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Maturation of Personality in Adolescence

Theo A. Klimstra, William W. Hale III, Quinten A. W. Raaijmakers, Susan J. T. Branje, and Wim H. J. Meeus
Utrecht University

The present research assesses adolescent personality maturation by examining 3 measures of change and stability (i.e., mean-level change, rank-order stability, and profile similarity) of Big Five personality traits, employing data from a 5-annual-wave study with overlapping early to middle (n = 923) and middle to late (n = 390) adolescent cohorts. Results indicated that mean levels of Agreeableness and Emotional Stability increased during adolescence. There was mixed evidence for increases in Extraversion and Openness. Additionally, rank-order stability and profile similarity of adolescent personality traits clearly increased from early to late adolescence. For all change facets, the authors found evidence for gender differences in the timing of adolescent personality maturation, as girls were found to mature earlier than boys.

Keywords: personality, adolescence, longitudinal, maturation, five-factor model

Adolescence is generally regarded as being the formative period in a person's life. In this period, an individual physically transforms from a child into an adult (Petersen, Crockett, Richards, & Boxer, 1988). These physical changes are paralleled by psychosocial changes: A transition takes place from being a child who relies strongly on his or her parents' teachings to becoming an adult who makes his or her own informed decisions (Erikson, 1950). Adolescence has been shown to be a period where individuals, for example, gain an increasingly more stable identity status (Meeus, Iedema, Helsen, & Vollebergh, 1999), form stable cultural orientations (Vollebergh, Iedema, & Raaijmakers, 2001), and establish increasingly more salient and intimate relations with peers and romantic partners (Furman & Buhrmester, 1992). It is likely that these changes toward maturation in biological and psychosocial domains are also reflected by changes in personality traits.

Adolescent personality maturation should be indicated by changes, signified by (normative) growth of personality traits (e.g., Caspi, Roberts, & Shiner, 2005). Maturation should also be reflected by increases in stability, as interindividual differences should become more settled (e.g., Costa & McCrae, 1994), and personality profiles should become more stable and better organized (e.g., Roberts, Caspi, & Moffitt, 2001). Nevertheless, adolescent personality maturation, as measured by indices of change and stability, has received much less attention than adult personality maturation (Caspi et al., 2005). In the last decade, this situation has changed as an ever-increasing number of studies have focused on maturation of personality during adolescence. Despite this increased attention, studies that longitudinally track personality maturation across adolescence on an annual basis in large population samples are still lacking. Therefore, the current study sets out to assess various facets of change and stability in personality maturation across the entire period of adolescence (i.e., ages 12 to 20), using five-annual-wave data on overlapping early to middle adolescent and middle to late adolescent cohorts.

Theo A. Klimstra, William W. Hale III, Quinten A. W. Raaijmakers, Susan J. T. Branje, and Wim H. J. Meeus, Research Centre Adolescent Development, Utrecht University, Utrecht, The Netherlands.

Correspondence concerning this article should be addressed to Theo A. Klimstra, Research Centre Adolescent Development, Utrecht University, P.O. Box 80.140, 3508 TC Utrecht, The Netherlands. E-mail: t.a.klimstra@uu.nl

Measuring Personality Maturation in Adolescence

Throughout the last 2 decades there has been a growing consensus on the higher order structure of personality, as a majority of researchers now agree that personality can be subsumed into five broad traits: the Big Five (Caspi et al., 2005). The Big Five personality traits are Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience (McCrae & Costa, 1987). Extraversion refers to dominance and activity in interpersonal situations; Agreeableness refers to the willingness to maintain positive and reciprocal relationships with others; Conscientiousness refers to organizational and motivational aspects of a person's behavior; Emotional Stability indicates the ability to deal effectively with negative emotions; and Openness to Experience refers to how a person deals with new information at a personal and experiential level. It has been demonstrated that the Big Five traits apply to adolescent personality in the same way that they do to adult personality (Digman & Inouye, 1986; John, Caspi, Robins, Moffitt, & Stouthamer-Loeber, 1994) and that self-report is a reliable and valid method of measuring Big Five traits in adolescents (e.g., De Fruyt, Mervielde, Hoekstra, & Rolland, 2000; Soto, John, Gosling, & Potter, 2008).

Several recent empirical studies (Akse, Hale, Engels, Raaijmakers, & Meeus, 2007; Branje, van Lieshout, & Gerris, 2007; De Fruyt et al., 2006; McCrae et al., 2002; Pullmann, Raudsepp, & Allik, 2006; Roberts et al., 2001) and meta-analyses (Roberts & DelVecchio, 2000; Roberts, Walton, & Viechtbauer, 2006) have examined aspects of adolescent personality maturation. For this purpose, these studies have focused on the three earlier mentioned indicators of maturation: (a) mean-level growth (i.e., increases) on

the Big Five traits, (b) an increase in rank-order stability of the Big Five traits, and (c) a more stable and consistent organization of the personality profile (i.e., increases in profile similarity). These three indicators of maturation are now explored.

Mean-Level Change

A large number of longitudinal studies on mean-level change were summarized in a meta-analysis by Roberts et al. (2006). They demonstrated that adolescents generally become more extraverted, more emotionally stable, and more open to experience as they grow older. The adolescent personality traits of Agreeableness and Conscientiousness tend to stay relatively stable over time. There is, however, a lack of agreement on the amount and the direction of change, as the statistic indicating heterogeneity of results among the studies included in the meta-analysis reached significance for all Big Five dimensions, except for Emotional Stability. There are several possible causes for this heterogeneity: (a) Several studies included a limited number of participants ($n < 100$), limiting the generalizability of results from specific studies; (b) a vast majority of the included longitudinal studies had high attrition rates (>20%); (c) studies were published across a long period of time (1968–2004), possibly causing birth cohort effects (e.g., Twenge, 2000, 2001); and, as the authors themselves already indicated, (d) a wide variety of measures were used that were not all specifically designed to measure the Big Five, thereby causing measurement variance.

Recent longitudinal studies on adolescent personality development (Branje et al., 2007; De Fruyt et al., 2006; McCrae et al., 2002; Pullmann et al., 2006) that were not included in the meta-analysis of Roberts et al. (2006) all used measures exclusively designed to measure the Big Five. Nevertheless, these studies also show considerable heterogeneity of findings. One study that specifically focused on early adolescents (De Fruyt et al., 2006) found increases in Emotional Stability, decreases in Openness and Conscientiousness, and stable levels of Extraversion and Agreeableness. Two other studies focused on the period from early to middle adolescence (Branje et al., 2007; McCrae et al., 2002). Both of these studies found increases in Openness and stable levels of Emotional Stability but did not agree on the developmental course of the other three dimensions. Whereas Branje et al. (2007) found decreases in Extraversion but increases in Agreeableness and Conscientiousness, McCrae et al. (2002) found stable levels of Extraversion and Agreeableness and decreases in Conscientiousness. These inconsistencies might be due to specific sample characteristics, as McCrae et al.'s sample included only gifted students and Branje et al.'s sample included only adolescents from middle-class two-parent families with at least two children. Finally, one study (Pullmann et al., 2006) compared personality changes in early, middle, and late adolescents. Overall, they found more mean-level change in early and middle adolescence than in late adolescence. Specifically, their early adolescents increased in Emotional Stability and Extraversion, decreased in Agreeableness, and had stable levels of Openness and Conscientiousness. The middle adolescents displayed increases in Emotional Stability, Extraversion, and Openness but stable levels of Agreeableness and Conscientiousness. The late adolescents increased in Openness but exhibited no changes on the other four Big Five traits. Although the study by Pullmann et al. (2006) provides valuable information on adolescent personality maturation because it covers the entire adolescent period, they were able to measure personality traits only twice in the same individuals. Therefore, they were unable to test whether personality maturation is described by a linear or a curvilinear pattern. In addition, their attrition rates were high (22%–57%), which could have influenced their results.

In sum, the meta-analysis (Roberts et al., 2006) and the recent empirical studies (Branje et al., 2007; De Fruyt et al., 2006; McCrae et al., 2002; Pullmann et al., 2006) agree that levels of Openness increase after early adolescence, whereas there is also strong evidence for increasing levels of Emotional Stability. Concerning the other three dimensions, there is less agreement on mean-level change. Nevertheless, when considering the results of the aforementioned studies, the number of Big Five dimensions where mean-level increases, and thus maturation, were found exceeds the number of dimensions where decreases were found. Overall, previous studies suggest that when personality traits change, they tend to change in the direction of maturation, although there are inconsistencies regarding the specific traits that mature and regarding the period of adolescence in which maturation takes place.

Rank-Order Stability

Indices of rank-order stability indicate whether the rank order of individuals on a certain trait is maintained over time. Mean levels on a certain trait might change, but the rank order can remain stable at the same time. Hence, mean-level change and rank-order stability can be interpreted as two independent constructs (Roberts & DelVecchio, 2000; Roberts et al., 2006). If mean-level changes are accompanied by high rank-order stability, the observed mean-level changes reflect normative change. Normative changes are changes that occur to a similar degree in most people in the population, and they are considered to reflect universal maturation processes (e.g., Helson, Kwan, John, & Jones, 2002; Kasen, Chen, Sneed, Crawford, & Cohen, 2006; Roberts et al., 2006). Therefore, to asses whether there are such universal maturation processes, indices of rank-order stability need to be assessed alongside indices of mean-level change. In addition, an increase in rank-order stability can, by itself, also be interpreted as maturation, because interindividual differences should become more set with age (Costa & McCrae, 1994).

A meta-analysis by Roberts and DelVecchio (2000) and empirical studies by Akse et al. (2007) and Pullmann et al. (2006) indicated that rank-order stability of personality indeed increases as adolescents grow older. However, the meta-analysis by Roberts and DelVecchio used not only Big Five measures but also considered a wide range of measures such as ego-identity questionnaires, temperament scales, and Rorschach tests. Akse et al. and Pullmann et al. had only a limited number of measurement occasions for rank-order stability (i.e., two and three, respectively) and could therefore not systematically examine increases. In sum, the studies that have been available up to now indicate that rank-order stability of personality traits increases as adolescents grow older, just as Costa and McCrae (1994) predicted. However, the aforementioned studies have only a limited number of measurement occasions and do not provide information that helps us to understand exactly when in adolescence personality traits start to become more settled. For that purpose, longitudinal studies systematically assessing

year-to-year changes in rank-order stability in adolescent Big Five traits are needed.

Profile Similarity

Profile similarity provides information on the stability of a constellation of traits over time within a person and is therefore, unlike rank-order stability and mean-level change, not informative of changes in individual personality traits. It is also different from other change indices, because profile similarity indicates to what extent a person's personality configuration changes over time; it is not indicative of changes at the sample level. Profile similarity is usually calculated with *q*-correlations. Like Pearson correlations, *q*-correlations range from −1 to 1. The higher the *q*-correlation, the more stable a constellation of traits within a person (e.g., Ozer & Gjerde, 1989; Roberts et al., 2001). A more stable constellation of traits indicates that a person's personality profile is well organized and is therefore an indicator of maturation (Roberts et al., 2001).

Previous studies on profile similarity of personality by Block (1971), Roberts et al. (2001), and De Fruyt et al. (2006; the only Big Five study on adolescent profile similarity) found average *q*-correlations exceeding .70 in adolescence. The only study reporting on longitudinal changes in profile similarity from early adolescence to late adolescence (Ozer & Gjerde, 1989) found that profile similarity was stable across time. However, because only a small sample of adolescents ($n = 84$) was employed, the generalizability of these results is debatable. Large-scale longitudinal studies reporting on systematic increases of profile similarity in adolescents are not yet available.

The State of the Art of Studies on Personality Maturation in Adolescence

Our discussion of research on the three change measures reveals that there have been quite a few studies examining aspects of personality maturation in adolescence, specifically during the last decade. However, studies on mean-level change do not agree on exactly what Big Five dimensions maturation processes are most evident, there are no studies available that can inform us on exactly where in adolescence interindividual differences in personality traits start to become more settled, and large-scale longitudinal studies systematically tracking changes in profile similarity are not yet available. In addition, most of the aforementioned studies did not asses all three indicators of maturation (i.e., increases on the Big Five traits, increasingly stable rank order with regard to interindividual differences, and a better organized personality profile) in one design, even though it is not possible to gain a comprehensive perspective on maturation of personality unless all three indicators are assessed (e.g., Caspi & Roberts, 1999; Roberts et al., 2001). The one study (De Fruyt et al., 2006) that did examine all three indicators only assessed maturation in childhood and early adolescence. The three indicators of maturation have so far not been assessed together in studies covering other periods in adolescence.

Another issue is that a majority of the published studies, including the one by De Fruyt et al. (2006), measured adolescent personality traits only twice for the same participants. Changes found in studies with only two longitudinal measurement occasions may be caused by temporary factors that influence scores on one of the measurement occasions, whereas consistent change across several measurement occasions is more likely to reflect reliable developmental trends. Consequently, the reliability of change trajectories has been shown to increase steadily as the number of measurement occasions increases (Willett, Singer, & Martin, 1998). In addition, two measurement occasions allow for the assessment of only linear change, which implies that it is possible to find no changes if the underlying pattern is curvilinear. Finally, studies with only two measurement occasions are unable to investigate systematic increases in rank-order stability and profile similarity.

In sum, to advance the knowledge of adolescent personality maturation, studies that longitudinally and systematically measure various indicators of personality change and stability in a large and broad sample of adolescents, using multiple measurement waves, are needed. The current study aims to provide such a comprehensive perspective on personality maturation.

Gender Differences in Personality

Because previous studies found gender differences in adolescent personality change, we also consider the role of gender in adolescent personality maturation. We now discuss the gender differences found by these previous studies.

With regard to the first aspect of personality maturation (i.e., increases in mean levels of Big Five traits), three of the aforementioned longitudinal studies on mean-level change in adolescent personality traits explicitly examined gender differences. Two of those studies compared overall mean levels of personality traits of adolescent boys and girls. Branje et al. (2007) found that boys tended to be more extraverted and open to experience than girls, whereas McCrae et al. (2002) concluded the exact opposite. In addition, McCrae et al. found higher levels of Agreeableness and lower levels of Emotional Stability in girls when compared to boys, whereas Branje et al. found no gender differences on these two dimensions. With regard to changes, there is also little agreement among studies. Branje et al. found decreases for boys and increases for girls in Extraversion. For Agreeableness, Conscientiousness, and Openness, they found stability for boys, but increases for girls. Both studies agreed that there were no gender differences in Conscientiousness. The other two longitudinal studies reporting on gender differences (McCrae et al., 2002; Pullmann et al., 2006) found a more advantageous developmental pattern for Emotional Stability for boys than for girls, as Pullmann et al. (2006) reported increases for boys and stability for girls, and McCrae et al. reported stability for boys and decreases for girls. Emotional Stability was the only dimension where Branje et al. did not find gender differences in change rates. Thus, there is little agreement on gender differences in both mean levels and mean-level changes in Big Five traits.

Gender differences concerning the second aspect of maturation (i.e., increases in rank-order stability) were examined in three studies. In their meta-analysis, Roberts and DelVecchio (2000) did not find gender differences in rank-order stability across the life span. Due to the underrepresentation of studies assessing gender differences in personality change in the meta-analysis, they were unable to focus on a specific period, such as adolescence. Furthermore, studies that specifically focused on adolescents either found that girls were somewhat more stable than boys (Pullmann et al.,

2006) or found no gender differences (McCrae et al., 2002). However, because none of the aforementioned studies systematically measured year-to-year changes in rank-order stability in adolescence, it is not possible to use these studies to explore whether interindividual differences in personality traits start to become more set at a similar age for adolescent boys and girls. To examine such possible gender differences in the timing of longitudinal changes in rank-order stability for boys and girls, studies that assess year-to-year changes in rank-order stability are needed.

Finally, with respect to the third aspect of adolescent personality maturation (i.e., an increasingly more organized personality profile), only two studies have examined gender differences. Ozer and Gjerde (1989) found no substantial differences, whereas Roberts et al. (2001) reported higher profile similarity in girls when compared to boys. However, as previously mentioned, the former study employed a small sample and the latter focused on the transition from adolescence into adulthood. In addition, neither of these two studies focused on Big Five trait profiles. Thus, gender differences in mean levels and increases in Big Five profile similarity still need to be investigated.

In sum, previous studies have examined gender differences for all three aspects of adolescent personality maturation. However, there is little agreement (i.e., for mean-level change), or there is mixed evidence (i.e., for rank-order stability and profile similarity), with regard to gender differences in personality change. These inconsistencies in findings of previous studies could be due to the possibility that gender differences mainly exist in the timing of personality development, as suggested by Branje et al. (2007). They proposed that the gender differences they found at age 16 (i.e., more increases in girls than in boys, and hence higher mean levels on several personality traits for girls) could be caused by a pubertal timing effect in personality. Branje et al. therefore suggested that boys could catch up with girls with regard to personality in late adolescence. However, they were unable to test this hypothesis. Such differences in the timing of personality maturation might exist, as there are profound gender differences in indices of pubertal timing and neurological maturation processes.

On one of the most used indicators of pubertal timing, peak height velocity (i.e., the age at which an adolescent exhibits the fastest growth rate), girls have been shown to be 2 years ahead on average, when compared to boys (e.g., Beunen et al., 2000; Petersen et al., 1988). In addition, brain development in several areas is up to 1 year ahead in girls (Giedd et al., 1999; Lynn, 1994). Due to these gender differences in pubertal timing and neurological development, girls usually look more mature and have a cognitive advantage (Colom & Lynn, 2004) in the earlier stages of adolescence. In a review, Paikoff and Brooks-Gunn (1991) indicated that adolescents who mature earlier are also ahead on several factors related to Big Five traits, such as social maturity, peer prestige, leadership, and self-esteem. Gender differences in pubertal timing and neurological maturation are, therefore, likely to be reflected in gender differences in Big Five personality maturation.

Hypotheses

In sum, we will examine whether adolescent personality maturation is reflected by (a) increasing mean levels of Big Five traits, (b) increasingly more settled interindividual differences, and (c) better organized personality profiles. We expect increasing mean levels of Big Five traits through adolescence but also substantial interindividual differences in these increases. Previous studies consistently found evidence for increases in Openness in adolescence, but it is unclear in exactly which other traits maturation is reflected. Increasingly more settled interindividual differences are expected to be signified by increases in rank-order stability of personality traits, whereas a better organized personality profile is expected to be indicated by increases in *q*-correlations. Finally, we expect gender differences in the timing of all three aspects of personality maturation. Specifically, girls should exhibit high mean levels, rank-order stability, and profile similarity of personality at an earlier stage in adolescence than boys.

Method

Participants

Data for this study were collected as part of a five-annual-wave longitudinal research project on Conflict and Management of Relationships (CONAMORE; Meeus et al., 2006), with a 1-year interval between each wave. The longitudinal sample was composed of 1,313 adolescents. They were divided into an early to middle adolescent cohort ($n = 923$; 70.3%), who were 12.4 years old on average ($SD = 0.59$), and a middle to late adolescent cohort ($n = 390$; 29.7%), who were 16.7 years old on average ($SD = 0.80$) during the first wave of measurement. Because both age groups were assessed during five measurement waves, a total age range from 12 to 20 years was available.

The early to middle adolescent cohort consisted of 468 boys (50.7%) and 455 girls (49.3%), and the middle to late adolescent cohort consisted of 169 boys (43.3%) and 221 girls (56.7%). In the younger cohort, 85.1% indicated that they were living with both their parents, and in the older cohort a similar percentage of adolescents (84.3%) reported the same. Other adolescents lived with their mothers (7.9% and 7.2% in the younger and older cohorts, respectively) or elsewhere (e.g., with their fathers, with one biological parent and one stepparent, or with other family members). The composition of the two cohorts did not significantly differ with regard to ethnicity. In the younger cohort, 83.4% identified themselves as Dutch, and 16.6% indicated that they belonged to an ethnic minority (e.g., Surinamese, Antillean, Moroccan, Turkish). In the older cohort these figures were 87.4% and 12.6%, respectively. In the year that the current study was initiated (2001), 21% of all Dutch early to middle adolescents and 22% of all Dutch middle to late adolescents belonged to ethnic minorities (Statistics Netherlands, 2008a). Thus, ethnic minorities were slightly underrepresented in our sample. With regard to education, all participants initially were in junior high and high schools. Given the Dutch educational system, most participants changed school at least once during the study. Specifically, participants in the younger cohort switched from junior high school to high school, whereas most of the participants in the older cohort switched from high school to college. Because of the sample recruitment procedure, 100% of our middle to late adolescents were in high school or college, whereas national demographic statistics (Statistics Netherlands, 2008a, 2008b, 2008c) reveal that 96% of all Dutch middle to late adolescents were in some form of education at that age during the period covered in the current study (i.e., 2001–2005).

Sample attrition was 1.2% across waves: In Waves 1, 2, 3, 4, and 5 the number of participants was 1,313, 1,313 (923 early to middle adolescents and 390 middle to late adolescents), 1,293 (923 early to middle adolescents and 370 middle to late adolescents), 1,292 (923 early to middle adolescents and 369 middle to late adolescents), and 1,275 (913 early to middle adolescents and 362 middle to late adolescents), respectively. For each analysis we used the optimal method to estimate missing values. For the latent growth curve analyses (used to asses mean-level change), we therefore used the full information maximum likelihood (FIML) procedure in Mplus (Muthén & Muthén, 2007). As the analyses concerning rank-order stability and profile similarity were run in SPSS, where FIML is not available, we used the expectation-maximization (EM) procedure to estimate missing values for these analyses. Across waves, 4.9% of the data were missing. Little's (1988) missing completely at random test, a regular test to compare imputed with nonimputed data, revealed a normed chi-square (χ^2/df) of 1.35. According to guidelines by Bollen (1989), this indicates a good fit between sample scores with and without imputation.

Procedure

The participating adolescents were recruited from several randomly selected schools in the province of Utrecht, The Netherlands. Of the 20 schools that were approached, 12 schools (60%) decided to participate. There were no general differences between participating and nonparticipating schools. All offered comparable educational programs. We were unable to collect data on personality or other variables among the pupils of the nonparticipating schools. Students at the participating schools and their parents received an invitation letter describing the research project and goals and explaining the possibility of declining participation. More than 99% of the approached students decided to participate. All participants signed the informed consent form. The questionnaires were completed at the participants' own (junior) high school or at home, during annual assessments. Confidentiality of responses was guaranteed. Verbal and written instructions were offered. The adolescents received €10 (approximately U.S. $15) as a reward for every wave they participated in.

Personality Measures

Personality was assessed with a shortened 30-item Dutch version of Goldberg's Big Five questionnaire (Gerris et al., 1998; Goldberg, 1992). In this instrument, a 7-point Likert scale with a response format ranging from 1 (*completely untrue*) to 7 (*completely true*) is used to assess five personality dimensions: Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience. All dimensions are measured with six items each, such as "talkative" (Extraversion), "sympathetic" (Agreeableness), "systematic" (Conscientiousness), "worried" (Emotional Stability, reverse scored), and "creative" (Openness to Experience). Previous studies (e.g., Branje, van Lieshout, & van Aken, 2004; De Fruyt et al., 2006; Dubas, Gerris, Janssens, & Vermulst, 2002; Scholte, van Aken, & van Lieshout, 1997) have demonstrated that this measure provides a valid and reliable estimate of adolescent Big Five personality traits. In the current study, reliability across waves was high, as the ranges of internal consistency coefficients (Cronbach's alphas) for each Big Five trait in early to middle adolescents were as follows: Extraversion (.76–.85), Agreeableness (.80–.88), Conscientiousness (.81–.88), Emotional Stability (.81–.84), and Openness to Experience (.76–.78). For middle to late adolescents, these figures were as follows: Extraversion (.86–.91), Agreeableness (.81–.88), Conscientiousness (.87–.92), Emotional Stability (.79–.85), and Openness to Experience (.74–.79).

Strategy of Analyses

We examined three types of change and stability (i.e., mean-level change, rank-order stability, and profile similarity) in early to middle and middle to late adolescents, and we examined gender differences in these change measures. We estimated *mean-level change* with latent growth curve modeling (LGCM; e.g., Duncan, Duncan, Stryker, Li, & Alpert, 1999), using maximum likelihood (ML) estimation in Mplus (Muthén & Muthén, 2007). LGCM provides mean initial levels (i.e., intercepts) and mean change rates (i.e., slopes), which are based on individual growth trajectories of all participants. To indicate the extent to which there are interindividual differences in growth, intercept and slope variances are also incorporated in the analysis and provided in the output. Therefore, LGCM integrates individual-level change and mean-level change in one analysis (e.g., Branje et al., 2007). Different shapes of development can be tested, as linear and curvilinear shapes of development can be specified with the slopes. Because latent variables are used in LGCM to estimate mean-level change, it controls for measurement error (e.g., Duncan et al., 1999), which is not possible with classical techniques, such as repeated measures analysis of variance, which has been used in a majority of previous studies on adolescent personality maturation (except for Branje et al., 2007, who also used LGCM).

To assess gender differences in mean levels and change, we used a multigroup design with four groups: early to middle adolescent boys and girls and middle to late adolescent boys and girls. All participants in the younger cohort were in their 1st year of secondary education at Time 1 (T1) and in their 5th year of secondary education at T5, whereas the participants from the older cohort were in their 5th year of secondary education at T1. Measurement wave was fully confounded with the number of years adolescents had experienced secondary education (i.e., grade level) and was also largely confounded with age (see sample description). No data were available concerning the exact chronological age of the participants. Therefore, we used measurement occasion, which was fully confound with grade level, to specify our growth models. For convenience of presentation, we refer to the stage of adolescence (i.e., early, middle and late adolescence), instead of measurement wave or grade level, when discussing our results.

One wave of overlap existed between the two age cohorts. During this one wave of overlap (i.e., T5 for early to middle adolescents and T1 for middle to late adolescents), adolescents were 16 years of age on average, and all had experienced 5 years of secondary education. Therefore, we placed the intercept at T5 for early to middle adolescents and at T1 for middle to late adolescents (i.e., slope factor loadings were −4, −3, −2, −1, and 0 for the five consecutive measurement occasions for early to middle adolescents, and they were 0, 1, 2, 3, and 4 for middle to late adolescents). We used the same growth factor loadings for

boys and girls. We chose the kind of growth model that best applied to our data by testing models with linear growth, as well as models with curvilinear growth, for all Big Five traits separately. We used the unconstrained models to determine growth in the various groups (i.e., early to middle adolescent boys and girls and middle to late adolescent boys and girls), and we used chi-square difference tests to assess differences between these groups in growth estimates (i.e., means and variances of intercepts and slopes). Model fit of the various models was judged by assessing root-mean-square errors of approximation (RMSEAs), comparative fit indices (CFIs), and Tucker–Lewis fit indices (TLIs). RMSEAs below .08 and CFIs and TLIs over .95 indicate an adequate model fit; relatively lower RMSEAs and higher CFIs and TLIs indicate a better fit when comparing models (Kline, 1998). Intercepts and slopes within the same model were allowed to correlate, as this significantly improved the fit of all models.

Pearson correlations were used to assess *rank-order stability*. To test for gender differences and age-related increases in rank-order stability, we transformed correlation coefficients to *z*-scores using Fisher's *r*-to-*z* transformation. We tested gender differences in *z*-scores for significance by comparing a test–retest *z*-score for a certain measurement wave interval within an age cohort for boys with *z*-scores obtained for girls at that same measurement wave interval within the same age cohort (e.g., the T1–T2 *z*-score for early to middle adolescent boys was compared to the T1–T2 *z*-score for early to middle adolescent girls). To test for age effects, we compared *z*-scores for the same between-waves interval for the two cohorts within gender cohorts (e.g., the T1–T2 *z*-scores obtained for early to middle adolescent girls were compared to the T1–T2 *z*-scores for middle to late adolescent girls).

Profile similarity was assessed with *q*-correlations (e.g., Block, 1971; Roberts et al., 2001). We calculated a *q*-correlation for each individual separately, by correlating a rank-ordered set of Big Five traits at one measurement occasion (e.g., T1) with a rank-ordered set of the same Big Five traits at the subsequent measurement occasion (e.g., T2). Biesanz, West, and Kwok (2003) proposed that LGCM can be used to assess mean-level changes in profile similarity, if enough measurement occasions are available. As this was the case in the current study, we conducted LGCM to assess age-related increases in mean *q*-correlations. Because profile similarity was measured from T1 to T2, T2 to T3, T3 to T4, and T4 to T5, four measurement occasions were available for each cohort. We chose a multigroup design with four groups: early to middle adolescent boys and girls and middle to late adolescent boys and girls (for the four consecutive measurement occasions, factor loadings were 0, 1, 2, and 3, for all groups). To assess gender and age effects, and to judge model fit, we followed the same procedure previously described for the LGCMs on mean-level change.

Results

Mean-Level Change

To assess mean-level change, we ran a set of five univariate multigroup LGCMs to assess personality change and gender differences therein. Four groups were distinguished: early to middle adolescent boys and girls and middle to late adolescent boys and girls. Observed means and standard deviations of these groups are provided in Table 1.

For all Big Five factors, the best fitting and most parsimonious models were models for curvilinear growth. In curvilinear models, growth is a combination of linear and curvilinear slopes. Because that makes it hard to judge growth patterns from a table only, the estimated growth of Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness is displayed in Figures 1A (boys) and 1B (girls). Fit indices of the unconstrained models appear in Table 2. Growth parameters of the unconstrained models and between-groups differences as tested with chi-square difference tests are displayed in Table 3.

We found only some evidence for increases in Extraversion in early to middle adolescence. There was, however, a cohort effect, as levels of Extraversion were lower in the middle to late adolescent cohort than in the early to middle adolescent cohort. There was little evidence for gender differences in Extraversion. In early

Table 1
Observed Means and Standard Deviations of Personality

	Early to middle adolescence										Middle to late adolescence									
	T1		T2		T3		T4		T5		T1		T2		T3		T4		T5	
Factor	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Boys																				
E	4.87	0.98	4.75	0.97	4.89	0.98	4.88	1.06	4.96	1.08	4.63	1.20	4.66	1.08	4.78	1.01	4.87	1.08	4.93	1.13
A	4.93	1.16	5.05	1.03	5.00	0.94	5.14	0.96	5.31	0.78	5.17	0.98	5.49	0.71	5.58	0.58	5.58	0.59	5.68	0.60
C	4.05	1.13	4.16	1.18	3.93	1.13	3.89	1.16	4.01	1.19	4.10	1.20	4.18	1.21	4.22	1.10	4.23	1.12	4.32	1.18
ES	4.70	1.16	4.60	1.10	4.78	0.97	4.81	0.99	4.89	1.00	4.58	1.11	4.56	1.02	4.68	1.02	4.85	0.94	4.77	0.99
O	4.38	1.14	4.56	1.10	4.40	1.00	4.45	1.04	4.57	1.01	4.72	1.08	4.90	0.89	4.89	0.82	4.87	0.93	4.95	0.85
Girls																				
E	4.95	1.05	4.93	1.14	4.91	1.17	4.83	1.18	4.91	1.14	4.62	1.21	4.78	1.18	4.82	1.20	4.79	1.14	4.77	1.18
A	5.20	0.97	5.37	0.91	5.33	0.89	5.47	0.74	5.57	0.67	5.50	0.74	5.67	0.57	5.66	0.61	5.73	0.56	5.73	0.55
C	4.23	1.09	4.29	1.14	4.25	1.16	4.28	1.17	4.35	1.19	4.38	1.21	4.47	1.22	4.54	1.22	4.64	1.24	4.71	1.19
ES	4.57	1.08	4.36	1.12	4.40	1.14	4.39	1.08	4.36	1.08	4.09	0.98	4.04	1.00	4.21	0.97	4.22	1.05	4.24	1.04
O	4.40	1.01	4.60	1.04	4.57	1.07	4.75	0.96	4.83	0.94	4.83	0.88	4.97	0.84	4.91	0.87	4.97	0.82	4.87	0.86

Note. For early to middle adolescent boys, $n = 468$, and for girls, $n = 455$. For middle to late adolescent boys, $n = 169$, and for girls, $n = 221$. E = Extraversion; A = Agreeableness; C = Conscientiousness; ES = Emotional Stability; O = Openness; T = time.

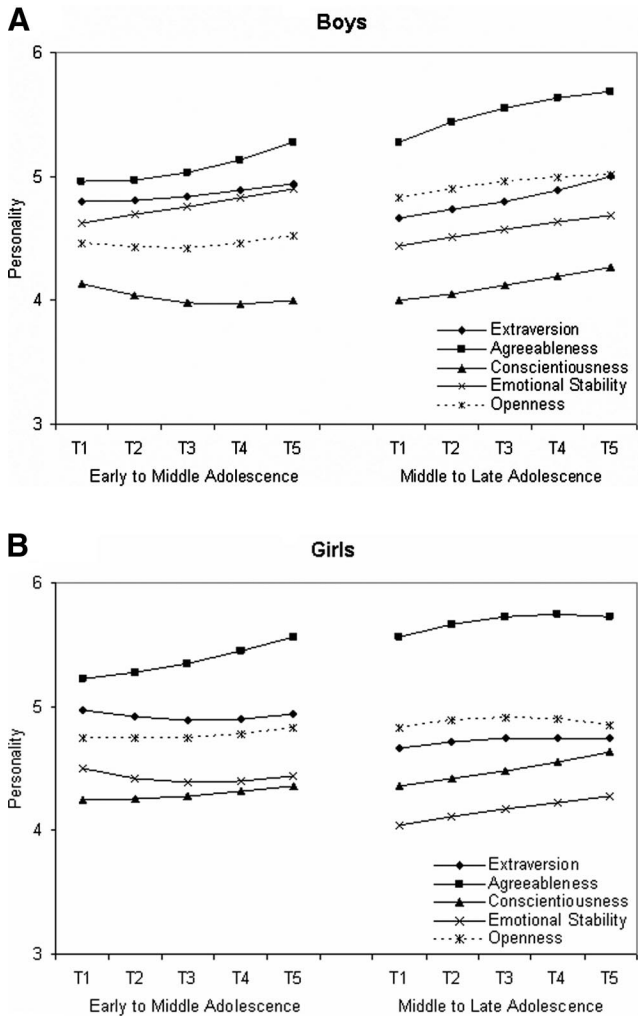

Figure 1. Estimated growth of Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness for boys (A) and girls (B). T = time.

to middle adolescence, boys displayed a small curvilinear increase, whereas girls displayed a nonsignificant increase in Extraversion. These gender differences failed to reach significance. In middle to late adolescence, we found no significant changes for boys, but girls displayed a curvilinear pattern that resulted in very little change. Therefore, boys and girls had similar levels of Extraversion throughout adolescence.

Adolescents in our sample became much more agreeable as they grew older, evidenced by increases in early to middle and middle to late adolescent boys and girls. These changes usually followed a curvilinear pattern. Only in early to middle adolescent girls was change described by a linear pattern. In early adolescence, girls had higher levels of Agreeableness than did boys. Because both boys and girls displayed similar increases toward middle adolescence, these gender differences were still present in middle adolescence. However, boys exhibited somewhat stronger increases than girls in middle to late adolescence. As a result, gender differences in Agreeableness had almost disappeared by late adolescence.

Levels of Conscientiousness were mostly stable throughout adolescence. There were, however, profound gender differences. Boys began with lower levels of Conscientiousness than girls in early adolescence. Their levels of Conscientiousness decreased in a curvilinear fashion toward middle adolescence, whereas girls displayed stable levels Conscientiousness. In middle to late adolescence the initial gender differences remained, as levels of Conscientiousness did not change significantly for either boys or girls. By late adolescence, girls were still more conscientious than boys.

For Emotional Stability, we generally found increases within cohorts. However, there were large cohort effects, as levels of Emotional Stability were much lower in middle to late adolescence, when compared to early to middle adolescence. In addition, there were clear gender differences, as girls had much lower levels of Emotional Stability than boys in early adolescence. These gender differences became even somewhat larger toward middle adolescence, as levels of Emotional Stability increased for boys but remained stable for girls. However, these gender differences in change were just not significant. In the middle to late adolescent cohort, girls again had much lower levels of Emotional Stability than boys. As both boys and girls exhibited a similar increase, gender differences in Emotional Stability were maintained across time.

We found only some evidence for increases in Openness throughout adolescence. However, there were substantial gender differences and a cohort effect. From early adolescence to middle adolescence, girls displayed higher levels of Openness than boys, although boys displayed curvilinear increases, whereas girls retained a stable level of Openness. For boys, there was a cohort effect, as their levels of Openness were higher in middle to late adolescence than in early to middle adolescence, even though we compared the two age cohorts at a point where their mean ages were similar (i.e., 16 years old). For girls, such cohort differences

Table 2
Fit Indices for Unconstrained Univariate Multigroup Latent Growth Curve Models

Factor	χ^2	*df*	CFI	TLI	RMSEA	90% CI of RMSEA
Extraversion	44.80**	24	.99	.99	.05	.03–.07
Agreeableness	55.47**	32	.99	.98	.05	.03–.07
Conscientiousness	37.35*	24	1.00	.99	.04	.01–.07
Emotional Stability	65.25***	27	.98	.98	.07	.05–.09
Openness	63.25***	27	.99	.98	.06	.04–.09

Note. CFI = comparative fit index; TLI = Tucker–Lewis fit index; RMSEA = root-mean-square error of approximation; CI = confidence interval.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3
Growth Factors of the Unconstrained Univariate Multigroup Latent Growth Curve Models

	Boys				Girls			
	Early to middle adolescence		Middle to late adolescence		Early to middle adolescence		Middle to late adolescence	
Growth factor	*M*	σ^2	*M*	σ^2	*M*	σ^2	*M*	σ^2
Intercepts								
Extraversion	4.97^{***a}	0.76^{***1}	4.63^{***b}	0.89^{***1}	4.91^{***a}	1.29^{***2}	4.64^{***b}	1.10^{***2}
Agreeableness	5.28^{***a}	$0.30^{***1,2}$	5.24^{***a}	0.26^{***2}	5.56^{***b}	0.35^{***1}	5.54^{***b}	0.23^{***2}
Conscientiousness	3.96^{***a}	0.95^{***1}	4.12^{***a}	0.86^{***1}	4.33^{***b}	1.15^{***1}	4.39^{***b}	1.14^{***1}
Emotional Stability	4.92^{***a}	$0.67^{***1,2}$	4.51^{***b}	0.64^{***1}	4.37^{***b}	0.95^{***2}	4.06^{***c}	0.62^{***1}
Openness	4.53^{***a}	0.77^{***1}	4.79^{***b}	0.49^{***2}	4.81^{***b}	0.82^{***1}	4.85^{***b}	0.49^{***2}
Linear slopes								
Extraversion	$.09^{*a}$	$.07^{1}$	$.06^{a}$	$.25^{*1,2}$	$.03^{a}$	$.29^{***2}$	$.14^{**a}$	$.25^{**1,2}$
Agreeableness	$.18^{***a,b}$	$.07^{1,2}$	$.23^{***a}$	$.00^{1}$	$.09^{**b}$	$.22^{***2}$	$.13^{***a,b}$	$.00^{1}$
Conscientiousness	$.05^{a}$	$.10^{1}$	$.05^{a}$	$.12^{1}$	$.06^{a}$	$.13^{1}$	$.08^{a}$	$.07^{1}$
Emotional Stability	$.11^{*a}$	$.26^{**1}$	$.13^{*a}$	$.00^{2}$	$.04^{a}$	$.16^{*1,2}$	$.07^{a}$	$.23^{**1,2}$
Openness	$.09^{*a}$	$.17^{*1}$	$.05^{a}$	$.01^{2}$	$.06^{a}$	$.19^{**1}$	$.12^{**a}$	$.04^{2}$
Quadratic slopes								
Extraversion	$.01^{a}$	$.01^{1}$	$.01^{a}$	$.01^{*1}$	$.01^{a}$	$.01^{**1}$	$-.03^{*b}$	$.01^{*1}$
Agreeableness	$.24^{*a}$	$.01^{1}$	$-.03^{**b}$	$.00^{2}$	$.00^{c}$	$.02^{***1}$	$-.02^{*b}$	$.00^{2}$
Conscientiousness	$.02^{*a}$	$.01^{1}$	$.00^{b}$	$.00^{1}$	$.01^{b}$	$.01^{1}$	$.00^{b}$	$.00^{1}$
Emotional Stability	$.01^{a}$	$.02^{***1}$	$-.01^{a}$	$.01^{2}$	$.02^{a}$	$.00^{2}$	$-.01^{a}$	$.01^{**1}$
Openness	$.02^{a}$	$.01^{1}$	$.00^{a,b}$	$.00^{1}$	$-.01^{b}$	$.01^{**1}$	$-.03^{**c}$	$.00^{1}$

Note. Intercepts were moved to age 16 (i.e., fifth measurement in the younger cohort and first measurement in the older cohort). Different superscripts indicate significant ($p < .05$) gender, age cohort, or Gender × Age Cohort differences in means and variances of intercepts, linear slopes, and quadratic slopes. To facilitate interpretation, comparisons between means are represented with letters, whereas comparisons between variances are represented with digits.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

were not found. As a result, boys and girls had similar levels of Openness in middle to late adolescence. In that period, girls displayed a curvilinear pattern that resulted in very little change across time. Changes for boys did not reach significance.

Rank-Order Stability

Pearson correlations were calculated to assess rank-order stability of personality across adolescence. For boys, correlations ranged from .31 (Agreeableness from T1 to T2) to .62 (Conscientiousness from T3 to T4) in early to middle adolescence and from .27 (Agreeableness from T1 to T2) to .75 (Conscientiousness from T3 to T4) in middle to late adolescence. Test–retest correlations for girls ranged from .41 (Agreeableness T1 to T2) to .75 (Extraversion T4 to T5) in early to middle adolescence and from .52 (Agreeableness T1 to T2, and T3 to T4) to .86 (Conscientiousness T4 to T5) in middle to late adolescence. All test–retest correlations for boys and girls are displayed in Table 4.

To test the hypothesis that rank-order stability would increase as adolescents grow older, differences between correlation coefficients in early to middle adolescence and middle to late adolescence were tested for significance ($p < .05$) across all four between-measurement intervals (i.e., T1–T2, T2–T3, T3–T4, and T4–T5), for boys and girls separately. Significant differences between age cohorts are represented in bold font in Table 4.

For boys, test–retest correlations of Extraversion, Conscientiousness, and Emotional Stability were generally higher in middle to late adolescence when compared to early to middle adolescence, except for the T3–T4 correlations on all these three dimensions, which were equal in both age cohorts. In general, rank-order stability for Agreeableness and Openness did not increase with age, as only the T1–T2 correlation for Openness was significantly higher in the older cohort than in the younger cohort. In sum, 10 out of 20 test–retest correlations were higher in the older cohort than in the younger cohort; the other 10 test–retest correlations were not significantly different for the two age cohorts. Hence, we found evidence for age-related increases in rank-order stability of personality traits for boys.

For girls, test–retest correlations were generally higher in middle to late adolescence than in early to middle adolescence for Extraversion, Conscientiousness, and Openness (except for the T3–T4 correlation of Openness, which did not significantly differ for the two age cohorts). For Emotional Stability, test–retest correlations were equal for both age cohorts on the first two time intervals (T1–T2 and T2–T3) and were higher in the older cohort on the other two time intervals (T3–T4 and T4–T5). For Agreeableness, only the T3–T4 correlation was higher in the older cohort than in the younger cohort; the other test–retest correlations were not significantly different for the two age cohorts. Taken together, 14 out of 20 test–retest correlations were higher in middle to late adolescence than in early to middle adolescence. The remaining 6 test–retest correlations were equal in the two age cohorts. Therefore, evidence for age-related increases in rank-order stability was even stronger in girls than in boys.

With regard to gender differences, 18 out of 40 test–retest correlations were significantly higher for girls than for boys. The

Table 4
Rank-Order Stability and Profile Similarity of Personality

Factor	Early to middle adolescence				Middle to late adolescence			
	T1–T2	T2–T3	T3–T4	T4–T5	T1–T2	T2–T3	T3–T4	T4–T5
Boys								
Extraversion	**.35**	**.48**	.62	**.60**	**.59**	.65	.71	**.75**
Agreeableness	.31	.48	.53	.47	.27	.42	.48	.34
Conscientiousness	**.45**	**.59**	.69	**.64**	**.60**	**.71**	.75	**.74**
Emotional Stability	**.32**	**.39**	.50	**.51**	**.51**	.63	.62	**.73**
Openness	**.36**	.51	.61	.61	**.53**	.58	.62	.70
Profile similarity	.42	.51	.61	.63	.63	.73	.77	.76
Girls								
Extraversion	**.55**	**.67**	**.68**	.75	**.70**	.76	**.81**	**.82**
Agreeableness	.41	.46	.51	**.53**	.52	.56	.52	**.67**
Conscientiousness	**.55**	**.60**	.67	.72	**.79**	**.81**	**.81**	.86
Emotional Stability	.48	.59	**.56**	.66	.57	.65	**.68**	.75
Openness	**.52**	**.54**	.60	**.69**	**.64**	.69	.67	**.79**
Profile similarity	.55	.63	.63	.74	.73	.79	.78	.82

Note. All correlations are significant at $p < .001$. Underlined test–retest correlations represent significant gender differences. Test–retest correlations in bold represent significant age differences. T= time.

other 22 were equal for both genders. Thus, girls generally exhibited higher levels of rank-order stability than boys. Test–retest correlations that were different for adolescent boys and girls are underlined in Table 4.

Profile Similarity

We measured profile similarity by calculating *q*-correlations for all 1-year between-measurement intervals included in the study. Mean *q*-correlations are provided for early to middle and middle to late adolescent boys and girls separately. This procedure resulted in a total of 16 mean *q*-correlations, allowing us to examine increases in profile similarity through adolescence and gender differences therein. Mean *q*-correlations for boys and girls are displayed in the bottom row of Table 4. For both boys and girls, average *q*-correlations were moderate to high in early to middle adolescence and high in middle to late adolescence. We used multigroup LGCM to assess changes and gender differences in these changes for *q*-correlations. Growth parameters of the unconstrained model and between-groups differences, as tested with chi-square difference tests, are displayed in Table 5. The estimated growth of profile similarity in boys and girls is plotted in Figure 2.

The unconstrained model had an adequate fit, $\chi^2(12) = 29.44$, $p = .003$; CFI = .97; TLI = .94; RMSEA = .07; 90% confidence interval = .04–.10, and revealed that profile similarity increased as adolescents grew older. Overall, increases were somewhat larger in early to middle adolescence than in middle to late adolescence. There were also large gender differences. Compared to boys, girls displayed higher levels of profile similarity in early adolescence. As a result, girls had already reached a mean *q*-correlation higher than .70 by middle adolescence. Boys, on the other hand, displayed stronger curvilinear increases than girls, both in early to middle and middle to late adolescence. However, because they initially had much lower levels of profile similarity than girls, they reached an average mean *q*-correlation higher than .70 only by late adolescence.

Discussion

In adolescence, the transition from being a dependent child to being an independent adult takes place (Erikson, 1950). This maturation process should be reflected by mean-level increases on Big Five traits (e.g., Caspi et al., 2005), increasingly more settled interindividual differences (e.g., Costa & McCrae, 1994), and an increasingly better organized personality profile (e.g., Roberts et al., 2001). We assessed these three aspects of maturation using a 5-year longitudinal design with overlapping early to middle and middle to late adolescent cohorts, and we tested for gender differences. In general, we found evidence for all three aspects of maturation and demonstrated that girls matured at a younger age than boys.

Table 5
Growth Factors in the Unconstrained Multigroup Latent Growth Curve Model for Profile Similarity

Growth factor	Early to middle adolescence		Middle to late adolescence	
	Boys	Girls	Boys	Girls
Intercepts				
Mean	$.42^{***a}$	$.56^{***b}$	$.63^{***b}$	$.75^{***c}$
σ^2	$.14^{***1}$	$.10^{***1}$	$.11^{***1}$	$.01^{2}$
Linear slopes				
Mean	$.13^{***a}$	$.03^{b}$	$.12^{***a}$	$.03^{b}$
σ^2	$.10^{*1}$	$.16^{***2}$	$.08^{*1}$	$.02^{3}$
Quadratic slopes				
Mean	$-.02^{*a}$	$.01^{b}$	$-.03^{**a}$	$.00^{b}$
σ^2	$.01^{1}$	$.02^{***3}$	$.01^{**2}$	$.00^{1}$

Note. Different superscripts indicate significant ($p < .05$) gender, age cohort, or Gender × Age Cohort differences in means and variances of intercepts, linear slopes, and quadratic slopes. To facilitate interpretation, comparisons between means are represented with letters, whereas comparisons between variances are represented with digits.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

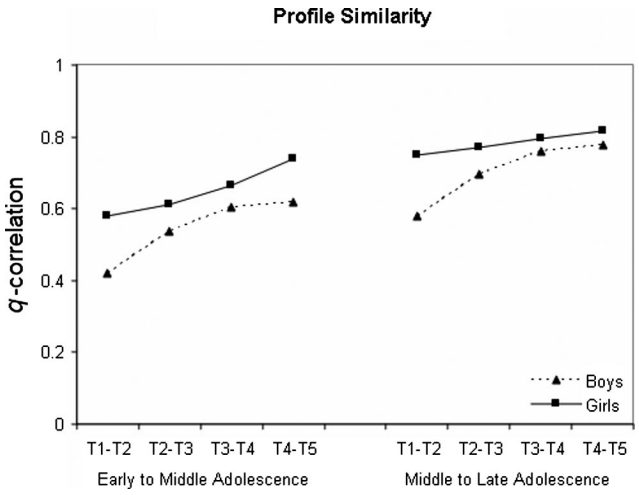

Figure 2. Estimated growth of profile similarity (*q*-correlations) for boys and girls. T = time.

General Changes in Mean Levels of Personality Traits

With regard to mean-level changes, the strongest evidence for increases was found for Agreeableness. This was a surprising finding, considering that previous studies (Branje et al., 2007; De Fruyt et al., 2006; McCrae et al., 2002; Pullmann et al., 2006; Roberts et al., 2006) found very little evidence for maturation on this dimension. We discuss two possible causes for discrepancies between our results and those obtained with previous studies: (a) the effect of our inclusion of multiple measurement waves and (b) birth cohort differences between our sample and samples included in the meta-analysis by Roberts et al. (2006). In addition, a theoretical perspective on the increases in Agreeableness is provided.

A first source of the discrepancies between our findings and those from previous studies is likely to be the inclusion of multiple measurement occasions across the entire range of adolescence. An examination of Figures 1A and 1B reveals that there are indeed periods within adolescence where Agreeableness does not increase (e.g., T1–T3 in early to middle adolescent boys and T2–T5 for middle to late adolescent girls). If we would have concentrated on these specific periods within adolescence, we would have found no change with regard to Agreeableness. However, when the entire range of adolescence is taken into account, mean-level increases can be readily observed. For that reason, our results demonstrate that in order to obtain a comprehensive and reliable perspective on adolescent personality development, frequent assessments that cover the entire period of adolescence are needed.

Second, discrepancies between our findings and those obtained with the meta-analysis (Roberts et al., 2006) could be caused by birth cohort effects. Roberts et al. (2006) included cohorts that grew up in the 1960s and 1970s, a time when questioning of norms and traditions was a widespread phenomenon. Roberts et al. noted that cohorts who grew up in that era tended to exhibit little increases in Agreeableness. However, cohorts born before and after that period, when norms and traditions were questioned to a lesser extent (see Roberts et al., 2006), displayed much larger increases. The cohorts in the present study were born in the late 1980s; this could explain why we found increases in Agreeableness whereas such increases were not found in the meta-analysis.

Although the increases we found for Agreeableness may not be in agreement with findings from a majority of previous studies, they make theoretical sense. In adolescence, peer relations become increasingly more salient and intimate (e.g., Furman & Buhrmester, 1992; Shulman, Laursen, Kalman, & Karpovsky, 1997). In order to form more intimate relationships, it is important to be able to maintain positive relationships. The ability to maintain positive relationships with others has been shown to be related to Agreeableness (Jensen-Campbell et al., 2002), which could explain the mean-level increases for Agreeableness in the current study.

Similar to previous studies (De Fruyt et al., 2006; McCrae et al., 2002; Pullmann et al., 2006; Roberts et al., 2006), we found little evidence for increases in Conscientiousness. Conscientiousness comprises lower order traits of self-control (Jensen-Campbell & Malcolm, 2007), attention, persistence, and responsibility (Caspi et al., 2005). These lower order traits are important for keeping up a reasonable level of performance at school. Hence, higher levels of Conscientiousness have been shown to be related to academic achievement (Di Fabio & Busoni, 2007; Graziano & Ward, 1992; Noftle & Robins, 2007). Academic achievement is important throughout the entire period of adolescence, and it is therefore perhaps not surprising that our results, as well as results of previous studies, indicate that levels of Conscientiousness are quite stable throughout adolescence.

In the current study, we found some evidence for small increases in Openness. These increases were consistent with a majority of previous studies, except for De Fruyt et al. (2006), who found decreases in early adolescence. Openness has been shown to be related to the most advanced status in identity formation, identity achievement (e.g., Crocetti, Rubini, Luyckx, & Meeus, 2008; Luyckx, Goossens, Soenens, Beyers, & Vansteenkiste, 2005). The achievement of a stable sense of identity is considered to be crucial to advance to subsequent developmental stages after adolescence (Erikson, 1950). In line with this reasoning, Openness has also been found to be beneficial during one major transition that awaits after adolescence: the entrance into the labor market. Openness has been shown to be adaptive in the early stages of a professional career, as Openness is positively related to success in job interviews (Caldwell & Burger, 1998) and training proficiency (Salgado, 1997). Increases in Openness could, therefore, indicate that adolescents become increasingly more ready for the developmental challenges that await after adolescence.

Similar to some previous studies (Pullmann et al., 2006; Roberts et al., 2006), we found some evidence for maturation within cohorts for Extraversion. Similar increases within age cohorts were found for Emotional Stability. These increases were in agreement with previous studies by De Fruyt et al. (2006), Pullmann et al. (2006), and Roberts et al. (2006). Surprisingly, the age-related increases for Extraversion and Emotional Stability in the current study were accompanied by counterintuitive differences between cohorts. Levels of Extraversion and Emotional Stability were lower in middle to late adolescence than they were in early to middle adolescence. Cohort effects were not expected in general, as we compared levels of personality traits for the two age cohorts at the point where the two cohorts had experienced a similar amount of years of education and had similar mean ages. In addition, we found no differences between the cohorts on background variables.

Birth cohort effects have been reported before (Twenge, 2000, 2001) but were not expected to occur in this study, as participants in the younger cohort were born only 4 years after the participants in the older cohort.

Despite cohort effects, the increases we found for Emotional Stability within the separate age cohorts suggest that adolescents cope with the stresses of life in an increasingly more adaptive way as they grow older. Similar to the increases in Emotional Stability, the small increases in Extraversion can also be interpreted as maturation. Extraversion comprises lower order traits of shyness, social competence, dominance, and activity level (Caspi et al., 2005). Therefore, the slight increases in Extraversion in the current study signify decreases in shyness and increases in social competence, dominance, and activity level. These changes should help adolescents to behave in more mature ways.

The evidence we found with regard to maturation can be explained in terms of social investment (Roberts & Wood, 2006), as three of the Big Five traits have been shown to be related to social investment (i.e., Agreeableness, Conscientiousness, and Emotional Stability; Lodi-Smith & Roberts, 2007), and another one has been hypothesized to indicate social investment (i.e., Extraversion; Roberts, Wood, & Smith, 2005). Social investment refers to investment in, and commitment to, adult social roles in the primary domains of work, family, and society at large (Lodi-Smith & Roberts, 2007). Concrete conceptualizations of these domains of social investment include career (i.e., work), social investment in a relation with a romantic partner and/or one's children (i.e., family), and volunteer work (i.e., society). Hence, the changes toward maturity we observed for Extraversion, Agreeableness, and Emotional Stability could reflect a process wherein adolescents are becoming increasingly ready to socially invest as they grow older.

General Changes in Stability of Personality

Individual differences in Big Five personality traits became much more set with age in the current study. In early to middle adolescence, almost all test–retest correlations were already moderate (i.e., $>.30$), and they continued to increase in a systematic way in middle to late adolescence. In fact, a spectacular increase can be observed in Table 4, as average rank-order stability increases from .43 in early adolescence to .72 in late adolescence. Therefore, our study confirms the results from a meta-analysis that derived the Big Five factors from measures not specifically designed to assess these traits (Roberts & DelVecchio, 2000) and from two empirical studies that used a limited number of measurement occasions (Akse et al., 2007; Pullmann et al., 2006). The current study demonstrated that the increases in rank-order stability found in these previous studies take place in a systematic way throughout adolescence. Hence, the view that individual differences in personality traits become increasingly more set with age (e.g., Costa & McCrae, 1994) is strongly supported by the current study.

The profound increases in rank-order stability do not imply that mean-level changes no longer occurred. For example, mean levels of Extraversion in girls changed significantly in middle to late adolescence, whereas rank-order stability was over .70 at that point. Thus, our results show that high rank-order stability can indeed be accompanied by mean-level changes, because these two change indices are independent (Roberts & DelVecchio, 2000; Roberts et al., 2006). If mean levels continue to change while the rank order remains quite stable, most adolescents must change in the same direction and at a similar change rate. Changes that occur to a similar degree in most people in the population are called normative changes and reflect universal maturation processes (e.g., Helson et al., 2002; Kasen et al., 2006; Roberts & DelVecchio, 2000; Roberts et al., 2006). Thus, as adolescents grow older, an increasing proportion of the mean-level changes that occur should be interpreted as normative changes.

Apart from evidence for maturation on separate personality traits, we also found strong evidence for increases in the stability of personality profiles. The formation of a stable personality profile is considered an important sign of maturation, as previous studies have shown that personality traits indicating maturity (i.e., constraint, negative and positive emotionality) predict profile similarity (Donnelan, Conger, & Burzette, 2007; Roberts et al., 2001). The average stability of Big Five personality trait constellations was only moderate in early adolescence (.42 and .55 between T1 and T2 for early to middle adolescent boys and girls, respectively) but increased to a high level in late adolescence (.76 and .82 between T4 and T5 for middle to late adolescent boys and girls, respectively). Increases were much larger in early to middle adolescence than in middle to late adolescence. In late adolescence, profile similarity seems to have reached a plateau level, as substantial increases no longer occurred.

In sum, adolescent personality development in the current study is described by mean-level increases on most personality traits, especially for Agreeableness and Emotional Stability, whereas there was also some evidence for increases in Extraversion and Openness. Furthermore, individual differences become much more settled with age, and personality profiles become better organized. There were, however, substantial gender differences for all these three indicators of adolescent personality maturation. These gender differences are now discussed.

Gender Differences in Adolescent Personality Maturation

With regard to the first indicator of maturation, mean-level increases (e.g., Caspi et al., 2005), profound gender differences were found in the current study. These gender differences applied to initial levels, as well as change rates.

For Agreeableness, girls exhibited higher initial levels and increased at a faster rate than boys in early to middle adolescence. Only Branje et al. (2007) had similar findings, although they found gender differences only in change rates. Branje et al. already suggested that boys could catch up with girls with regard to personality development. They were unable to test this proposition, but our results for Agreeableness suggest that that boys indeed caught up with girls. Thus, our results suggest that girls mature at an earlier age than boys with regard to Agreeableness.

In early adolescence, girls also displayed higher levels of Conscientiousness than boys. These gender differences became larger toward middle adolescence, as boys displayed a small curvilinear decrease, whereas girls retained a stable level of Conscientiousness. In middle to late adolescence, the gender differences persisted, as both boys and girls displayed stable levels of Conscientiousness. Gender differences in mean levels of Conscientiousness were not found in previous studies. However, Jensen-Campbell and Malcolm (2007) showed that Conscientiousness is important

for maintaining positive interpersonal relationships. We previously discussed the importance of Agreeableness with regard to that domain. Taken together, the gender differences in Agreeableness and Conscientiousness can be explained from an evolutionary point of view (Geary, Byrd-Craven, Hoard, Vigil, & Numtee, 2003), as the maintenance of positive interpersonal relationships is much more emphasized by girls than by boys. Boys, on the other hand, are more focused on dominance in social relationships (Geary et al., 2003), which is among the lower order traits that comprise Extraversion (Caspi et al., 2005). However, this greater evolutionary importance of dominance for boys when compared to girls is not reflected by gender differences in Extraversion in the current study. Similar to previous studies by Pullmann et al. (2006) and McCrae et al. (2002), we found very little evidence for gender differences in adolescence.

In the current study, girls had higher levels of Openness in early adolescence to middle adolescence. McCrae et al. (2002) had previously demonstrated similar gender differences in mean levels of Openness. Unlike boys, girls did display curvilinear changes in middle to late adolescence, but these changes were only small. Overall, boys and girls displayed similar levels of Openness in middle to late adolescence. However, our findings for Openness should be interpreted with some care, because we found a cohort effect for boys indicating that levels of Openness were higher in the older cohort than in the younger cohort. The possible causes of such cohort effects were discussed earlier, as we found similar cohort effects in general changes of Emotional Stability and Extraversion.

For Emotional Stability, our results were similar to those from studies by McCrae et al. (2002) and Pullmann et al. (2006), as we found a more advantageous developmental pattern for boys when compared to girls. Gender differences in Emotional Stability began to emerge toward middle adolescence, as boys' levels increased and girls' did not change. These gender differences persisted in middle to late adolescence, as boys and girls displayed similar change rates in the older cohort. The gender differences in Emotional Stability in the current study mirror the pattern of gender differences found in studies on internalizing problems (Clark, Smith, Neighbors, Skerlec, & Randall, 1994; Hale, Raaijmakers, Muris, Van Hoof, & Meeus, 2008), which consistently demonstrate higher levels of internalizing problems in girls when compared to boys.

Overall, the gender differences we found were not in agreement with findings from the meta-analysis by Roberts et al. (2006), as they did not find gender differences in mean-level change. The figures with the growth curves reveal a possible explanation for the discrepancies between our findings and theirs: By the end of adolescence most of the gender differences have disappeared. When Roberts et al. assessed mean-level changes across adolescence they were unable to assess gender differences in the timing of changes within adolescence. The contrast between the findings from their meta-analyses and our findings highlight the main contribution of our study with regard to gender differences in mean-level change: The most noticeable gender differences are not related to the magnitude of change across adolescence; it is the timing of these changes within adolescence that is different for boys and girls.

Gender differences for the second aspect of maturation, an increasingly more stable rank order of individuals on personality traits (e.g., Costa & McCrae, 1994), were even more clear than gender differences in mean-level change. Throughout adolescence, girls exhibited higher levels of rank-order stability than boys did. As a result, they had already reached very high levels of rank-order stability (i.e., $>.70$) by middle adolescence. Boys reached such high levels of rank-order stability only in late adolescence. However, girls were not only earlier in reaching high levels of rank-order stability. In fact, levels of rank-order stability continued to rise in late adolescence at a similar pace for boys and girls. As a result, gender differences were maintained across time.

With regard to the third aspect of maturation, increasingly more stable personality profiles (e.g., Roberts et al., 2001), there were again substantial gender differences. Girls had much more stable profiles when compared to boys in early to middle adolescence. By middle adolescence, girls had already reached high levels of profile similarity ($>.70$), whereas boys passed this .70 benchmark approximately 2 years later. Hence, girls have a stable personality at an earlier stage of adolescence than do boys. Our findings with regard to the third aspect of maturation, an increasingly more stable personality profile, are therefore consistent with our findings on the first and second aspects of maturation.

In sum, our findings with regard to all three aspects of personality maturation (i.e., increasing mean levels, increasingly more stable interindividual differences, and better organized personality profiles) provide evidence for maturation. In agreement with a suggestion by Branje et al. (2007), we found that gender differences in personality maturation often disappear in late adolescence. Hence, there is clear evidence for gender differences in the timing of personality maturation.

Coincidently, the age difference between when boys and girls reach high levels of profile similarity and rank-order stability (approximately 2 years) is about the same as the age difference that has been found with regard to peak height velocity (i.e., the age at which an adolescent exhibits the fastest growth rate), which is an important marker of pubertal timing (e.g., Beunen et al., 2000; Petersen et al., 1988). Girls have also been shown to be ahead of boys in brain development (Giedd et al., 1999; Lynn, 1994). These biological advantages seem to be reflected in personality development. However, to investigate whether Big Five personality development on the one hand, and biological or neurological development on the other hand, are indeed related, future studies should assess both types of maturation in the same longitudinal design.

Girls not only have an advantage with regard to biological and neuronal development, they also have been found to exhibit higher levels of self-reflection than boys (Burwell & Shirk, 2007). These gender differences in self-reflection could also explain gender differences in personality development. Repetitively reflecting on oneself could possibly facilitate personality consistency. However, self-reflection is also associated with rumination (Trapnell & Campbell, 1999), which has been shown to be more prevalent among girls as well (Compas, Malcarne, & Fondacaro, 1988). Rumination is a strong predictor of internalizing problem behaviors, such as depression (for an overview, see Hyde, Mezulis, & Abramson, 2008). As a result, self-reflection might facilitate maturation of personality, but it can have a detrimental effect as well. In the current study, this harmful effect was possibly reflected in the disadvantageous developmental pattern girls displayed for Emotional Stability.

Limitations and Future Directions

Several limitations of the current study need to be recognized. First, we used only adolescent self-reports to assess personality traits. Social desirability might have a negative impact on the validity, and reported personality change might be caused by changes in beliefs adolescents have about their selves (Robins, Fraley, Roberts, & Trzesniewski, 2001). However, Robins, Noftle, Trzesniewski, and Roberts (2005) demonstrated that beliefs about changes in personality were actually quite accurate in a sample of young adults. In addition, Soto et al. (2008) recently showed that self-reports already provide an accurate estimate of personality at age 10 and that the psychometrics of the Big Five do not change as adolescents grow older. Therefore, we believe that our use of adolescent self-reports is an appropriate method of assessing adolescent personality change.

A second potential limitation is that the current study focuses only on the patterns of personality trait development (i.e., the role of age in personality change) and the role of gender in these patterns. Several other factors, like family relations (Branje et al., 2004) and genetic factors (e.g., Caspi et al., 2005; De Fruyt et al., 2006), have been suggested as moderators of personality change. Even though our examination of the role of gender and the inclusion of multiple measurement waves already adds substantially to the understanding of adolescent personality development, the role of other potential moderators of adolescent personality change should also be assessed in future studies.

The present study assesses personality traits across shorter time intervals than most previous studies have, but the 1-year interval between measurements can still be considered a third limitation. In 1 year, a lot of events can occur, and these events could have a substantial impact on personality. Measuring short-term fluctuations in personality traits would allow for an investigation of the susceptibility of personality traits to life events and could thereby add to the discussions on stability and change in adolescent personality development.

A possible fourth, methodological, limitation is related to the specification of our growth model. Recent methodological advances allow us to use chronological age as input in LGCM (e.g., Mehta & West, 2000), but we used grade level to specify growth processes. In life-span theory (e.g., Baltes, Reese, & Lipsitt, 1980; Baltes, Staudinger, & Lindenberger, 1999), both chronological age and grade level are considered to be part of the same set of developmental influences: normative age-graded influences. Adolescents at the same grade level experience the same social expectations and environmental demands (e.g., Petersen & Crockett, 1985), which means that grade level is just as good an indicator of maturation as chronological age. Moreover, chronological age was largely confounded with grade level in the current study.

Finally, a fifth limitation concerns the use of two age cohorts to cover the entire range of adolescence. We tried to "glue" the two age cohorts together, by putting the intercept of the growth models at the one measurement wave where the two cohorts overlapped (i.e., T5 of the younger cohort and T1 of the older cohort). With this approach, we found predominantly systematic increases in rank-order stability and profile similarity. For mean-level change, however, cohort differences occurred for Extraversion and Emotional Stability, and in Openness for boys. Therefore, the cohorts could not always be glued together to obtain an accelerated model of personality development through adolescence with regard to mean-level change. The best solution to this problem would be to have annual assessments on one cohort across the entire range of adolescence. However, because conducting a 5-year longitudinal study while keeping attrition rates low already requires a substantial investment, following adolescents with frequent measurements across even longer periods of time is usually not feasible. A viable solution to the problem we experienced with regard to cohort differences in mean levels of personality traits would be to have a cohort-sequential design with more than one wave of overlap between cohorts (e.g., Branje et al., 2007).

Conclusion

Despite potential limitations, the improved research design and analytic approach of the current study adds substantially to the understanding of adolescent personality development. We found strong evidence of adolescent personality maturation for all three indicators, as mean levels of Agreeableness and Emotional Stability increased, interindividual differences became more settled, and personality profiles became increasingly more stable as adolescents grew older. Mixed evidence was found for mean-level increases in Extraversion and Openness. In addition, we found strong evidence for gender differences in the timing of personality maturation. Girls reached high mean levels of Agreeableness at an earlier stage of adolescence when compared to boys. Our results further indicated that interindividual differences and personality profiles stabilize at an earlier age for girls than for boys.

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