

 Open access • Journal Article • DOI:10.1002/PER.524

Personality development from 12 to 18 years of age: changes in mean levels and structure of traits: — [Source link](#)

Jüri Allik, Kaia Laidra, Anu Realo, Helle Pullmann

Institutions: University of Tartu

Published on: 01 Sep 2004 - European Journal of Personality (John Wiley & Sons, Ltd)

Topics: Personality, Hierarchical structure of the Big Five, Big Five personality traits and culture, Big Five personality traits and Alternative five model of personality

Related papers:

- [Personality Trait Development From Age 12 to Age 18: Longitudinal, Cross-Sectional, and Cross-Cultural Analyses](#)
- [Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies.](#)
- [The rank-order consistency of personality traits from childhood to old age: a quantitative review of longitudinal studies.](#)
- [Personality development: stability and change.](#)
- [Stability and Change in Adolescents' Personality: A Longitudinal Study](#)

Share this paper:    

View more about this paper here: <https://typeset.io/papers/personality-development-from-12-to-18-years-of-age-changes-26bvw2mw8j>

Personality Development from 12 to 18 Years of Age: Changes in Mean Levels and Structure of Traits

JÜRI ALLIK*, KAIA LAIDRA, ANU REALO and HELLE PULLMANN

The Estonian Centre of Behavioural and Health Sciences, University of Tartu, Estonia

Abstract

The Estonian NEO-FFI was administered to 2650 Estonian adolescents (1420 girls and 1230 boys) aged from 12 to 18 years and attending 6th, 8th, 10th, or 12th grade at secondary schools all over Estonia. Although the mean levels of personality traits of Estonian adolescents were quite similar to the respective scores of Estonian adults, there was a developmental gap in Agreeableness and Conscientiousness. Three of the five personality dispositions demonstrated a modest cross-sectional change in the mean level of the trait scores: the level of Openness increased and the levels of Agreeableness and Conscientiousness decreased between 12 and 18 years of age. Although the five-factor structure of personality was already recognizable in the sample of 12-year-old children, it demonstrated only an approximate congruence with the adult structure, suggesting that not all children of that age have developed abilities required for observing one's own personality dispositions and for giving reliable self-reports on the basis of these observations. The self-reported personality trait structure matures and becomes sufficiently differentiated around age 14–15 and grows to be practically indistinguishable from adult personality by the age of 16. Personality of adolescents becomes more differentiated with age: along with the growth of mental capacities the correlations among the personality traits and intelligence become smaller. Copyright © 2004 John Wiley & Sons, Ltd.

INTRODUCTION

Although it is often claimed that adolescence is a time of storm and stress (Arnett, 1999), the results of cross-sectional studies demonstrate that the mean levels of Neuroticism, Extraversion, Agreeableness, and Conscientiousness among adolescents resemble quite closely the respective scores of the adult population (Costa & McCrae, 2002). Only self-reported scores of Openness seem to be lower during adolescence than during adulthood, despite the fact that the levels of Openness seem to show some increase among the younger

*Correspondence to: Jüri Allik, Department of Psychology, University of Tartu, Tiigi 78, Tartu 50410, Estonia.
E-mails: juri@psych.ut.ee; juri.allik@ut.ee

Contract/grant sponsor: Estonian Science Foundation.

Received 21 October 2003

Accepted 9 March 2004

high-school age to college age (Cattell, Cattell, & Johns, 1984; Costa, Parker, & McCrae, 2000b; Costa & McCrae, 2002). Thus, except for their intellectual curiosity, junior high and high school children (according to their self-reports) are not considerably more emotionally unstable, antagonistic, or less diligent than adults. Although adolescents' personality scores resemble quite closely adults' scores, researchers have discovered small but systematic changes in personality traits during adolescence. For example, girls, but not boys, show a significant increase in depression scores from childhood to adolescence, reaching a maximum at age 15 (Twenge & Nolen-Hoeksema, 2002). In contrast to depression, self-esteem is high in childhood and drops during adolescence (Robins et al., 2002). Consistent with these reports, McCrae and colleagues (2002) found that in three samples of adolescents from two countries, the United States and Belgium, girls between age 12 and age 18 increased in neuroticism, both boys and girls increased in openness, and there were no consistent changes in other personality traits. All this evidence suggests that age trends in personality traits during adolescence are generally rather small (Costa & McCrae, 2002).

A direct comparison of adolescents with adults presumes that the measurement instruments are the same for both groups. Although many simplified inventories have been developed for children, a recent experience has shown that even 12-year-old children have enough abilities to understand and respond properly to items from adult personality questionnaires (De Fruyt, Mervielde, Hoekstra, & Rolland, 2000; Markey, Markey, Tinsley, & Ericson, 2002; McCrae et al., 2002; Parker & Stumpf, 1998). For example, De Fruyt and his colleagues (2000), who used the Dutch version of the Revised NEO Personality Inventory (NEO-PI-R) on a sample of Flemish schoolchildren aged 12 to 18, showed that adolescents experienced relatively few difficulties with understanding items from the adult personality test and that even the youngest group of participants demonstrated a satisfactory congruence to the adult normative structure (De Fruyt et al., 2000). Markey and his colleagues (2002) also provided evidence that even 10–12-year-olds are able to rate themselves across five personality traits (using the short version of the NEO-PI-R, the NEO-FFI) when appropriate verbal prompts are used (for example, the prompt 'trick' was used to help to clarify the meaning of the word 'manipulate'). Although pre-adolescents' self-ratings were moderately correlated (correlations ranged from 0.23 for Openness to 0.46 for Conscientiousness) with their mothers' ratings, relatively low reliabilities of the self-ratings (Cronbach alphas ranged from 0.51 to 0.80) indicate that the self-reported personality structure of 10–12-year-old children may not be completely identical with the structure of adults.

Although the mean levels of personality traits remain relatively stable through adolescence and resemble the mean levels of adults, this does not guarantee that the personality structure of children is exactly equivalent to that of adults. There is evidence that adult-like personality structures can be found in children as young as 12 years old (Parker & Stumpf, 1998; De Fruyt et al., 2000; McCrae et al., 2002). This general similarity, however, does not imply that the pattern of covariation between traits of younger adolescents has already differentiated enough to resemble the adult personality structure in all details. Due to the lack of data it is not yet clear precisely when personality reaches maturity (Costa & McCrae, 1994). As the expression of 'developed personality' or 'maturity' carries a wide set of different meanings, in this study we limit its meaning to the structure of personality traits (i.e. the pattern of covariations among test items). In other words, we take the self-reported personality of adolescents to be fully developed when the structure of their personality traits shows high or almost perfect congruence to the structure of adults. We can also talk about personality structure only in a limited sense,

because the cross-sectional approach that was used in this study can only reveal the structure of a group as a collective whole, not in any particular individual of that group.

Personality and intellectual abilities

Like weight and height, intelligence test scores increase rapidly over the years of adolescence. The growth of mental capacities is most rapid in the growth spurt period between 10 and 15 years (Raven, 2000). At approximately the same time one could expect adolescents to become mature enough to analyse their own personalities and give reliable reports about themselves when filling out personality questionnaires. In order to do so, they should be able to read and understand the meaning of the items included in personality questionnaires that are usually designed and intended for adults. Cattell (1957), for example, was convinced that many 'pure' personality factors have some substantial intellectual ability component and that the general ability influences some of these genuinely personality manifestations such as scope of interests or achievement motivation. Empirical studies, however, have typically found only a modest correlation between measures of personality and intelligence (Eysenck, 1994; Goff & Ackerman, 1992; Zeidner, 1995; for a metareview see Ackerman & Heggstad, 1997). Openness to Experience as measured by the Revised NEO Personality Inventory seems to be consistently related to psychometrically measured intelligence and other cognitive abilities (McCrae & Costa, 1997; Moutafi, Furnham, & Crump, 2003). Although aesthetic sensitivity, intellectual curiosity, and independence of judgment have often been found to be associated with intelligence, the link between these two constructs is neither invariable nor very strong (Allik, 2002; Allik & Realo, 1997). Also, it is not clear whether the increase in Openness during adolescence is an intrinsic development of personality or a part of the general growth in cognitive competence. In order to separate these two possibilities, it is necessary to measure both personality traits and mental abilities. It is possible that the increase in mean levels of Openness shows no separate age trend apart from the general growth of mental abilities.

The lack of systematic correlation between personality and ability, however, does not exclude that individuals with low or high intellectual abilities might use their intellectual resources differently to express their individuality (Allik & Realo, 1997). In other words, the relationship between personality and ability may exhibit a more regular pattern when higher order interactions between these two measures are examined. Shure and Rogers (1963), for example, noticed that the factor structure of personality traits is different for different ability groups. In turn, Austin, Hofer, Deary, and Eber (2000) demonstrated that the correlation between ability measures varies with level of Neuroticism. Perhaps the most intriguing hypothesis concerning the higher order relationship between personality and ability was proposed by Brand and colleagues (1994), who maintained that individuals higher in intelligence show greater differentiation in personality. According to this proposal, the size of correlations among the personality factors decreases with increasing mental abilities. This proposal parallels a relatively well established observation that the inter-correlations among various intelligence scales were higher for individuals with lower mental ability scores than for individuals with higher scores (Detterman & Daniel, 1989). This general idea that more intelligent persons have greater differentiation in personality has found at least partial support in adult samples (Austin, Deary, & Gibson, 1997; Austin et al., 2000). In particular, a bigger variability in personality scores was found in high-ability groups (Austin et al., 1997).

Since the works of Kurt Lewin (1951) human development is usually conceptualized as a process of differentiation. According to Lewin, the living space—that is the psychological environment that the person experiences subjectively—becomes progressively more articulated and compartmentalized with increasing age. Following this tradition, Shavelson, Hubner, and Stanton (1976) proposed that self-concept of young children becomes more differentiated with age. Consistent with this proposal, subsequent studies found that with increasing age the correlations among the components of the self-concept became smaller and the self-concept factors became more distinct (Byrne & Shavelson, 1996; Marsh, Craven, & Debus, 1991). Also, Mervielde and De Fruyt (2000) found that the peer nomination personality structure of children was less differentiated and could be represented only by three factors (instead of five). The most obvious reason for the increasing differentiation of the personality and self-concept factors is the growth of mental capacities. Although the expansion of intellectual abilities is the most obvious cause of differentiation, it is certainly not the only one. The structure of self also depends on the information available to an individual, not exclusively on cognitive abilities to process this information (Markus & Wurf, 1987). During adolescence individuals become familiar with new types of activity and experience, which may also broaden their understanding of their self and personality traits.

This article deals with three main topics—the mean level of traits, the covariation between traits, and the interaction between personality and intelligence—and tries to provide answers to the following questions. How similar or different are the adolescents' mean levels of personality traits to the respective scores of adults? How does the mean level of trait scores change among adolescents aged 12–18 years? When does the five-factor personality structure reach maturity? How does psychometrically measured intelligence affect the maturing of the personality structure? Does the personality structure of adolescents become more differentiated with age?

METHOD

Sample

The Estonian NEO-FFI was administered to a large sample of Estonian adolescents attending 6th, 8th, 10th, and 12th grades. The sample consisted of 2650 adolescents (1420 girls and 1230 boys) with a mean age of 14.9 years ($SD = 2.0$), ranging from 12 to 18 years. Forty-three participants who were younger or older were not included in the analysis. The mean ages of the participants for the four grades (or age groups) were 12.4 ($n = 749$), 14.4 ($n = 737$), 16.1 ($n = 676$), and 17.7 ($n = 488$) years, respectively. The sample was drawn from 27 Estonian-speaking public secondary schools and gymnasiums from different regions of Estonia, covering all 15 Estonian counties, the capital and largest city, Tallinn, several smaller cities (Tartu, Pärnu, Kohtla-Järve, etc.), small towns, and rural areas. About 75% of all students in Estonia study in Estonian-speaking public secondary schools or gymnasiums. Since boys and girls attend mixed secondary schools in Estonia, there is no difference in the socio-economic status between their families. Consent was obtained from adolescents and their parents. Data were collected in 2001.

Data from adolescents were compared with a representative sample of Estonian adults consisting of 1905 individuals (793 men and 1112 women). The mean age of the adult sample was 37.5 years ($SD = 11.6$), ranging from 19 to 60 years. Data were gathered to

establish Estonian norms for the NEO-FFI and contained participants with diverse demographic and educational backgrounds. For some analyses presented below, the adult sample was divided into four age groups: 19–29 years, 30–39 years, 40–49 years, and 50–60 years. The mean ages of the participants for the four age groups were 23.8 ($n = 560$), 34.3 ($n = 547$), 44.3 ($n = 427$), and 54.7 ($n = 371$) years, respectively.

Measures

All participants were asked to complete the Estonian NEO-FFI, which consists of 60 items; each of the five major personality dimensions—Neuroticism (N), Extraversion (E), Openness to Experience (O), Agreeableness (A), and Conscientiousness (C)—is represented by 12 items. Although the Estonian version is very similar to the original NEO-FFI (Costa & McCrae, 1992), the content of the items is not completely identical. The Cronbach alphas of the Estonian NEO-FFI subscales for the representative adult sample were 0.86 (N), 0.84 (E), 0.85 (O), 0.69 (A), and 0.85 (C).

In addition to the Estonian NEO-FFI, Raven's Standard Progressive Matrices (SPM) test (Raven, 1981) was used to measure the intellectual abilities of the adolescent participants. The SPM is commonly regarded as a high-quality measure of pure non-verbal reasoning ability which is relatively independent of specific learning acquired in a particular cultural or educational context (Jensen, 1998). The SPM is made up of a series of diagrams or designs with a part missing and those taking the tests are expected to select the correct part to complete the designs from a number of options printed beneath (Raven, 2000). The same test can be used for a wide age range, consisting of five sets of 12 different matrices, gradually increasing in difficulty. The SPM was standardized in Estonia on the same sample of adolescents (Lynn, Allik, Pullmann, & Laidra, 2002). The mean score on the SPM was 50.0 ($SD = 6.5$). The test was administered without any time limits.

RESULTS

Mean scores of the adolescent sample for the five personality factors were transformed into *T*-scores based on the Estonian young adult (19–29 years old) sample scores. Thus, all data are presented relative to the mean scores of the young adults, which were set equal to 50 with a standard deviation of 10 points; data for men and women were analysed separately. As shown in Table 1, all *T*-scores for both sexes and all grades are larger than 42 and smaller than 55, with most values close to 50 (i.e. the mean scores of young adults). Due to a large number of participants, ANOVA or multiple regression analysis can detect very small, yet significant, differences between various groups that are of limited theoretical or practical importance. Indeed, a series of two-way ANOVAs showed that there were significant age differences for all personality factors, whereas Extraversion and Agreeableness also demonstrated sex differences (girls were more extraverted and less agreeable than boys). In order to get a more realistic estimation of the contribution of age and sex to the personality scores, we estimated the percentage of variance explained by these two factors and their interaction in the variance of personality traits. Using different methods of estimation (e.g. maximum likelihood) we found that only on two occasions did the percentage of the explained variance that is attributable to these two factors and their combinations exceed the level of 1%. Specifically, the difference between sexes accounts for about 3% of the variance in Extraversion: girls, on average, score approximately one

Table 1. Mean *T*-scores and standard deviations of the domain scales of the Estonian NEO-FFI (compared with the Estonian adult sample from 19 to 29 years old) and the standard progressive matrix (SPM) row scores across sex and grade

| | Grade | <i>n</i> | Personality dimensions | | | | | | | | | | Ability | |
|-------|-------|----------|------------------------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|----------|-----------|
| | | | N | | E | | O | | A | | C | | SPM | |
| | | | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Girls | 6 | 371 | 52.0 | 9.4 | 51.2 | 8.5 | 42.2 | 7.99 | 53.0 | 10.3 | 49.8 | 8.48 | 47.6 | 6.61 |
| | 8 | 367 | 55.0 | 9.1 | 51.5 | 10.0 | 42.2 | 8.85 | 48.4 | 10.3 | 47.0 | 8.75 | 49.7 | 6.29 |
| | 10 | 403 | 52.6 | 9.8 | 52.7 | 9.7 | 43.0 | 8.68 | 47.6 | 9.5 | 46.8 | 8.97 | 52.0 | 5.11 |
| | 12 | 279 | 52.3 | 9.2 | 51.2 | 10.0 | 44.5 | 8.96 | 46.0 | 9.6 | 46.1 | 8.45 | 52.9 | 5.06 |
| | Girls | 1420 | 53.0 | 9.5 | 51.7 | 9.5 | 42.9 | 8.64 | 48.9 | 10.3 | 47.5 | 8.79 | 50.4 | 6.18 |
| Boys | 6 | 378 | 54.1 | 8.7 | 48.6 | 7.9 | 42.3 | 7.51 | 52.4 | 10.2 | 48.3 | 7.70 | 44.7 | 7.15 |
| | 8 | 370 | 53.9 | 10.4 | 49.0 | 9.1 | 42.3 | 8.18 | 50.4 | 9.9 | 47.6 | 8.56 | 49.3 | 6.05 |
| | 10 | 273 | 51.4 | 8.4 | 49.5 | 9.0 | 42.9 | 7.48 | 49.0 | 7.9 | 47.1 | 7.62 | 53.3 | 4.48 |
| | 12 | 209 | 51.5 | 9.1 | 49.8 | 9.8 | 44.2 | 8.44 | 48.3 | 8.4 | 46.6 | 7.96 | 53.3 | 4.89 |
| | Boys | 1230 | 53.0 | 9.3 | 49.1 | 8.8 | 42.8 | 7.89 | 50.3 | 9.5 | 47.5 | 8.01 | 49.5 | 6.92 |
| | All | 2650 | 53.0 | 9.4 | 50.5 | 9.3 | 42.8 | 8.30 | 49.6 | 9.9 | 47.5 | 8.44 | 50.0 | 6.55 |

N = Neuroticism; E = Extraversion; O = Openness; A = Agreeableness; C = Conscientiousness; SPM = Standard Progressive Matrices.

T-score point higher than boys on Extraversion. The grade of adolescents (age) contributes approximately 5% to the variation in Agreeableness. As can be seen from Table 1, older school children are more antagonistic than younger adolescents. Although Openness also tends to increase through adolescence, only 0.8% of its variance is attributable to age differences. Table 1 shows no systematic trend in standard deviations: older children were not more variable in their personality traits than younger children.

Because the interaction between age and sex explains only a relatively small proportion of variance in personality traits, developmental trends in personality trait mean levels of both sexes can be pooled. Figure 1 shows the mean scores for the five personality factors for four grades in comparison with four adult age groups. Neuroticism and Extraversion demonstrated a smooth transition from adolescence to adulthood: with age young people become less extraverted and less neurotic. However, two other factors—Agreeableness and Conscientiousness—demonstrated a discontinuity in their development, indicating a developmental gap. They both slightly declined between ages 12 and 18 but jumped to a considerably higher level after age 18, which supports the idea of a sudden leap in socialization at the age of graduation from high-school (McCrae et al., 2002). Differently from Agreeableness and Conscientiousness, increase in Openness already begins in early adolescence and culminates, in accordance with other studies (McCrae et al., 2000), during college age.

To examine how the factor structure of the Estonian NEO-FFI derived from the adolescent sample differs from that derived from the Estonian adult sample, a series of principal component analyses (followed by varimax rotations) were conducted separately for each grade. The adolescents' varimax matrices were then Procrustes rotated by targeting them to the Estonian adult structure and the respective congruence coefficients were calculated (cf. McCrae, Zonderman, Costa, & Bond, 1996). Although the five-factor structure of personality was already recognizable in the sample of youngest adolescents (the 6th grade), it did not replicate the adult structure perfectly. Only 36 items out of 60 had

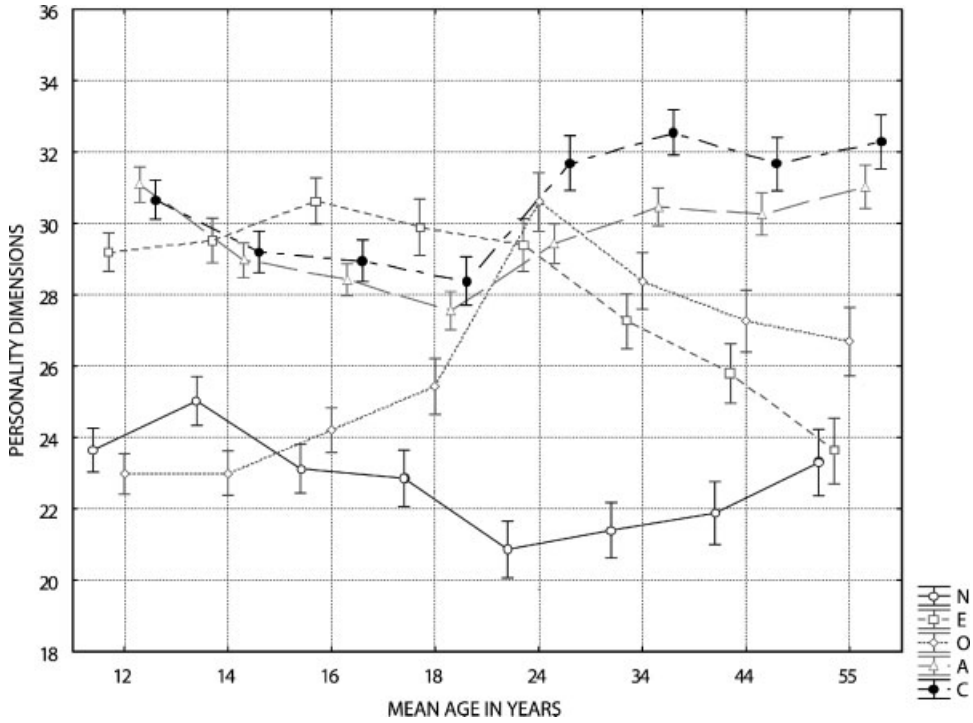


Figure 1. The mean level changes in personality traits for adolescents (grades from 6 to 12) compared with four age groups of the Estonian adult population.

congruence coefficients higher than 0.90. In the next age group (the 8th grade) there were already 50 such items, and in the two oldest age groups (the 10th and 12th grades) only seven and three items, respectively, failed to break the 0.90 barrier. Coefficients of congruence for five factors with the adult structure are presented in Table 2. All but one (Openness in the 6th grade) were above 0.90, which is typically regarded as a threshold for replication (Everett, 1983). The mean congruence coefficient (see the last column in Table 2) increased from 0.87 in the 6th grade to 0.94, 0.96, and 0.96 in the 8th, 10th, and 12th grades, respectively.

A similar increase can be observed in the proportion of variance explained by the five factors. In the sample of 6th graders, the five factors accounted for 32.9% of the total

Table 2. Congruence coefficients of the Procrustes rotated factor structures of adolescents for grades from 6 to 12 with the Estonian adult (19–60 years) varimax structure

| Grade | Personality dimensions | | | | | Total |
|-------|------------------------|------|------|------|------|-------|
| | N | E | O | A | C | |
| 6 | 0.90 | 0.92 | 0.77 | 0.91 | 0.90 | 0.87 |
| 8 | 0.96 | 0.94 | 0.92 | 0.93 | 0.95 | 0.94 |
| 10 | 0.97 | 0.96 | 0.95 | 0.90 | 0.98 | 0.96 |
| 12 | 0.98 | 0.96 | 0.96 | 0.92 | 0.96 | 0.96 |

N = Neuroticism, E = Extraversion, O = Openness, A = Agreeableness, C = Conscientiousness.

variance. In the 8th, 10th, and 12th grades the percentage increased to the following levels—34.2%, 38.5%, and 38.8%, respectively. (If compared with the Estonian adult sample, the same five factors explained 38.2% of the total variance.) Such an increase in both the size of the congruence coefficients and the percentage of explained variance may be a reflection of the monotonic increase in the scales' reliability. The mean Cronbach alphas in all five personality dimensions changed from 6th to 12th grade in the following progression: 0.72, 0.77, 0.81, and 0.81, reaching the mean level of internal consistency reliability in the adult population (Cronbach alpha = 0.82) approximately in the 10th grade.

Why is the personality structure of the 6th grade students different from the others? The first plausible explanation is that, of course, some of the test items may be too difficult to understand at this age. For example, the Openness item (translation from Estonian to English) 'I am more interested in books that give practical advice and knowledge, than in books that argue about world matters', which has a congruence coefficient as low as 0.05, is not surprisingly a difficult question for 12-year-old boys and girls. It is, however, not only the semantic obscurity of the items that makes the structure of the 6th graders different from their older co-students. For example, the two items of Neuroticism 'I seldom feel fear and anxiety' and 'I seldom feel loneliness and dejection' are probably not describing unfamiliar concepts even for young children. Nevertheless, these two items appear to convey a different meaning from the other Neuroticism items because they loaded on the Openness factor. It is also indicative that these two and other 'deviant' Neuroticism items are reversed, proving the absence of negative emotions, loneliness, and dejection. This result agrees with an earlier observation that negatively worded items are particularly difficult to be appropriately answered by young children (Marsh, 1986).

Thus, we may conclude that approximately 12-year-old adolescents have a kind of 'proto-structure' at the group level, which, during the next 2–4 years, develops into a full-weight five-factor structure of personality. What is behind these developmental changes in personality structure? In order to investigate this question, we divided our participants within each grade into approximately three equal groups according to their SPM scores. We ignored the medium group and computed the five-factor principal component solutions for each low and high intelligence group. Next, we Procrustes rotated the obtained factor structures towards the varimax solution of the Estonian adult (19–60 years old) structure. Figure 2 shows the mean Cronbach alphas and the congruence coefficients separately for low and high intelligence groups.

As can be seen, both the internal consistency reliability and congruence indicators were higher in high intelligence groups than in lower intelligence groups. However, the impact of intelligence was particularly strong in the youngest group of respondents and virtually vanished in the two older age groups. This pattern indicates, as far as this structure is concerned, that when evaluating one's own personality one's IQ score is unimportant after it reaches a certain level. However, there is a minimal amount of mental ability required for observing one's own personality dispositions and for giving reliable self-reports on the basis of these observations.

Table 3 shows correlations between personality traits and the SPM scores for four grades. In accordance with the differentiation hypothesis, the size of correlation between personality traits and abilities decreased with age. The last column in Table 3 shows the average absolute correlations between five personality dimensions and intelligence scores per grade. While among the 6th graders all five personality traits are significantly related to intelligence, only one trait, Openness to Experience, is correlated with intelligence in the 12th grade. As we expected, the correlation between Openness to Experience and the SPM

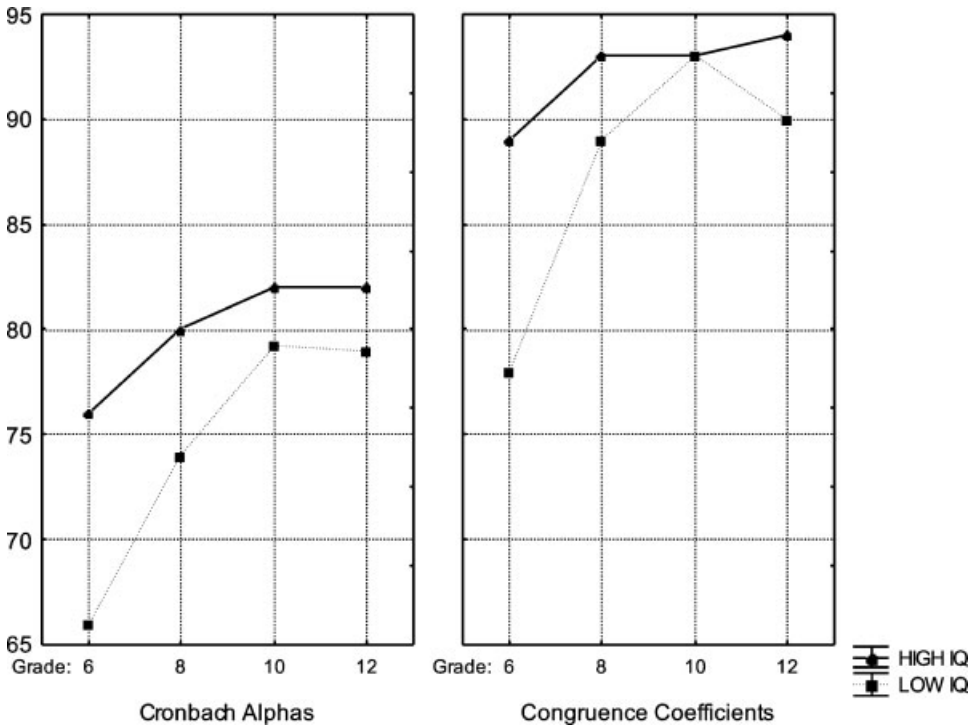


Figure 2. The mean Cronbach alphas (A) and the mean congruence coefficients (B) of the five domain scales of the Estonian NEO-FFI separately for low (indicated by boxes) and high (indicated by circles) intelligence groups in four different grades.

scores was also significant for the whole sample ($r = 0.09, p = 0.000$). (For comparison, the correlation between Openness and age was of the same magnitude: $r = 0.09, p = 0.000$.) Therefore, it is possible that the increase in Openness is caused not by age as such but primarily by the growth of general mental capacities. In order to test this possibility we tried to predict the Openness scores simultaneously from our participants' chronological age (measured in months) and the SPM scores. After controlling for IQ (i.e. SPM score), the contribution of age became insignificant ($\beta = 0.04, t(2663) = 1.85, p = 0.065$) but the impact of intelligence on Openness even increased ($\beta = 0.13, t(2663) = 6.58, p < 0.000$). Thus, after accounting for the level of intelligence, the effect of age on Openness disappears. Interestingly, the same thing happens for Agreeableness and Conscientiousness: after accounting for IQ, the role of chronological age becomes statistically insignificant. In other words, within each group of approximately equal IQ levels, there is neither age related increase in Openness nor decrease in Agreeableness and Conscientiousness.

Like the correlations between personality and intelligence, the correlations among personality traits also decrease with age. As expected, the average correlation of 0.24 in the 6th grade drops to 0.12 in the 12th grade. Particularly telling is the decrease of the correlation between Agreeableness and Conscientiousness: from 0.49 in the 6th grade to 0.33, 0.29, and 0.18 in the 8th, 10th, and 12th grades, respectively. Thus, one can conclude that with age the self-report measures of personality and intelligence become more distinct and less correlated with one another.

Table 3. Correlations between the domain scales of the Estonian NEO-FFI and the standard progressive matrices (SPMs) in grades from 6 to 12

| Grade | | Personality dimensions | | | | | Average $ r $ |
|-------|-----|------------------------|-------------|-------------|-------------|-------------|---------------|
| | | N | E | O | A | C | |
| 6 | E | -0.30 | | | | | 0.24 |
| | O | 0.00 | 0.11 | | | | |
| | A | -0.35 | 0.14 | 0.41 | | | |
| | C | -0.43 | 0.25 | 0.37 | 0.49 | | |
| | SPM | -0.12 | 0.14 | 0.19 | 0.15 | 0.20 | |
| 8 | E | -0.23 | | | | | 0.16 |
| | O | 0.05 | 0.07 | | | | |
| | A | -0.21 | 0.07 | 0.17 | | | |
| | C | -0.42 | 0.20 | 0.25 | 0.33 | | |
| | SPM | -0.12 | 0.07 | 0.09 | 0.04 | 0.06 | |
| 10 | E | -0.23 | | | | | 0.16 |
| | O | 0.08 | 0.18 | | | | |
| | A | -0.23 | 0.10 | 0.21 | | | |
| | C | -0.35 | 0.21 | 0.14 | 0.29 | | |
| | SPM | -0.19 | 0.03 | 0.07 | 0.06 | 0.09 | |
| 12 | E | -0.26 | | | | | 0.12 |
| | O | 0.04 | 0.16 | | | | |
| | A | -0.19 | 0.05 | 0.14 | | | |
| | C | -0.36 | 0.18 | 0.03 | 0.18 | | |
| | SPM | -0.08 | 0.02 | 0.12 | 0.00 | 0.00 | |

Significant correlations at the level of $p < 0.05$ are shown in bold type. N=Neuroticism; E=Extraversion; O=Openness; A=Agreeableness; C=Conscientiousness; SPM=Standard Progressive Matrices; Average $|r|$ =the average absolute correlation of the matrix.

DISCUSSION

Compared with the dramatic rise of intellectual capabilities occurring between 12 and 18 years of age (Lynn et al., 2002), the development of personality traits seems to be practically frozen. In the current study, only a small fraction of the change in the mean levels of personality traits was explained by age—only in the case of Agreeableness and Conscientiousness did it exceed the 1% level. The same appears to be true for gender differences. None of the interactions between age and sex exceeded the 1% level, supporting the observation that the same maturational trends are seen for males and females (Costa and McCrae, 2002).

In this study we found, in accordance with prevailing tendency (Feingold, 1994), that girls were more extraverted than boys. Yet, this difference accounted for around only 3% of the explained variance (see also Roberts, Caspi, & Moffitt, 2001). Even if small disparities are occasionally observed, as in this study, the sexual uniformity of personality development is in sharp contrast with the divergent growth of the intellectual abilities of boys and girls (Lynn, Allik, Pullmann, & Laidra, 2004).

Previous cross-sectional and longitudinal studies have concluded that most personality changes occur before the age of 30, with only modest changes thereafter (Costa & McCrae, 1994, 2002; for a different view see Srivastava, John, Gosling, & Potter, 2003). This study contains surprising evidence that at least, at a cross-sectional level, the mean

levels of personality traits change very little between 12 and 18 years of age. Even the slight increase in Openness and decline in Agreeableness and Conscientiousness were mainly attributable to individual differences in intelligence, not to age *per se*. This of course does not mean that the personality traits of any given individual are stable during a life span. Data suggest that the median test–retest stability for adolescents is considerably lower than for adults (Costa & McCrae, 2002). A systematic analysis of published data allows the formulation of a general rule: the stability of individual differences in personality is inversely related to age (Roberts & DelVecchio, 2000; Cole et al., 2001). A recent four-year longitudinal study also demonstrated that self-reported personality traits are relatively fluid from age 12 to age 16 (McCrae et al., 2002). This means, for example, that each child can become either more nervous or emotionally stable, either more curious about things happening around him/her or less interested in experiencing something new and unusual during his or her life span, but on average the changes in opposite directions balance each other. In other words, the adolescents' reactions to 'storms of youth' are unpredictable—some children become more agreeable but approximately the same number of children become more disagreeable and antagonistic.

It seems that a human being, of Estonian origin at least, is never more extraverted than at the age of 16. From that point on, the mean level of Extraversion can only decline. This appears to be a rather universal rule, as in Germany, Great Britain, Spain, and the Czech Republic people also appear to be more extraverted between the age of 14–17 years than at any other period across their whole life-span (McCrae et al., 2000, 2004). Although in the United States and in some other cultures the same rule is applicable for Neuroticism, Estonia (along with Italy, Croatia, and Russia, McCrae et al., 2000) seems to belong to a group of cultures where the mean level of self-reported Neuroticism remains basically the same throughout life or have a curvilinear trend (McCrae et al., 2004). The small decline in Agreeableness and Conscientiousness among Estonian adolescents between 12 and 18 years old appears to hit its low-point by the end of secondary school; afterwards, as people get older, the scores start rising as in many other countries (cf. Costa et al., 2000a; Roberts et al., 2001). A relatively sharp increase in social adjustment and purposefulness that happens after age 18 seems to suggest a discontinuity in the developmental process (McCrae et al., 2002).

The mean level of Openness starts to grow in the late adolescents and reaches a life-time high in the mid-20s. This trend is consonant with data from other countries showing that Openness reaches its maximum in the early or even late 20s (Costa & McCrae, 2002), which is different from other personality traits. For example, in the British and Czech samples, 22–29 year olds were most open-minded (McCrae et al., 2000). However, in another Czech sample both self-reported and informant rated Openness scores decreased from young adulthood (McCrae et al., 2004). In the Estonian adult sample, the mean score of Openness was highest among the 23–27 year olds and started to decline rather rapidly after this age. In general, despite some interesting and relatively small cross-cultural variations, there appear to be pan-cultural trends in personality (Costa & McCrae, 2002; McCrae et al., 2004).

When is personality fully developed? Or more precisely, when does the structure of personality traits acquire the adult form? Some psychologists, especially those who work in the psychoanalytical tradition, are inclined to think that personality is formed in early childhood, usually around the age of 3–5 years old, with the development of the main intrapsychical forces, Ego and Superego. Researchers who place more emphasis on society and culture, in contrast, have a tendency to postpone the development of the

crystallized personality structure to the later period of life, when the socialization process is already more advanced (Shiner, 1998). It is clear that by the age of 7–8, children have beliefs about the stability of human traits and have a tendency to make trait judgments (Heyman & Dweck, 1998). On the basis of the results of this study, we can only say that the self-reported personality trait structure matures around the age of 14–15 and becomes practically indistinguishable from the adult personality by age 16. This does not mean, of course, that children younger than 12 years old do not have a personality. Inability to judge one's own personality does not necessarily mean that one's personality is absent. One possibility is that they have an age-specific structure that is different from the personality structure common to adults. For example, it has been proposed that, in addition to the common five factors, there are two additional factors—Irritability and Activity—that are independent of the Big Five in early adolescent years (Robins, John, & Caspi, 1994). It is also possible that the number of factors is the same in early adolescence but that their content is different from that which is found in adulthood. Instead of Openness, for example, young children can be characterized by a factor called Flexibility–Rigidity (Thomas & Chess, 1977) or Agreeableness and Emotional Stability, which can blend into two different components, both with a strong interpersonal connotation (Besevegis & Pavlopoulos, 1999). Our data, however, do not suggest the existence of any additional factors beyond the Big Five or grouping of items into a different set of factors. Although the five-factor structure was fragmented and not fully articulated, it was clearly recognizable already in the sample of the 12-year-old adolescents. There are also some indications that the five-factor structure does not appear at once, in an all-or-none fashion, but rather in a gradual way with some traits maturing earlier than others. Two of the five factors—Extraversion and Agreeableness, for instance, demonstrated a satisfactory correspondence with the adult factor structure (with congruence coefficients 0.92 and 0.91, respectively, see Table 3) already in the youngest group of the 6th graders, while Openness was considerably less similar to the loading pattern that is typical of the adults. The result seems quite logical: young children first learn to analyse their own behavior, thoughts and feelings in terms of activity level and agreeableness; and only afterwards in terms of irritability, task persistence, and openness. Interestingly, in the study of familiarity with Goldberg's markers for his five-factor structure, young adolescents reported the greatest familiarity with Agreeableness markers and the least familiarity with Emotional Stability markers (Graziano, Jensen-Campbell, Steele, & Hair, 1998). In order to separate traits from children's ability to estimate them, it is necessary to employ observer ratings in addition to self-report data. For example, Mervielde, Buyst, and De Fruyt (1995) have demonstrated that the five-factor structure already emerged in the ratings of teachers for 6–8-year-old primary school children. These data seem to suggest that young school children do not lack some personality traits but they experience difficulties in describing these traits properly (Mervielde & De Fruyt, 2002).

The mean IQ scores of the Estonian adolescent sample (the last columns in Table 1) are 2–5 points higher than the British IQ norms of 1979 for the respective age group and virtually identical to them after adjustment for the estimated secular increase of intelligence over the 20-year period (Lynn et al., 2002). Thus, the maturing of Estonian children's intellectual capacities advances along a very similar though not totally identical developmental trajectory as in Great Britain and Iceland, for example (Pullmann, Allik, & Lynn, 2004). Is this equally true for the maturing of the personality structure? Or is the maturing rate of personality more dictated by social milieu (see also Baltes & Nesselrode, 1972; Helson & Kwan, 2000)? Unfortunately, we do not know the answer. The available

data of academically talented North-American (Parker & Stumpf, 1998) or standard North-American (Markey et al., 2002; McCrae et al., 2002) or Dutch-speaking (De Fruyt et al., 2000) adolescents have not been analysed separately for a sufficient number of different age groups. Although a recent study demonstrated that the factor structure of 12–14 years olds was almost identical to the structure seen in adults (McCrae et al., 2002), the available information is still insufficient for any firm conclusion.

Longitudinal studies have shown that the ability to control one's impulses and delay gratification, observed at the age of three, can consistently predict the same personality traits at the age of 23 (Block, 1993). Another comparable study also demonstrated that personality traits, such as Agreeableness, measured around the age of 8–12 can predict levels of antisocial behaviour 10 years later (Shiner, 2000). Thus, there is something persistent in children's personality that can be judged by well informed observers, who generally agree with each other (Caspi, 2000). If the number of rating scales is wide enough, the domain of descriptors used by knowledgeable others (teachers or parents, for instance) to characterize adolescent personality is very often and almost exhaustively accounted for by five robust factors (Digman & Inouye, 1986; Goldberg, 2001). These results, and a quantity of other data, accompanied by our own observations, make it very unlikely that children younger than 12 years of age and scoring, say, less than 38 points on the SPM do not already have a personality structure or that it is very dissimilar to the adult structure. Existing data clearly indicate that the personality structure in early adolescence resembles that of adults in all five dimensions, at least when it is estimated by knowledgeable adults (Barbaranelli, Caprara, Rabasca, & Pastorelli, 2003; Costa & McCrae, 2002; Markey et al., 2002; Mervielde et al., 1995). Accordingly, it is more likely that the fragility of the self-reported personality structure in 12-year-olds is caused by its introspective inaccessibility due to insufficient cognitive capabilities and verbal skills that are prevalent in this age group. When a group of the most intellectually gifted 6th graders, who on average were even younger than their less gifted classmates, was analysed separately, their personality structures were comparable to the adult personality structures. In any case, this may not be the best news for trait psychologists. Although the NEO-PI and other similar personality instruments may be linguistically convenient for junior high-schoolers, these instruments require some other mental abilities that are lacking among a considerable number of 12-year-old children and younger. It is an open question whether self-reports have some reliability and validity among 12-year-olds or younger, provided that the adult questionnaires are replaced with specially worded child items. The only validity test that has been carried out so far showed that there was an agreement between children's answers and their mothers' ratings about their personality (Costa & McCrae, 2002; Markey et al., 2002). Nonetheless, even a sizeable mother–child correlation does not warrant that the personality structure, the pattern of covariations among items, is developed enough and resembles the structure that can be recovered from the mothers' ratings (Van Aken, van Lieshout, & Haselager, 1996).

The fragility of the self-reported personality structure in 12-year-olds can be explained by insufficient differentiation of personality in young adolescents. Brand and colleagues (1994) proposed that higher intellectual abilities provide an individual more freedom of development, leading to more articulated and well defined personality trait structure in higher ability groups. So far the personality differentiation hypothesis has been formulated and tested in the relation of adult personality. However, it is logical to expect that this hypothesis is even more valid in the developmental perspective concerning the emergence of personality structure in the early adolescents' self-reports. The results demonstrated that

the personality dimensions of 12-year-olds were less differentiated than those of older adolescents. For example, in the youngest grade the correlation between Agreeableness and Conscientiousness was 0.49, indicating that young adolescents tended to confuse sympathy and cooperation towards others with self-control and determination. With age the correlation between Agreeableness and Conscientiousness decreases, reaching 0.18 in the last grade, which is typical of the adult population. Thus, the correlation between separate personality traits is higher among young children and fewer personality dimensions are needed to explain the variance on self-report personality questionnaires. Indeed, the congruence between 12-year-olds' personality structure and the five-factor structure of adults was the smallest among the examined age groups. However, the lack of differentiation among young adolescents is not limited to personality in the narrow sense of this word. The correlation between personality and ability also tends to decrease with age. While among the youngest adolescents (i.e. from the 6th grade) intellectually more developed children tended to be less neurotic and more extraverted, intellectually curious, diligent, and friendly towards other people than their less gifted counterparts, no such association was observed among the 12th graders. Only active imagination and independence of judgments were still correlated with the level of intellectual development.

The personality differentiation hypothesis has been proposed in two forms: either correlations decreases with the increase of intelligence, suggesting that more personality dimensions are required to explain the variance in high ability than in low ability groups, or high ability subjects differ from one another more than low ability subjects (Austin et al., 1997). The results of this study support only the first of these two hypotheses: the personality of older and consequently intellectually more developed adolescents was more differentiated than their younger counterparts but not more variable (see Table 1).

Conclusions

Although the mean levels of personality traits of Estonian adolescents were quite similar to the respective scores of Estonian adults, there was a developmental gap in Agreeableness and Conscientiousness. Three of the five personality dispositions demonstrated a noticeable cross-sectional change in the mean level of the trait scores: between 12 and 18 years of age the level of Openness increased and the levels of Agreeableness and Conscientiousness decreased. These changes, however, which at best accounted only for 5% of the total variance, were most probably related to the growth of the psychometrically measured intelligence (SPM); when this was taken into account, the correlation between age and personality traits became insignificant. Although the five-factor structure of personality was already recognizable in the sample of 12-year-old children, it did not demonstrate an exact congruence with the adult structure. Because the impact of intelligence on the maturity of personality structure was greatest among 12-year-old children and virtually vanished in older age groups, we argue that the self-reported personality trait structure matures around the age of 14–15 and becomes practically indistinguishable from the adult personality by age 16. This pattern of results suggests that a certain amount of mental ability is required for observing one's personality dispositions and for formulating reliable self-reports on the basis of these observations. This pattern of results is also in harmony with a proposal that individuals higher in intelligence show greater differentiation in personality (Brand et al., 1994). With increasing mental abilities the sizes of correlations among the personality factors and also between personality factors and ability decrease.

ACKNOWLEDGEMENT

Jüri Allik was a fellow at the Swedish Collegium for Advanced Study in the Social Sciences (Uppsala, Sweden) and Anu Realo was a postdoctoral research fellow at the University of Leuven (Belgium) during the preparation of this article. This research was supported by an Estonian Science Foundation grant 4519 and an Estonian Ministry of Education and Science grant 0180543 provided for the first author of the study. We thank Richard Lynn and Anneli Veisson for their help in carrying out this project and Robert R. McCrae, Lord Carlisle, and Jeannine Richards for their helpful comments on earlier versions of the manuscript.

REFERENCES

- Ackerman, P. L., & Heggestad, E. D. (1997). Intelligence, personality, and interests: Evidence for overlapping traits. *Psychological Bulletin*, *121*, 219–245.
- Allik, J. (2002). Towards a theory of personality. In C. von Hofsten, & L. Bäckman (Eds.), *Psychology at the turn of the millennium, Social, developmental, and clinical perspective* (Vol. 2, pp. 179–200). New York: Psychology.
- Allik, J., & Realo, A. (1997). Intelligence, academic abilities, and personality. *Personality and Individual Differences*, *23*, 809–814.
- Arnett, J. J. (1999). Adolescent storms and stress, reconsidered. *American Psychologist*, *54*, 317–326.
- Austin, E. J., Deary, I. J., & Gibson, G. J. (1997). Relationship between ability and personality: Three hypotheses tested. *Intelligence*, *25*, 49–70.
- Austin, E. J., Hofer, S. M., Deary, I. J., & Eber, H. W. (2000). Interaction between intelligence and personality: Results from two large samples. *Personality and Individual Differences*, *29*, 405–427.
- Baltes, P., & Nesselroade, J. R. (1972). Cultural change and adolescent personality development: An application of longitudinal sequences. *Developmental Psychology*, *7*, 244–256.
- Barbaranelli, C., Caprara, G. V., Rabasca, A., & Pastorelli, C. (2003). A questionnaire for measuring the Big Five in late childhood. *Personality and Individual Differences*, *34*, 645–664.
- Besevegis, E., & Pavlopoulos, V. (1999). Personality components for 12-year olds. In I. Mervielde, I. Deary, D. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 129–140). Tilburg: Tilburg University Press.
- Block, J. (1993). Studying personality the long way. In D. Funder, R. D. Parke, C. Tomlinson-Keasy, & K. Widaman (Eds.), *Studying lives through time: Personality and development* (pp. 9–41). Washington, DC: American Psychological Association.
- Brand, C., Egan, V., & Deary, I. J. (1994). Intelligence, personality, and society: Constructivist versus essentialist possibilities. In D. K. Detterman (Ed.), *Current topics in human intelligence, Theories of intelligence* (Vol. 4, pp. 29–42). Norwood NJ: Ablex.
- Byrne, B. M., & Shavelson, R. J. (1996). On the structure of social self-concept for pre-, early, and late adolescents: A test of the Shavelson, Hubner, and Stanton (1976) model. *Journal of Personality and Social Psychology*, *70*, 599–613.
- Caspi, A. (2000). The child is father of the man: Personality continuities from childhood to adulthood. *Journal of Personality and Social Psychology*, *78*, 158–172.
- Cattell, R. B. (1957). *Personality and motivational structure and measurement*. New York: World.
- Cattell, R. B., Cattell, M. D., & Johns, E. (1984). *Manual and norms for the High School Personality Questionnaire*. Champaign, IL: Institute for Personality and Ability Testing.
- Cole, D. A., Maxwell, S. E., Martin, J. M., Peeke, L. G., Seroczynski, A. D., Tram, J. M., Hoffman, K. B., Ruiz, M. D., Jacquez, F., & Maschman, T. (2001). The development of multiple domains of children and adolescent self-concept: A cohort sequential longitudinal design. *Child Development*, *72*, 1723–1746.

- Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO-PI-R) and NEO Five-Factor Inventory (NEO-FFI)*. Professional manual. Odessa, FL: Psychological Assessment Resources.
- Costa, P. T., Jr., & McCrae, R. R. (1994). 'Set like plaster'? Evidence for the stability of adult personality. In T. Heatherton, & J. Weinberger (Eds.), *Can personality change* (pp. 21–40). Washington, DC: American Psychological Association.
- Costa, P. T., Jr., & McCrae, R. R. (2002). Looking backward: Changes in the mean levels of personality traits from 80 to 12. In D. Cervone, & W. Mischel (Eds.), *Advances in personality science* (pp. 219–237). New York: Guilford.
- Costa, P. T., Jr., McCrae, R. R., Martin, T. A., Oryol, V. E., Senin, I. G., Rukavishnikov, A. A., Shimonaka, Y., Nakazato, K., Gondo, Y., Takayama, M., Allik, J., Kallasmaa, T., & Realo, A. (2000a). Personality development from adolescence through adulthood: Further cross-cultural comparisons of age differences. In V. J. Molfese, & D. Molfese (Eds.), *Temperament and personality development across the life span* (pp. 235–252). Hillsdale, NJ: Erlbaum.
- Costa, P. T., Jr., Parker, W. D., & McCrae, R. R. (2000b, February). *Adult development, Episode I: Personality stability and change in gifted adolescents*. Paper presented at the 1st Annual Meeting of the Society for Personality and Social Psychology, Nashville, TN.
- De Fruyt, F., Mervielde, I., Hoekstra, H. A., & Rolland, J.-P. (2000). Assessing adolescents' personality with the NEO-PI-R. *Assessment*, 7, 329–345.
- Detterman, D. K., & Daniel, M. H. (1989). Correlations of mental tests with each other and with cognitive variables are highest for low IQ groups. *Intelligence*, 13, 349–359.
- Digman, J. M., & Inouye, J. (1986). Further specification of the five robust factors of personality. *Journal of Personality and Social Psychology*, 50, 116–123.
- Everett, J. E. (1983). Factor comparability as a means of determining the number of factors and their rotation. *Multivariate Behavioral Research*, 18, 197–218.
- Eysenck, H. J. (1994). Personality and intelligence. In R. J. Sternberg, & P. Ruzgis (Eds.), *Personality and intelligence* (pp. 3–31). New York: Cambridge University Press.
- Feingold, A. (1994). Gender differences in personality: A meta-analysis. *Psychological Bulletin*, 116, 429–456.
- Goff, M., & Ackerman, P. L. (1992). Personality–intelligence relations: Assessment of typical intellectual engagement. *Journal of Educational Psychology*, 84, 537–552.
- Goldberg, L. R. (2001). Analyses of Digman's child-personality data: Derivation of Big-Five factor scores from each of six samples. *Journal of Personality*, 69, 709–743.
- Graziano, W. G., Jensen-Campbell, L. A., Steele, R. G., & Hair, E. C. (1998). Unknown words in self-reported personality: Lethargic and provincial in Texas. *Personality and Social Psychology Bulletin*, 24, 893–905.
- Helson, R., & Kwan, V. S. Y. (2000). Personality development in adulthood: The broad picture and processes in one longitudinal sample. In S. E. Hapson (Ed.), *Advances in personality psychology* (Vol. 1, pp. 77–106). Hove: Psychology.
- Heyman, G. D., & Dweck, C. S. (1998). Children's thinking about traits: Implication for judgment of self and others. *Child Development*, 69, 391–403.
- Jensen, A. R. (1998). *The g factor*. Westport, CT: Praeger.
- Lewin, K. (1951). *Field theory in social science: Selected theoretical papers*. New York: Harper.
- Lynn, R., Allik, J., Pullman, H., & Laidra, K. (2002). A study of intelligence in Estonia. *Psychological Reports*, 91, 1022–1026.
- Lynn, R., Allik, J., Pullmann, H., & Laidra, K. (2004). Sex differences on the progressive matrices among adolescents: Some data from Estonia. *Personality and Individual Differences*, 36, 1249–1255.
- Markey, P. M., Markey, C. N., Tinsley, B. J., & Ericson, A. J. (2002). A preliminary validation of preadolescents' self-reports using the five-factor model of personality. *Journal of Research in Personality*, 36, 173–181.
- Markus, H., & Wurf, E. (1987). The dynamic self-concept: A social psychological perspective. *Annual Review of Psychology*, 38, 299–337.
- Marsh, H. W. (1986). The bias of negatively worded items in rating scales for young children: A cognitive-developmental phenomenon. *Developmental Psychology*, 22, 37–49.
- Marsh, H. W., Craven, R. G., & Debus, R. (1991). Self-concept of young children 5 to 8 years of age: Measurement and multidimensional structure. *Journal of Educational Psychology*, 83, 377–392.

- McCrae, R. R., & Costa, P. T., Jr. (1997). Conceptions and correlates of openness to experience. In R. Hogan, J. Johnson, & S. Briggs (Eds.), *Handbook of personality psychology* (pp. 825–847). San Diego, CA: Academic.
- McCrae, R. R., Costa, P. T., Jr., Hrebícková, M., Urbánek, T., Martin, T. A., Oryol, V. E., Rukavishnikov, A. A., & Senin, I. G. (2004). Age differences in personality traits across cultures: Self-report and observer perspective. *European Journal of Personality, 18*, 143–157.
- McCrae, R. R., Costa, P. T., Jr., Ostendorf, F., Angleitner, A., Hrebícková, M., Avia, M. D., Sanz, J., Sánchez-Bernardos, M. L., Kusdil, M. E., Woodfield, R., Saunders, P. R., & Smith, P. B. (2000). Nature over nurture: Temperament, personality, and lifespan development. *Journal of Personality and Social Psychology, 78*, 173–186.
- McCrae, R. R., Costa, P. T., Jr., Terracciano, A., Parker, W. D., Mills, C. J., De Fruyt, F., & Mervielde, I. (2002). Personality trait development from age 12 to age 18: Longitudinal, cross-sectional, and cross-cultural analyses. *Journal of Personality and Social Psychology, 83*, 1456–1468.
- McCrae, R. R., Zonderman, A. B., Costa, P. T., Jr., & Bond, M. H. (1996). Evaluating replicability of factors in the Revised NEO Personality Inventory: Confirmatory factor analysis versus Procrustes rotation. *Journal of Personality and Social Psychology, 70*, 552–566.
- Mervielde, I., Buyst, V., & De Fruyt, F. (1995). The validity of the Big Five as a model for teachers' ratings of individual differences among children aged 4 to 12. *Personality and Individual Differences, 18*, 525–534.
- Mervielde, I. M., & De Fruyt, F. (2000). The Big Five personality factors as a model for the structure of children's peer nominations. *European Journal of Personality, 14*, 91–106.
- Mervielde, I., & De Fruyt, F. (2002). Assessing children's traits with the Hierarchical Personality Inventory for Children. In B. De Raad, & M. Perugini (Eds.), *Big Five assessment* (pp. 129–146). Seattle: Hogrefe and Huber.
- Moutafi, J., Furnham, A., & Crump, J. (2003). Demographic and personality predictors of intelligence: A study using the NEO personality inventory and the Myers–Briggs type indicator. *European Journal of Personality, 17*, 79–94.
- Parker, W., & Stumpf, H. (1998). A validation of the Five-Factor Model of personality in academically talented youth across observers and instruments. *Personality and Individual Differences, 25*, 1005–1025.
- Pullmann, H., Allik, J., & Lynn, R. (2004). The growth of IQ among Estonian schoolchildren from 7 to 19. *Journal of Biosocial Science, 36*, (Published online March 16, 2004 DOI:10.1017/S0021932003006503).
- Raven, J. (1981). *Manual for Raven's Progressive Matrices and Mill Hill Vocabulary Scales*. Oxford: Oxford Psychologists.
- Raven, J. (2000). The Raven's Progressive Matrices: Change and stability over culture and time. *Cognitive Psychology, 41*, 1–48.
- Roberts, B. W., Caspi, A., & Moffitt, T. E. (2001). The kids are alright: Growth and stability in personality development from adolescence to adulthood. *Journal of Personality and Social Psychology, 81*, 670–683.
- Roberts, B. W., & DelVecchio, W. F. (2000). The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin, 126*, 3–25.
- Robins, R. W., John, O. P., & Caspi, A. (1994). Major dimensions of personality in early adolescence: The Big Five and beyond. In C. F. Halverson, G. A. Kohnstamm, & R. P. Martin (Eds.), *The developing structure of temperament and personality from infancy to adulthood* (pp. 267–291). Hillsdale, NJ: Erlbaum.
- Robins, R. W., Trzesniewski, K. H., Gosling, S. D., Tracy, J. L., & Potter, J. (2002). Global self-esteem across the life span. *Psychology and Aging, 17*, 423–434.
- Shavelson, R. J., Hubner, J. J., & Stanton, G. C. (1976). Self-concept: Validation of construct interpretation. *Review of Educational Research, 46*, 407–441.
- Shiner, R. L. (1998). How shall we speak of children's personalities in middle childhood? A preliminary taxonomy. *Psychological Bulletin, 124*, 308–332.
- Shiner, R. (2000). Linking childhood personality with adaptation: Evidence for continuity and change across time into late adolescence. *Journal of Personality and Social Psychology, 78*, 310–325.
- Shure, G. H., & Rogers, M. S. (1963). Personality factor stability for three ability levels. *Journal of Psychology, 55*, 445–456.

- Srivastava, S., John, O., Gosling, S. D., & Potter, J. (2003). Development of personality in early and middle adulthood: Set like plaster or persistent change? *Journal of Personality and Social Psychology*, *84*, 1041–1053.
- Thomas, A., & Chess, S. (1977). *Temperament and development*. New York: Brunner–Mazel.
- Twenge, J. M., & Nolen-Hoeksema, S. (2002). Age, gender, race, socioeconomic status, and birth cohort differences on the Children's Depression Inventory: A meta-analysis. *Journal of Abnormal Psychology*, *111*, 578–588.
- Van Aken, M. A. G., van Lieshout, C. F. M., & Haselager, G. J. T. (1996). Adolescents' competence and the mutuality of their self-descriptions and descriptions of them by others. *Journal of Youth and Adolescence*, *25*, 285–306.
- Zeidner, M. (1995). Personality trait correlates of intelligence. In D. H. Saklofske, & M. Zeidner (Eds.), *International handbook of personality and intelligence* (pp. 299–319). New York: Plenum.