non-invariant solutions showed virtually identical profiles at both time points in solutions in which the profiles were freely estimated across time. Therefore, assuming invariance of the profiles across time seemed reasonable to us despite the slightly larger BIC values in these groups. In the Australian data set, the BIC values indicated that the models that assumed MI across time were superior for all age groups for both males and females (see Table S3).

German data. Table 6 shows the latent transition probabilities for the SOEP, separately for each age group and gender. As can be seen, the consistency of type membership (i.e., the probability of being categorized as the same type at both measurement occasions) was very high for all of the three personality types for both men and women and most age groups. At least 88% of individuals classified as resilients in 2005 were also categorized as resilients four years later. Somewhat lower consistency was found in individuals older than 60 (males: between 83% and 85%; females: between 74% and 84%). Thus, transitions from the resilient type to one of the other two types were generally rare. Consistency of type membership was also high for overcontrollers with at least 87%

of individuals remaining in this type across the 4-year time period. Again, there was less consistency in the oldest age group (males: 83%; females: 75%), which was entirely due to transitions from overcontrollers to undercontrollers.

The undercontrollers had the lowest, but nevertheless still high, consistency of type membership across four years. There was particularly low consistency for male undercontrollers younger than 30 (63%), which was mainly due to transitions to the resilient type. The consistency of male undercontrollers was higher in older age groups (at least 87%). Female undercontrollers showed high consistency in type membership in young adulthood (90%) and less consistency in older age groups (between 75% and 81%), which was mainly due to changing to the overcontroller type in middle adulthood and changing to the resilient type after age 70.

In sum, we generally found high consistency in type membership across a period of 4 years. There was particularly high consistency in resilients and overcontrollers in young and middle adulthood. On the contrary, we found less consistency in the undercontrollers and generally in individuals of old age.

Australian data. The latent transition probabilities for the HILDA data can be found in Table 7. Again, there was high consistency in type membership for all types, age groups and both genders. Consistency was particularly high in resilients (men: at least 95%; women: at least 98%), with slightly less consistency in the oldest age group (men: 89%; women: 79%). In this age group, some male resilients tended to change to the undercontroller type, whereas some female resilients tended to change to the overcontroller or average type. Similarly, there was very high consistency of type membership for male overcontrollers (at least 91%) with slightly less consistency in the oldest age group (83%),

which was entirely due to some individuals moving to the resilient group. Female overcontrollers showed high consistency up to age 60 (at least 88% remained overcontrollers) and less stability in old age (between 70% and 82%), which was mainly due to moving to the resilient or undercontroller groups. Membership in the average type group was also very consistent across time for both males (at least 93%) and females (at least 87%). Thus, changes to one of the other three types were rare.

As in the German sample, undercontrollers were those with the least consistent type membership; however, the probability of remaining an undercontroller was still quite high for men (at least 83%) but with less consistency in the youngest age group (75%), mainly due to changing to the average type. By contrast, membership in the undercontroller group was high for young and middle-aged females (until age 50; at least 93%) with less consistency in older age groups (between 74% and 87%), mainly due to changing to the average and resilient types.

In conclusion, there was high consistency in type membership in the Australian data set as well. This was particularly true for members of the resilient, overcontroller, and average type groups, and comparatively less so for individuals initially categorized as undercontrollers. Also, there was comparatively less consistency in old age and less consistency in type membership for male undercontrollers in young adulthood.

Discussion

The aim of this study was to examine personality consistency and change using a holistic typological approach. This enabled us to provide results on how the configuration of traits changed (or remained consistent) across adulthood and old age. In the following, we link our findings to our initial research questions.

Identification of Personality Types

Our current analyses revealed that three personality types in the German data set and four personality types in the Australian data set were the minimum numbers needed to describe differences in adult personality profiles. Additional types comprised only a small percentage of individuals and were oftentimes characterized by a pattern of extreme and/or low values on some or all personality traits. Hence, these additional types did not add substantial information for the characterization of the general population. However, researchers interested in very specific subgroups of individuals who might be at greater risk of experiencing specific life outcomes (e.g., on issues of clinical or health psychology) might choose a more differentiated type solution as appropriate.

The types identified in the German and Australian data sets were similar in some but not all regards and also largely resembled personality types found in adolescence (cf. Table 1). In both data sets, we found a resilient type with high values on all or most personality traits. We also found an undercontroller type with low values on agreeableness and conscientiousness in both data sets. However, this type was additionally characterized by low values on emotional stability in the Australian data set. This might be due to a focus on hostility instead of vulnerability in the items on emotional stability in the questionnaire used in the Australian study compared to the one used in the German study (John et al., 2008; for a comparison of questionnaires see also below). High hostility as a characteristic of undercontrollers matches the finding that individuals of this type are prone to aggressiveness (e.g., Asendorpf et al., 2001; Asendorpf & van Aken, 1999; Atkins, 2007; Hart et al., 1997).

There was less similarity with regard to the other personality types. Overcontrollers had comparatively low values on emotional stability and medium levels on agreeableness and conscientiousness in both data sets. However, in the German data, overcontrollers were additionally characterized by low extraversion and openness. By contrast, Australian overcontrollers had average values on extraversion and high values on openness. Also, the Australian sample produced an additional average type, which was not found in the German sample. It remains an important task for future research to examine whether these structural differences are due to cultural differences or are a consequence of the different questionnaires (see below) and whether they could be replicated with different measures.

Measurement Invariance of Personality Types

As expected, we found very similar personality types for men and women in both data sets. With regard to age, three different results were plausible. Specifically, type structure could have either been consistent across age groups (McCrae et al., 2006), become further differentiated with increasing age (Tackett et al., 2012), or become less differentiated in old age (Roberts et al., 2008). The results of the MI tests were consistent with the first idea according to which there is consistency in personality types across all of adulthood and old age.

Age and Type Sizes

In both data sets, we found a higher number of resilients in older age groups compared to younger age groups. This suggests that the developmental trend towards resilience found in adolescent populations (Meeus et al., 2011) continues in adulthood. These differences were particularly pronounced in the Australian data. In the German data, this cross-sectional age trend was smaller, and for women, it ended in middle adulthood. As

the resilient type is associated with successful adaptation in several life domains (for an overview, see Donnellan & Robins, 2010), a higher prevalence of resilients in older age groups can be interpreted as an indicator of personality maturation.

Also in line with our assumptions and previous results from adolescent populations (Meeus et al. 2011) was the finding that the probability of being categorized as an undercontroller was lower in older age groups compared to younger age groups. In the German data set, these differences were particularly pronounced in young adults. In the Australian data set, the differences were less abrupt but rather continuous across adulthood. This finding is also an indicator of personality maturation as undercontrollers often find it difficult to adapt to the demands of life (Donnellan & Robins, 2010).

The cross-sectional association between age and the probability of being categorized as an overcontroller was less consistent. In line with our expectations, we found that there were fewer overcontrollers in older age groups of female Australians with a smaller effect of age for male Australians. By contrast, the number of overcontrollers was higher in older compared to younger age groups in the German data set. Because overcontrollers tend to be less confident in social relationships and are prone to internalizing problems such as depression (Donnellan & Robins, 2010), examining individual and cultural differences for predicting overcontrolled type membership is an important avenue for future research.

To conclude, we found that age was associated with the probability of being categorized into a specific personality type in both samples. The cross-sectional age differences suggest that individuals mature in their personality across adulthood, indicated

by an increased prevalence of resilients and a decreased prevalence of undercontrollers in older compared to younger age groups.

Longitudinal Consistency of Type Membership

In line with our expectations, we found high longitudinal consistency in type membership across the 4 years in both data sets and for most subgroups (i.e., each type, gender, and age group), which is consistent with the high long-term predictive validity of personality types (cf. Asendorpf & Denissen, 2006; Chapman & Goldberg, 2011). The vast majority of individuals was categorized into the same personality type in both assessment years.

However, there were also some systematic differences: There was less consistency in the undercontroller type compared to the other personality types. This was particularly true for young men: Every fourth of them switched to the resilient type across these four years in Germany and every fifth switched to the average type in Australia. This reflects that a high number of men developed towards a more adapted personality in these years, a trend typical for young adulthood (Roberts et al., 2008). In addition to approaches that focused on single traits, our more holistic approach suggests that this functional development is not restricted to single personality traits but is an overall developmental trend affecting several personality traits in a person simultaneously.

Also in line with our expectations, we found particularly high consistency in middle adulthood and less consistency in old age. This pattern is consistent with recent findings showing that personality may change substantially again in old age (Ardelt, 2000; Lucas & Donnellan, 2011; Specht et al., 2011; Wortman et al., 2012). The majority of theoretical and empirical studies on adult personality development still focus on young adulthood (for

an overview, see Specht, Bleidorn, et al., 2013). Our findings show that more research on the causes and mechanisms of personality development across the entire life span, particularly in old age, is needed.

In conclusion, in terms of short-term consistency, we found that type membership was relatively stable across a period of four years. This high consistency suggests that personality types are not affected by the momentary ups and downs of life and thus are able to provide meaningful predictions of long-term outcomes (cf. Asendorpf & Denissen, 2006; Chapman & Goldberg, 2011).

Limitations

This study is characterized by some noteworthy strengths that include the use of LPA, which enabled us to control for measurement error, to systematically examine questions of MI across groups and time, and to examine the longitudinal stability of types; the large, representative, and age-heterogeneous samples from two different nations, which make our results highly generalizable; and the use of longitudinal data, which allowed us to test the consistency of personality types across several years.

Despite these desirable characteristics of the sample and type of analysis, there are certain limitations that should be addressed in future research. First, we used data from individuals ranging in age from adolescence (age 15) to old age (age 82). It would be worthwhile to expand our analyses to even younger individuals. Several studies have analyzed personality types in childhood, but these studies were rarely based on large, longitudinal, and representative samples.

Second, it would be desirable to observe the same individuals over longer time periods (e.g., across all of adulthood) in longitudinal studies with more than two time points

(Luhmann, Orth, Specht, Kandler, & Lucas, 2013). Comparing developmental trajectories of different birth cohorts enables researchers to disentangle developmental and cohort effects as well as effects of measurement repetitions. This is particularly important given that former studies found some discrepancy in cross-sectional and longitudinal results in the SOEP (Lucas & Donnellan, 2011; Specht et al., 2011; Specht, Egloff, & Schmukle, 2013) and in the HILDA (Wortman et al., 2012). Thus, the present results comparing different age groups could partly reflect cohort effects rather than true age effects.

Third, profile analyses have several strengths such as the latent modeling approach but also have some limitations. For example, the identification of the optimal number of types with quantitative criteria is limited in this approach, so subjectivity is unavoidable (see Horn, 1967, for a discussion of risks associated with subjectivity in psychological science). There is still no appropriate indicator of absolute model fit that would enable a strictly confirmatory approach to LPA. Thus, we used exploratory models here and rather descriptive indexes of model fit resulting in findings that are still tentative and that need to be replicated and/or verified by independent analysts (Funder et al., 2014). Also, the BIC and other fit measures can lead to inconclusive results in LPA, making it necessary to use theory, interpretability, and model parsimony as additional criteria for model selection (Marsh et al., 2009; Meeus et al., 2011). Finally, LPA assumes within-type normality, which could be violated in practice (see Bauer & Shanahan, 2007, for a discussion of this issue).

Another limitation of the LPA approach is that a model with a few types for thousands of cases necessarily always represents a simplification of reality (see Asendorpf, 2006, on ‘typeness of personality profiles’, an approach that tries to overcome this

simplification). There is typically considerable within-type heterogeneity due to differences in level or even differences in shape. As a result of this simplification, estimates of the stability of the types across time are likely to represent overestimates. A complete modeling of the remaining heterogeneity would require a much large number of types, which leads to practical and interpretational problems. Thus, the choice to apply profile analyses certainly depends on the ultimate purpose of the study, and other analytical approaches (e.g., Davison et al., 2009) might be more suitable in other studies.

Fourth, the data used here were based solely on self-reports. This might have caused response biases such as social desirable responding or a tendency for acquiescence. As a result, for example, the proportion of individuals in the classes interpreted as resilients might be overestimated. Multimethod approaches (e.g., observer reports or behavioral observation methods) would therefore be a valuable addition based on which the convergent validity of the three personality types across different assessment methods could be examined. In addition, questionnaires used in large surveys are often short in length (e.g., only three items per trait in the SOEP). Future studies should aim at incorporating longer questionnaires that may have larger reliabilities than the scales used in the present study. On the other hand, both LPA and LPTA control for measurement error in the observed scores when estimating latent profiles, making the use of short scales with moderate reliabilities less problematic.

Last, personality types should be examined in cultures other than Germany and Australia to study the cross-cultural consistency of the pattern and prevalence of personality types. Also, comparisons across countries were limited in this study because of the use of different questionnaires. John et al. (2008) compared the original versions of the

questionnaires used here and found that the two are very similar with regard to extraversion, openness, agreeableness, and conscientiousness (convergent validity correlations, corrected for imperfect reliability were .99, .95, .93, and .96, respectively) but less similar with regard to emotional stability (the corrected convergent validity correlation was .82). This is due to an "underweighting of depression, anxiety, and vulnerability and the relative overweighting of hostility" (p. 136) in the Mini-makers compared to the BFI. To allow for cross-cultural comparisons of personality types that are less subjective but are instead based on quantitative criteria, future studies should use the same measures in each nation, and these measures should ideally have higher internal consistencies than the BFI-S used here.

Conclusion

Personality types enable the comprehensive and parsimonious classification of individuals with respect to several personality characteristics simultaneously. We found that these types are largely robust across gender and age groups and that they are apparently not subject to fluctuating environmental characteristics, as reflected by the high stability of type membership across time. As such, personality types might be particularly suitable for predicting long-term outcomes or as parsimonious control variables in analyses that do not focus primarily on personality effects. Despite the high consistency, some changes in type membership were found in the undercontrollers and in individuals in old adulthood. This highlights the importance for future research to identify the driving causes of this continuing development with a specific focus on old age.

In sum, our findings provide insights into the high consistency of personality types across gender and age, suggesting that adult personality types are a robust classification

system to organize individual differences in personality traits. Examining the interplay of life outcomes and adult personality type membership is a promising avenue for future research that aims at considering the holistic nature of personality.

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Table 1

Overview of Studies on Personality Types in Adolescence and Adulthood

Authors	Year	Sample characteristics	Questionnaire	Analytic strategy	Personality types
Akse, Hale, Engels, Raaijmakers, & Meeus[a]	2004	*N* = 1,142 (53% female), Dutch adolescents	Adjective check list	Cluster analysis	resilients: high on ES, E, A undercontrollers: low on O, A, C overcontrollers: high on C, low on ES, E
Akse, Hale, Engels, Raaijmakers, & Meeus[a]	2007	*N* = 338 (55% female), Dutch adolescents	Adjective check list	Cluster analysis	resilients: high on ES, E, A undercontrollers: low on O, A, C overcontrollers: low on ES, E
Asendorpf, Borkenau, Ostendorf, & van Aken	2001	Study 1: *N* = 730 (50% female), 18-24 years Study 2: *N* = 568 (50% female), 18-24 years Study 3: *N* = 312 (55% female), 18-22 years all German	NEO-FFI in Study 1 and 3; adjective list in Study 2	Cluster analysis	resilients: high on ES, A, C undercontrollers: low on C overcontrollers: low on ES, E
Avdeyeva & Church	2005	*N* = 398 (approx. 66% female), Filipino college students	NEO-PI-R	Cluster analysis	Male types: resilient/overcontrolled: high on ES, A, C brittle/undercontrolled: low on ES, A, C adjusted/moderate: average Female types: resilient/overcontrolled: high on C, low on E

					brittle/undercontrolled: low on ES, A, C adjusted/outgoing: high on O
Barbaranelli	2002	*N* = 421 (61% female), 20-30 years, Italian	NEO-PI	Cluster analysis	resilients: high on ES, C undercontrollers: high on O, A overcontrollers: low on ES, E, O, A
Boehm, Asendorpf, & Avia	2002	*N* = 1,218 (50% female), 20-30 years, Spanish	NEO-PI	Cluster analysis	resilients: high on ES, E, A, C undercontrollers: low on C overcontrollers: low on ES, E, O, A
Costa, Herbst, McCrae, Samuels, & Ozer	2002	Study 1: *N* = 486 Study 2: *N* = 1,856 Study 3: *N* = 274 Study 4: *N* = 242 all English speaking adults (50% female)	NEO-PI-R	Cluster analysis	resilients: high on ES, E, O, A, C undercontrollers: low on A overcontrollers: low on O
de Fruyt, Mervielde, & van Leeuwen	2002	*N* = 464 (51% female), 12-15 years, Dutch	NEO PI-R and HiPIC	Cluster analysis	resilients: high on ES, E, O, A, C undercontrollers: low A, C overcontrollers: low on E, O
Dubas, Gerris, Janssens, & Vermulst	2002	*N* = 305 (55% female), 14-19 years, Dutch	Adjective check list	Cluster analysis	resilients: high on ES, E, A undercontrollers: low on O, A, C overcontrollers: average
Grumm & von Collani	2009	*N* = 141 (82% female), 18-55 years (84% between 18 and 25 years), German	NEO-FFI	Cluster analysis	resilients: high on ES, E non-desirables: high on O, low on ES, A, C reserved overcontrollers: high on A, C, low on O

Klimstra, Hale, Raaijmakers, Branje, & Meeus[a]	2010	*N* = 923 (49% female), Dutch adolescents	Adjective check list	Latent class analysis	resilients: high on E, A undercontrollers: low on O, A, C overcontrollers: low on ES, E
Klimstra, Luyckx, Teppers, Goossens, & de Fruyt	2011	*N* = 250 (63% female), 15-19 years, Dutch	NEO-PI-3	Cluster analysis	resilients: high on ES, E, C undercontrollers: low on O, A, C overcontrollers: low on ES, E
McCrae, Terracciano, Costa, & Ozer	2006	*N* = 1,540 (46% female), 17-93 years, English	California Adult Q-Set	Inverse factor analysis	resilients: high on ES, E, O 2nd type: high on C, low on E, A 3rd type: high on A, low on ES
Meeus, van de Schoot, Klimstra, & Branje[a]	2011	*N* = 1,313 (51% female), 12-20 years, Dutch	Adjective check list	Latent class analysis	resilients: high on E, O, A undercontrollers: high on ES and low on O, A, C overcontrollers: low on ES, E
Rammstedt, Riemann, Angleitner, & Borkenau	2004	*N* = 600 (78% female), 18-70 years, German	NEO-PI-R	Cluster analysis	resilients: high on ES, A, C undercontrollers: high on E, O and low on ES, A, C overcontrollers: low on E, O
Schnabel, Asendorpf, & Ostendorf	2002	study 1: *N* = 786 (50% female), 20-30 years study 2: *N* = 730 (50% female), 18-24 years both German	study 1: NEO-PI-R study 2: NEO-FFI	Cluster analysis	resilient: high on ES, C undercontrollers: high on O, low on C overcontrollers: low on ES, E
Scholte, van Lieshout, de Wit, & van Aken	2005	*N* = 3,284 (43% female), 12-18 years, Dutch	Bipolar items-questionnaire	Cluster analysis	resilients: high on ES, E, O, A, C undercontrollers: low on A, C overcontrollers: low on ES, E, O
Steca, Alessandri, & Caprara	2010	*N* = 735 (56% females), 65-95, Italian	Big Five Questionnaire	Cluster analysis	resilients: high von ES, O, A, C undercontrollers: low on C overcontrollers: low on ES, E, O, A

van Leeuwen, de Fruyt, & Mervielde	2004	*N* = 491 (52% female), 10-18 years, Dutch	Adjective check list	Cluster analysis	resilients: high on ES, E, O, A, C undercontrollers: low on A, C overcontrollers: low on ES, E

Note. Restricted to studies using self-reports of the Big Five personality traits. ES = emotional stability; E = extraversion; O = openness to experience; A = agreeableness; C = conscientiousness.

[a] data came from the Conflict and Management of Relationships survey (CONAMORE)

Table 2

Means, Standard Deviations, and Intercorrelations for the Big Five Personality Traits for Men and Women in the German Data Set

	Emotional stability	Extraversion	Openness	Agreeableness	Conscientiousness
			Means (standard deviations)		
Men	4.36 (1.16)	4.69 (1.12)	4.38 (1.17)	5.22 (0.99)	5.82 (0.96)
Women	3.87 (1.21)	4.90 (1.11)	4.52 (1.22)	5.56 (0.93)	5.95 (0.89)
			Correlations		
Emotional Stability	-	.17	.07	.18	.13
Extraversion	.19	-	.34	.08	.17
Openness	.10	.38	-	.13	.15
Agreeableness	.11	.06	.09	-	.28
Conscientiousness	.09	.18	.15	.33	-

Note. N_{men} = 6,999 and N_{women} = 7,719. Response scales for the Big Five personality traits range from 1 (*does not apply to me at all*) to 7 (*applies to me perfectly*). Means, standard deviations, and correlations were averaged across the two assessment years. Correlations for men (women) are displayed above (below) the diagonal.

Table 3

Means, Standard Deviations, and Intercorrelations for the Big Five Personality Traits for Men and Women in the Australian Data Set

	Emotional stability	Extraversion	Openness	Agreeableness	Conscientiousness
			Means (standard deviations)		
Men	5.13 (0.97)	4.47 (0.92)	4.26 (1.02)	5.24 (0.83)	5.09 (0.95)
Women	5.17 (1.00)	4.73 (1.00)	4.16 (1.08)	5.69 (0.77)	5.30 (0.98)
			Correlations		
Emotional Stability	-	.26	-.15	.47	.35
Extraversion	.26	-	.07	.26	.20
Openness	-.18	.09	-	.09	.06
Agreeableness	.46	.26	.08	-	.36
Conscientiousness	.35	.19	.04	.35	-

Note. N_{men} = 3,808 and N_{women} = 4,507. Response scales for the Big Five personality traits range from 1 (*does not describe me at all*) to 7 (*describes me very well*). Means, standard deviations, and correlations were averaged across the two assessment years. Correlations for men (women) are displayed above (below) the diagonal.

Table 4

Means of the Big Five Personality Traits for each Personality Type, Separately for Men and Women, in the German Data Set

Big Five personality traits	Men			Women		
	Resilients	Under-controllers	Over-controllers	Resilients	Under-controllers	Over-controllers
Emotional stability	0.41	0.01	-0.09	-0.03	-0.34	-0.50
Extraversion	0.39	-0.25	-0.74	0.49	-0.15	-0.78
Openness	0.35	-0.24	-0.62	0.42	-0.10	-0.87
Agreeableness	0.19	-0.72	-0.39	0.39	-0.43	0.25
Conscientiousness	0.51	-1.50	0.09	0.52	-1.36	0.19

Note. N_{men} = 6,999 and N_{women} = 7,719. Variables were standardized using the 2005 means and standard deviations and only information from the first measurement point is included here. Mean-level differences for all of the Big Five personality traits between personality types within each gender were significant at a level of a Bonferroni-adjusted *p* (for 15 comparisons within each gender) of .05.

Table 5

Means of the Big Five Personality Traits for each Personality Type, Separately for Men and Women, in the Australian Data Set

Big Five personality traits	Men				Women			
	Resilients	Under-controllers	Over-controllers	Average type	Resilients	Under-controllers	Over-controllers	Average type
Emotional stability	0.88[a]	-1.06[c]	-1.11[c]	0.13[b]	0.76[a]	-1.57[d]	-0.77[c]	-0.10[b]
Extraversion	0.33[a]	-0.64[c]	-0.28[b]	-0.20[b]	0.50[a]	-0.60[d]	0.10[b]	-0.32[c]
Openness	0.08[b]	0.01[b]	0.74[a]	-0.11[c]	-0.08[c]	0.17[b]	0.44[a]	-0.50[d]
Agreeableness	0.68[a]	-1.49[d]	-0.10[b]	-0.35[c]	0.83[a]	-1.24[d]	0.18[b]	-0.24[c]
Conscientiousness	0.60[a]	-0.89[d]	-0.03[b]	-0.20[c]	0.59[a]	-1.04[d]	-0.09[b]	-0.29[c]

Note. N_{men} = 3,808 and N_{women} = 4,507. Variables were standardized using the 2005 means and standard deviations and only information from the first measurement point is included here. Values with different superscripts (a, b, c, and d, respectively) indicate significant mean-level differences between personality types within each gender at a level of a Bonferroni-adjusted *p* (for 30 comparisons within each gender) of .05.

Table 6

Latent Transition Probabilities for the German Data Set, Separately for Men and Women and Each Age Group

Initial type membership	Type membership at the second measurement occasion					
	Men			Women		
	Resilient	Under-controller	Over-controller	Resilient	Under-controller	Over-controller
Resilient						
< 30 years	**.96**	.01	.03	**.92**	.08	.00
31-40 years	**.89**	.07	.04	**.92**	.07	.00
41-50 years[a]	**.90**	.10	.00	**.90**	.10	.00
51-60 years	**.90**[a]	.07[a]	.03[a]	**.88**	.11	.02
61-70 years	**.83**	.10	.07	**.84**[a]	.13[a]	.03[a]
> 70 years	**.85**	.06	.10	**.74**	.11	.15
Undercontroller						
< 30 years	.26	**.63**	.11	.10	**.90**	.00
31-40 years	.03	**.92**	.05	.15	**.79**	.07

41-50 years[a]	.00	**1.00**	.00	.04	**.75**	.21
51-60 years	.05[a]	**.89**[a]	.07[a]	.01	**.81**	.18
61-70 years	.13	**.87**	.00	.11[a]	**.76**[a]	.13[a]
> 70 years	.00	**1.00**	.00	.23	**.78**	.00
Overcontroller						
< 30 years	.00	.00	**1.00**	.00	.00	**1.00**
31-40 years	.01	.00	**.99**	.00	.00	**1.00**
41-50 years[a]	.09	.00	**.91**	.00	.08	**.92**
51-60 years	.00[a]	.02[a]	**.98**[a]	.00	.10	**.90**
61-70 years	.00	.14	**.87**	.00[a]	.04[a]	**.97**[a]
> 70 years	.00	.17	**.83**	.00	.25	**.75**

Note. N_{men} = 6,999 and N_{women} = 7,719. Estimated latent transition probabilities of being classified into each of the three personality types at the second measurement point separately for each type membership at the first measurement point (first column). Stabilities of type membership are printed in bold.

[a] Please note that BIC values in these subgroups were slightly higher in models assuming measurement invariance across time compared with the respective models without this constraint (cf. main text on page 24 and Table S3).

Table 7

Latent Transition Probabilities for the Australian Data Set, Separately for Men and Women and Each Age Group

Initial type membership	Type membership at the second measurement point							
	Men				Women			
	Resilient	Under-controller	Over-controller	Average type	Resilient	Under-controller	Over-controller	Average type
Resilient								
< 30 years	**.99**	.00	.01	.00	**.99**	.01	.00	.00
31-40 years	**.99**	.01	.00	.00	**1.00**	.00	.00	.00
41-50 years	**.99**	.01	.00	.00	**.98**	.02	.00	.00
51-60 years	**.95**	.00	.05	.00	**1.00**	.00	.00	.00
61-70 years	**.98**	.02	.00	.00	**.99**	.00	.00	.02
> 70 years	**.89**	.10	.01	.00	**.79**	.00	.09	.12
Undercontroller								
< 30 years	.00	**.75**	.05	.20	.00	**.93**	.01	.07
31-40 years	.00	**.95**	.00	.05	.01	**.96**	.02	.01

41-50 years	.03	**.96**	.00	.02	.01	**.94**	.00	.06
51-60 years	.06	**.83**	.00	.11	.00	**.87**	.00	.13
61-70 years	.01	**.93**	.00	.05	.02	**.74**	.02	.22
> 70 years	.08	**.92**	.00	.00	.16	**.79**	.00	.06
Overcontroller								
< 30 years	.08	.02	**.91**	.00	.12	.00	**.88**	.00
31-40 years	.02	.00	**.94**	.04	.05	.03	**.92**	.00
41-50 years	.00	.00	**1.00**	.00	.00	.00	**1.00**	.00
51-60 years	.00	.02	**.98**	.00	.00	.00	**1.00**	.00
61-70 years	.00	.06	**.94**	.00	.16	.14	**.70**	.00
> 70 years	.18	.00	**.83**	.00	.03	.12	**.82**	.03
Average type								
< 30 years	.00	.07	.00	**.93**	.00	.04	.00	**.96**
31-40 years	.00	.05	.00	**.95**	.00	.00	.00	**1.00**
41-50 years	.00	.00	.00	**1.00**	.00	.00	.00	**1.00**
51-60 years	.00	.02	.00	**.98**	.00	.00	.00	**1.00**

61-70 years	.00	.00	.00	**1.00**	.08	.05	.00	**.87**
> 70 years	.00	.00	.00	**1.00**	.00	.05	.00	**.95**

Note. N_{men} = 3,808 and N_{women} = 4,507. Estimated latent transition probabilities of being classified into each of the four personality types at the second measurement point separately for each type membership at the first measurement point (first column). Stabilities of type membership are printed in bold.

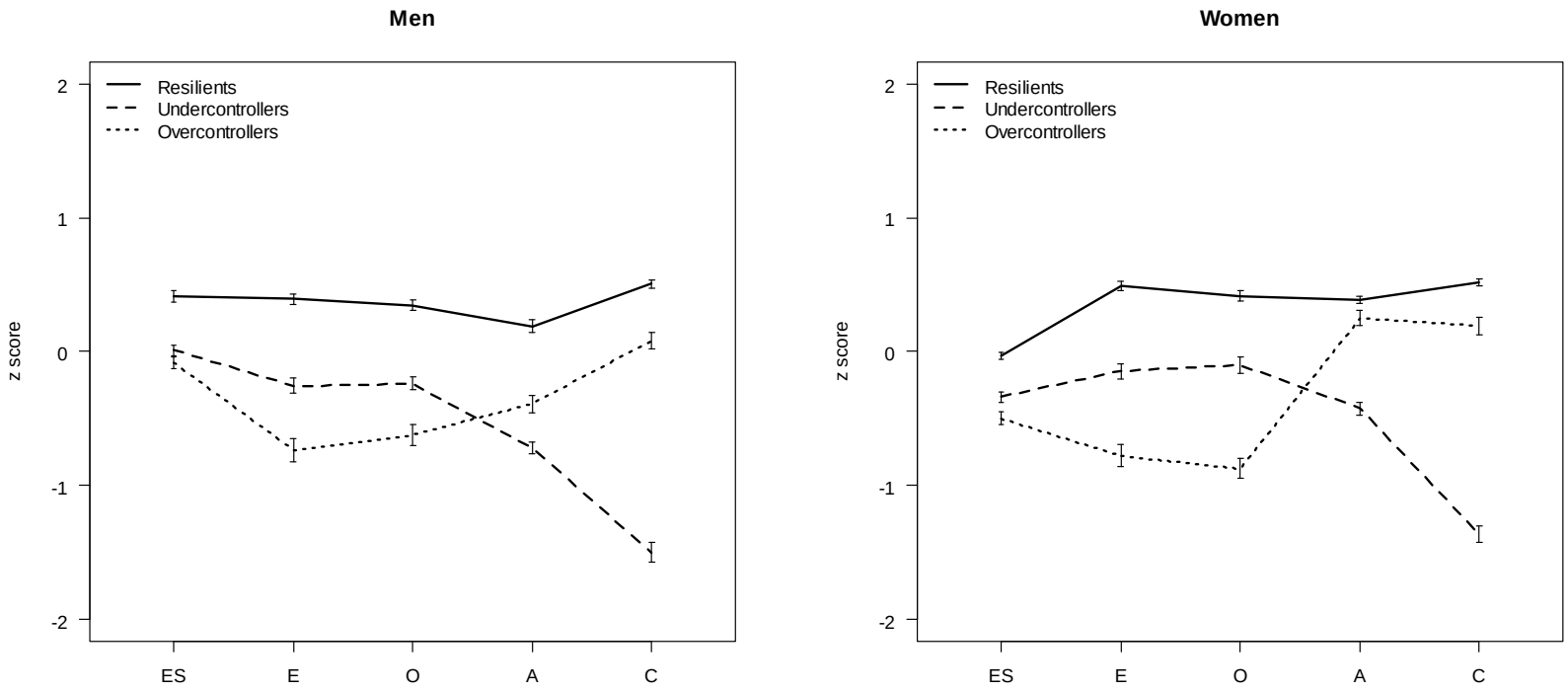

Figure 1. Latent profile plots for the German data set by gender. Variables were standardized using the 2005 means and standard deviations and only information from the first measurement point is included here. Error bars reflect standard errors. ES = emotional stability, E = extraversion, O = openness to experience, A = agreeableness, C = conscientiousness.

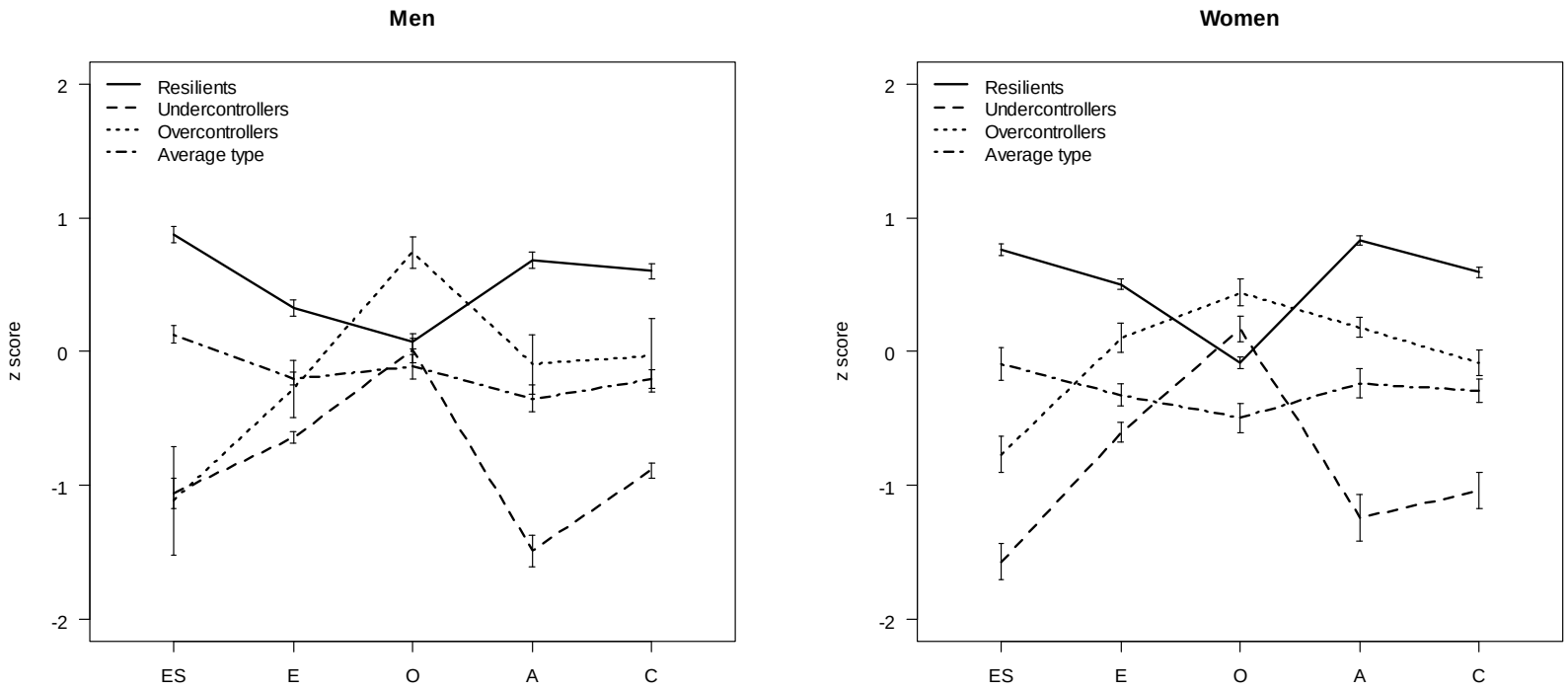

Figure 2. Latent profile plots for the Australian data set by gender. Variables were standardized using the 2005 means and standard deviations and only information from the first measurement point is included here. Error bars reflect standard errors. ES = emotional stability, E = extraversion, O = openness to experience, A = agreeableness, C = conscientiousness.

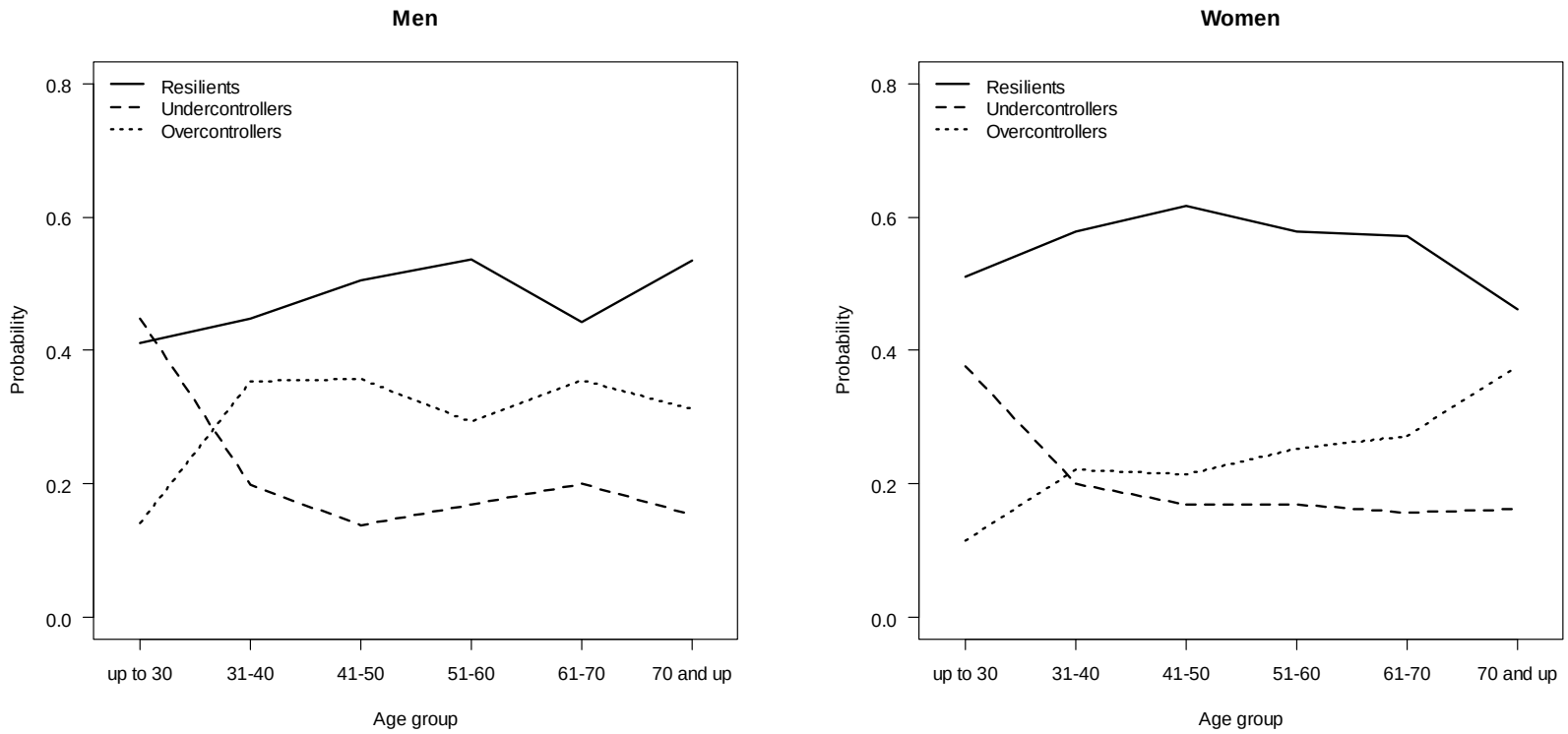

Figure 3. Probability of type membership depending on age group, separately for men and women in the German data set. Only information from the first measurement point is included here.

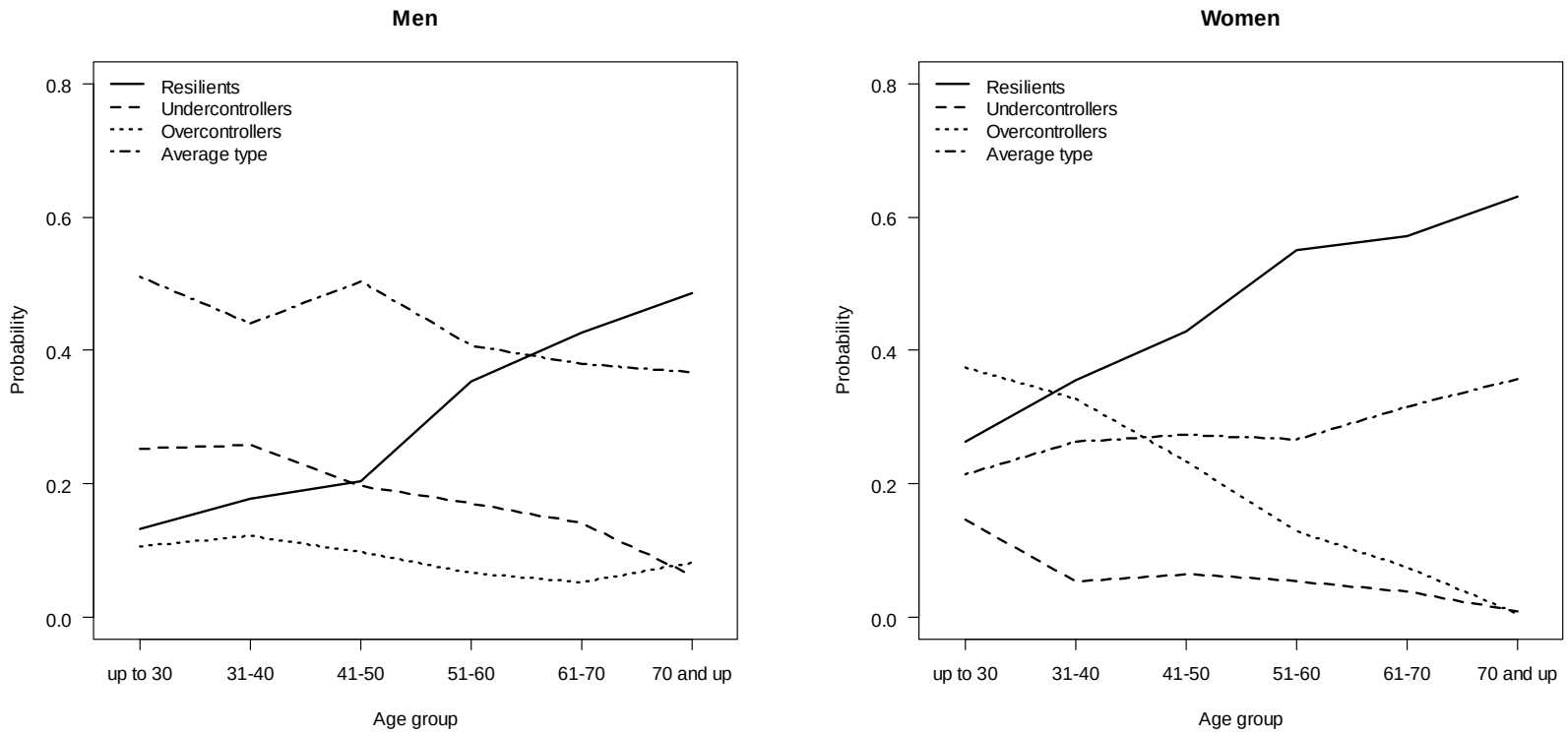

Figure 4. Probability of type membership depending on age group, separately for men and women in the Australian data set. Only information from the first measurement point is included here.

Supplemental Material

Table S1

Comparison of Models With a Different Number of Personality Types for the German and Australian Data Sets

Number of types	BIC	
	German data set	Australian data set
2	207,721	114,232
3	206,088	113,650
4	205,132	113,322
5	204,562	113,158
6	204,046	113,049

Note. Only information from the first measurement point is included here. BIC = Bayesian information criterion.

Table S2

Testing Measurement Invariance Across Age Groups and Gender in the German and Australian Data Sets

Model	BIC	
	German data set	Australian data set
Model 1: measurement invariance across all groups	278,328	152,690
Model 2a: measurement invariance across age but not gender	**277,289**	**152,513**
Model 2b: measurement invariance across gender but not age	278,133	152,886
Model 3: no measurement invariance across age or gender	277,619	153,447

Note. Only information from the first measurement point is included here. The smallest BIC values per data set are printed in bold. BIC = Bayesian information criterion.

Table S3

Testing Measurement Invariance Across Time in the German and Australian Data Sets

Subgroup	BIC			
	German data set		Australian data set	
	MI across time	no MI across time	MI across time	no MI across time
Male				
< 30 years	**34,149**	34,219	**23,329**	23,435
31-40 years	**34,990**	35,021	**19,413**	19,537
41-50 years	41,588	**41,585**	**21,256**	21,373
51-60 years	32,940	**32,921**	**17,413**	17,522
61-70 years	**34,396**	34,424	**11,656**	11,768
> 70 years	**14,771**	14,842	**5,991**	6,080
Female				
< 30 years	**38,596**	38,604	**29,463**	29,566
31-40 years	**39,241**	39,289	**22,892**	23,003
41-50 years	45,203	**45,197**	**26,279**	26,390
51-60 years	**35,000**	35,061	**18,979**	19,083
61-70 years	34,856	**34,851**	**13,295**	13,391
> 70 years	**18,033**	18,045	**7,211**	7,297

Note. Columns contain BIC values for models that assume measurement invariance across time and the respective models that relax this restriction. The smallest BIC values within each subgroup for each data set are printed in bold. BIC = Bayesian information criterion. MI = measurement invariance.

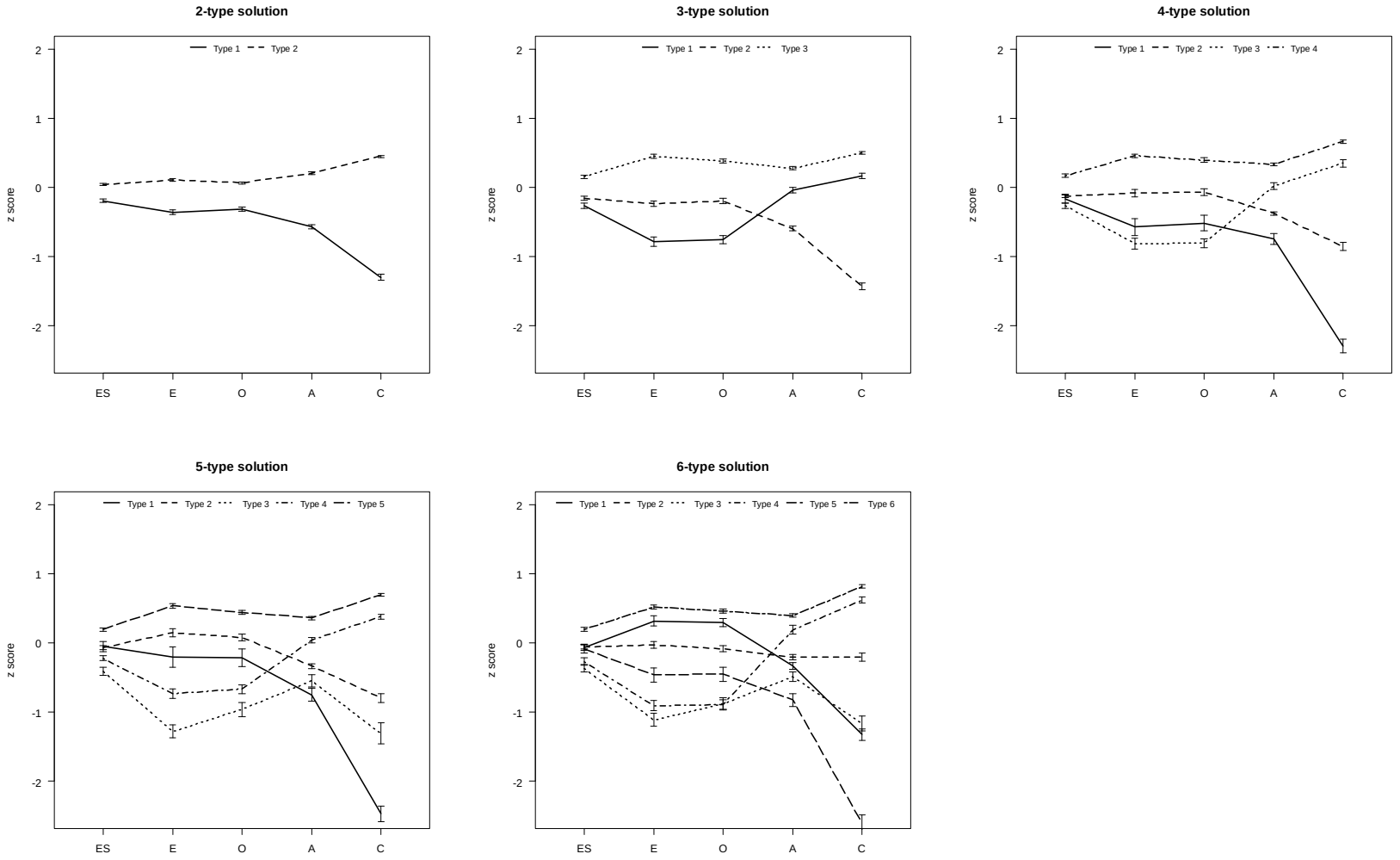

Figure S1. Latent profile plots for two to six personality types in the German data set. Variables were standardized using the 2005 means and standard deviations and only information from the first measurement point is included here. Error bars reflect

standard errors. ES = emotional stability, E = extraversion, O = openness to experience, A = agreeableness, C = conscientiousness.

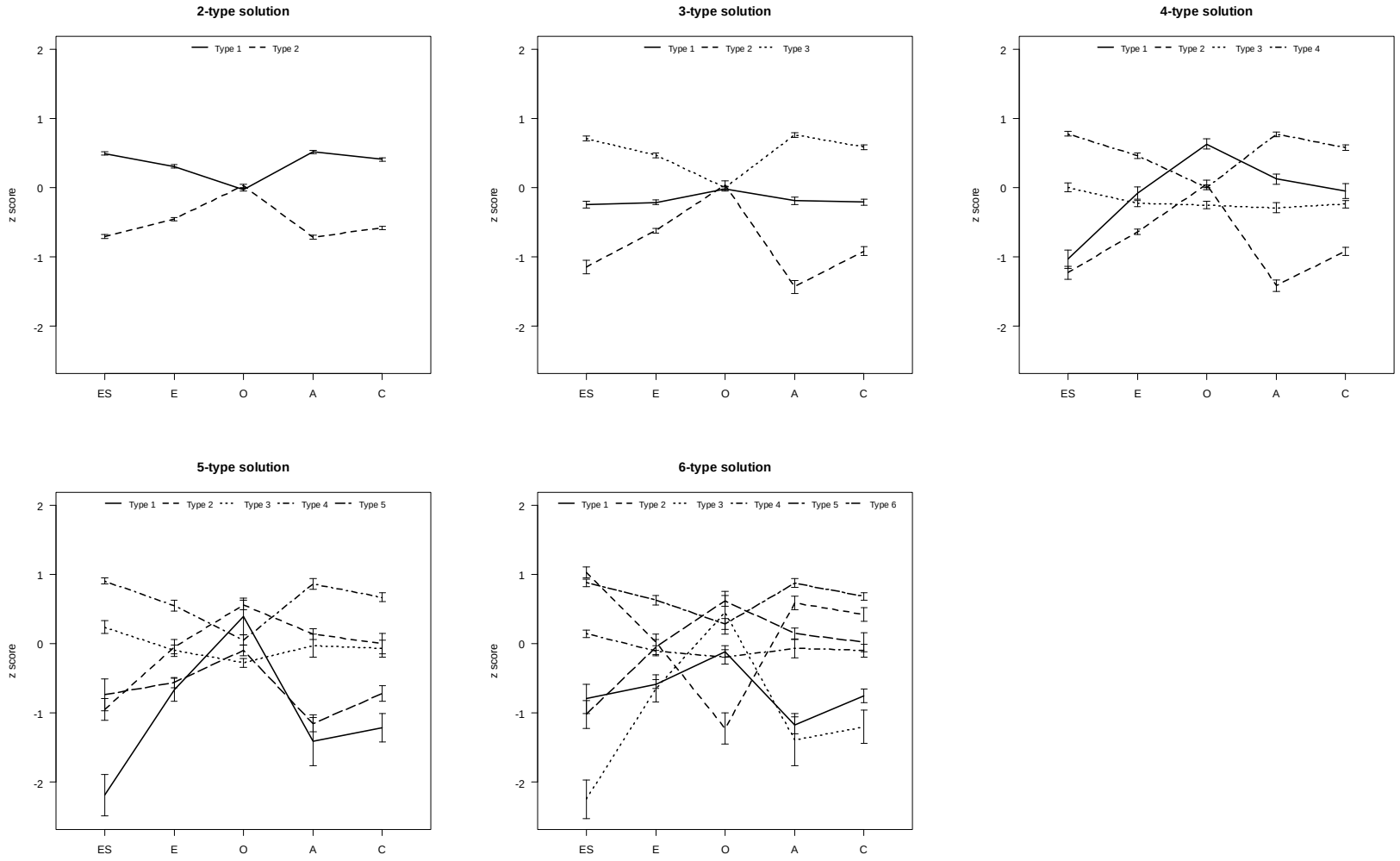

Figure S2. Latent profile plots for two to six personality types in the Australian data set. Variables were standardized using the 2005 means and standard deviations and only information from the first measurement point is included here. Error bars reflect

standard errors. ES = emotional stability, E = extraversion, O = openness to experience, A = agreeableness, C = conscientiousness.