

Age Differences in Personality Traits From 10 to 65: Big Five Domains and Facets in a Large Cross-Sectional Sample

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Hypotheses about mean-level age differences in the Big Five personality domains, as well as 10 more specific facet traits within those domains, were tested in a very large cross-sectional sample ($N = 1,267,218$) of children, adolescents, and adults (ages 10–65) assessed over the World Wide Web. The results supported several conclusions. First, late childhood and adolescence were key periods. Across these years, age trends for some traits (a) were especially pronounced, (b) were in a direction different from the corresponding adult trends, or (c) first indicated the presence of gender differences. Second, there were some negative trends in psychosocial maturity from late childhood into adolescence, whereas adult trends were overwhelmingly in the direction of greater maturity and adjustment. Third, the related but distinguishable facet traits within each broad Big Five domain often showed distinct age trends, highlighting the importance of facet-level research for understanding life span age differences in personality.

Keywords: Big Five, five-factor model, facet traits, age differences, age trends

How does the personality of a typical middle-aged adult differ from that of a typical young adult? From that of a typical adolescent? Such questions concern mean-level age differences in personality traits, which occur when the average standing on a trait differs as a function of age. Much recent research has examined age differences in the Big Five trait domains: Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness to Experience. The available data indicate that, from emerging adulthood through middle age, Conscientiousness and Agreeableness show positive age trends, Neuroticism shows a negative trend, and Extraversion and Openness to Experience show flat trends (Allemand, Zimprich, & Hendricks, 2008; Denissen, Geenen, van Aken, Gosling, & Potter, 2008; Donnellan & Lucas, 2008; McCrae et al., 1999, 2000; Roberts, Walton, & Viechtbauer, 2006; Srivastava, John, Gosling, & Potter, 2003; Terracciano, McCrae, Brant, & Costa, 2005).

These studies provide an informative sketch of mean-level age differences in personality traits, but much further work is needed

to complete the picture. The present research was therefore conducted to address two remaining issues, using data from a very large cross-sectional sample. First, how do personality traits differ by age across childhood and adolescence, and how do these differences fit with adult trends—are trends at younger and older ages similar, or do some traits show quite different trends in childhood and adolescence versus adulthood? Second, do the Big Five domains themselves capture all of the important information about age differences in personality traits, or do the more specific facet traits within these broad domains sometimes show substantially different trends?

Note that these questions about mean-level age differences are distinct from questions about rank-order changes. Rank-order changes occur when the relative positioning of individuals on a trait changes over time—for example, if the most conscientious individuals in a group of young adults were no longer the most conscientious individuals when the group reached middle age. The present research focuses exclusively on mean-level age differences, rather than rank-order changes, consistent with its cross-sectional design.

Age Differences in Personality Across Late Childhood and Adolescence

Late childhood and adolescence are periods of rapid biological, social, and psychological change. For example, the biological changes that define puberty—accelerated growth, changes in body shape, and the development of secondary sex characteristics—typically begin around age 11 for girls and age 13 for boys (Marshall & Tanner, 1986). Socially, there are normative changes in youths' relationships with adults and peers (Buhmester, 1996;

This article was published Online First December 20, 2010.

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This research was supported by a faculty research grant from Colby College awarded to Christopher J. Soto. We thank Christiana Lumbert and Adam K. Thompson for their helpful comments on drafts of this article.

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Hunter & Youniss, 1982; Rice & Mulkeen, 1995) and in their attitudes toward social values and norms (Colby, Kohlberg, Gibbs, & Lieberman, 1983; Eisenberg & Morris, 2004). Psychologically, youths work to establish coherent identities (Erikson, 1968), and they develop more complex, abstract, and better differentiated self-concepts (Byrne & Shavelson, 1996; Donahue, 1994; Harter, 1999, 2006; Harter & Monsour, 1992; Marsh, 1989; Marsh & Ayotte, 2003; Montemayor & Eisen, 1977; Soto, John, Gosling, & Potter, 2008).

Many of these changes have implications for personality traits, and previous research has shown that youths can provide reliable and valid Big Five self-reports (e.g., De Fruyt, Mervielde, Hoekstra, & Rolland, 2000; Measelle, John, Ablow, Cowan, & Cowan, 2005; Soto et al., 2008). Few studies, however, have examined age differences in the Big Five across childhood and adolescence (Caspi, Roberts, & Shiner, 2005; Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2009), and fewer still have examined how differences across these years fit with adult trends. Moreover, findings from the available studies often conflict with one another (Klimstra et al., 2009). For example, most studies have found positive age trends for Openness to Experience in adolescence (Allik, Laidra, Realo, & Pullmann, 2004; Branje, van Lieshout, & Gerris, 2007; McCrae et al., 2002; Pullmann, Raudsepp, & Allik, 2006), but some have found negative trends (De Fruyt et al., 2006; Lamb, Chuang, Wessels, Broberg, & Hwang, 2002). Findings for the other four domains have been even less consistent.

It is unclear whether these inconsistencies reflect differences in the populations sampled, the particular age groups selected, the personality measures used, or a combination of these factors (Klimstra et al., 2009). One intriguing possibility is that some traits might show curvilinear age trends, with opposite directions in different parts of childhood and adolescence, and therefore that the trends observed in a particular study will depend on the age groups selected. For example, two previous studies that found negative patterns for Openness to Experience examined age trends from childhood into adolescence (De Fruyt et al., 2006; Lamb et al., 2002), whereas four studies that found positive patterns for this domain examined age trends from early adolescence into emerging adulthood (Allik et al., 2004; Branje et al., 2007; McCrae et al., 2002; Pullmann et al., 2006). One interpretation of these mixed results is that they suggest a curvilinear pattern for Openness to Experience, with a negative age trend from childhood to early adolescence, then a positive trend into adulthood.

Unfortunately, the available data for the other four domains do not converge on any particular age trends—either linear or curvilinear. For each of these domains, there has been an almost equal split between studies finding significant positive trends, studies finding significant negative trends, and studies finding null results (e.g., for Agreeableness, compare Branje et al., 2007; McCrae et al., 2002; and Pullman et al., 2006). Moreover, this between-study variability does not appear to relate with the particular age ranges examined; unlike the findings for Openness to Experience, neither studies centered around early adolescence nor those centered around late adolescence have consistently found trends in the same direction. The overall pattern of results may therefore indicate (a) a lack of substantial age differences on these domains across late childhood and adolescence, (b) curvilinear age trends that previous studies have not been well suited to capture, given that most have

included only a few age groups, or (c) methodological differences across studies, such as differences in sampling and measurement procedures.

Thus, one major goal of the present research was to test hypotheses about age differences in Big Five domains and facets across late childhood and adolescence and about how these fit with adult trends. Importantly, we used a sample that allowed us to precisely estimate age-specific means, year by year, and thereby identify periods within childhood and adolescence when age trends are especially pronounced, or even have opposite directions at different ages. Moreover, we used a personality measure, the Big Five Inventory (BFI; John, Donahue, & Kentle, 1991; John, Naumann, & Soto, 2008; Soto & John, 2009a), that has been shown to converge with a variety of other Big Five measures (Gosling, Rentfrow, & Swann, 2003; John et al., 2008; John & Srivastava, 1999; Soto & John, 2009a) and to elicit reliable and valid Big Five self-reports from children and adolescents. Specifically, a previous study examined the measurement properties of the BFI for participants at each year of age from 10 to 20 (Soto et al., 2008). Overall, the internal consistency of the domain scales, differentiation among the scales, and clarity of the BFI's factor structure were somewhat better at older ages. However, after controlling for individual differences in response style, at each age the domain scales' alpha reliabilities averaged at least .71, and the BFI's intended five-factor structure was clearly recognizable: Congruence coefficients with the age 20 structure were at least .93 for each domain at each age, exceeding the standard of .90 that indicates factor replication (Barrett, 1986; Mulaik, 1972). Taken together, these findings show that respondents as young as age 10 can provide meaningful information about their own personalities using the BFI.

Age Differences in Personality at the Level of Big Five Facets

Each broad Big Five domain subsumes several more specific traits, often referred to as "facets" (e.g., Costa & McCrae, 1992, 1995; John et al., 2008). For example, the Conscientiousness domain encompasses the more specific traits of orderliness and self-discipline, among others (Roberts, Chernyshenko, Stark, & Goldberg, 2005). Such same-domain facet traits correlate with each other across individuals: An orderly person is also likely to be self-disciplined. However, these correlations are not perfect or nearly so, with values typically averaging about .40 (Costa & McCrae, 1992). Indeed, previous research has shown that the distinctions between same-domain facets are important, because each facet captures unique personality information (Costa & McCrae, 1995; McCrae & Costa, 1992), and this unique information predicts a variety of important behaviors and life outcomes—beyond the level of prediction afforded by the five broad domains themselves. For example, individual Big Five facets relate uniquely with academic achievement (O'Connor & Paunonen, 2007), alcohol consumption and abuse (Ruiz, Pincus, & Dickinson, 2003), delinquent behavior (Heaven, 1996), eyewitness accuracy and suggestibility (Liebman et al., 2002), life satisfaction (Herringer, 1998), personality disorders (Samuel & Widiger, 2008), and many other behaviors (Ashton, Jackson, Paunonen, Helmes, & Rothstein, 1995; Paunonen & Ashton, 2001).

Because more specific facet traits can be distinguished within each Big Five domain, and because these facets capture unique information about behavior, it is important to ask whether the facets within each domain show similar or different age trends. If same-domain facets show identical or nearly identical trends, then the five broad domains themselves would be sufficient to capture all of the important information about age differences in personality traits. If, however, different facets show quite different trends, then facet-level research is needed to achieve a full understanding of life span age differences in personality.

Considerable recent attention has been devoted to age differences in personality traits at the level of the broad Big Five domains, but few studies have examined differences at the facet level. The available evidence suggests that, within at least some domains, different facets show different trends. For example, a recent meta-analysis (Roberts et al., 2006) distinguished between two facets of Extraversion: social dominance (defined as assertiveness and self-confidence) and social vitality (defined as gregariousness, positive affect, and energy level). The results indicated important differences between these two facets: Mean levels of social dominance increased from the college years through early adulthood, whereas levels of social vitality were flat. Similarly, a recent study examined age trends for the 30 facets assessed by the NEO Personality Inventory–Revised (NEO PI-R; Costa & McCrae, 1992) in a sample of mostly middle-aged and older adults (Terracciano et al., 2005). Within most Big Five domains, different facets showed different age trends. For example, within the Agreeableness domain, Altruism showed a positive age trend, whereas Modesty did not.

To our knowledge, no previous study has precisely tracked age trends for Big Five facets from childhood through middle age. Therefore, a second central aim of the present research was to test hypotheses about age differences in Big Five facets across these years. We tested these hypotheses using the BFI facet scales (Soto & John, 2009a), which assess two facet traits within each broad Big Five domain: Assertiveness and Activity within the Extraversion domain, Altruism and Compliance within the Agreeableness domain, Order and Self-Discipline within the Conscientiousness

domain, Anxiety and Depression within the Neuroticism domain, and Openness to Aesthetics and Openness to Ideas within the Openness to Experience domain. Table 1 presents example items for the 10 BFI facet scales.

Although a consensus has not yet emerged about the ideal way to define the facets of each Big Five domain, there is considerable overlap among previously proposed facet-level structures (John et al., 2008), and the BFI facet scales assess traits common to several of these (Soto & John, 2009a). Specifically, each BFI facet corresponds with a conceptually similar construct from at least three of the five following models: (a) the facets assessed by the NEO PI-R (Costa & McCrae, 1992), (b) facets identified in analyses of English and German trait adjectives (Saucier & Ostendorf, 1999), (c) circumplex regions defined in analyses of English trait adjectives (Hofstee, de Raad, & Goldberg, 1992), (d) aspects of the Big Five identified in analyses of existing questionnaire scales (DeYoung, Quilty, & Peterson, 2007), and (e) facets identified in the item pool of the California Psychological Inventory (Soto & John, 2009b). For example, the BFI Anxiety facet corresponds with the Anxiety, Emotionality, IV-/IV-, Withdrawal, and Anxiety facets of these five models, respectively.

Testing Hypotheses About Age Differences in Big Five Domains and Facets From Late Childhood Through Middle Age

The present research tested several specific hypotheses about age differences in Big Five domains and facets across late childhood (approximately ages 10–12), adolescence (ages 13–17), emerging adulthood (ages 18–25), early adulthood (ages 26–35), early middle age (ages 36–50), and late middle age (ages 51–65). These hypotheses are summarized in Table 2.

Conscientiousness and Agreeableness

During childhood and adolescence, one important developmental task is for youths to become more autonomous in their social

Table 1
The BFI Facet Scales: Names and Example Items

BFI facet scale	Example items
Extraversion	
Assertiveness	1. Has an assertive personality. 2. Is sometimes shy, inhibited. (R)
Activity	3. Is full of energy. 4. Generates a lot of enthusiasm.
Agreeableness	
Altruism	1. Is helpful and unselfish with others. 2. Is considerate and kind to almost everyone.
Compliance	3. Has a forgiving nature. 4. Starts quarrels with others. (R)
Conscientiousness	
Order	1. Tends to be disorganized. (R) 2. Can be somewhat careless. (R)
Self-Discipline	3. Perseveres until the task is finished. 4. Is easily distracted. (R)
Neuroticism	
Anxiety	1. Worries a lot. 2. Remains calm in tense situations. (R)
Depression	3. Is depressed, blue. 4. Can be moody.
Openness to Experience	
Openness to Aesthetics	1. Values artistic, aesthetic experiences. 2. Has few artistic interests. (R)
Openness to Ideas	3. Likes to reflect, play with ideas. 4. Is curious about many things.

Note. Reverse-keyed items are denoted by (R). The common stem for all BFI items is “I see myself as someone who . . .” BFI = Big Five Inventory.

Table 2
Summary of Hypotheses

Big Five domain or facet	Expected age trend	
	Childhood and adolescence	Adulthood
Conscientiousness	Negative, then positive	Positive
Self-Discipline	Negative, then positive	Positive
Order	Negative, then positive	Flat
Agreeableness	Negative, then positive	Positive
Altruism	Negative, then positive	Positive
Compliance	Negative, then positive	Positive
Neuroticism	Positive for females, flat for males	Negative
Anxiety	Positive for females, flat for males	Negative
Depression	Positive for females, flat for males	Negative
Extraversion	Flat	Flat
Activity	Negative	Flat
Assertiveness	Flat	Positive
Openness to Experience	Positive	Flat
Openness to Ideas	Positive	Flat
Openness to Aesthetics	Flat	Flat

values and behavior (Colby et al., 1983; Eisenberg & Morris, 2004; Larson, Richards, Moneta, Holmbeck, & Duckett, 1996; Steinberg & Silverberg, 1986). Specifically, young children generally accept the values and norms conveyed to them by adult authority figures and try to act accordingly (Colby et al., 1983; Eisenberg & Morris, 2004). In contrast, adolescents seek greater autonomy from authority figures, both by spending a greater amount of time away from adult supervision (Patterson & Stouthamer-Loeber, 1984) and by more frequently questioning and resisting values, rules, and norms that they perceive as imposed on them by adults. These changes create greater opportunities for risky and rebellious behaviors, ranging from arguments with parents and other authority figures (C. Jackson, 2002; Smetana, 1995, 2000) to unprotected sex and criminal activity (Centers for Disease Control and Prevention, 2008; Federal Bureau of Investigation, 2007; Loeber & Farrington, 2000; Steinberg, 1986).

From late adolescence into adulthood, youths increasingly develop and internalize abstract moral and social principles that promote prosocial and responsible behaviors (Eisenberg, Carlo, Murphy, & van Court, 1995; Eisenberg & Morris, 2004). They also continue to develop self-regulatory skills that can help them avoid risky behaviors in the interest of long-term goals (Demetriou, 2000; Gestsdottir & Lerner, 2008; Murphy, Eisenberg, Fabes, Shepard, & Guthrie, 1999). In terms of the Big Five, we hypothesized that these changes would lead to curvilinear patterns for Conscientiousness and Agreeableness across childhood and adolescence. Specifically, we expected that mean levels of Conscientiousness, Agreeableness, and their more specific facets would show negative age trends from late childhood into adolescence, then positive trends from late adolescence into emerging adulthood.

During early adulthood and middle age, many people work at two important life tasks: achieving in a job or career and forming satisfying and supportive close relationships (Erikson, 1968; Hogan & Roberts, 2004). Because Conscientiousness and Agreeableness facilitate the successful pursuit of these goals (Hogan & Roberts, 2004; Ozer & Benet-Martínez, 2006; Roberts & Wood, 2006), mean levels of overall Conscientiousness and Agreeable-

ness should show positive age trends from emerging adulthood through middle age. At the facet level, because prosocial tendencies, cooperation with others, and reliability are generally more important for achieving these life goals than is preference for organization and structure, we hypothesized that these trends would be more pronounced for the Altruism and Compliance facets of Agreeableness, and for the Self-Discipline facet of Conscientiousness, than for the Order facet of Conscientiousness (cf. J. J. Jackson et al., 2009).

Neuroticism

We expected that overall Neuroticism, and its more specific facets of Anxiety and Depression, would show different age trends in childhood and adolescence versus adulthood, as well as different trends for males versus females. Previous research has demonstrated that, by early adulthood, levels of Neuroticism tend to be higher among women than among men (e.g., Donnellan & Lucas, 2008), but less is known about the emergence of this gender difference. During adolescence, girls are more likely than boys to face a variety of important social and psychological difficulties, including awareness of negative gender expectations and stereotypes (Hill & Lynch, 1983; Wichstrøm, 1999), body image concerns (Stice & Bearman, 2001; Stice, Hayward, Cameron, Killen, & Taylor, 2000), and negative self-perceptions (Cole, Martin, Peeke, Seroczynski, & Fier, 1999; Dweck, 1986, 1989). We therefore hypothesized that (a) gender differences in Neuroticism, Anxiety, and Depression would be first present in adolescence, such that girls would show higher mean levels than would boys, and (b) these gender differences would be primarily due to positive age trends for Neuroticism, Anxiety, and Depression among girls, rather than to negative trends among boys.

Over the course of adulthood, most people shift toward greater use of emotion regulation strategies that effectively reduce negative affect (Helson & Soto, 2005; John & Gross, 2004; Labouvie-Vief, Diehl, Jain, & Zhang, 2007). Moreover, most adults establish close relationships that become more satisfying and supportive over time (Anderson, Russell, & Schumm, 1983; Carstensen,

1992; Gorchoff, John, & Helson, 2008; Kapinus & Johnson, 2003; Lang & Carstensen, 2002; Rollins & Cannon, 1974) and potentially buffer them from life stressors. Therefore, we expected that levels of Neuroticism, Anxiety, and Depression would show negative age trends across early adulthood and middle age.

Extraversion

We expected that different facets of Extraversion would show different age trends. Both psychologists' models of child temperament (e.g., Buss & Plomin, 1984; Rothbart, Ahadi, & Evans, 2000; Thomas & Chess, 1977) and nonpsychologists' descriptions of children's personalities (Eaton, 1994; John, Caspi, Robins, Moffitt, & Stouthamer-Loeber, 1994) often include the trait of activity level as a central feature. In contrast, models of adult personality usually relegate this trait to secondary status, as a facet of Extraversion (e.g., Costa & McCrae, 1992; Saucier & Ostendorf, 1999). One plausible explanation for this difference is that children typically show much higher levels of activity than do adults. We therefore hypothesized that the BFI Activity facet of Extraversion, which assesses energy and enthusiasm, would show a pronounced negative age trend from late childhood into adolescence, whereas the Assertiveness facet, which assesses social dominance, talkativeness, and expressiveness, would not.

During early adulthood and middle age, many people strive to increase their social status, both inside and outside of their work role (Helson, Soto, & Cate, 2006; Kuhlen, 1968), and most people achieve their highest level of status during middle age (Cameron, 1970; Helson & Soto, 2005; Lachman, Lewkowicz, Marcus, & Peng, 1994; Roberts, 1997). We hypothesized that these normative changes in status would be accompanied by a positive age trend for Assertiveness from emerging adulthood into middle age (cf. Roberts et al., 2006). We did not expect the Activity facet of Extraversion to show a similarly positive trend.

Openness to Experience

We hypothesized that overall Openness to Experience, and particularly the facet of Openness to Ideas, would show positive age trends from adolescence into emerging adulthood, for two reasons. The first concerned normative changes in youths' cognitive capacities. Compared with children, adolescents are better able to think in terms of the abstract and hypothetical (Flavell, Miller, & Miller, 1993; Inhelder & Piaget, 1958), and these capacities open up new possibilities for creativity and exploration. The second reason was the transition to college. More than half of all recent high school graduates attend college (U.S. Census Bureau, 2006), and the college years typically expose students to a variety of new ideas and people, and also provide greater freedom (compared with earlier schooling) for students to pursue their particular areas of intellectual interest.

Across early adulthood and middle age, the notion that people become "set in their ways" seems to suggest that mean levels of overall Openness to Experience, and particularly Openness to Ideas, should show negative age trends. However, this may be a caricature of adulthood, as many adults continue to experience important transitions in work (e.g., job change), relationships (e.g., parenthood, divorce, remarriage), and education (e.g., college or graduate school) across these years (U.S. Census Bureau, 2001,

2006), suggesting ongoing openness to new experiences (cf. Roberts et al., 2006).

The Present Research Design

In the present research, we examined age differences in Big Five domains and facets from late childhood through middle age, using data from a very large cross-sectional sample ($N = 1,267,218$) assessed over the World Wide Web. Compared with previous studies of Big Five age trends, the present design had four distinctive features. First, most previous studies have used samples either of children and adolescents or of adults. In contrast, the present sample included participants ranging in age from 10 to 65 years old. This allowed us to examine how age differences across childhood and adolescence fit with adult trends, and specifically to test whether some personality traits show quite different age trends in childhood and adolescence versus adulthood.

Second, most previous studies have each estimated trait mean levels for only a few age groups, or estimated relatively simple age trends (e.g., linear, quadratic). In contrast, the present sample, which included at least 945 participants at each individual year of age within its range, allowed for much more fine-grained analyses than have been previously possible. Specifically, we computed trait mean levels year by year from ages 10 to 65 and used these age-specific means to test hypotheses that some traits show complex age trends that have different slopes, or even opposite directions, in different periods of life.

Third, only a small handful of previous studies have examined age trends at the level of Big Five facets. Two of these studies have each considered facets for only one of the Big Five domains: Extraversion (Roberts et al., 2006) or Conscientiousness (Jackson et al., 2009). The remaining studies have all used the same instrument, the NEO PI-R (Costa & McCrae, 1992), highlighting a need for research that tests the generalizability of their findings to other measures. Toward this end, we used the BFI (John et al., 1991, 2008; Soto & John, 2009a) in the present research to measure 10 facet traits (see Table 1). This allowed us to test whether all—or almost all—meaningful information about age differences in personality traits can be captured by the Big Five domains themselves or whether a complete understanding of such differences requires consideration of facet-level traits.

Finally, whereas most cross-sectional studies collect data over the course of only a few weeks or months, the present data were collected over a period of 7 years. This longer period of data collection produced variation in participant year of birth beyond that shared with age at time of participation. For example, the sample included individuals who all participated at the age of 30 but were born in different years: 1973, 1974, 1975, 1976, 1977, 1978, and 1979. This variation in birth years, in turn, enhanced the generalizability of our findings and allowed us to test whether earlier born versus later born participants' personalities differed systematically from each other. We consider the possibility of such birth-cohort effects, as well as other alternative explanations for our findings, in the Discussion section.

Method

Participants. Participants were 1,267,218 residents of English-speaking countries who volunteered to provide personality

and demographic information over the World Wide Web as part of the Gosling-Potter Internet Personality Project (see Srivastava et al., 2003). Participants ranged in age from 10 to 65 years old ($M = 25.7$ years old, $SD = 10.9$ years), and 65% were female. Importantly, the sample included at least 945 participants at each year of age, including at least 422 participants of each gender.¹

The sample was diverse in terms of ethnicity and nationality. Regarding ethnicity, 70% of participants were White/Caucasian, 8% were Asian/Asian American, 6% were Black/African American, 6% were Hispanic/Latino, 1% were American Indian/Native American, 5% reported their ethnicity as "other," and 4% did not report their ethnicity. Regarding nationality, 72% were residents of the United States, 6% were residents of Canada, 6% were residents of the United Kingdom, 1% were residents of Ireland, 3% were residents of Australia, 1% were residents of New Zealand, and 11% did not report their nationality.

The sample was also diverse in terms of socioeconomic status. When asked to describe their social class, 12% of participants described themselves as working class, 10% as lower-middle class, 20% as middle class, 8% as upper-middle class, 1% as upper class, 35% as not financially independent (presumably, almost all of these were students), and 14% did not describe their social class. Regarding highest level of education completed, 20% had not (or not yet) graduated high school, 43% were high school graduates (including those who were currently attending college), 15% were college graduates, 10% had completed graduate or professional school, and 12% did not report their level of education.

Procedure. The data were collected using a noncommercial, advertisement-free website, outofservice.com, that offers its visitors free feedback on several surveys and personality measures. Potential participants could reach this site in a number of ways, including search engines, links from other websites, and informal channels such as e-mail, online discussion forums, and word-of-mouth. All participants anonymously completed an English-language, Web-based version of the BFI (John et al., 1991, 2008; Soto & John, 2009a). After submitting their responses, participants received automatically generated, generally worded feedback about their standing on each of the Big Five domains as well as background information about the Big Five and suggestions for ways to learn more about personality theory and research.

Relations to two previous studies. Age trends for the Big Five domains in adulthood (ages 21 to 60) were examined in an earlier study (Srivastava et al., 2003), using a sample of 132,515 adults assessed via outofservice.com between December 1998 and August 2000. The sample analyzed here was assessed between March 2003 and April 2009. Thus, the two samples do not overlap, and our domain-level analyses from ages 21 to 60 should be regarded as an independent replication of this earlier study. Srivastava et al. (2003) did not examine age differences (a) in childhood and adolescence or (b) at the level of Big Five facets, and so our use of outofservice.com data to address these issues is entirely novel.

Another study (Soto et al., 2008) examined the measurement properties of the BFI domain scales from late childhood into emerging adulthood (ages 10 to 20), using a sample of 230,047 youths assessed via outofservice.com between December 1998 and May 2004. Thus, a small portion of the present sample ($N = 74,234$, or 6%) overlaps with that analyzed by Soto et al. (2008), and our analyses of the BFI domain scales' measurement proper-

ties should be considered an extension of this previous study. However, Soto et al. (2008) did not examine the measurement properties of the BFI facet scales, nor, most importantly, did they examine mean-level age trends for any of the BFI domain or facet scales.

Measurement.

The Big Five Inventory (BFI). The BFI (John et al., 1991, 2008; Soto & John, 2009a) is designed to efficiently measure the core aspects of each Big Five domain. Its 44 items are short, easy-to-understand phrases that participants rate on a 5-point agreement scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). These items can be used to score five domain scales, as well as 10 facet scales (see Table 1) that were recently developed to assess more specific personality traits within each broad domain (Soto & John, 2009a). These traits were selected to overlap with the facet constructs assessed by the widely used NEO PI-R (Costa & McCrae, 1992) and are each common to several other Big Five facet models (e.g., DeYoung et al., 2007; Hofstee et al., 1992; Saucier & Ostendorf, 1999; Soto & John, 2009b).

The BFI was well suited to the present research for several reasons. First, the BFI domain and facet scales have previously demonstrated strong internal consistency, retest reliability, convergence with longer Big Five measures, and self-peer agreement (e.g., Benet-Martínez & John, 1998; DeYoung, 2006; John et al., 2008; John & Srivastava, 1999; Rammstedt & John, 2007; Soto & John, 2009a). Second, the BFI is easy to understand; its fifth-grade reading level (Benet-Martínez & John, 1998) makes it accessible to younger respondents (Soto et al., 2008) and to other individuals with relatively little formal education. Fourth, the individual BFI items assess common behaviors, thoughts, and feelings that should be relevant to respondents of diverse ages and backgrounds. Finally, the BFI can be completed in less than 15 min, a clear advantage for a study to which each participant was expected to devote only a limited amount of time.

Controlling for individual differences in acquiescent response style. Acquiescent response style is the tendency to consistently agree (yea-saying) or consistently disagree (nay-saying) with test items, regardless of their content. Uncontrolled individual differences in acquiescence can pose a serious threat to validity, especially for scales with an imbalance of true- and false-keyed items. In particular, such differences bias scale means and interscale correlations (McCrae, Herbst, & Costa, 2001; Soto et al., 2008). They also distort factor structures, sometimes even resulting in the emergence of an artifactual acquiescence factor (Soto et al., 2008; Ten Berge, 1999).

The BFI domain and facet scales are not fully balanced, and preliminary analyses indicated that acquiescence varied somewhat by age in the present sample. Specifically, we indexed acquiescence as the within-person mean response to a set of 16 pairs of BFI items with opposite implications for personality (see Soto & John, 2009a; Soto et al., 2008). The average score on this index showed a positive age trend across late childhood and adolescence, then a slightly negative trend across adulthood. Moreover, indi-

¹ The age range of 10–65 was selected on the basis of preliminary analyses indicating that reduced age-specific sample sizes outside this range resulted in less precise estimated means and therefore less systematic age trends.

vidual differences in acquiescence were much more pronounced in the youngest age groups, with almost twice as much variance in acquiescence at age 10 as at ages 20 and older (cf. Soto et al., 2008). Individual differences in acquiescence were therefore controlled, through within-person centering around the acquiescence index, prior to all analyses presented here.²

Checking overall data quality. Previous research indicates that psychological studies conducted over the Internet yield valid data that replicate findings obtained using more traditional assessment methods (Buchanan & Smith, 1999; Chuah, Drasgow, & Roberts, 2006; Gosling, Vazire, Srivastava, & John, 2004; McGraw, Tew, & Williams, 2000; Robins, Trzesniewski, Tracy, Gosling, & Potter, 2002; Skitka & Sargis, 2006; Srivastava et al., 2003). Nevertheless, two sets of preliminary analyses were conducted to check the overall quality of the present data, and specifically to make sure that the sample did not include large proportions of participants who responded randomly or who blatantly self-enhanced.

First, the alpha reliabilities of the BFI domain and facet scales were examined. If the present sample included a high proportion of random responders, then these reliability coefficients would be substantially lower than in other samples. This was not the case. In the overall sample, the alpha reliabilities of the five domain scales were .87 for Extraversion, .81 for Agreeableness, .85 for Conscientiousness, .84 for Neuroticism, and .78 for Openness ($M = 0.83$), values typical for these scales (John et al., 2008; John & Srivastava, 1999). The alpha reliabilities of the 10 shorter facet scales averaged .67, ranged from .82 for Assertiveness to .51 for Depression, and were very similar to those found in two previous samples (Soto & John, 2009a).

Second, discriminant correlations among the domain scales were examined. If the present sample included a high proportion of self-enhancers, then the magnitudes of these correlations would be larger than usual, because self-enhancers would describe themselves as highly extraverted, agreeable, conscientious, emotionally stable (i.e., not neurotic), and open to experience. This also was not the case. In the overall sample, the average magnitude of the interscale correlations was .19, which is very similar to the values obtained in previous studies (Gosling et al., 2003; John et al., 2008; John & Srivastava, 1999).

Examining the appropriateness of cross-age comparisons. The strength of the conclusions that can be drawn from cross-age comparisons of BFI scale scores depends on the extent to which the BFI functions similarly at different ages. A previous study found that the internal consistency of the BFI domain scales, and differentiation among them, were better at older ages across late childhood and adolescence but that the overall five-dimensional structure of the BFI could be recovered as early as age 10 (Soto et al., 2008). As a further check in the present sample, (a) alpha reliabilities and interscale correlations were examined and (b) principal-components analyses were conducted in each of 20 age groups (every individual year of age from 10 to 20, then every 5 years from 21 to 65).

Consistent with the findings of Soto et al. (2008), the alpha reliabilities of the BFI domain and facet scales were somewhat higher at older ages. Specifically, the mean reliability of the domain scales showed a positive age trend from .75 at age 10 to .83 at age 18, and was either .83 or .84 in each of the older groups. Similarly, the mean reliability of the shorter facet scales showed a

positive trend from .54 at age 10 to .67 at age 18, and was between .67 and .69 in each older group. Correlations among the domain scales also differed somewhat by age. Specifically, the mean magnitude of the interscale correlations showed a negative age trend from .22 at age 10 to .16 at age 18, then a positive trend to .26 at ages 61–65.

Despite these age differences in reliability and interscale correlations, the BFI's intended five-dimensional structure was clearly recovered in principal-components analyses conducted in each age group. In each group, a scree test indicated five meaningful dimensions, and five components were therefore extracted and varimax-rotated. Congruence coefficients were then computed to compare each component in each age group with the corresponding component in the age-21-to-25 group; this was selected as the reference group because the BFI's intended five-dimensional structure emerged very clearly in it, as in previous studies of emerging-adult samples (e.g., Benet-Martínez & John, 1998). These congruence coefficients averaged .99, and all 100 were at least .96, easily exceeding the standard of .90 that indicates factor replication (Barrett, 1986; Mulaik, 1972). Taken together, these results indicate that the overall structure of the BFI was very consistent across late childhood, adolescence, and adulthood, although there was greater measurement error at younger ages.

Presentation of results. Preliminary analyses indicated that (a) almost all of the domain and facet traits assessed by the BFI showed substantial mean-level age differences, (b) some traits showed age trends that differed considerably by gender, and (c) the shapes of some trends were curvilinear and quite complex. These trends could not be closely fit by regression models, even models that included higher order polynomial age terms (quadratic, cubic, quartic, quintic, etc.) and corresponding Age \times Gender interaction terms. These preliminary analyses also indicated that the size of the present sample rendered conventional tests of statistical significance meaningless; for example, in the full sample, a correlation of .003 between two variables would be statistically significant at the $\alpha = .001$ level, and a correlation of .02 would be significant at the $\alpha = 1 \times 10^{-100}$ level.

We therefore present our results with a focus on the patterns and sizes of age and gender differences. In describing these patterns, we refer to "age trends" and "age differences"—rather than developmental "changes," "increases," or "decreases"—due to the present research's cross-sectional design. For the same reason, note that we use prepositional phrases such as "across middle age," "by late adolescence," and "from adolescence into adulthood" to refer to cross-sectional age ranges, rather than periods of development over time.

² There was strong overall agreement between age trends for the BFI domain and facet scales in the raw and centered data. For each of the 30 combinations of gender with a domain or facet scale, we computed a correlation comparing the set of 56 age-specific means from the raw data with the set of 56 age-specific means from the centered data. These 30 correlations averaged .99, and all were at least .93. Differences between the raw and centered trends were attributable to age differences in acquiescence inflating mean scores on scales with a majority of true-keyed items (and suppressing mean scores on scales with a majority of false-keyed items) during late adolescence and emerging adulthood, relative to older and younger age groups.

We use the *T*-score metric to index effect sizes; *T* scores are standard scores with a mean of 50 and standard deviation of 10. In terms of Cohen's (1988) now conventional guidelines for interpreting effect sizes, a difference of 2 *T*-score points represents a small effect, a difference of 5 points represents a medium effect, and a difference of 8 points represents a large effect. To control for age and gender effects when converting to *T* scores, we computed the overall mean of each BFI domain and facet scale by first computing its mean in each of the 112 age- and gender-specific samples (56 years of age \times 2 genders) and then averaging these 112 group means. Similarly, we computed the overall standard deviation of each scale as the square root of the pooled within-group variance term from a two-way (56 years of age \times 2 genders) analysis of variance—an estimate that controls for between-group variance. This process produced a *T*-score distribution uninfluenced by the age and gender differences that are the subject of the present research. In the present sample, all pairwise age differences of at least 2 *T*-score points were statistically significant at the $\alpha = .00001$ level.

Results

Mean scores on the BFI domain and facet scales, by age and gender, are shown in Figures 1–5. We calculated these group means separately for each individual combination of age and gender (age-10 males, age-10 females, age-11 males, age-11 fe-

males, etc.); no smoothing functions have been applied. In each figure, single lines show the means for males, and double lines show the means for females. In Figures 1B, 2B, 3B, 4B, and 5B, black lines show the means for one facet of a domain, and gray lines show the means for the other facet.

Conscientiousness. Mean levels of Order, Self-Discipline, and overall Conscientiousness are shown in Figure 1. As hypothesized, overall Conscientiousness showed very different age trends in late childhood and adolescence versus adulthood. Specifically, as shown in Figure 1A, Conscientiousness showed a negative age trend from late childhood into adolescence; the total difference was approximately 3 *T*-score points, or one third of a standard deviation unit. Conscientiousness then showed a pronounced positive trend from adolescence through emerging adulthood, with a total difference of approximately 7 *T*-score points. This trend was even more pronounced for females than for males, such that by emerging adulthood females were slightly more conscientious, on average, than were males (by approximately 2 *T*-score points).

At the facet level, Figure 1B illustrates that Self-Discipline and Order showed age trends across these years similar to overall Conscientiousness, with negative trends from late childhood into adolescence (with total differences of 2 or 3 *T*-score points), then pronounced positive trends through emerging adulthood (with total differences of 5 or 6 *T*-score points). Gender differences in these two facets, however, related differently with age. Like overall

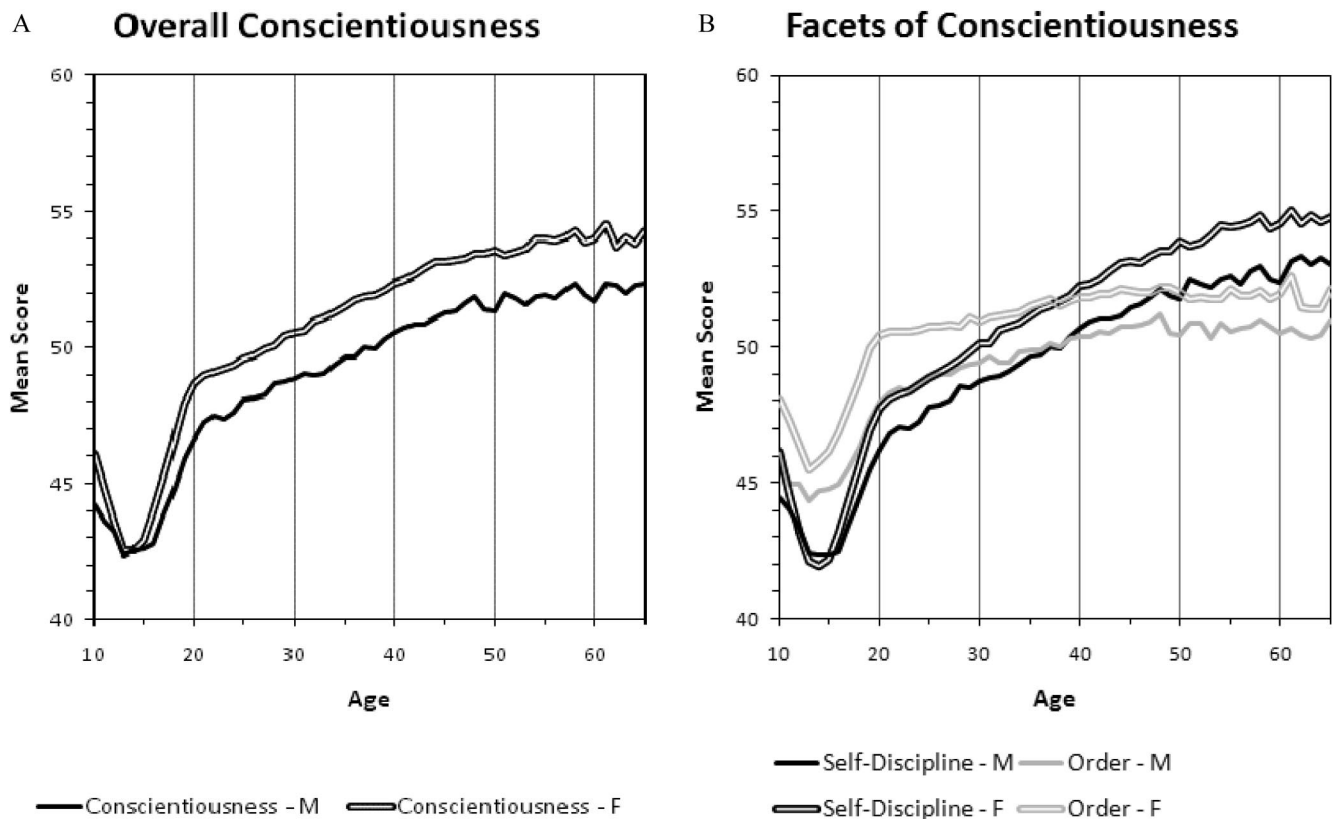


Figure 1. Means for overall Conscientiousness (A) and its facets (B), by age and gender. Single lines show the means for males, and double lines show the means for females. In Panel B, black lines show the means for Self-Discipline, and or gray lines show the means for Order.

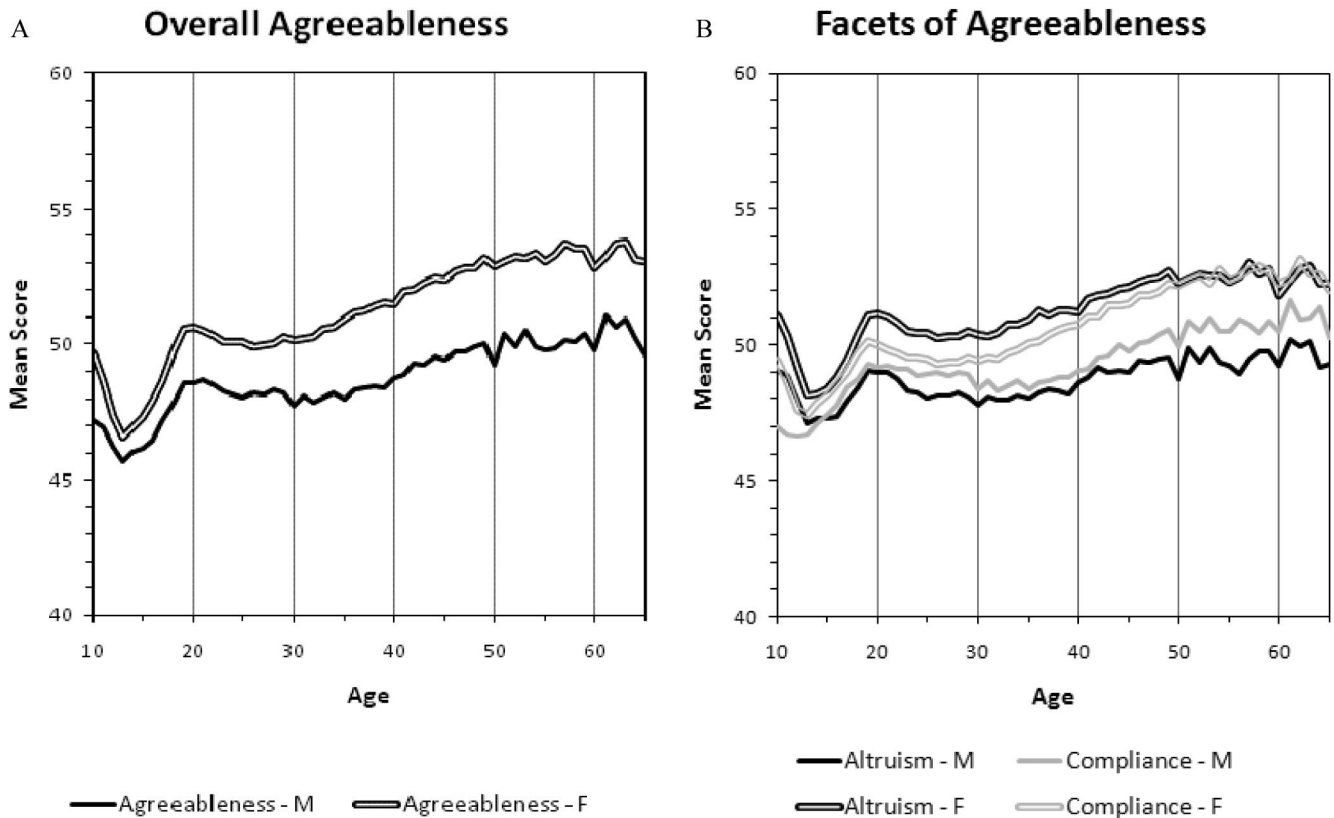


Figure 2. Means for overall Agreeableness (A) and its facets (B), by age and gender. Single lines show the means for males, and double lines show the means for females. In Panel B, black lines show the means for Altruism, and gray lines show the means for Compliance.

Conscientiousness, a small gender difference in Self-Discipline was first present in emerging adulthood. In contrast, females were more orderly than males, on average, at each age from 10 to 65.

Overall Conscientiousness showed a further, although less pronounced, positive trend across early adulthood and middle age, with age differences of approximately 5 more *T*-score points for both males and females. At the facet level, as hypothesized, these differences were substantial for Self-Discipline (approximately 6 *T*-score points), but only trivial for Order (approximately 1 *T*-score point). Altogether, the total age differences from adolescence through middle age were approximately 11 *T*-score points for overall Conscientiousness and Self-Discipline. These are very large cross-sectional age effects that equal the difference between scores at the 50th and 86th percentiles of a normal distribution. The total age difference for Order was approximately 7 *T*-score points, a substantial effect that equals the difference between scores at the 50th and 76th percentiles of a normal distribution.

Agreeableness. Mean levels of Altruism, Compliance, and overall Agreeableness are shown in Figure 2. As hypothesized, overall Agreeableness showed age trends similar to Conscientiousness, although the trends for Agreeableness were somewhat less pronounced. As shown in Figure 2A, Agreeableness showed a negative trend from late childhood into adolescence (with a total difference of approximately 2 *T*-score points), a positive trend from adolescence into emerging adulthood (with a total difference

of approximately 3 *T*-score points), and a further positive trend across early adulthood and middle age (with a difference of approximately 3 more *T*-score points). The total difference of 6 *T*-score points from adolescence through middle age represents a substantial age effect, equal to the difference between scores at the 50th and 73rd percentiles of a normal distribution.

At the facet level, Figure 2B illustrates that Altruism and Compliance showed age trends similar to overall Agreeableness, with only one qualification: Compliance did not show a negative trend from late childhood into adolescence for males. Instead, males showed low levels of Compliance even at age 10, a finding unlikely to surprise elementary-school teachers. Regarding gender differences more generally, at each age females were somewhat more agreeable, altruistic, and compliant, on average, than were males (by approximately 2 *T*-score points).

Neuroticism. Mean levels of Anxiety, Depression, and overall Neuroticism are shown in Figure 3. There were only trivial gender differences in these traits at age 10 (less than 1 *T*-score point), but, as hypothesized, there were very different age trends for males versus females across late childhood, adolescence, and adulthood. For females, Anxiety and overall Neuroticism showed positive trends into adolescence (with total differences of approximately 3 *T*-score points), flat trends through emerging adulthood, and then negative trends across early adulthood and middle age (with total differences of approximately 5 *T*-score points). In

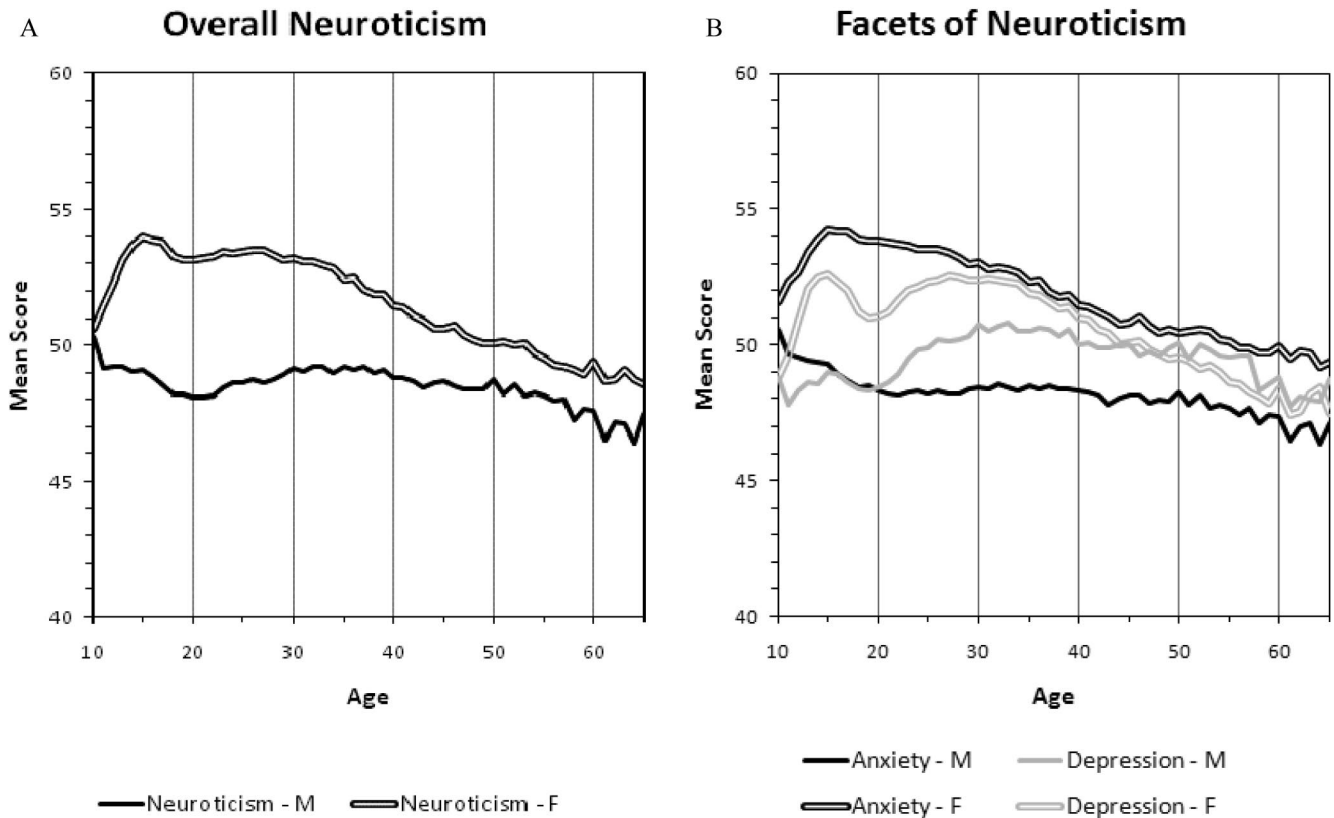


Figure 3. Means for overall Neuroticism (A) and its facets (B), by age and gender. Single lines show the means for males, and double lines show the means for females. In Panel B, black lines show the means for Anxiety, and gray lines show the means for Depression.

contrast, males' mean levels of Anxiety and overall Neuroticism showed slightly negative trends from late childhood through middle age (with total differences of approximately 2 *T*-score points). Substantial gender differences in both of these traits (of approximately 5 *T*-score points) were present by midadolescence, such that females were more prone to anxiety and other negative emotions, on average, than were males. The magnitudes of these gender differences diminished across early adulthood and middle age, although a small difference (of approximately 2 *T*-score points) was present even at the end of middle age.

Age trends for Depression—by which we mean general susceptibility to sad affect, rather than any clinical disorder—differed from those for Anxiety and overall Neuroticism in several ways. First, and unexpectedly, mean levels of Depression showed two distinct peaks for females—one in adolescence and one in early adulthood; Depression then showed a negative trend (with a total difference of approximately 5 *T*-score points) across middle age. Second, for males, levels of Depression showed a positive trend (with a total difference of approximately 3 *T*-score points) from late childhood into early adulthood, then a slightly negative trend (with a total difference of approximately 2 *T*-score points) across middle age. Third, although a substantial gender difference in mean levels of Depression (of approximately 4 *T*-score points) was present by midadolescence, the size of this difference diminished with age, and men and women reported equal levels of sad affect by late middle age.

Extraversion. Mean levels of Assertiveness, Activity, and overall Extraversion are shown in Figure 4. Figure 4B illustrates that, as hypothesized, Activity and Assertiveness showed different age trends in late childhood, adolescence, and emerging adulthood. Activity showed a marked negative trend from late childhood through adolescence, as well as a less pronounced negative trend across emerging adulthood. The total age difference across these years was approximately 7 *T*-score points, a large effect that equals the difference between scores at the 50th and 24th percentiles of a normal distribution.

In contrast, Assertiveness and overall Extraversion showed only modestly negative trends from late childhood into adolescence, then flat trends through emerging adulthood. Unlike Activity, the negative trends for Assertiveness and overall Extraversion were somewhat more pronounced for males (with total differences of 4 or 5 *T*-score points) than for females (with total differences of 2 or 3 *T*-score points), such that by midadolescence females were more talkative, expressive, and generally extraverted than were males (by approximately 2 *T*-score points). Contrary to expectations, Assertiveness did not show a positive age trend across early adulthood. Instead, Assertiveness, Activity, and overall Extraversion showed flat trends from early adulthood through middle age.

Openness to Experience. Mean levels of Openness to Aesthetics, Openness to Ideas, and overall Openness to Experience are shown in Figure 5. We had expected that overall Openness, and particularly Openness to Ideas, would show positive age trends

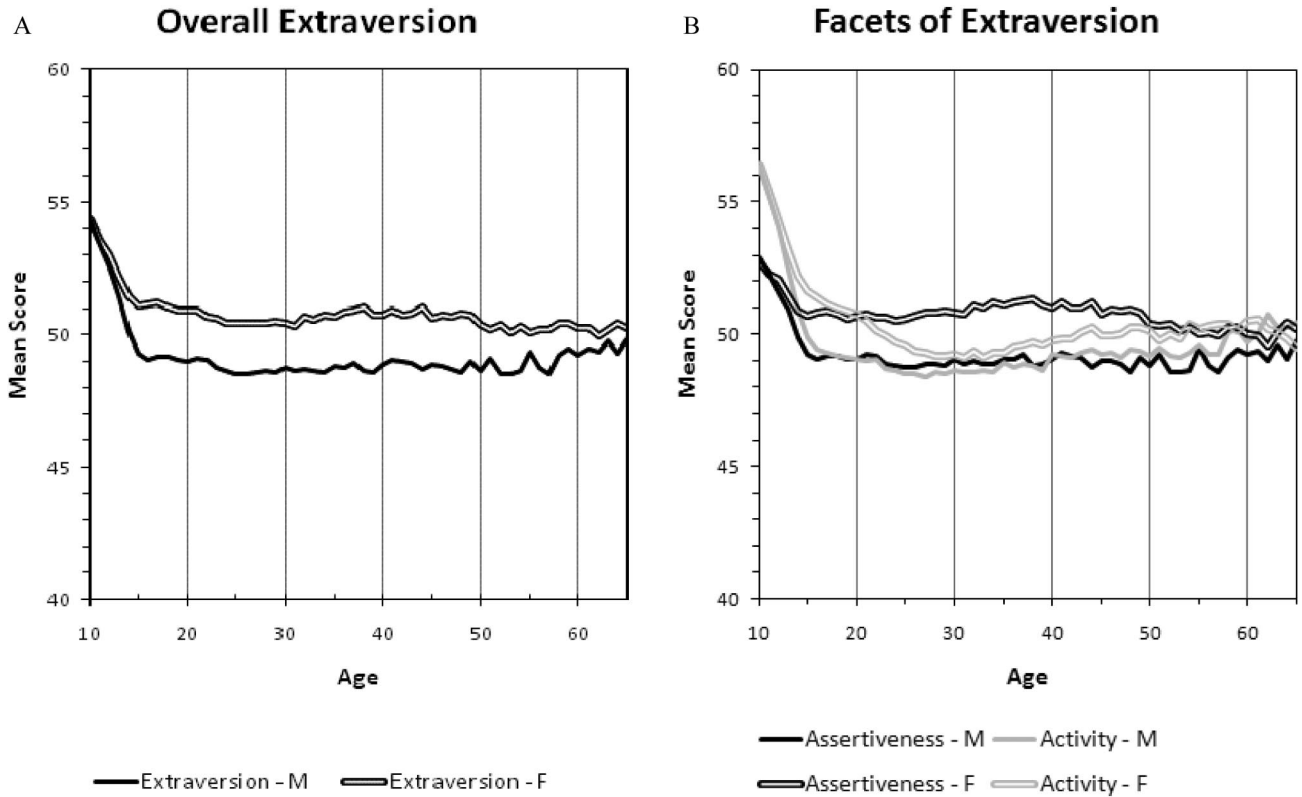


Figure 4. Means for overall Extraversion (A) and its facets (B), by age and gender. Single lines show the means for males, and double lines show the means for females. In Panel B, black lines show the means for Assertiveness, and gray lines show the means for Activity.

from adolescence into emerging adulthood, then flat trends through late middle age. As Figure 5 illustrates, this hypothesis was only partially supported. Openness to Ideas and overall Openness showed negative trends from late childhood into early adolescence (with total differences of approximately 2 *T*-score points), and further negative trends across adolescence for females (with differences of approximately 2 more *T*-score points). These traits then showed positive trends across emerging adulthood for both genders (with total differences of 2 or 3 *T*-score points), and further slightly positive trends through middle age (with differences of approximately 2 more *T*-score points). Small gender differences were present by emerging adulthood, such that males were somewhat more open, on average, than were females (by 2 or 3 *T*-score points).

Mean levels of Openness to Aesthetics showed a rather different pattern. For males, Openness to Aesthetics showed a positive age trend from late childhood through emerging adulthood (with a total difference of approximately 3 *T*-score points), then a flat trend across early adulthood and middle age. For females, Openness to Aesthetics showed a flat trend from late childhood through early adulthood, then a slightly positive trend across middle age (with a total difference of approximately 3 *T*-score points). At each age, females were more open to aesthetics, on average, than were males. This difference was only trivial (approximately 1 *T*-score point) in early adulthood and early middle age, but was more substantial (3 or 4 *T*-score points) in late childhood, adolescence, and late middle age.

Discussion

The present results support several conclusions about age differences in personality traits from late childhood through middle age, in terms of the Big Five domains and their more specific facets. They also highlight some key issues in need of further investigation.

Age differences in personality traits across late childhood and adolescence. How do the mean levels of Big Five domains and facets differ across childhood and adolescence? In the present sample, Agreeableness, Conscientiousness, and their more specific facets showed curvilinear, nonmonotonic age trends, with negative trends from late childhood into early adolescence, then pronounced positive trends into emerging adulthood. Extraversion showed a negative trend from late childhood into adolescence; facet-level analyses indicated that this was mainly due to age differences in Activity, rather than Assertiveness.

Age trends for Neuroticism and Openness to Experience differed both by gender and by facet. Within the Neuroticism domain, Anxiety and Depression showed marked positive trends from late childhood into adolescence among females; Depression—but not Anxiety—then showed a negative trend into the college years. In contrast, among males, Anxiety showed a negative trend across late childhood and adolescence, whereas Depression showed a flat trend. Among both males and females, Openness to Ideas showed a negative trend into adolescence, then a positive trend across the college years. In contrast, Openness to Aesthetics showed a pos-

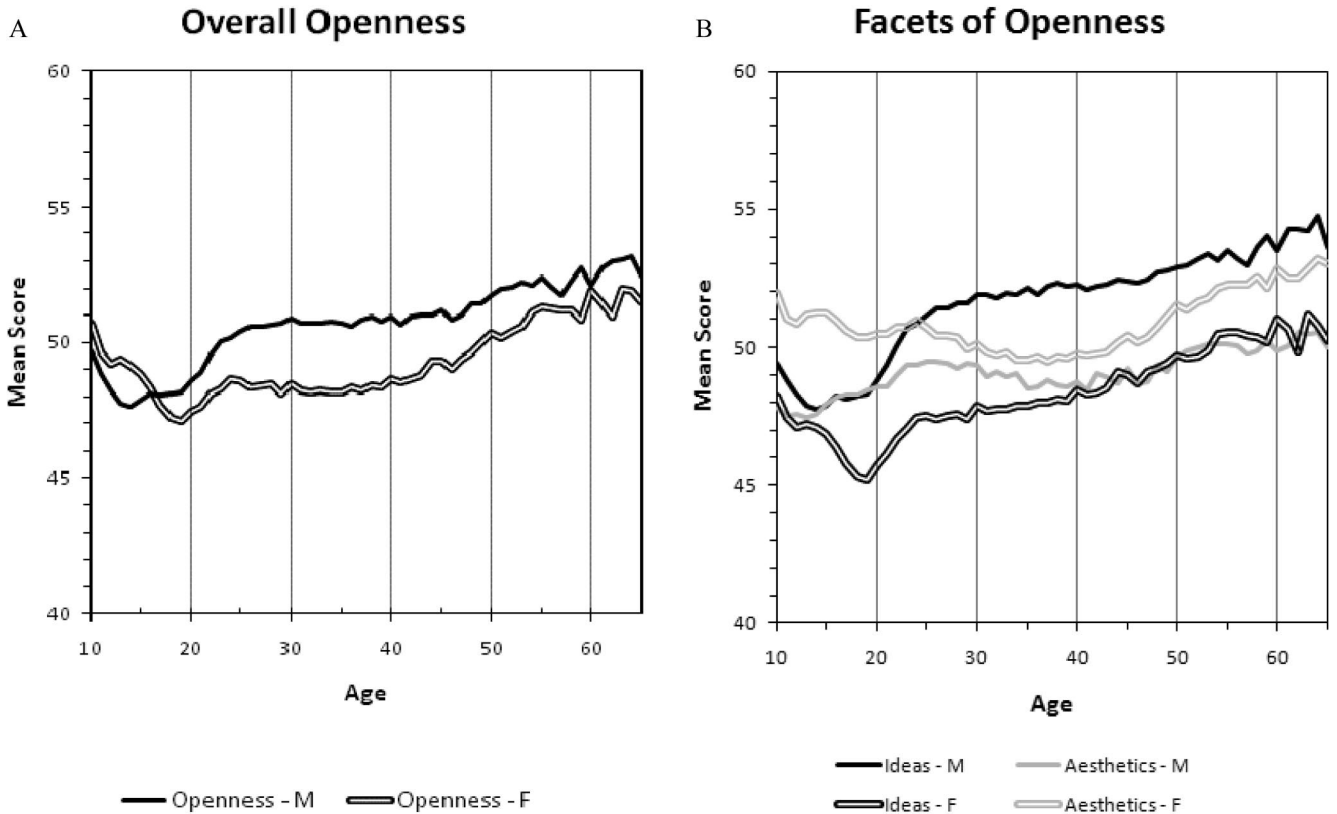


Figure 5. Means for overall Openness (A) and its facets (B), by age and gender. Single lines show the means for males, and double lines show the means for females. In Panel B, black lines show the means for Openness to Ideas, and gray lines show the means for Openness to Aesthetics.

itive trend from late childhood into emerging adulthood among males only.

Taken together, these results indicate that late childhood and adolescence are key periods for understanding life span age differences in personality traits, although we acknowledge that the overall uncertainty of the present findings is greater at younger ages, due to greater measurement error. Some traits showed substantial age differences only across late childhood and adolescence, some showed especially pronounced trends, and some even showed curvilinear trends with opposite directions at different ages. Moreover, several of these curvilinear patterns—including those for Agreeableness, Conscientiousness, and Openness to Ideas—illustrate that life span age differences in personality traits do not simply represent a monotonic trend toward greater and greater psychosocial adjustment. Instead, they indicate that the biosocial changes and challenges of early adolescence (“storm and stress;” Hall, 1904) are often accompanied by negative personality trends.

The curvilinear patterns found in the present research may help explain some of the seemingly inconsistent findings from previous studies that have examined age trends for the Big Five in adolescence. For example, some studies have found negative trends for Openness to Experience in early adolescence (e.g., De Fruyt et al., 2006), whereas others have found positive trends from adolescence into emerging adulthood (e.g., McCrae et al., 2002). Both sets of

results are consistent with the present finding that Openness shows a curvilinear pattern from late childhood through emerging adulthood, with a negative trend at younger ages and a positive trend at older ages.

Such curvilinear trends may also help explain why a recent meta-analysis suggested that mean-level age trends for the Big Five domains may be less pronounced across adolescence (defined as ages 10–18) than across early adulthood (defined as ages 22–30; Roberts et al., 2006). For example, averaging negative age trends in early adolescence with positive trends in late adolescence would lead to the conclusion that there were only modest age differences overall. Thus, the present results highlight the special importance of research that can capture curvilinear patterns by precisely estimating trait mean levels year by year across late childhood and adolescence.

A final point regarding the importance of late childhood and adolescence is that mean-level gender differences in several traits were first present across these years. The social and biological changes surrounding puberty are often experienced in quite different ways by boys versus girls (e.g., Cole et al., 1999; Dweck, 1986, 1989; Hill & Lynch, 1983; Stice & Bearman, 2001; Stice et al., 2000; Wichstrøm, 1999), and these differences appear to have gender-specific implications for adolescents’ personalities. Most strikingly, we found pronounced positive age trends for both the Anxiety and Depression facets of Neuroticism among adolescent

girls, but not among boys. These patterns parallel epidemiological findings that gender differences in rates of clinical depression (Angold & Worthman, 1993; Hankin et al., 1998) and anxiety (Hale, Raaijmakers, Muris, van Hoof, & Meeus, 2008) are present by adolescence. The convergence of these findings highlights adolescence as a key period for understanding—and potentially reducing—gender differences in anxious and sad affect.

Age differences in personality traits across adulthood. How do the mean levels of Big Five domains and facets differ across adulthood? In the present research, the most pronounced age trends were positive trends for Agreeableness and the Self-Discipline facet—but not the Order facet—of Conscientiousness. Specifically, our results indicate that a typical 65-year-old is more self-disciplined than approximately 85% of early adolescents, and more agreeable than approximately 75% of early adolescents. Both of these findings agree well with previous cross-sectional (Donnellan & Lucas, 2008; Jackson et al., 2009; McCrae et al., 1999, 2000; Srivastava et al., 2003) and longitudinal (Roberts et al., 2006; Terracciano et al., 2005) studies. They should also be welcome news to young people (and their parents), especially those who question whether they will have the psychosocial maturity needed to successfully negotiate important life tasks, such as pursuing a career, establishing close and supportive relationships, or contributing to the welfare of the next generation (e.g., Erikson, 1968; Hogan & Roberts, 2004).

Anxiety, Depression, and overall Neuroticism showed negative age trends across early adulthood and middle age. These were more pronounced among women than men, such that by late middle age, mean-level gender differences were either small (for Anxiety and overall Neuroticism) or nonexistent (for Depression). Previous research has consistently found negative trends for Neuroticism across adulthood (McCrae et al., 1999, 2000; Roberts et al., 2006; Srivastava et al., 2003; Terracciano et al., 2005). Moreover, the pattern of smaller gender differences in Neuroticism, Anxiety, and Depression at older ages converges with epidemiological findings that women show higher rates of clinical depression than men in early adulthood, but not in middle age (e.g., Bebbington et al., 1998; Bland, Newman, & Orn, 1988). The present results thus highlight a need for additional research examining gender differences in Neuroticism and its facets across adulthood.

Extraversion and Openness to Experience showed the smallest age differences across adulthood. Previous results regarding these domains have been mixed, with some studies finding lower levels at older ages (e.g., McCrae et al., 1999, 2000), but others finding flat age trends (e.g., Roberts et al., 2006; Srivastava et al., 2003). Taken together, the available evidence now indicates that there are likely no more than modest age differences in overall Extraversion and Openness across early adulthood and middle age. In our view, however, the possibility of positive trends for the Assertiveness facet of Extraversion warrants further investigation (cf. Helson & Soto, 2005; Roberts et al., 2006; Terracciano et al., 2005).

Age differences and levels of analysis: Domains versus facets. Do the related but distinguishable facet traits within each broad Big Five domain show similar or different age trends? The present results indicate that, within most domains, different facets show different trends. For some domains, these differences were relatively subtle, but for others—particularly Extraversion, Conscientiousness, and Neuroticism—they were quite pronounced.

This conclusion is further supported by the few previous studies that have examined facet-level age trends within at least some of the Big Five domains (Jackson et al., 2009; Roberts et al., 2006; Terracciano et al., 2005).

Importantly, this growing body of findings indicates that conceptualizing traits at the level of Big Five facets is necessary for a full understanding of life span age differences in personality; research at the domain level can provide a rough sketch of these differences, but not a complete picture. Looking ahead, future research at the facet level will benefit from continued efforts to identify the most important traits within each broad Big Five domain (e.g., DeYoung et al., 2007; John et al., 2008), in the same way that consensus around the broad domains themselves has facilitated progress toward tracing the general contours of age differences in personality.

Considering alternative explanations: Cohort, self-selection, and social desirability. In the present research, we examined data from a large and diverse cross-sectional sample. Compared with previous studies, this design had the important advantage of allowing us to estimate mean levels of Big Five domains and facets year by year from late childhood through middle age. However, it also had some limitations.

First, the cross-sectional nature of the design raises the possibility that some of the observed age trends might reflect birth-cohort effects—the effects of older and younger participants being born during earlier and later years, respectively—rather than, or in addition to, aging effects (Schaie, 1977). For example, if individuals born in the 1940s were more strongly socialized, in childhood and adolescence, to be altruistic and polite than were individuals born in the 1970s, this could produce positive cross-sectional age differences in Agreeableness across adulthood—even if individuals did not typically become more agreeable as they aged.

An unusual feature of the present research, compared with previous cross-sectional studies, is that the data were collected over a 7-year period. Therefore, each specific age group in the sample (e.g., age 30) included members of several different birth cohorts (e.g., individuals born in 1973, 1974, 1975, 1976, 1977, 1978, and 1979). Including a range of birth years in each age group provides a degree of generalizability across cohorts. Moreover, this variation in birth years, within the age groups, allowed us to directly test for some cohort differences between earlier- and later born participants. Specifically, we conducted a series of 15 analyses of variance; each analysis included year of participation, age, and gender as between-subjects factors, and one of the 15 BFI domain or facet scales as the dependent variable.

If there were pronounced differences between earlier- and later-born participants, then (a) the estimated marginal means by year of participation (controlling for age and gender) should differ substantially from each other and (b) the estimated marginal means by age and gender (controlling for year of participation) should differ substantially from the observed means shown in Figures 1–5. Neither of these expectations was met. Regarding the estimated marginal means by year of participation, all 105 of these (7 years of participation \times 15 traits) were between 49.40 and 51.27—very close to their expected value of 50.00. Regarding the estimated marginal means by age and gender, these were virtually identical to those shown in Figures 1–5. Specifically, each of the 1,680 estimated means (56 ages \times 2 genders \times 15 traits) was within 0.24 *T*-score points of its corresponding observed mean.

These results argue against the influence of pronounced cohort effects, a conclusion further supported by two other aspects of the present findings. First, the observed adult age trends—particularly the positive trends for Conscientiousness and Agreeableness, and the negative trend for Neuroticism—agree well with the available longitudinal data (cf. Roberts et al., 2006), which are not susceptible to cohort effects. Second, several personality traits—such as Agreeableness, Conscientiousness, Depression, Activity, and Openness to Ideas—showed age trends from late childhood into emerging adulthood that were pronounced and curvilinear. To explain these trends, cohort effects would need to be similarly curvilinear and even more pronounced (given that each age-specific mean included data from members of several different birth cohorts). This seems quite unlikely. Even so, further research—especially studies that repeatedly assess members of multiple birth cohorts—is needed to fully separate cohort and aging effects on personality traits.

A second limitation is that our participants were volunteers, raising the possibility of differential self-selection effects—individuals at different ages volunteering to participate for different reasons associated with their personality traits. For example, one possible explanation for the slightly negative age trend for Openness to Experience from late childhood into adolescence, and for the slightly positive trend across middle age, is that children and middle-aged adults who choose to complete questionnaires in exchange for personality feedback may be especially concerned with understanding themselves, an aspect of Openness (Beitel & Cecero, 2003; Costa & McCrae, 1992). In contrast, actively seeking out personality feedback may be a more common behavior among adolescents and emerging adults (Erikson, 1968). Therefore, participants at the tails of the present age distribution may have been somewhat self-selected for Openness to Experience, resulting in elevated mean levels of Openness at these ages.

We tested for possible self-selection effects within the present sample by examining the variability of Big Five domains and facets in different age groups. If our youngest and oldest participants were indeed self-selected on the basis of their personality traits, then the observed variability of scores on those traits would be largest in adolescence and emerging adulthood (where age-specific samples would be most representative) and smallest in late childhood and late middle age (where age-specific samples would be most self-selected).

To identify any such trends, we computed the standard deviation of each domain and facet scale in (a) late childhood (ages 10–12), (b) adolescence and emerging adulthood (ages 13–25), and (c) late middle age (ages 51–65), controlling for gender differences. Then, for each scale, we computed two ratios to compare its standard deviation (a) in late childhood versus during adolescence and emerging adulthood and (b) in late middle age versus in adolescence and emerging adulthood. Whereas ratios substantially smaller than 1.00 would indicate much less variability in the youngest or oldest age groups—and thus the possibility of differential self-selection—the obtained ratios were consistently close to 1.00. Specifically, the 15 late-childhood ratios averaged 0.99, and only two were less than 0.90—those for Assertiveness (0.89) and overall Extraversion (0.88). The 15 late-middle-age ratios averaged 1.01, and all were greater than 0.90.

In summary, the variability of each domain and facet scale was quite consistent across age groups, and the scales that showed the

largest age differences in variability—Assertiveness and overall Extraversion—did not also show the largest age differences in mean levels. These results suggest that the present findings are not likely due to differential self-selection effects, but replication using different methods of sample recruitment remains important.

A final limitation is that our data are personality self-reports. Although previous research has demonstrated substantial self-peer agreement for the BFI domain and facet scales (e.g., Benet-Martínez & John, 1998; DeYoung, 2006; John et al., 2008; John & Srivastava, 1999; Rammstedt & John, 2007; Soto & John, 2009a), agreement between self-reports, peer reports, and observer reports of behavior is imperfect (e.g., Gosling, John, Craik, & Robins, 1998). A particular concern here is that the youngest participants in the present sample may be inaccurate or unreliable judges of their own personalities. For example, negative age trends for self-reported Agreeableness and Conscientiousness from late childhood into adolescence might reflect unrealistically positive self-views in childhood compared with more accurate views in adolescence (cf. Robins et al., 2002).

One way to test this possibility is to examine the individual BFI items. Because these items differ in their social desirability, we can compare age differences in the average responses to more and less desirable items. Specifically, if age differences in personality self-reports across late childhood and adolescence are mainly due to children's inflated self-views, then average responses to the most socially desirable items should be much higher at younger ages, responses to the least desirable items should be much lower at younger ages, and responses to more evaluatively neutral items should show relatively small age differences.

For each of the 44 BFI items (and separately for males and females), we therefore computed an age-difference index equal to the average response in late childhood (ages 10–12) minus the average response in early adolescence (ages 13–15); positive values on this index indicate a higher average response in childhood than in adolescence, and negative values indicate the opposite. The social desirability of each item was indexed as its mean standardized rating, by 15 judges, on a scale ranging from 1 (*extremely undesirable*) to 9 (*extremely desirable*) ($\alpha = .96$; see Robins, Tracy, Trzesniewski, Potter, & Gosling, 2001). We then correlated the mean social desirability ratings with the age-difference index. We did this separately (a) for males and for females and (b) across the 26 BFI items keyed in a socially desirable direction (i.e., the true-keyed Extraversion, Agreeableness, Conscientiousness, and Openness items, and false-keyed Neuroticism items) and across the 18 items keyed in a socially undesirable direction, resulting in a total of four correlations.

If responses to the most and least socially desirable items showed especially large age differences, then all of these correlations should be positive, and substantial in size. This, however, was not the case. Instead, only one of the four correlations was positive (for females, across the socially undesirable items), and this correlation was small and did not approach statistical significance ($r = .18, p = .47$). These results indicate that the age differences across late childhood and adolescence found here were not mainly due to children's inflated self-views. However, we readily acknowledge the importance of replicating these findings using nonself-report data. Although replication using multiple data sources is always an important issue, it is particularly important when considering personality self-reports from children and ado-

lescents, which are less reliable than adults' reports (Soto et al., 2008). Thus, a key goal for future research is to examine age differences in personality traits across childhood and adolescence using informant reports and observational data (see also Branje et al., 2007).

From description to explanation. As research findings continue to show mean-level age differences in personality traits across the life span, they also raise questions about the causes of these differences. For example, why might middle-aged adults generally be more agreeable, self-disciplined, and emotionally stable than young adults?

We caution that the present results should not be taken as evidence for particular causes of age differences in personality traits. For example, any pattern of mean-level differences could be attributable to either social or biological factors (McCrae et al., 2000). With this caveat in mind, however, there are several ways in which the present findings can inform future research designed to directly investigate the causes of age differences in personality traits. First, the finding that Altruism, Compliance, and Self-Discipline all showed similar age trends (see Figures 1B and 2B) suggests that these three traits might be influenced by similar social and biological factors. For example, these traits' positive trends from adolescence through middle age might all result from investment in a common set of social roles—such as student, worker, and parent—that frequently call for prosocial behavior and impulse regulation (Helson, Kwan, John, & Jones, 2002; Hogan & Roberts, 2004; Roberts & Wood, 2006), or from the ongoing development of neurobiological systems that help regulate such behavior (DeYoung, Peterson, & Higgins, 2002).

Conversely, the findings that Order and Self-Discipline (see Figure 1B), Anxiety and Depression (see Figure 3B), Assertiveness and Activity (see Figure 4B), and Openness to Aesthetics and to Ideas (see Figure 5B) showed quite different age trends indicate that different facet traits within the same broad Big Five domain are sometimes influenced by different mechanisms. For example, investment in student, worker, and parent roles may typically lead to greater persistence and self-control, but not to greater orderliness.

Finally, the shapes of the age trends for some traits suggest key periods in the life span. For example, the gender-specific age trends for Depression (see Figure 3B) suggest that positive trends in sad affect might be caused by at least two distinct sets of mechanisms: one that typically affects adolescent girls, but not boys, and one that affects both men and women in emerging and early adulthood. One possible explanation for this pattern is that high levels of sad affect among adolescent girls might be due to negative gender expectations and stereotypes that are especially salient across these years (Hill & Lynch, 1983; Wichstrøm, 1999), whereas high levels among early-adult men and women might reflect common physical and emotional strains linked with the transition to parenthood (Walker, 1977).

The most direct approach for testing these hypotheses, and others like them, is through longitudinal studies in which personality traits—and causal factors that might influence them—are assessed repeatedly over time. Such studies could not only estimate mean-level age trends but also distinguish between individuals who show especially positive or negative changes on a particular trait. They could therefore identify social and biological factors that predict individual differences in subsequent personal-

ity change—a necessary condition for inferring causation. For example, a previous longitudinal study of women's adult development examined the effects of work investment on personality change across middle age (Helson & Soto, 2005). It identified women who were more and less invested in their careers during their early 50s and found that the women who were most invested, at this age, subsequently showed especially steep declines in assertiveness during the years surrounding retirement, as work pressures eased. This pattern suggests that individual differences in work investment led to differences in the experience of retirement, and ultimately to differences in personality change. Such studies, however, remain rare, and new research could contribute immensely to our understanding of the processes underlying age differences in personality traits.

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Received October 2, 2009
Revision received July 7, 2010
Accepted August 17, 2010 ■