



# HHS Public Access

Author manuscript

*J Pers Soc Psychol.* Author manuscript; available in PMC 2018 July 01.

Published in final edited form as:

*J Pers Soc Psychol.* 2017 July ; 113(1): 144–166. doi:10.1037/pspp0000137.

## Parental Educational Attainment and Adult Offspring Personality: An Intergenerational Lifespan Approach to the Origin of Adult Personality Traits

**Angelina R. Sutin,**

Florida State University College of Medicine, 1115 W. Call Street, Tallahassee, FL 32306, (850) 645-0438, Fax: (850) 645-1773

**Martina Luchetti,**

Florida State University College of Medicine, 1115 W. Call Street, Tallahassee, FL 32306, (850) 645-0440, Fax: (850) 645-1773

**Yannick Stephan,**

EA 4556 Dynamic of Human Abilities and Health Behaviors, Department of Sport Sciences, Psychology and Medicine, University of Montpellier, 4, Boulevard Henry IV, 34000 Montpellier, France

**Richard W. Robins, and**

Department of Psychology, University of California, Davis, CA 95616-8686, (530) 754-8299, Fax: (530) 752-2087

**Antonio Terracciano**

Florida State University College of Medicine, 1115 W. Call Street, Tallahassee, FL 32306, (850) 645-0355, Fax: (850) 645-8441

### Abstract

Why do some individuals have more self-control or are more vulnerable to stress than others? Where do these basic personality traits come from? Although a fundamental question in personality, more is known about how traits are related to important life outcomes than their developmental origins. The present research took an intergenerational lifespan approach to address whether a significant aspect of the childhood environment – parental educational attainment – was associated with offspring personality traits in adulthood. We tested the association between parents' educational levels and adult offspring personality traits in seven samples (overall age range 14–95) and meta-analytically combined the results (total  $N > 60,000$ ). Parents with more years of education had children who were more open, extraverted, and emotionally stable as adults. These associations were small but consistent, of similar modest magnitude to the association between life events and change in personality in adulthood, and were also supported by longitudinal analyses. Contrary to expectations, parental educational attainment was unrelated to offspring Conscientiousness, except for a surprisingly negative association in the younger cohorts. The results were similar in a subsample of participants who were adopted, which suggested that environmental mechanisms were as relevant as shared genetic variants. Participant levels of

education were associated with greater conscientiousness, emotional stability, extraversion, and openness and partially mediated the relation between parent education and personality. Child IQ and family income were also partial mediators. The results of this research suggest that parental educational attainment is one intergenerational factor associated with offspring personality development in adulthood.

## Keywords

Intergenerational; Parental Educational Attainment; Personality Development

---

## Introduction

What are the developmental origins of personality traits? Why do some people grow up to be conscientious or emotionally stable, while others lack discipline or are more vulnerable to stress? The word origin typically conjures the biological basis of traits, such as their genetic roots. And, indeed, behavioral genetics studies indicate that about 50% of the variance in personality is due to genetics (van den Berg et al., 2014), although the specific variants that contribute to personality remain elusive (de Moor et al., 2015). Such studies likewise indicate that 50% of the variance in personality can be attributed to the environment, and, by middle adulthood, both genetics and the environment contribute equally to personality stability (Briley & Tucker-Drob, 2014). Origin can also refer to the early life environment in which the individual grows and develops. For most people, parents are a significant part of their environment from birth until at least young adulthood. Parental characteristics may shape the child's environment in ways that have long-term associations with personality in adulthood (Josefsson et al., 2013).

This research took an intergenerational lifespan approach to address whether a specific parental characteristic – parental educational attainment – matters for offspring trait psychological functioning and development in adulthood. As a point of comparison, we also examined how the individual's own level of education is associated with personality and personality development in adulthood. Educational attainment is known to have benefits for the recipient and benefits that may also span generations (Lundborg, Nilsson, & Rooth, 2013); we examined whether these cross-generational associations extended to offspring personality traits.

## Lifespan Models of Personality

The traits that define the Five Factor Model (FFM) of personality are known to change over time (Lucas & Donnellan, 2011; Roberts & DelVecchio, 2000; Roberts, Walton, & Viechtbauer, 2006), and contemporary models of personality recognize that trait development occurs across the lifespan, from infancy through old age (Caspi, Roberts, & Shiner, 2005; McCrae & Costa, 2003). These models likewise recognize that traits develop, in part, from both the genetic and environmental context in which children grow up (Chapman, Hampson, & Clarkin, 2014). Much like genes that set the foundation for adult personality, the early social environment in which the child grows and develops is likely to be critical for trait development across the lifespan.

Trait development does not stop at the end of childhood. As lifespan models indicate, personality development is a lifelong process (Caspi et al., 2005). Much of the work on the development of FFM personality traits in adulthood has focused on either their normative trajectory (e.g., Terracciano, McCrae, Brant, & Costa, 2005) or how life events are associated with personality change (e.g., Specht, Egloff, & Schmukle, 2011). This line of research has yielded important insights into the nature of adult personality development. As a complement to this body of work, it is critical to investigate how experiences in the first few decades of life shape personality, as adult personality is an extension of trait psychological functioning in childhood (Eisenberg, Duckworth, Spinrad, & Valiente, 2014). That is, much of the adult research starts after critical windows of development earlier in life. To fully articulate the trajectory of personality across the lifespan, it is necessary to address whether early life factors have long-term implications for trait development. Such an approach is consistent with research in other domains that has found the early life environment to have lasting effects on mental (Quesnel-Vallée & Taylor, 2012) and physical (Lundborg et al., 2013) health outcomes.

Within lifespan models of personality, the broad definition of environmental context typically includes characteristics of the parents (Shanahan, Hill, Roberts, Eccles, & Friedman, 2014). In the literature on childhood traits, specific parental characteristics, including maternal education, have been associated with aspects of temperament (Lengua, 2006). If parental characteristics, such as education, have a foundational role in trait development, then their effect may extend beyond temperament to adult personality. Education in particular has both individual and intergenerational benefits that may extend to personality. We review this literature next.

### **Education: Individual and Intergenerational Benefits**

Educational attainment is one robust pathway through which people live happier, healthier, and longer lives. Individuals with more years of education tend to live longer (Lager & Torssander, 2012; Mackenbach et al., 2015), are less prone to depressive symptoms (Sutin et al., 2013), and have greater well-being (Kahneman & Krueger, 2006). The positive correlates of educational attainment are not limited to health. At the level of the individual, for example, educational attainment is associated with higher income and greater occupational prestige (Baum, Ma, & Payea, 2013). At the societal level, geographical areas with higher average levels of educational attainment have less crime and greater civic engagement (Lochner, 2011). And, from an economic perspective, an educated workforce increases productivity and innovation and contributes to greater economic growth (Hanushek & Wößmann, 2010). Thus, from the individual to society, educational attainment bestows many benefits.

Educational attainment is not just beneficial for the individual but also confers benefits to the individual's offspring. Parents with more years of education, for example, have children who achieve more, in part through greater resources and parental expectations for success (Davis-Kean, 2005). The association between parental educational attainment and the child's cognitive skills starts early. Young children with parents who have more years of education score higher on tests of executive functioning (Sarsour et al., 2011), even among families

who live in chronic poverty (Raver, Blair, & Willoughby, 2013). Parental education continues to have a positive effect on offspring outcomes into adulthood. Adult children of parents with more years of education, for example, are less likely to smoke (Fagan, Brook, Rubenstone, & Zhang, 2005) or suffer from major depression (Park, Fuhrer, & Quesnel-Vallée, 2013) and are more likely to be in good physical health (Lundborg et al., 2013). Less is known, however, about the intergenerational transfer of parental education to offspring personality. We next turn to how personality is associated with individual levels of education and the potential intergenerational transfer of education for trait development.

### Personality and Education

There is a well-recognized connection between individual levels of educational attainment and personality traits. Of the five traits, Openness tends to be the strongest correlate of education: Individuals who score higher in Openness tend to stay in school longer (Goldberg, Sweeney, Merenda, & Hughes, 1998; Mortensen et al., 2014; O'Connell & Sheikh, 2011). The association may partly reflect the overlap between facets of Openness (e.g., Ideas) and characteristics that are linked to higher education, such as intellect. Individuals who are intellectually curious and enjoy exploring ideas may likewise be motivated for higher education to satisfy these needs. The associations are more modest and less consistent for the other four traits. Lower Neuroticism has been associated with higher education, such that individuals who are more emotionally stable tend to go farther in school (Mortensen et al., 2014; O'Connell & Sheikh, 2011); both positive and negative associations have been found for Extraversion, Agreeableness, and Conscientiousness (Costa et al., 2007; Goldberg et al., 1998; Mortensen et al., 2014; O'Connell & Sheikh, 2011).

There is less evidence that education is related to personality development. Longitudinal studies suggest that although those who pursue higher education are, in fact, higher on Openness, the trajectory of Openness tends to be similar for those who do versus do not go to college (Leikas & Salmela-Aro, 2015; Lüdtke, Roberts, Trautwein, & Nagy, 2011). Some studies have found that Conscientiousness is associated with pursuing higher education (Damian, Su, Shanahan, Trautwein, & Roberts, 2015), whereas others have not found this association (Leikas & Salmela-Aro, 2015; Lüdtke et al., 2011). Further, higher education may (Leikas & Salmela-Aro, 2015) or may not (Lüdtke et al., 2011) be associated with increases in Conscientiousness in young adulthood. These studies, however, have focused on whether the experience of going to college is associated with change in personality; less research has focused on whether years of education is associated with change in personality across adulthood.

The concurrent association between adult personality and educational attainment is difficult to interpret because individuals with certain traits may seek out opportunities for higher education and/or education may contribute to the development of the traits. For example, individuals who are open may seek out opportunities for higher education, and higher education challenges students to think in different ways that might foster greater Openness. In contrast to the question of whether individual educational levels are associated with personality, the direction of causality is less ambiguous for the effect of the parent's educational level on their offspring's personality. That is, in most cases, parents will have

completed all, or most, of their education before their child's personality develops. As such, the possibility of reverse causality (e.g., a child high in Neuroticism limiting a parent's efforts to further their education) is considerably less likely than the possibility that the individual's personality will impede his educational attainment.

Although relatively sparse, there is some evidence for an intergenerational association between parental educational attainment and offspring personality traits. A recent study found that parents with more years of education had adolescents who scored higher in Conscientiousness, an association that was mediated by parental (e.g., support) and material (e.g., both necessities and opportunities for learning) investments (Conger, Martin, & Masarik, in press); the other domains were not examined in the study. This association may extend into adulthood and to other traits: A study of adults found that those whose parents had higher education scored higher in Extraversion and Openness, and the father's educational attainment was further associated with greater emotional stability and Conscientiousness (Jonassaint, Siegler, Barefoot, Edwards, & Williams, 2011). In other studies that accounted for the individual's level of education, however, the association between parental social class (often defined by parental educational attainment) and adult offspring personality was eliminated (Flensburg-Madsen & Mortensen, 2014; Furnham & Cheng, 2014). This pattern suggests that offspring education may fully mediate the association between parental education and offspring personality through either environmental or genetic mechanisms. The relation between parental educational attainment and offspring Openness, however, may persist even after accounting for the offspring's level of education (Steinmayr, Dinger, & Spinath, 2010). Since personality traits are complex, any individual factor is likely to have a modest effect and most previous studies have either focused on specific populations or are across countries that have different educational systems that make comparisons across cultures difficult. Large-scale, well-powered studies that focus on one education system and that are more representative of the population are needed to better disentangle how both parental educational attainment and individual levels of education are associated with personality in adulthood.

### **Mechanisms**

There are a number of mechanisms that are likely to contribute to the association between parental educational attainment and adult offspring personality traits. As suggested in previous research, parents with more years of education may be able to offer their children more support and enrichment that lead to the development of specific traits (Conger et al., in press). It is also possible that individuals with more years of education have stable employment, which may contribute to a more consistent and less stressful home environment. Such an environment may promote the development of more mature character traits (Josefsson et al., 2013).

In the present research, we tested several mechanisms that may link parental education with offspring personality. First, we tested whether the offspring's education mediated the relation between parental education and offspring personality. Parental education is a strong predictor of offspring educational attainment: Offspring with parents who have more years of education are approximately 2–3 times more likely to graduate from college than

offspring with parents who have less education (McGue, Rustichini, & Iacono, in press). To the extent that education is associated with specific traits (Mortensen et al., 2014), it may be one mechanism that accounts for part of the association between parental education and offspring personality.

Second, we tested whether adolescent IQ mediated the association between parental education and adult offspring personality. Parental education is associated with the development of offspring cognitive functioning (Sarsour et al., 2011), which could account for the relation between parental education and offspring traits related to higher cognitive functioning, such as higher Openness and lower Neuroticism. Given that the association between parental education and other outcomes (e.g., health) tend to be diminished when offspring IQ and education are included as covariates (Chandola, Deary, Blane, & Batty, 2006; Luo & Waite, 2005), it is likely that these two factors are mechanisms through which parental education shapes offspring personality.

Third, it may also be the case that the benefits of parental education for offspring personality are due to the greater financial resources that often come with education (Baum et al., 2013). That is, parents with more years of education may have more economic means to be able to provide more opportunities for artistic expression and other life experiences (e.g., travel) that may foster greater Openness. In addition, with greater financial security, there may be less anxiety about making ends meet, which would contribute to greater stability, less stress, and ultimately lower Neuroticism. To that end, we tested income as one mechanism that contributed to the association between parental education and offspring personality.

Finally, there is a genetic component to education and a genetic overlap between education and personality (Okbay et al., in press). Polygenic scores for education and Neuroticism that are derived from meta-analyses of genome-wide association studies (GWAS), for example, tend to be correlated, which supports the notion of shared genetic influences (Okbay et al., in press). As such, it is possible that any association found between parental education and offspring personality may be due to shared genetics across generations (parent and child) and between education and personality. In addition to genetics, an important question for the origin of personality is the role of environmental factors, and parental education is a potentially relevant environmental correlate of offspring personality.

To address this issue, we examined the association between parental education and offspring personality in a subsample of participants who were adopted. If the associations between parental education and offspring personality were only due to genetics, then it would be expected that there would be no relation between parental education and offspring personality in the adoption subsample. If, however, the associations between parental education and offspring personality are similar in the adoption subsample to the sample of biological parents and children, then genetics cannot be the only factor that accounts for the association between parental education and offspring personality because there is no genetic overlap between adoptive parents and children.

Whether the associations are similar in the adoptee subsample is relevant to the common question of the shared environment in behavioral genetics. Estimates from twin studies

routinely indicate that none of the variance in personality can be attributed to the shared environment (Bouchard & Loehlin, 2001). From this perspective, basic parental characteristics should be irrelevant to personality development because such factors would be considered part of the shared environment. There are, however, limitations to behavioral genetic studies based solely on twins, and these limitations may lead to biased estimates of the effect of the shared environment (Polderman et al., 2015). More sophisticated approaches that consider adopted siblings as well as twins suggest that up to 25% of the variance in personality traits can be attributed to the shared environment (Matteson, McGue, & Iacono, 2013). Such estimates open the door to identifying specific aspects of the childhood environment that may have long-lasting associations with offspring personality.

### Modifiers

In addition to potential mechanisms, we also considered potential modifiers of the association between parental education and offspring personality. First, the association between parental education and offspring personality may be stronger in younger adulthood and dissipate across the lifespan. As offspring get further away from their childhood environment, for example, factors that were proximal in childhood, such as parental education, may be less relevant for personality. In addition, as offspring develop through adulthood, they may have their own experiences that shape personality (Specht et al., 2011) and compete with more distal factors that contribute to trait development. Alternatively, the effect of parental education on personality may be foundational and the association immune to subsequent experiences.

Second, we considered whether cohort moderated the association between parental education and adult offspring personality. The meaning, structure, and accessibility to education have changed substantially over the 20<sup>th</sup> century (Goldin, 2001). As such, a parent's experience with education is likely to be very different for a child born in 1940 versus in 1980. We thus addressed whether the association between parental education and offspring personality varied as a function of differences in cohort to address potential differences in the meaning of education.

### Current Research

The present research took an intergenerational life-course perspective to examine whether educational attainment of parents, as well as the self, was associated with adult offspring personality. We tested for the relation between parental educational attainment and personality and individual educational attainment and personality in seven samples, totaling more than 60,000 participants. Given the economic and social advantages of growing up with parents with more years of education (Hout, 2012), we expected that the offspring of parents with more years of education would have lower scores on Neuroticism and higher scores on the other four traits. Based on findings from previous studies, we expected the strongest and most reliable effect to be for Openness. In addition to determining whether the effects were replicable, these samples allowed us to examine whether the associations were similar across the lifespan (i.e., whether the relations between parental educational attainment and adult personality dissipate or grow stronger with age), whether there were

differences by birth cohort, and potential mechanisms (offspring educational level, offspring IQ, family income, genetics) that might explain the observed associations.

In addition to examining the association at a single point in time, we also addressed whether education, both parent and self, was associated with a change in personality over time.

Personality traits develop across the lifespan and many factors within the environment have been proposed to shape their trajectory. We tested whether education was one such factor in the four samples that had longitudinal assessments of personality across two waves. Similar to the cross-sectional analysis, we expected education, both parent and self, to be associated with declines in Neuroticism and increases in the other four traits.

## Method

The samples came from six large-scale longitudinal studies with publically available data and one large sample of undergraduate students. Demographic information for each sample is given in Table 1. All seven studies had a validated measure of the five personality traits and parental educational attainment reported either by the parents or by their adult offspring. In each of the samples, all participants who had the necessary data available were included in the analyses. Intercorrelations among the study variables in each sample are in the supplemental material (Tables S1–S7). The Institutional Review Board at the Florida State University approved this research (protocol #IRB00000446, “Secondary Data Analysis of Public Health Databases”). The personality data from the large-scale studies used in this current research have been published previously. The individual’s own level of education and parent educational attainment have been used as covariates in studies from these datasets, but as far as we know, no study has used these data to explicitly examine how parent educational attainment is associated with offspring personality.

### Sample 1. The National Longitudinal Study of Adolescent to Adult Health (Add Health)

Add Health is a longitudinal study that aims to identify how social environments (broadly construed) and behaviors in adolescence contribute to important outcomes, such as health and achievement, in young adulthood. Add Health was initiated during the 1994–1995 school year with a national sample of students in grades 7–12. Add Health now has four complete waves of data. The most recent assessment wave with available data (wave 4) was in 2008; this was the first wave to include an FFM measure of personality. Documentation and a portion of the Add Health data are available for public download (<http://www.cpc.unc.edu/projects/addhealth>).

**Participants**—A total of 13,534 participants from wave 4 of Add Health had information on at least one personality trait and their parent’s report of education. Participants were drawn from wave 4 because this wave was the first wave to include an FFM measure of personality traits. This sample was 53% female and the mean age was 29.00 ( $SD=1.74$ , range = 25 to 34).



## Measures

**Personality:** Participants in Add Health completed the Mini International Personality Item Pool (Mini-IPIP; Donnellan, Oswald, Baird, & Lucas, 2006). The Mini-IPIP is a 20-item measure that is used when time is limited. Each domain is measured with four items. Response options ranged from 1 (*strongly agree*) to 5 (*strongly disagree*). The Mini-IPIP has good reliability and validity in young adult populations in general (Donnellan et al., 2006) and specifically in Add Health (Baldasaro, Shanahan, & Bauer, 2013) and has been used extensively to examine the association between personality and health (Sutin & Terracciano, 2016) and financial (Xu, Beller, Roberts, & Brown, 2015) outcomes.

**Education:** Participants reported their level of education at wave 4 ( $M=14.55$ ,  $SD=2.24$ ). At the baseline wave in 1994–1995, when participants were adolescents, mother’s reported their level of education ( $M=13.46$ ,  $SD=2.97$ ) and that of their partner ( $M=13.66$ ,  $SD=3.17$ ). All participants reported their educational attainment on an ordinal scale. For consistency and interpretability, the ordinal scale was converted to a continuous measure of years of education (e.g., a high school diploma was recoded as 12 years of education, an associate’s degree to 14 years of education, a bachelor’s degree to 16 years of education, a master’s degree to 18 years of education, and an M.D. or Ph.D. to 20 years of education). Maternal and paternal educational attainment was correlated  $.59$ ,  $p<.01$  in this sample.

**Income and IQ:** At the baseline wave, parents reported the family’s total income for 1994. Specifically, the question stated, “About how much total income, before taxes did your family receive in 1994? Include your own income, the income of everyone else in your household, and income from welfare benefits, dividends, and all other sources” ( $M$ (in thousands)= $46.14$ ,  $SD=47.44$ ). We took the natural log of income because the distribution of income showed the typical right skew. Also at this wave, the adolescents completed the Add Health Picture Vocabulary Test, which is a brief version of the Peabody Picture Vocabulary Test, a measure of verbal IQ. Participants were asked the meaning of 87 items. Raw scores were standardized by age ( $M=101.06$ ,  $SD=14.34$ ). This measure has been used extensively to examine socioeconomic, environmental, and genetic antecedents of verbal IQ (e.g., Schwartz, 2015).

### Sample 2. National Longitudinal Survey of Youth – Children and Young Adults (NLSY-CY)

The National Longitudinal Surveys (NLS) are a suite of studies administered by the Bureau of Labor Statistics. Studies within this suite assess participants’ labor market activities, significant life events, and other relevant information about the individual. The children and young adult children of women participating in the National Longitudinal Survey of Youth 79 were recruited to participate in the NLSY79 Children and Young Adult Survey (NLSY-CY). In this study, mothers provided information on their children; from age 14 and older, the children themselves completed surveys about their lives. Data for the present project were drawn from the 2010 assessment. Data and documentation for the NLSY-CY are available for public download (<http://www.bls.gov/nls/>).

**Participants**—Participants were the children and young adult children of the women participating in the NLSY79. A total of 5,582 participants had information on personality

and parental education. This sample was 50% female and had a mean age of 22.86 ( $SD=4.85$ ; range = 14 to 37).

### Measures

**Personality:** Participants completed the Ten Item Personality Inventory (TIPI), a brief but validated measure of the five traits (Gosling, Rentfrow, & Swann, 2003). Each domain was measured with two items (one reversed scored) on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

**Education:** Participants reported their own level of education ( $M=12.18$ ,  $SD=2.28$ ). The mothers of participants, as part of their assessment in the NLSY79, reported their level of educational attainment ( $M=12.97$ ,  $SD=2.53$ ) on an ordinal scale that was converted to a continuous measure (see description under Add Health). Educational attainment for fathers was not available in this sample.

### Sample 3. The Midlife in the United States (MIDUS) Study

MIDUS is a national sample of Americans who were initially recruited into a study on how behavioral, psychological, and social factors contribute to health and well-being with age. During the initial assessment in 1994–1995 (MIDUS I), participants completed a 30-minute telephone interview and a self-administered questionnaire that included the variables of interest in the present study. More information about MIDUS and how to access the data can be found on the MIDUS website (<http://www.midus.wisc.edu/>).

**Participants**—A total of 6,036 participants (52% female,  $M_{age} = 46.55$ ,  $SD=12.82$ ; range = 20 to 75) from MIDUS I had data on parental education and at least one personality trait. Some participants completed a second assessment (MIDUS II) approximately 10 years later. A total of 3,687 participants who had personality and parental education at baseline completed the personality measure at the follow-up.

### Measures

**Personality:** Personality traits were assessed using the Midlife Development Inventory (MIDI; Lachman & Weaver, 1997). Participants were asked how much 25 adjectives that assessed Neuroticism (e.g., moody), Extraversion (e.g., talkative), Openness (e.g., creative), Agreeableness (e.g., helpful), and Conscientiousness (e.g., organized) described them on a scale ranging from 1 (*not at all*) to 4 (*a lot*). This measure has been used extensively in MIDUS to examine change in personality over time (Stephan, Sutin, & Terracciano, 2014) and the health outcomes associated with personality (Turiano et al., 2012).

**Education:** At the baseline assessment, participants reported their own level of education ( $M=14.11$ ,  $SD=2.54$ ) and the educational attainment of their mother ( $M=11.51$ ,  $SD=3.10$ ) and father ( $M=11.38$ ,  $SD=3.84$ ) on an ordinal scale. This scale was converted to a continuous measure (see description under Add Health). The correlation between maternal and paternal educational attainment was .60,  $p<.01$  in this sample.

## Samples 4 and 5. The Wisconsin Longitudinal Study Graduate (WLS-G) and Sibling (WLS-S) Samples

WLS was initiated with a random sample of individuals who graduated from a Wisconsin high school in 1957. Participants have been reassessed multiple times; the first measure of personality was in the 1992 assessment. This sample of graduates is referred to as the WLS-Graduate (WLS-G) sample. In addition to the Graduate sample, a selected sibling of many of the graduates was recruited into the study. Siblings first reported on their personality in the 1993 assessment. This sample is referred to as the WLS-Sibling (WLS-S) sample. More information about both WLS samples and how to access the data can be found on the WLS website (<http://www.ssc.wisc.edu/wlsresearch/>).

**Participants**—A total of 6,408 target respondents from the WLS-G sample (54% female,  $M_{age} = 53.21$ ,  $SD = .63$ , range = 51 to 56) and 3,623 siblings from the WLS-S sample (54% female,  $M_{age} = 51.41$ ,  $SD = 7.37$ ; range = 21 to 79) completed the measure of personality and had their parents' report of education. Approximately 10 years after the first personality assessment, participants in both WLS samples completed another assessment that included personality. A total of 5,318 graduates and 2,789 siblings completed the personality measure at this follow-up assessment.

### Measures

**Personality:** Personality traits were measured with the Big Five Inventory (BFI; John, Naumann, & Soto, 2008). Participants rated items that finish the sentence stem, "I see myself as someone who..." on a scale from 1 (*strongly disagree*) to 5 (*strongly agree*). Participants in both WLS samples completed a 29-item version of the scale. This measure has been used successfully to examine how personality contributes to health (Jokela et al., 2013) and economic (Judge, Livingston, & Hurst, 2012) outcomes.

**Education:** At the 1992 and 1993 assessments, respectively, participants in the graduate ( $M = 13.75$ ,  $SD = 2.32$ ) and sibling ( $M = 13.46$ ,  $SD = 2.43$ ) samples reported on their number of years of education. At the original assessment in 1957 when the target participant was an adolescent, mothers and fathers completed demographic measures about themselves, including their own levels of educational attainment ( $M = 10.70$ ,  $SD = 2.96$  and  $M = 10.37$ ,  $SD = 3.17$ , respectively, for mothers and fathers). Maternal and paternal educational attainment correlated to  $.50$ ,  $p < .01$ .

**IQ:** In the 1950s, most high school students in Wisconsin took the Henmon-Nelson Test of Mental Ability. Scores from this standardized test were available for participants in both the graduate and sibling samples and have been used in economic studies of earning potential (Zax & Rees, 2002). The Henmon-Nelson Test measures verbal, spatial, and numerical knowledge and reasoning. Scores on the subscale are composited into a general intellectual functioning score and standardized to a mean of 100 and standard deviation of 15. The WLS-G had a mean of 102.44 ( $SD = 14.53$ ) and the WLS-S had a mean of 104.03 ( $SD = 15.67$ ).

### Sample 6. The Health and Retirement Study (HRS)

HRS is a longitudinal study of Americans ages 50 and older and their spouses. HRS participants are re-interviewed every two years. Starting in 2004, participants in the enhanced face-to-face interview received a psychosocial questionnaire that they completed and returned by mail to the University of Michigan. Starting in 2006, this leave-behind questionnaire included a measure of personality traits. Half of the HRS participants used in this study completed the psychosocial questionnaire in 2006; the other half completed it in 2008. These two samples were combined as our analytic sample. Participants completed the same personality measure in 2010 and 2012, respectively. These assessments were combined as follow-up. More information about HRS and how to access the data can be found on the University of Michigan's website (<http://hrsonline.isr.umich.edu/index.php>).

**Participants**—Across the combined 2006 and 2008 samples, 12,027 participants had at least one personality score and parental education data (58% female,  $M_{age}=66.02$ ,  $SD=8.88$ ; range = 25 to 95). Personality was again assessed in the next leave-behind questionnaire that occurred in 2010 and 2012. These assessments were combined as follow-up (i.e., a four-year interval across all participants;  $N=8,773$ ).

#### Measures

**Personality:** Participants completed the same personality scale as in MIDUS, except one additional item was added to the Conscientiousness scale. Similar to MIDUS, this measure has been used extensively to examine factors that predict change in personality (Sutin, Stephan, & Terracciano, 2015) and the health outcomes associated with personality (Jokela et al., 2013).

**Education:** As part of the demographic questionnaire, participants reported on their number of years of education ( $M=12.84$ ,  $SD=2.98$ ) and the educational attainment (in years) of their mothers ( $M=9.87$ ,  $SD=3.65$ ) and fathers ( $M=9.52$ ,  $SD=4.01$ ). The correlation between maternal and paternal educational attainment was .67,  $p<.01$  in this sample.

### Sample 7. Undergrad Sample

**Participants**—Undergraduates completed a number of measures as part of a prescreening questionnaire in exchange for course credit or extra credit. A total of 20,835 undergraduates completed this questionnaire (65% female,  $M_{age}=19.44$ ,  $SD=2.19$ , range = 17 to 59).

#### Measures

**Personality:** Participants completed the same personality measure as in the WLS sample, except that it was the full 44-item version of the Big Five Inventory rather than the abbreviated version.

**Education:** Participants indicated their year in college ( $M=13.94$ ,  $SD=1.08$ ) and reported on the educational attainment of their mother ( $M=14.74$ ,  $SD=3.16$ ) and father ( $M=15.42$ ,  $SD=3.44$ ) on an ordinal scale that was converted to a continuous measure (see description under Add Health). Maternal and paternal educational attainment correlated to .65,  $p<.01$  in this sample.

## Statistical Overview

The analyses were conducted separately for each sample and then the results were meta-analytically combined. For the main analysis, we did a linear regression with each trait as the outcome and parental educational attainment as the predictor, controlling for relevant demographic characteristics (i.e., age, sex, and race, all self-reported). Maternal and paternal educational attainment were examined separately; supplemental analyses included maternal and paternal education in the same model. Listwise deletion was used to handle missing data. The results from each sample were combined through random-effects meta-analysis using the Comprehensive Meta-Analysis program. A random-effects meta-analysis was chosen because of variations in populations and measures, and there was no assumption that the true effect size would be identical in all studies (Borenstein, Hedges, Higgins, & Rothstein, 2010). We based the meta-analysis on the *t*-value of the coefficient and the sample size of each sample. Heterogeneity was assessed using the Q statistic and  $I^2$ . The Q statistic indicated the presence (versus absence) of heterogeneity, whereas the  $I^2$  indicated the degree of heterogeneity (Huedo-Medina, Sánchez-Meca, Marín-Martínez, & Botella, 2006). These measures of heterogeneity, however, should be interpreted with caution because they tend to be biased when the number of studies included in the meta-analysis is small (e.g., less than 10; (Huedo-Medina et al., 2006). We followed the same procedure to test the meta-analytic association between the individual's level of education and his/her personality.

**Moderators**—To examine whether the association between parental educational attainment and personality was moderated by offspring age, we tested for an interaction between each parent's educational attainment and offspring age in the individual samples that had sufficient variability in age (MIDUS, WLS-S, HRS, NLSY-CY). We then subjected the interaction effects to a meta-analysis. In addition to age as a moderator in the primary samples, we did a meta-regression within the meta-analysis to test whether the associations differed by mean age of the sample and by birth cohort (defined as the mean year of birth of each sample).

**Mechanisms**—We examined several mechanisms that could explain the association between parental education and offspring personality. First, we tested offspring education as a mediator of this relation using Preacher and Hayes's (Preacher & Hayes, 2008) method for testing mediation. Second, we likewise used this method to test adolescent IQ as a mediator in the Add Health and both WLS samples. Third, using the parent report of household income while participants were still children, we tested for an association between income and offspring personality and income as a mediator of the association between parental educational attainment and adult personality. Fourth, Add Health included a subsample of participants ( $N=545$ ) who were adopted. We reran the regression analysis on this subsample to examine whether the same pattern would emerge among parents and children who were not related genetically.

**Longitudinal analysis**—Finally, in the samples with two assessments of adult offspring personality (MIDUS, WLS-G, WLS-S, HRS), we tested whether parental educational attainment was associated with change in the traits over the approximately 4-year (HRS) to

10-year (MIDUS, WLS-G, WLS-S) follow-up periods. Specifically, we regressed follow-up personality on parental educational attainment (separately for mother and father), controlling for baseline personality and the demographic covariates. We also tested the association between participants' own years of education and change in the five traits. We meta-analyzed the results following the procedure described above.

## Results

The results are divided into four sections: (1) the association between educational attainment (parent, self) and adult offspring personality, (2) moderator analyses, (3) mediator analyses, and (4) the association between educational attainment (parent, self) and change in personality.

### Educational Attainment and Adult Offspring Personality

**Parental educational attainment**—Parental educational attainment was associated with three of the five traits (Table 2). Consistent with our hypothesis, the strongest association was with Openness: Participants who had mothers or fathers with more years of education scored higher in Openness. This association was positive and significant in all of the primary studies, with the exception that there was no association between maternal educational attainment and Openness in the NLSY-CY. Also consistent with our hypotheses, parental educational attainment was associated with Neuroticism and Extraversion, such that mothers and fathers with more years of education had offspring who scored lower in Neuroticism and higher in Extraversion as adults. The modest association between maternal educational attainment and Neuroticism was apparent in all of the primary samples, except for the WLS-S and student samples; the modest association with Extraversion held in all of the primary samples except for HRS. The modest association between paternal educational attainment and Neuroticism and Extraversion was apparent in three out of the six studies (Add Health, HRS, and WLS-G for Neuroticism; WLS-G, WLS-S, and Undergrad for Extraversion). Neither parents' educational attainment was related to either Agreeableness or Conscientiousness. The pattern of results was similar when both the mother's and father's education were entered simultaneously in the same model (Table S8). There was significant heterogeneity for each of the traits. The forest plots for each of the traits by maternal and paternal education are shown in Figure 1.<sup>1</sup>

**Offspring educational attainment**—We next did a meta-analysis of the association between participants' own levels of education and their personality (Table 3). The largest and most consistent association was for Openness: Participants with more years of education

<sup>1</sup>WLS included two samples that were nested within family (i.e., respondents and their siblings). To account for this non-independence, we used Hierarchical Linear Modeling (HLM; (Raudenbush, Bryk, & Congdon, 2004) to model siblings nested within family. In addition to addressing the dependent nature of the data, HLM allowed us to examine whether parental educational attainment had similar effects on siblings within the same family. The results from the HLM analysis largely mirrored the effects found in the two WLS samples. That is, both maternal and paternal educational attainment were associated with higher Extraversion (estimate=.11 [SE=.03] and .12 [SE=.03]) and higher Openness (estimate=.15 [SE=.02] and .12 [SE=.02]). Only the association between maternal educational attainment and Neuroticism was not apparent in the multi-level model (estimate=.00 [SE=.02]). Thus, after accounting for the dependent nature of the data, parental educational attainment had a similar association with each sibling's Extraversion and Openness. Interestingly, the correlations between siblings' personalities for these traits were modest ( $r=.11$  for Extraversion and  $r=.14$  for Openness) and essentially the same magnitude of the correlation between parental education and each trait.

scored higher in Openness. This association was apparent in all samples except the Undergrad Sample. After Openness, Neuroticism had the strongest and most consistent association with educational attainment: Participants with more schooling were more emotionally stable. Again, this association was apparent in all samples except the Undergrad Sample. Higher education was also associated with higher Conscientiousness (all samples) and, to a lesser extent, higher Extraversion (all samples except for the MIDUS and Undergrad samples). Educational attainment was unrelated to Agreeableness.

Participants in two of the samples (NLSY-CY and Undergrad) were still in school. When these two samples were excluded from the analysis, the pattern of associations was identical, with somewhat stronger coefficients for Neuroticism (point estimate =  $-.13$ , 95% CI =  $-.17$ ,  $-.09$ ,  $p < .001$ ) and Openness (point estimate =  $.27$ , 95% CI =  $.22$ ,  $.32$ ,  $p < .001$ ). The heterogeneity was slightly lower for these two traits when the two samples with students were excluded ( $Q = 72.12$ ,  $I^2 = 94.45$  for Neuroticism and  $Q = 116.70$  and  $I^2 = 96.57$  for Openness).

### Moderators

**Age**—In the meta-analysis, age did not moderate the association between parental educational attainment and offspring personality (Table S9) nor did age moderate the association between the individual's educational attainment and any of the five traits (Table S10). Consistent with the meta-analysis, there was not a consistent pattern in the moderating effect of age in the individual studies (Tables S9 and S10). The meta-regression, however, revealed an interesting pattern for the association between parental education and Conscientiousness: Among the younger samples, both mothers and fathers with more years of education had children who scored lower in Conscientiousness, an association not seen in the older samples (point estimate =  $-.002$ , 95% CI =  $-.00$ ,  $.00$ ,  $p = .001$  and point estimate =  $-.002$ , 95% CI =  $-.00$ ,  $.00$ ,  $p = .004$ , for maternal and paternal education, respectively). The meta-regression also revealed an effect of age for Openness: The association between parental education and Openness was slightly stronger in the older samples compared to the younger samples (point estimate =  $-.002$ , 95% CI =  $-.00$ ,  $.00$ ,  $p = .012$  and point estimate =  $-.002$ , 95% CI =  $-.00$ ,  $.00$ ,  $p = .030$ , for maternal and paternal education, respectively). There was no moderating effect of age in the meta-regression for the association between the individual's education and personality.

**Cohort**—The meta-regression suggested some differences in the association between maternal education and offspring Openness and Conscientiousness. For Openness, this association was slightly stronger among the older cohorts than the more recent ones (point estimate =  $-.002$ , 95% CI =  $-.00$ — $.00$ ,  $p = .014$ ). For Conscientiousness, the association was positive in the older cohorts, whereas it was negative in the recent cohorts (point estimate =  $-.001$ , 95% CI =  $-.00$ ,  $-.00$ ,  $p = .039$ ). There was no evidence that year of birth moderated the association between paternal education and offspring personality.

### Mechanisms

**Offspring education**—We next tested offspring education as a mediator of the association between parental education and offspring personality for the traits that had an

association with parental education in the primary analyses (i.e., Neuroticism, Extraversion, and Openness) in the non-student samples. As reported in Table 4, this pathway was a significant mediator for Neuroticism (all samples), Extraversion (Add Health, WLS-G, and HRS), and Openness (all samples). Of note, the direct effect of parental education on offspring personality was reduced when offspring education was included in the analysis, but maternal and paternal education were both still associated with lower offspring Neuroticism and higher offspring Extraversion and Openness. The individual's own level of education is thus a partial, but not full, mediator of these relations.

**IQ**—In the three samples that had a measure of adolescent IQ (Add Health, WLS-G, WLS-S), IQ was associated with parental educational attainment and adult offspring personality (Table S1 for Add Health, Table S3 for WLS-G, and Table S4 for WLS-S). Adolescent IQ partially mediated the relation between parental educational attainment and Neuroticism and Openness (all samples; Table 5): Parents with more years of education had children with higher IQs, which, in turn, was associated with lower Neuroticism and higher Openness in adulthood. Similar to offspring education, parental educational attainment was still a significant predictor of adult offspring personality even after accounting for adolescent IQ. IQ did not mediate the relation between parental education and offspring Extraversion (no samples).

**Household income**—We next examined parent reports of household income during adolescence in Add Health as a predictor of adult offspring personality, as a control variable, and as a mediator of the association between parental education and offspring personality (Table 6). Similar to education, higher household income was associated modestly with lower Neuroticism and higher Extraversion, Openness, and Agreeableness; it was unrelated to Conscientiousness. When both income and parental educational attainment (either maternal or paternal education) were included in the same model, the association between income and personality was generally reduced but still significant. The one exception was for Extraversion; there was no longer a positive association between household income and Extraversion once parental education was included as a predictor. Parental education remained a significant predictor of offspring personality when household income was included as a predictor. Further, income mediated the association between parental education and some of the offspring traits. Specifically, income mediated the relation between parental education and offspring Neuroticism (point estimate =  $-.02$ , 95% CI =  $-.03, -.01$ ,  $p < .001$  and point estimate =  $-.02$ , 95% CI =  $-.02, -.01$ ,  $p < .001$ , for maternal and paternal education, respectively), Openness (point estimate =  $.02$ , 95% CI =  $.01, .03$ ,  $p < .001$  and point estimate =  $.02$ , 95% CI =  $.01, .03$ ,  $p < .001$ , for maternal and paternal education, respectively), and Agreeableness (point estimate =  $.02$ , 95% CI =  $.01, .03$ ,  $p < .001$  and point estimate =  $.02$ , 95% CI =  $.01, .03$ ,  $p < .001$ , for maternal and paternal education, respectively). In all cases, income was not a full mediator; there was still a significant association between parental education and each of these traits.

**Adoption**—We reran the regression analyses on the subsample of participants ( $N=545$ ) who were adopted from the total Add Health sample. The associations between maternal educational attainment and adult personality were fairly similar or stronger than the



associations in the overall Add Health sample. Specifically, maternal educational attainment was associated with higher Openness ( $\beta=.22$ , 95% CI=.15–.32,  $p<.001$ ) and Agreeableness ( $\beta=.22$ , 95% CI=.15, .32,  $p<.001$ ), and lower Neuroticism ( $\beta=-.12$ ; 95% CI=-.22, -.04;  $p=.004$ ). Also similar to the total Add Health sample, maternal educational attainment was unrelated to Conscientiousness ( $\beta=-.05$ , 95% CI=-.13, .04,  $p=.267$ ) and, in contrast to the total sample, it was also unrelated to Extraversion ( $\beta=.01$ , 95% CI= -.07, .10,  $p=.763$ ). We tested for an interaction between parental education and adoption (yes/no) to examine whether any association in the subsample of participants who were adopted was statistically different from the association among participants who were not adopted. This interaction analysis indicated that the association between maternal educational attainment and child Openness and Agreeableness was slightly stronger among participants who were adopted than among participants who grew up with their biological mothers ( $\beta_{\text{interaction}}=.02$ , 95% CI=.00, .05,  $p=.024$  for Openness and  $\beta_{\text{interaction}}=.04$ , 95% CI=.01, .06;  $p<.001$  for Agreeableness); the interactions were not significant for the other three traits. Paternal education was also associated with higher offspring Openness ( $\beta=.15$ , 95% CI=.06, .26,  $p=.002$ ) and Agreeableness ( $\beta=.17$ , 95% CI=.09, .27,  $p<.001$ ) and lower Neuroticism ( $\beta=-.12$ , 95% CI=-.22, -.02,  $p=.015$ ) in the adoption subsample. Similar to the entire sample, paternal educational attainment was unrelated to Extraversion ( $\beta=.04$ , 95% CI=-.05, .14,  $p=.379$ ), but in contrast to the entire sample, it was related negatively to Conscientiousness ( $\beta=-.10$ , 95% CI=-.20, -.01,  $p=.038$ ). An interaction analysis indicated that the negative association between paternal educational attainment and child Conscientiousness was slightly stronger among participants who were adopted than among participants who grew up with their biological parents ( $\beta_{\text{interaction}}=-.02$ , 95% CI=-.05, .00;  $p=.044$ ); none of the other interactions were significant.

## Educational Attainment and Adult Personality Development

**Parental educational attainment**—There were modest associations between parental educational attainment and change in personality across adulthood (Table 7). Specifically, individuals who had parents with more years of education (either mother or father) tended to decline modestly more in Neuroticism (MIDUS and HRS for maternal education, all samples for paternal education) and increase modestly more in Extraversion (HRS only for maternal education, WLS-G and HRS for paternal education) and Openness (all samples for maternal education, all samples except MIDUS for paternal education) between baseline and follow-up. These small associations also held when controlling for the individual's own level of education, except for the association between maternal education and the increase in Extraversion.

**Offspring educational attainment**—The effect of individual educational attainment on personality change was stronger than the effect of parental educational level (Table 8). Participants with more years of education decreased more in Neuroticism over the follow-up period and increased more in Openness and Conscientiousness. The association between educational attainment and change in both Neuroticism and Openness was apparent in all four of the samples; the association with change in Conscientiousness was apparent in all samples except MIDUS. Educational attainment was unrelated to changes in Extraversion or Agreeableness.

## Discussion

Using data from seven samples, the present research provided evidence that parental educational attainment was associated with adult offspring personality. In particular, parents with more years of education had adult children who were more open, extraverted, and emotionally stable. These associations were modest to small but consistent across samples that varied widely in terms of age, time of measurement, and average parental education. These small associations were of similar magnitude to the association between life events and personality development in adulthood. These modest associations were independent of the adult child's own level of educational attainment, which also had consistent relations with these traits. The mediation analyses suggested that these relations were due in part, but not entirely, to offspring education, adolescent IQ, and the family's economic resources. The associations were also not only due to shared genetics. Surprisingly, parental educational attainment was associated with lower Conscientiousness among the younger samples. This work builds on lifespan models of personality to identify how specific aspects of the early life environment are associated with adult personality

### Parental Education and Adult Offspring Personality

**Openness**—Across the seven samples, Openness was a consistent trait correlate of parental educational attainment. Mothers' and fathers' years of education were both associated modestly with their adult child's general tendency to be creative and open-minded. Parents with more years of education tend to provide an enriched environment for their children that may foster the development of Openness. In families with higher educational attainment, for example, parents read to their children more, have more books around the house, are more supportive of their child's learning, and provide more opportunities to learn new things (Larson, Russ, Nelson, Olson, & Halfon, 2015). Such exposure to a more complex and varied environment may nurture a comfort with and preference for variety. In addition, parents with more years of education may instill in their children a deeper appreciation for art, nature, and the complexities of the inner and outer world and model behaviors indicative of Openness that their children notice and imitate. These enriched environments may cultivate greater Openness from an early age.

**Neuroticism and Extraversion**—Parents with more years of education also had adult children who scored somewhat lower in Neuroticism and higher in Extraversion. Emotion regulation is socialized during childhood within the family (Meyer, Raikes, Virmani, Waters, & Thompson, 2014); children learn how to regulate emotions from their parents (Bariola, Hughes, & Gullone, 2012; Morris et al., 2011). Parents who model how to reappraise emotions, for example, have children who use reappraisal strategies, whereas parents who model suppression have children who use suppression strategies (Gunzenhauser, Fäsche, Friedlmeier, & Suchodoletz, 2014). Educational attainment tends to be associated with more adaptive emotion regulation strategies (Wiltink et al., 2011), and there may be an intergenerational effect, with parents with greater educational attainment who are more likely to use and model adaptive emotion regulation strategies that, in turn, their children learn to use to regulate themselves. Adaptive emotion regulation strategies are related to declines in depressive symptoms over time (Berking, Wirtz, Svaldi, & Hofmann, 2014); this

process may consolidate into lower Neuroticism and higher Extraversion by adulthood. Maternal education has also been associated with declines in temperament traits related to fear and irritability across childhood (Lengua, 2006), which may be associated with greater emotional stability by adulthood. Parents with more years of education also tend to have children who are more socially skilled (Blair et al., 2015). By adulthood, this association may likewise consolidate into a general tendency to be sociable and assertive.

**Conscientiousness**—Across the seven samples, parental educational attainment was unrelated to adult offspring Conscientiousness. Previous research has been somewhat mixed, with some reporting that parents who have more education have adolescents who score higher in Conscientiousness (Conger et al., in press), while others find no association in adulthood, after accounting for the individual's own level of education (Furnham & Cheng, 2014). The positive association between the individual's own level of education and Conscientiousness apparently does not transfer from parent to child. Individuals who have more years of education are generally more industrious, organized, and self-disciplined. It would be expected that such individuals would be role models and provide an environment conducive to pass on these characteristics to their children. Surprisingly, parents with more years of education do not seem to instill these Conscientiousness-related traits in their children.

Instead, parental educational attainment actually had a negative association with Conscientiousness in the younger samples (approximately 14–30 years old) and more recent cohorts. That is, parents with more years of education had offspring who scored lower in Conscientiousness in young adulthood. From the current data, it is unclear whether this difference is due to cohort or to age (or other factors, such as differences among the personality questionnaires used). There have been significant shifts in parenting over the course of the 20<sup>th</sup> century (Pew Research Center, 2013) that may have long-term consequences for Conscientiousness. In recent cohorts, parents with more years of education may have adopted parenting styles that may be detrimental for their child's Conscientiousness. For example, over the second half of the 20<sup>th</sup> century, parents became much more involved in the schooling and education of their children, especially among mothers with more years of education (Schaub, 2010). This involvement may have had the unintended consequence of inhibiting the development of Conscientiousness if parents took on responsibilities instead of the child (e.g., making sure homework was completed and returned on time), which may hinder more than foster the development of this trait. The difference may also be due to age. The effect of parental educational attainment on Conscientiousness may dissipate across adulthood, particularly as offspring attain their own level of education and gain more responsibility and develop their own life history. Within the samples where the participants varied in age, however, there was no evidence that age moderated the association between parental educational attainment and offspring personality. None of the samples, however, adequately covered the full adult lifespan, and thus the interactions with age within a sample were not a strong test of whether the association between parental educational attainment and offspring Conscientiousness changes across adulthood.

## Mechanisms of the Parental Education-Adult Offspring Personality Relation

We found several mechanisms that contributed, in part, to the association between parental education and adult offspring personality. First, the offspring's own level of education was a consistent mediator of the association between parental education and offspring Neuroticism, Extraversion, and Openness. There is a strong relation between parental education and a child's educational attainment (McGue et al., in press), which may occur through both genetic (Okbay et al., in press) and environmental (e.g., expectations for success; Davis-Kean, 2005) pathways. The offspring's own educational achievement accounted for some, but not all, of this association.

Second, adolescent IQ likewise was a partial mediator of the association between parental education and offspring Openness and Neuroticism. Parents with more years of education tend to have children with higher executive functioning (Sarsour et al., 2011), one component of Openness (Murdock, Oddi, & Bridgett, 2013). In addition, greater cognitive capacity facilitates coping skills and the capacity to manage stress and uncertainty (Evans, Kouros, Samanez-Larkin, & Garber, 2016; Gottfredson & Deary, 2004), which may consolidate into greater emotional stability.

Third, income was a partial mediator between parental education and adult offspring personality. Individuals with more years of education also tend to have higher incomes and greater occupational prestige (Baum et al., 2013). These parents may have more economic resources that give their children access to a wider range of experiences and opportunities that are important for the development of personality, especially Openness. Likewise, greater economic security may alleviate stress within the family, which is likely to promote more emotional stability and sociability. And, indeed, household income was also associated with higher Openness and Extraversion and lower Neuroticism. As such, these greater economic resources, rather than educational attainment itself, may explain why parents with more education have children who are more open, extraverted, and emotionally stable. Although greater household income was a partial mediator of these associations, parental educational attainment remained a significant predictor of these traits.

Finally, the adoption subsample allowed us to examine whether the associations were due to factors other than genetics. From the perspective of twin studies, parental education can be viewed as part of the shared environment, which in behavioral genetics studies has been found to account for little to none of the variance in personality (Plomin, DeFries, Knopik, & Neiderhiser, 2016). Analysis of the adoption subsample in Add Health, however, indicated that similar relations were apparent among parents and offspring who were unrelated genetically. This pattern suggests that the effect of parental educational attainment on offspring personality might have been transmitted through the environment (broadly construed) and not only through genetics. A role for the shared environment was also partly supported by the results of the within-family analysis of the WLS-S sample (Footnote 1), which found an effect of parental education on sibling personality. Along with other research that has used more sophisticated designs than classic twin studies (Matteson et al., 2013), our findings support the importance of more research on shared environmental factors for advancing knowledge on the origins of personality traits.

It is of note that all of the mechanisms that we tested were partial mediators of the relation between parental education and offspring personality; none completely explained these associations. This pattern suggests that there are other pathways through which these associations may occur. Part of the association that we observed could be due to genetic variants that are passed through generations and influence both education and personality. There is some evidence for an overlap in the genetic variants associated with education and personality (Okbay et al., in press), and these shared variants may account for part of the association observed in the present research. It is important to note, however, that even when virtually all common variants are considered, polygenic scores explained 3% to 4% of the variance in education (Okbay et al., in press) and even less for personality (de Moor et al., 2015; Okbay et al., in press). Besides genetics, other factors such as differences in nutrition, disease, and exposure to pathogens and pollutants may mediate the association between parents' years of education and offspring personality. For example, mothers with higher education are more likely to breastfeed their children (Li, Darling, Maurice, Barker, & Grummer-Strawn, 2005), which in turn is associated with lower Neuroticism and higher Openness (Sutin, Stephan, & Terracciano, in press). Malnutrition, which is more common in offspring of parents with fewer years of education and fewer resources, is another potential mediator (Galler et al., 2013). And, households with lower levels of education and less income tend to experience more stress and adversity within the family (Conger & Donnellan, 2007). To the extent that stress and adversity are associated with increases in Neuroticism (Boals, Southard-Dobbs, & Blumenthal, 2014), growing up in such an environment may contribute to higher Neuroticism as an adult.

### Offspring Education and Personality

As a point of comparison to parental educational attainment, we also examined individual levels of education and personality traits. With the exception of Conscientiousness, the results paralleled those of parental educational attainment: Individuals with more years of education tended to be more open, extraverted, and emotionally stable, as well as more conscientious. The association between Openness and educational attainment has been well documented: Open individuals tend to achieve more years of education (Goldberg et al., 1998; Mortensen et al., 2014; O'Connell & Sheikh, 2011). Neuroticism has likewise had a fairly consistent, but more modest, association with educational attainment (Mortensen et al., 2014; O'Connell & Sheikh, 2011). The association between educational attainment and the other traits has been less straightforward. Although conscientious individuals get good grades in school (Nofle & Robins, 2007), the association between years of education and Conscientiousness tends to be more mixed and modest (Goldberg et al., 1998; Mortensen et al., 2014; O'Connell & Sheikh, 2011). The present research, using large samples with a total of more than 60,000 participants, however, suggests a consistent positive association between educational attainment and both Conscientiousness and Extraversion, although more modest than for Openness and Neuroticism. Agreeableness was unrelated to educational attainment.

These traits are associated with a number of factors that are known to contribute to success in school. Individuals high in Openness, for example, are highly motivated by intrinsic rewards, especially motivation to seek out intellectual stimulation and learn new things;

individuals high in Extraversion and Conscientiousness are also motivated by the value of education and the external rewards that come with doing well (Komarraju, Karau, & Schmeck, 2009). In addition to a strong will to achieve, individuals higher in Conscientiousness also have the persistence, organization, and discipline to achieve higher education. Individuals high in Neuroticism, in contrast, tend to lack motivation, which is a strong predictor of dropping out (Komarraju et al., 2009). While in school, individuals high in Neuroticism or low in Conscientiousness tend to procrastinate their assignments; these individuals tend to find their academic work aversive and are dependent on others to help get it done (Watson, 2001). In addition, individuals who are more vulnerable to negative emotions, disorganization, and who are less outgoing are more prone to experiencing both clinical and subclinical levels of depression (Kotov, Gamez, Schmidt, & Watson, 2010) that may interfere with their education. As such, the motivational, behavioral, and emotional patterns associated with personality traits may contribute to how far the individual goes in school. Such educational experiences may likewise strengthen the enduring patterns related to these traits.

### Education and Personality Development

The four samples with longitudinal data allowed us to examine whether education was also associated with personality development. The results generally mirrored the results of the primary analyses: Parents with more years of education had offspring who increased in their Openness, Extraversion, and emotional stability over the follow-up period. It is of note that these four samples were of middle-aged and older adults, aged up to 95 years old at baseline. This pattern indicates that there are long-term intergenerational associations with the trajectory of psychological functioning even at the end of the lifespan.

The present findings on the relation between parental education and change in personality in adulthood enrich the literature on factors that shape personality development later in life. Previous research has indicated that personality changes across adulthood (Roberts et al., 2000 2006), and there is interest in identifying factors associated with change. There have been many studies that have focused on how transitions in social roles (Neyer & Lehnart, 2007), experiencing stressful life events (Löckenhoff, Terracciano, Patriciu, Eaton, & Costa, 2009), and health status (Sutin, Zonderman, Ferrucci, & Terracciano, 2013) are associated with change in personality. Such studies typically assess factors proximal to the change; we extend this literature to a distal early life factor that has a long-term association with personality development, even in later life.

The individual's level of education was also associated with personality development in adulthood. Previous studies of educational attainment and personality development have focused primarily on how traits change as a function of attending college (Leikas & Salmela-Aro, 2015; Lüdtke et al., 2011). Although it is unclear whether going to college is associated with trait change over the transition from adolescence to adulthood (Leikas & Salmela-Aro, 2015; Lüdtke et al., 2011), the present findings more clearly show that higher educational attainment is associated with increases in Openness and Conscientiousness and declines in Neuroticism across middle and older adulthood.

Education may provide a personality reserve similar to the concept of cognitive reserve. Cognitive reserve refers to the ability of some individuals to maintain adequate cognitive functioning despite the presence of neuropathology in the brain (Stern, 2009). Education is thought to be one factor that contributes to cognitive reserve (Roe, Xiong, Miller, & Morris, 2007). In the context of personality, education may build emotional (e.g., coping; Frankenberg, Sikoki, Sumantri, Suriastini, & Thomas, 2013), behavioral (e.g., physical activity; Bauman et al., 2012), and cognitive (e.g., executive functioning; Albinet, Boucard, Bouquet, & Audiffren, 2012) reserves that bolster the individual's psychological functioning in older adulthood. That is, as individuals move through older adulthood, education may provide these reserves that help offset deficits that accrue with aging.

### Strengths, Limitations, and Future Directions

The present study has several strengths. First, we drew data from seven samples and meta-analytically combined the results. This approach allowed us to differentiate signal from noise and identify the most replicable associations. The overall pattern of results suggests that the relation between parental educational attainment and adult offspring personality is modest but lasting. Second, the seven samples together covered adolescence through older adulthood, spanned generations and time of measurement, and collectively were ethnically and geographically (within the US) diverse. This range revealed a potentially significant effect on the role of parental educational attainment in offspring Conscientiousness that may vary by age and/or cohort. Third, the information available in Add Health allowed us to test some alternative explanations for the association between parental educational attainment and offspring personality. Specifically, the associations were not due completely to genetics or family income. In addition, four of the samples had parental educational attainment reported by the parents themselves, so we did not rely solely on the child's report of their parents' years of education. The results were generally the same across samples with parent-reported education versus child-reported parent level of education. Finally, the intergenerational design practically eliminates the possibility of reverse causality (i.e., child personality is unlikely to cause parental educational attainment), although causal claims are unwarranted given the passive observational design of this research.

There are also some limitations that could be addressed in future research. First, all of the samples were drawn from the United States. The benefit of using samples from only one country is that all participants were exposed to the same educational system. Other countries, however, take a different approach to education, and the association between parental educational attainment and offspring personality may depend on the type of education the parent was exposed to. It would be of interest to test whether the present intergenerational findings replicate in other countries. Of interest, our findings with the individual's own education were similar to a study in 50 cultures ( $N=5,394$ ) that found that the individual level of education was associated with observer-rated Openness ( $r=.22$ ), Conscientiousness ( $r=.11$ ), Neuroticism ( $r=-.10$ ), and Extraversion ( $r=-.03$ ) (McCrae et al., 2005). Second, the multiple samples allowed us to determine the association between parental educational attainment and adult offspring personality and whether the effects were replicable, but we could not identify all of the mediating processes through which parental educational attainment leads to particular personality traits. Future work could examine

other mechanisms that contribute to these associations. Third, we did not have information on the parents' personality. Such information would be useful in disentangling the intergenerational relations between parental educational attainment and personality. In addition, our samples covered much of the lifespan but not early or middle childhood. Since personality development starts early in life, it would be worthwhile to examine how parental educational attainment is associated with the development of personality in childhood. Finally, although not a limitation, we note that the association between parent education and offspring personality is small. The consistent associations across independent samples indicate that the results are unlikely to be due to chance. Still, the results need to be interpreted in the context of the magnitude of the association. Given the complexity of adult personality, however, any individual factor that contributes to its development is likely to be small.

Despite these limitations, the present research suggests that parental characteristics are one early environmental correlate of adult personality. Parental educational attainment does not just have benefits for the individual; it also may have an intergenerational effect that helps promote more adaptive personality traits in offspring across the lifespan. Compared to the stability and trajectory of personality traits in adulthood, much less is known about their origin. Intergenerational approaches will help to identify other environmental factors that contribute to personality trait development across the lifespan.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

This research uses data from Add Health funded by grant P01-HD31921, with funding from 23 other federal agencies and foundations. Information about the Add Health data is available at <http://www.cpc.unc.edu/addhealth>. There was no direct support from P01-HD31921 for this analysis. The Wisconsin Longitudinal Study is supported by the National Institutes for Health, National Institute on Aging, with additional support from the Vilas Estate Trust, the National Science Foundation, the Spencer Foundation, and the Graduate School of the University of Wisconsin-Madison. WLS data are available here: <http://www.ssc.wisc.edu/wlsresearch/> The National Longitudinal Survey of Youth Children and Young Adult study is administered by the Bureau of Labor Statistics. More information about this study can be found here: <http://www.bls.gov/nls/> The Health and Retirement Study is sponsored by the National Institute on Aging (NIA-U01AG009740) and conducted by the University of Michigan. HRS data is publically available at <http://hrsonline.isr.umich.edu/>. The MIDUS I study (Midlife in the U.S.) was supported by the John D. and Catherine T. MacArthur Foundation Research Network on Successful Midlife Development. The MIDUS II research was supported by a grant from the National Institute on Aging (P01-AG020166) to conduct a longitudinal follow-up of the MIDUS I investigation. MIDUS data are publically available at <http://www.midus.wisc.edu/>. The authors received no direct financial support for this research.

## References

- Albinet CT, Boucard G, Bouquet CA, Audiffren M. Processing speed and executive functions in cognitive aging: how to disentangle their mutual relationship? *Brain and Cognition*. 2012; 79:1–11. DOI: 10.1016/j.bandc.2012.02.001 [PubMed: 22387275]
- Baldasaro RE, Shanahan MJ, Bauer DJ. Psychometric properties of the mini-IPIP in a large, nationally representative sample of young adults. *Journal of Personality Assessment*. 2013; 95:74–84. DOI: 10.1080/00223891.2012.700466 [PubMed: 22808913]



- Bariola E, Hughes EK, Gullone E. Relationships between parent and child emotion regulation strategy use: A brief report. *Journal of Child and Family Studies*. 2012; 21:443–448. DOI: 10.1007/s10826-011-9497-5
- Baum, S., Ma, J., Payea, K. Education pays 2013: The benefits of higher education for individuals and society. New York: NY: 2013. <http://trends.collegeboard.org/sites/default/files/education-pays-2013-full-report.pdf>
- Bauman AE, Reis RS, Sallis JF, Wells JC, Loos RJ, Martin BW, Group LPASW. Correlates of physical activity: Why are some people physically active and others not? *Lancet*. 2012; 380:258–271. DOI: 10.1016/S0140-6736(12)60735-1 [PubMed: 22818938]
- Berking M, Wirtz CM, Svaldi J, Hofmann SG. Emotion regulation predicts symptoms of depression over five years. *Behavior Research & Therapy*. 2014; 57:13–20. DOI: 10.1016/j.brat.2014.03.003
- Blair BL, Perry NB, O'Brien M, Calkins SD, Keane SP, Shanahan L. Identifying developmental cascades among differentiated dimensions of social competence and emotion regulation. *Developmental Psychology*. 2015; 51:1062–1073. DOI: 10.1037/a0039472
- Boals A, Southard-Dobbs S, Blumenthal H. Adverse Events in Emerging Adulthood Are Associated with Increases in Neuroticism. *Journal of Personality*. 2014; doi: 10.1111/jopy.12095
- Borenstein M, Hedges LV, Higgins JP, Rothstein HR. A basic introduction to fixed-effect and random-effects models for meta-analysis. *Research Synthesis Methods*. 2010; 1:97–111. DOI: 10.1002/jrsm.12 [PubMed: 26061376]
- Bouchard TJ Jr, Loehlin JC. Genes, evolution, and personality. *Behavioral Genetics*. 2001; 31:243–273. DOI: 10.1023/A:1012294324713
- Briley DA, Tucker-Drob EM. Genetic and environmental continuity in personality development: a meta-analysis. *Psychological Bulletin*. 2014; 140:1303–1331. DOI: 10.1037/a0037091 [PubMed: 24956122]
- Caspi A, Roberts BW, Shiner RL. Personality development: stability and change. *Annual Review of Psychology*. 2005; 56:453–484. DOI: 10.1146/annurev.psych.55.090902.141913
- Chandola T, Deary IJ, Blane D, Batty GD. Childhood IQ in relation to obesity and weight gain in adult life: the National Child Development (1958) Study. *International Journal of Obesity*. 2006; 30:1422–1432. DOI: 10.1038/sj.ijo.0803279 [PubMed: 16520812]
- Chapman BP, Hampson S, Clarkin J. Personality-informed interventions for healthy aging: conclusions from a National Institute on Aging work group. *Developmental Psychology*. 2014; 50:1426–1441. DOI: 10.1037/a0034135 [PubMed: 23978300]
- Conger R, Martin M, Masarik A. Dynamic associations among socioeconomic status (SES) parenting investments across time and generations. *Developmental Psychology*. in press.
- Conger RD, Donnellan MB. An interactionist perspective on the socioeconomic context of human development. *Annual Review of Psychology*. 2007; 58:175–199. DOI: 10.1146/annurev.psych.58.110405.085551
- Costa PT, Terracciano A, Uda M, Vacca L, Mamei C, Pilia G, ... McCrae RR. Personality traits in Sardinia: Testing founder population effects on trait means and variances. *Behavior Genetics*. 2007; 37:376–387. DOI: 10.1007/s10519-006-9103-6 [PubMed: 16972192]
- Damian RI, Su R, Shanahan M, Trautwein U, Roberts BW. Can personality traits and intelligence compensate for background disadvantage? Predicting status attainment in adulthood. *Journal of Personality and Social Psychology*. 2015; 109:473–489. DOI: 10.1037/pspp0000024 [PubMed: 25402679]
- Davis-Kean PE. The influence of parent education and family income on child achievement: the indirect role of parental expectations and the home environment. *Journal of Family Psychology*. 2005; 19:294–304. DOI: 10.1037/0893-3200.19.2.294 [PubMed: 15982107]
- de Moor MH, van den Berg SM, Verweij KJ, Krueger RF, Luciano M, Arias Vasquez A. ... Consortium, G. o. P. Meta-analysis of genome-wide association studies for neuroticism, and the polygenic association with major depressive disorder. *JAMA Psychiatry*. 2015; 72:642–650. DOI: 10.1001/jamapsychiatry.2015.0554 [PubMed: 25993607]
- Donnellan MB, Oswald FL, Baird BM, Lucas RE. The mini-IPIP scales: tiny-yet-effective measures of the Big Five factors of personality. *Psychological Assessment*. 2006; 18:192–203. DOI: 10.1037/1040-3590.18.2.192 [PubMed: 16768595]

- Eisenberg N, Duckworth AL, Spinrad TL, Valiente C. Conscientiousness: origins in childhood? *Developmental Psychology*. 2014; 50:1331–1349. DOI: 10.1037/a0030977 [PubMed: 23244405]
- Evans LD, Kouros CD, Samanez-Larkin S, Garber J. Concurrent and short-term prospective relations among neurocognitive functioning, coping, and depressive symptoms in youth. *Journal of Clinical Child and Adolescent Psychology*. 2016; 45:6–20. DOI: 10.1080/15374416.2014.982282 [PubMed: 25651455]
- Fagan P, Brook JS, Rubenstone E, Zhang C. Parental occupation, education, and smoking as predictors of offspring tobacco use in adulthood: a longitudinal study. *Addictive Behaviors*. 2005; 30:517–529. DOI: 10.1016/j.addbeh.2004.08.002 [PubMed: 15718068]
- Flensburg-Madsen T, Mortensen EL. Infant SES as a predictor of personality--is the association mediated by intelligence? *PLoS One*. 2014; 9:e103846.doi: 10.1371/journal.pone.0103846 [PubMed: 25078408]
- Frankenberg E, Sikoki B, Sumantri C, Suriastini W, Thomas D. Education, vulnerability, and resilience after a natural disaster. *Ecological and Society*. 2013; 18:16.doi: 10.5751/ES-05377-180216
- Furnham A, Cheng H. The social influences on trait conscientiousness: Findings from a nationally representative sample. *Personality and Individual Differences*. 2014; 69:92–97. DOI: 10.1016/j.paid.2014.05.017
- Galler JR, Bryce CP, Zichlin ML, Waber DP, Exner N, Fitzmaurice GM, Costa PT. Malnutrition in the first year of life and personality at age 40. *Journal of Child Psychology and Psychiatry*. 2013; 54:911–919. DOI: 10.1111/jcpp.12066 [PubMed: 23488644]
- Goldberg LR, Sweeney D, Merenda PF, Hughes JE. Demographic variables and personality: The effects of gender, age, education, and ethnic/racial status on self-descriptions of personality attributes. 1998; 24:393–403. DOI: 10.1016/S0191-8869(97)00110-4
- Goldin C. The human-capital century and American leadership: Virtues of the past. *The Journal of Economic History*. 2001; 61:263–292.
- Gosling SD, Rentfrow PJ, Swann WB. A very brief measure of the big-five personality domains. *Journal of Research in Personality*. 2003; 37:504–528. DOI: 10.1016/S0092-6566(03)00046-1
- Gottfredson LS, Deary IJ. Intelligence predicts health and longevity, but why? *Current Directions in Psychological Science*. 2004; 13:1–4. DOI: 10.1111/j.0963-7214.2004.01301001.x
- Gunzenhauser C, Fäsche A, Friedlmeier W, Suchodoletz. Face it or hide it: Parental socialization of reappraisal and response suppression. *Frontiers in Psychology Emotion Science*. 2014; 4doi: 10.3389/fpsyg.2013.00992
- Hanushek, EA., Wößmann, L. Education and economic growth. In: Peterson, P.Baker, E., McGaw, B., editors. *International Encyclopedia of Education*. Vol. 2. Oxford: Elsevier; 2010. p. 245-252.
- Hout M. Social and economic returns to college education in the United States. *Annual Review of Sociology*. 2012; 38:379–400. DOI: 10.1146/annurev.soc.012809.102503
- Huedo-Medina TB, Sánchez-Meca J, Marín-Martínez F, Botella J. Assessing heterogeneity in meta-analysis: Q statistic or I2 index? *Psychological Methods*. 2006; 11:193–206. DOI: 10.1037/1082-989X.11.2.193 [PubMed: 16784338]
- John, OP., Naumann, LP., Soto, CJ. Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In: John, OP.Robins, RW., Pervin, LA., editors. *Handbook of Personality: Theory and Reserach*. 3. New York: Guilford; 2008. p. 114-158.
- Jokela M, Batty GD, Nyberg ST, Virtanen M, Nabi H, Singh-Manoux A, Kivimäki M. Personality and all-cause mortality: individual-participant meta-analysis of 3,947 deaths in 76,150 adults. *American Journal of Epidemiology*. 2013; 178:667–675. DOI: 10.1093/aje/kwt170 [PubMed: 23911610]
- Jonassaint CR, Siegler IC, Barefoot JC, Edwards CL, Williams RB. Low life course socioeconomic status (SES) is associated with negative NEO PI-R personality patterns. *International Journal of Behavioral Medicine*. 2011; 18:13–21. DOI: 10.1007/s12529-009-9069-x [PubMed: 20012811]
- Josefsson K, Jokela M, Hintsanen M, Cloninger CR, Pulkki-Råback L, Merjonen P, ... Keltikangas-Järvinen L. Parental care-giving and home environment predicting offspring's temperament and character traits after 18 years. *Psychiatry Research*. 2013; 209:643–651. DOI: 10.1016/j.psychres.2013.01.007 [PubMed: 23380545]

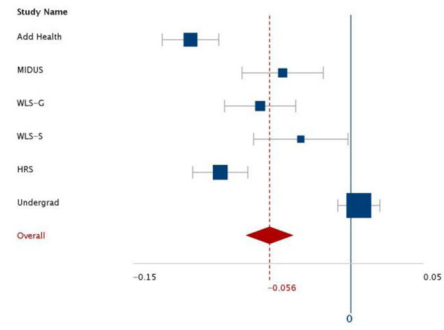
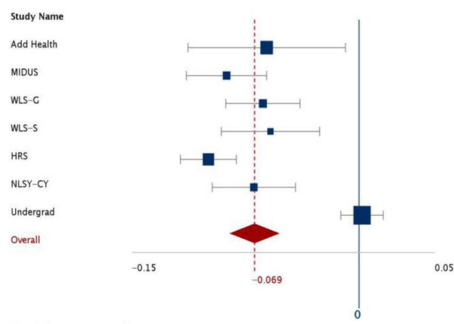
- Judge TA, Livingston BA, Hurst C. Do nice guys--and gals--really finish last? The joint effects of sex and agreeableness on income. *Journal of Personality and Social Psychology*. 2012; 102:390–407. DOI: 10.1037/a0026021 [PubMed: 22121889]
- Kahneman D, Krueger AB. Developments in the measurement of subjective well-being. *The Journal of Economic Perspectives*. 2006; 20:3–24. DOI: 10.1257/089533006776526030
- Komarraju M, Karau SJ, Schmeck RR. Role of the big five personality traits in predicting college students' academic motivation and achievement. *Learning and Individual Differences*. 2009; 19:47–52. DOI: 10.1016/j.lindif.2008.07.001
- Kotov R, Gamez W, Schmidt F, Watson D. Linking “Big” personality traits to anxiety, depressive, and substance use disorders: A meta-analysis. *Psychological Bulletin*. 2010; 136:768–821. <http://dx.doi.org/10.1037/a0020327>. [PubMed: 20804236]
- Lachman, ME., Weaver, SL. Unpublished Technical Report. Brandeis University; 1997. Midlife Development Inventory (MIDI) personality scales: Scale construction and scoring.
- Lager AC, Torssander J. Causal effect of education on mortality in a quasi-experiment on 1.2 million Swedes. *Proceedings of the National Academy of Sciences*. 2012; 109:8461–8466. DOI: 10.1073/pnas.1105839109
- Larson K, Russ SA, Nelson BB, Olson LM, Halfon N. Cognitive ability at kindergarten entry and socioeconomic status. *Pediatrics*. 2015; 135:e440–448. DOI: 10.1542/peds.2014-0434 [PubMed: 25601983]
- Leikas S, Salmela-Aro K. Personality trait changes among young Finns: the role of life events and transitions. *Journal of Personality*. 2015; 83:117–126. DOI: 10.1111/jopy.12088 [PubMed: 24444435]
- Lengua LJ. Growth in temperament and parenting as predictors of adjustment during children's transition to adolescence. *Developmental Psychology*. 2006; 42:819–832. DOI: 10.1037/0012-1649.42.5.819 [PubMed: 16953689]
- Li R, Darling N, Maurice E, Barker L, Grummer-Strawn LM. Breastfeeding rates in the United States by characteristics of the child, mother, or family: the 2002 National Immunization Survey. *Pediatrics*. 2005; 115:e31–37. DOI: 10.1542/peds.2004-0481 [PubMed: 15579667]
- Lochner, L. Nonproduction benefits of education: Crime, health, and good citizenship. In: Hanushek, E.Machin, S., Woessmann, L., editors. *Handbook of the Economics of Education*. Vol. 4. Amsterdam: Elsevier Science; 2011.
- Lucas RE, Donnellan MB. Personality development across the life span: longitudinal analyses with a national sample from Germany. *Journal of Personality and Social Psychology*. 2011; 101:847–861. DOI: 10.1037/a0024298 [PubMed: 21707197]
- Lundborg, P., Nillsson, A., Rooth, D. Parental education and offspring outcomes: Evidence from the Swedish compulsory schooling reform. Linnaeus University; 2013.
- Luo Y, Waite LJ. The impact of childhood and adult SES on physical, mental, and cognitive well-being in later life. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*. 2005; 60:S93–S101. DOI: 10.1093/geronb/60.2.S93
- Löckenhoff CE, Terracciano A, Patriciu NS, Eaton WW, Costa PT. Self-reported extremely adverse life events and longitudinal changes in five-factor model personality traits in an urban sample. *Journal of Traumatic Stress*. 2009; 22:53–59. DOI: 10.1002/jts.20385
- Lüdtke O, Roberts BW, Trautwein U, Nagy G. A random walk down university avenue: Life paths, life events, and personality trait change at the transition to university life. *Journal of Personality and Social Psychology*. 2011; 101:620–637. DOI: 10.1037/a0023743 [PubMed: 21744977]
- Mackenbach JP, Kulhánová I, Bopp M, Deboosere P, Eikemo TA, Hoffmann R. ... Consortium, E.-G.-S. Variations in the relation between education and cause-specific mortality in 19 European populations: a test of the “fundamental causes” theory of social inequalities in health. *Social Sciences and Medicine*. 2015; 127:51–62. DOI: 10.1016/j.socscimed.2014.05.021
- Matteson LK, McGue M, Iacono WG. Shared environmental influences on personality: a combined twin and adoption approach. *Behavioral Genetics*. 2013; 43:491–504. DOI: 10.1007/s10519-013-9616-8
- McCrae, RR., Costa, PT. *Personality in adulthood: A Five-Factor Theory perspective*. 2. New York: Guilford Press; 2003.

- McCrae RR. Universal features of personality traits from the observer's perspective: Data from 50 cultures. *Journal of Personality and Social Psychology*. 2005; 88:547–561. DOI: 10.1037/0022-3514.88.3.547 [PubMed: 15740445]
- McGue M, Rustichini A, Iacono WG. Cognitive, noncognitive, and family background contributions to college attainment: A behavioral genetic perspective. *Journal of Personality*. in press.
- Meyer S, Raikes HA, Virmani EA, Waters S, Thompson RA. Parent emotion representations and the socialization of emotion regulation in the family. *International Journal of Behavioral Development*. 2014; 38:164–173. DOI: 10.1177/0165025413519014
- Morris AS, Silk JS, Morris MD, Steinberg L, Aucoin KJ, Keyes AW. The influence of mother-child emotion regulation strategies on children's expression of anger and sadness. *Developmental Psychology*. 2011; 47:213–225. DOI: 10.1037/a0021021 [PubMed: 21244160]
- Mortensen EL, Flensburg-Madsen T, Molbo D, Christensen U, Osler M, Avlund K, Lund R. Personality in late midlife: associations with demographic factors and cognitive ability. *Journal of Aging and Health*. 2014; 26:21–36. DOI: 10.1177/0898264313519317 [PubMed: 24584258]
- Murdock KW, Oddi KB, Bridgett DJ. Cognitive correlates of personality: Links between executive functioning and the big five personality traits. *Journal of Individual Differences*. 2013; 34:97–104. DOI: 10.1027/1614-0001/a000104
- Neyer FJ, Lehnart J. Relationships matter in personality development: Evidence from an 8-year longitudinal study across young adulthood. *Journal of Personality*. 2007; 75:535–568. DOI: 10.1111/j.1467-6494.2007.00448.x [PubMed: 17489891]
- Noftle EE, Robins RW. Personality predictors of academic outcomes: Big Five correlates of GPA and SAT Scores. *Journal of Personality and Social Psychology*. 2007; 93:116–130. [PubMed: 17605593]
- O'Connell M, Sheikh H. 'Big Five' personality dimensions and social attainment: Evidence from beyond the campus. *Personality and Individual Differences*. 2011; 50:828–833. DOI: 10.1016/j.paid.2011.01.004
- Okbay A, Beauchamp JP, Fontana MA, Lee JJ, Pers TH, Rietveld CA, ... Benjamin DJ. Genome-wide association study identifies 74 loci associated with educational attainment. *Nature*. in press.
- Park AL, Fuhrer R, Quesnel-Vallée A. Parents' education and the risk of major depression in early adulthood. *Social Psychiatry and Psychiatric Epidemiology*. 2013; 48:1829–1839. DOI: 10.1007/s00127-013-0697-8 [PubMed: 23661148]
- Pew Research Cente.r. Modern parenting: Roles of moms and dads converge as they balance work and family. Washington, DC: 2013.
- Plomin R, DeFries JC, Knopik VS, Neiderhiser JM. Top 10 Replicated Findings From Behavioral Genetics. *Perspectives in Psychological Science*. 2016; 11:3–23. DOI: 10.1177/1745691615617439
- Polderman TJ, Benyamin B, de Leeuw CA, Sullivan PF, van Bochoven A, Visscher PM, Posthuma D. Meta-analysis of the heritability of human traits based on fifty years of twin studies. *Nature Genetics*. 2015; 47:702–709. DOI: 10.1038/ng.3285 [PubMed: 25985137]
- Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*. 2008; 40:879–891. DOI: 10.3758/BRM.40.3.879 [PubMed: 18697684]
- Quesnel-Vallée A, Taylor M. Socioeconomic pathways to depressive symptoms in adulthood: evidence from the National Longitudinal Survey of Youth 1979. *Social Science and Medicine*. 2012; 74:734–743. DOI: 10.1016/j.socscimed.2011.10.038 [PubMed: 22300713]
- Raudenbush, SW., Bryk, AS., Congdon, R. HLM (Version 6). Lincolnwood, IL: Scientific Software International; 2004.
- Raver CC, Blair C, Willoughby M. Poverty as a predictor of 4-year-olds' executive function: new perspectives on models of differential susceptibility. *Developmental Psychology*. 2013; 49:292–304. DOI: 10.1037/a0028343 [PubMed: 22563675]
- Roberts BW, DelVecchio WF. The rank-order consistency of personality traits from childhood to old age: A quantitative review of longitudinal studies. *Psychological Bulletin*. 2000; 126:3–25. DOI: 10.1037/0033-2909.126.1.3 [PubMed: 10668348]

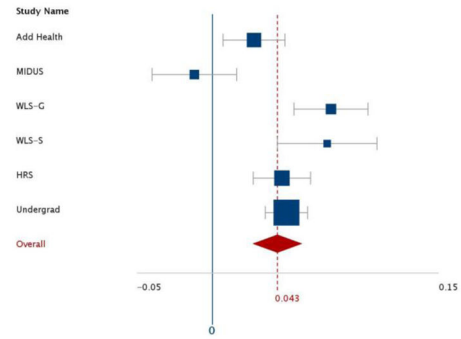
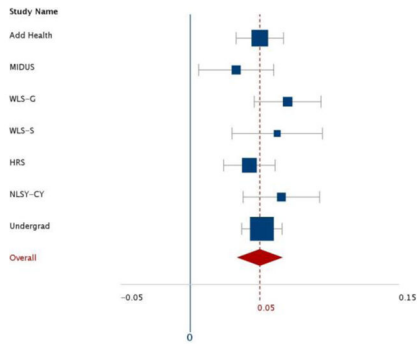
- Roberts BW, Walton KE, Viechtbauer W. Patterns of mean-level change in personality traits across the life course: a meta-analysis of longitudinal studies. *Psychological Bulletin*. 2006; 132:1–25. DOI: 10.1037/0033-2909.132.1.1 [PubMed: 16435954]
- Roe CM, Xiong C, Miller JP, Morris JC. Education and Alzheimer disease without dementia: support for the cognitive reserve hypothesis. *Neurology*. 2007; 68:223–228. DOI: 10.1212/01.wnl.0000251303.50459.8a [PubMed: 17224578]
- Sarsour K, Sheridan M, Jutte D, Nuru-Jeter A, Hinshaw S, Boyce WT. Family socioeconomic status and child executive functions: the roles of language, home environment, and single parenthood. *Journal of the International Neuropsychological Society*. 2011; 17:120–132. DOI: 10.1017/S1355617710001335 [PubMed: 21073770]
- Schaub M. Parenting for cognitive development from 1950 to 2000: The institutionalization of mass education and the social construction of parenting in the United States. *Sociology of Education*. 2010; 83:46–66. DOI: 10.1177/0038040709356566
- Schwartz JA. Socioeconomic status as a moderator of the genetic and shared environmental influence on verbal IQ: A multilevel behavioral genetic approach. *Intelligence*. 2015; 52:80–89. DOI: 10.1016/j.intell.2015.07.004
- Shanahan MJ, Hill PL, Roberts BW, Eccles J, Friedman HS. Conscientiousness, health, and aging: the life course of personality model. *Developmental Psychology*. 2014; 50:1407–1425. DOI: 10.1037/a0031130 [PubMed: 23244406]
- Specht J, Egloff B, Schmukle SC. Stability and change of personality across the life course: The impact of age and major life events on mean-level and rank-order stability of the big five. *Journal of Personality and Social Psychology*. 2011; 101:862–882. <http://dx.doi.org/10.1037/a0024950>. [PubMed: 21859226]
- Steinmayr R, Dinger FC, Spinath B. Parents' education and children's achievement: The role of personality. *European Journal of Personality*. 2010; 24:535–550. DOI: 10.1002/per.755
- Stephan Y, Sutin AR, Terracciano A. Physical activity and personality development across adulthood and old age: Evidence from two longitudinal studies. *Journal of Research in Personality*. 2014; 49:1–7. DOI: 10.1016/j.jrp.2013.12.003
- Stern Y. Cognitive reserve. *Neuropsychologia*. 2009; 47:2015–2028. DOI: 10.1016/j.neuropsychologia.2009.03.004 [PubMed: 19467352]
- Sutin AR, Stephan Y, Terracciano A. Perceived Discrimination and Personality Development in Adulthood. *Developmental Psychology*. 2016; 52:155–163. DOI: 10.1037/dev0000069 [PubMed: 26501729]
- Sutin AR, Stephan Y, Terracciano A. Breastfeeding and adult personality. *European Journal of Personality*. in press.
- Sutin AR, Terracciano A. Five factor model personality traits and the objective and subjective experience of body weight. *Journal of Personality*. in press.
- Sutin AR, Terracciano A, Milaneschi Y, An Y, Ferrucci L, Zonderman AB. The trajectory of depressive symptoms across the adult life span. *JAMA Psychiatry*. 2013; 70:803–811. DOI: 10.1001/jamapsychiatry.2013.193 [PubMed: 23760442]
- Sutin AR, Zonderman AB, Ferrucci L, Terracciano A. Personality Traits and Chronic Disease: Implications for Adult Personality Development. *Journals of Gerontology Series B: Psychology Sciences and Social Sciences*. 2013; doi: 10.1093/geronb/gbt036
- Terracciano A, McCrae RR, Brant LJ, Costa PT Jr. Hierarchical linear modeling analyses of the NEO-PI-R scales in the Baltimore Longitudinal Study of Aging. *Psychology and Aging*. 2005; 20:493–506. DOI: 10.1037/0882-7974.20.3.493 [PubMed: 16248708]
- Turiano NA, Pitzer L, Armour C, Karlamangla A, Ryff CD, Mroczek DK. Personality trait level and change as predictors of health outcomes: findings from a national study of Americans (MIDUS). *Journal of Gerontology Series B Psychological Sciences*. 2012; 67:4–12. DOI: 10.1093/geronb/gbr072
- van den Berg SM, de Moor MH, McGue M, Pettersson E, Terracciano A, Verweij KJ, ... Boomsma DI. Harmonization of Neuroticism and Extraversion phenotypes across inventories and cohorts in the Genetics of Personality Consortium: an application of Item Response Theory. *Behavioral Genetics*. 2014; 44:295–313. DOI: 10.1007/s10519-014-9654-x

- Watson DC. Procrastination and the five-factor model: A facet-level analysis. *Personality and Individual Differences*. 2001; 30:149–158. Procrastination and the five-factor model: A facet-level analysis.
- Wiltink J, Glaesmer H, Canterino M, Wölfling K, Knebel A, Kessler H, ... Beutel ME. Regulation of emotions in the community: Suppression and reappraisal strategies and its psychometric properties. *GMS Psycho-Social-Medicine*. 2011; 8doi: 10.3205/psm000078
- Xu Y, Beller AH, Roberts BW, Brown JR. Personality and young adult financial distress. *Journal of Economic Psychology*. 2015; 51:90–100. DOI: 10.1016/j.joep.2015.08.010
- Zax JS, Rees DI. IQ, academic performance, environment, and earnings. *The Review of Economics and Statistics*. 2002; 84:600–616. DOI: 10.1162/003465302760556440

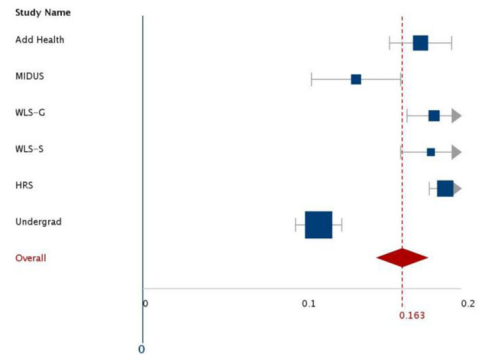
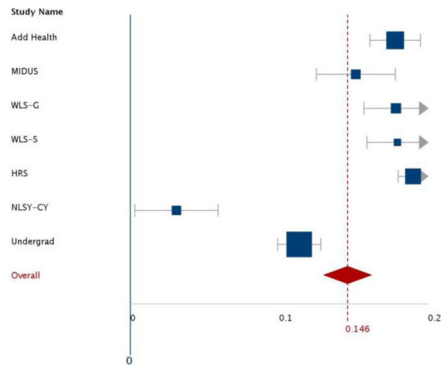
A. Neuroticism



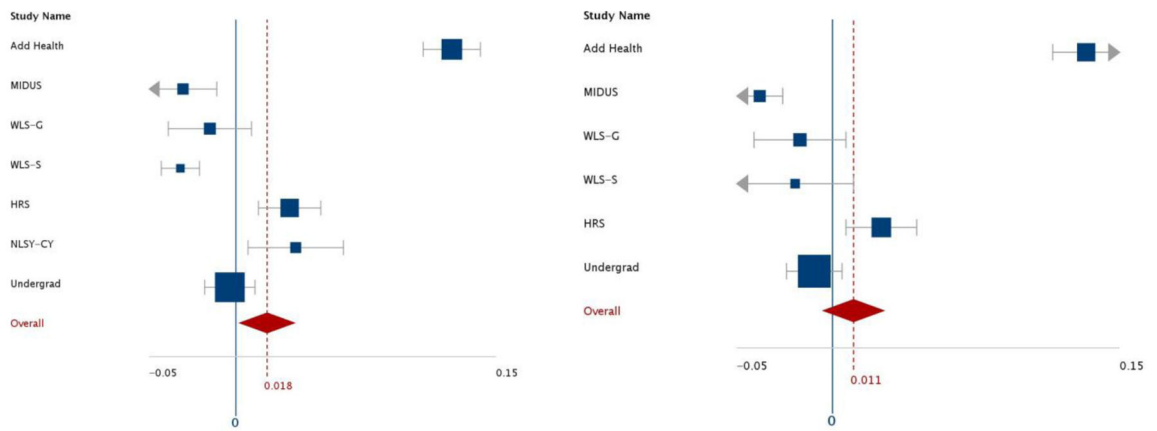
B. Extraversion



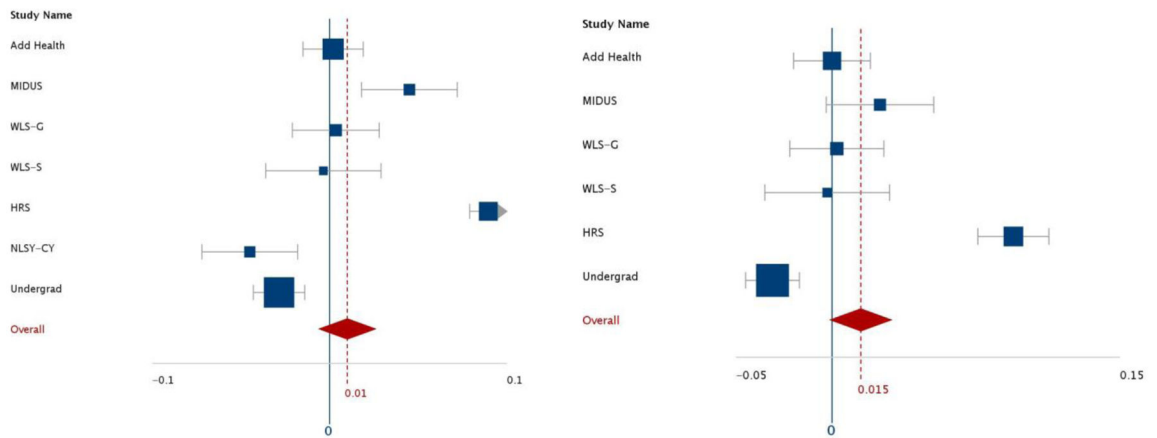
C. Openness



D. Agreeableness



E. Conscientiousness



**Figure 1.** Forest plot of the association between maternal (left) and paternal (right) educational attainment and (A) Neuroticism, (B) Extraversion, (C) Openness, (D) Agreeableness, and (E) Conscientiousness.



Table 1

## Descriptive Statistics for Each Sample

Participant	Add Health	MIDUS	WLS-G	WLS-S	HRS	NLSY-CY	Undergrad
Sex (female)	53%	52%	54%	54%	58%	50%	64%
Age (years)	29.00 (1.74)	46.55 (12.82)	53.21 (.63)	51.41 (7.37)	66.02 (8.88)	22.86 (4.85)	19.44 (2.19)
Race (white)	62%	90%	100%	100%	85%	46%	38%
Education	14.55 (2.24)	14.11 (2.54)	13.75 (2.32)	13.46 (2.43)	12.84 (2.98)	12.18 (2.28)	13.94 (1.08)
Year of birth	1979 (1.72)	1948 (12.78)	1939 (.49)	1940 (7.36)	1940 (8.84)	1986 (4.82)	1985 (2.86)
Parent Education							
Mother	13.46 (2.97)	11.51 (3.10)	10.70 (2.96)	10.77 (2.96)	9.87 (3.65)	12.97 (2.53)	14.74 (3.16)
Father	13.66 (3.17)	11.38 (3.84)	10.37 (3.17)	10.44 (3.21)	9.52 (4.01)	--	15.42 (3.44)
Sample <i>N</i>	13,534	6,036	6,408	3,623	12,027	5,582	20,835

Note. Add Health = National Longitudinal Study of Adolescent to Adult Health. MIDUS = Midlife in the United States. WLS-G = Wisconsin Longitudinal Study – Graduate Sample. WLS-S = Wisconsin Longitudinal Study – Sibling Sample. HRS = Health and Retirement Study. NLSY-CY = National Longitudinal Survey of Youth-Children and Young Adults. Undergrad = undergraduate sample.

**Table 2**  
Association Between Mother's and Father's Educational Attainment and Adult Offspring Personality Traits

	Mother Education			Father Education		
	$\beta$	95% CI	<i>p</i>	$\beta$	95% CI	<i>p</i>
<u>Neuroticism</u>						
Add Health	-.12	-.11, -.10	<.001	-.11	-.13, -.09	<.001
MIDUS	-.09	-.11, -.06	<.001	-.05	-.08, -.02	.001
WLS-G	-.06	-.09, -.04	<.001	-.06	-.09, -.04	<.001
WLS-S	-.06	-.09, -.03	<.001	-.03	-.07, -.00	.039
HRS	-.10	-.12, -.08	<.001	-.09	-.11, -.07	<.001
NLSY-CY	-.07	-.10, -.04	<.001	--	--	--
Undergrad	.00	-.01, .02	.773	.00	-.01, .02	.465
Meta-analysis	-.07	-.11, -.03	<.001	-.06	-.10, -.02	<.001
Heterogeneity						
Q	143.40	--	.000	117.75	--	<.001
I <sup>2</sup>	95.82	--	--	95.75	--	--
Total <i>N</i>	67,370			56,774		
<u>Extraversion</u>						
Add Health	.05	.03, .07	<.001	.03	.01, .05	.008
MIDUS	.03	.01, .06	.015	-.01	-.04, .02	.406
WLS-G	.07	.05, .09	<.001	.08	.05, .10	<.001
WLS-S	.06	.03, .10	<.001	.08	.04, .11	<.001
HRS	.04	.02, .06	<.001	.05	.03, .06	<.001
NLSY-CY	.07	.04, .09	<.001	--	--	--
Undergrad	.05	.04, .07	<.001	.05	.04, .06	<.001
Meta-analysis	.05	.04, .06	<.001	.04	.02, .06	<.001
Heterogeneity						
Q	6.74	--	.345	30.23	--	<.001
I <sup>2</sup>	11.00	--	--	83.46	--	--
Total <i>N</i>	67,436			56,840		
<u>Openness</u>						

	Mother Education			Father Education		
	$\beta$	95% CI	<i>p</i>	$\beta$	95% CI	<i>p</i>
Add Health	.18	.16, .20	<.001	.17	.16, .19	<.001
MIDUS	.15	.12, .18	<.001	.14	.11, .16	<.001
WLS-G	.18	.16, .21	<.001	.19	.17, .21	<.001
WLS-S	.19	.16, .22	<.001	.20	.16, .23	<.001
HRS	.20	.18, .22	<.001	.20	.18, .22	<.001
NLSY-CY	.03	.00, .06	.029	--	--	--
Undergrad	.11	.10, .13	<.001	.11	.10, .12	<.001
Meta-analysis	.15	.10, .19	<.001	.16	.13, .20	<.001
Heterogeneity						
Q	165.88	--	<.001	91.80	--	<.001
<i>I</i> <sup>2</sup>	96.38	--	--	94.55	--	--
Total <i>N</i>	67,304			56,740		
				<u>Agreeableness</u>		
Add Health	.12	.11, .14	<.001	.13	.12, .15	<.001
MIDUS	-.04	-.06, -.01	.006	-.05	-.08, -.03	<.001
WLS-G	-.02	-.04, .01	.229	-.02	-.04, .01	.169
WLS-S	-.01	-.04, -.02	.487	-.02	-.05, .01	.191
HRS	.03	.01, .05	.001	.03	.01, .04	.006
NLSY-CY	.03	.01, .06	.014	--	--	--
Undergrad	-.00	-.02, .01	.637	-.01	-.02, .00	.202
Meta-analysis	.02	-.03, .06	.439	.01	-.04, .06	.698
Heterogeneity						
Q	194.26	--	<.001	198.09	--	<.001
<i>I</i> <sup>2</sup>	96.91	--	--	97.48	--	--
Total <i>N</i>	67,432			56,840		
				<u>Conscientiousness</u>		
Add Health	.00	-.02, .02	.812	.00	-.02, .02	.992
MIDUS	.04	.02, .07	.001	.02	-.00, .05	.079
WLS-G	.00	-.02, .03	.774	.00	-.02, .03	.838
WLS-S	.00	-.04, .023	.830	.00	-.04, .03	.884

	Mother Education			Father Education		
	$\beta$	95% CI	<i>p</i>	$\beta$	95% CI	<i>p</i>
HRS	.10	.08, .12	<.001	.10	.08, .11	<.001
NLSY-CY	-.04	-.07, -.02	.001	--	--	--
Undergrad	-.03	-.04, -.01	<.001	-.03	-.04, -.02	<.001
Meta-analysis	.01	-.03, .05	.614	.02	-.03, .06	.480
Heterogeneity						
Q	139.16	--	<.001	112.84	--	<.001
I <sup>2</sup>	95.69	--	--	95.57	--	--
Total <i>N</i>	67,430			56,836		

*Note.* Coefficients are standardized beta coefficients controlling for age, sex, and race. CI=confidence interval. Add Health = National Longitudinal Study of Adolescent to Adult Health. MIDUS = Midlife in the United States. WLS-G = Wisconsin Longitudinal Study – Graduate Sample. WLS-S = Wisconsin Longitudinal Study – Sibling Sample. HRS = Health and Retirement Study. NLSY-CY = National Longitudinal Survey of Youth-Children and Young Adults. Undergrad = undergraduate sample.

**Table 3**

Association Between Offspring Educational Attainment and Adult Personality Traits

	$\beta$	95% CI	<i>p</i>
<u>Neuroticism</u>			
Add Health	-.19	-.21, -.18	<.001
MIDUS	-.11	-.13, -.08	<.001
WLS-G	-.10	-.12, -.07	<.001
WLS-S	-.10	-.13, -.07	<.001
HRS	-.16	-.17, -.14	<.001
NLSY-CY	-.11	-.14, -.08	<.001
Undergrad	-.01	-.03, .01	.269
Meta-analysis	-.11	-.17, .05	<.001
Heterogeneity			
Q	344.44	--	<.001
I <sup>2</sup>	98.26	--	--
Total <i>N</i>	67,458		
<u>Extraversion</u>			
Add Health	.06	.04, .08	<.001
MIDUS	-.01	-.03, .02	.566
WLS-G	.06	.04, .08	<.001
WLS-S	.04	.01, .07	.012
HRS	.08	.06, .09	<.001
NLSY-CY	.09	.06, .12	<.001
Undergrad	-.02	-.04, .000	.046
Meta-analysis	.04	.01, .07	.011
Heterogeneity			
Q	103.82	--	<.001
I <sup>2</sup>	94.22	--	--
Total <i>N</i>	67,307		
<u>Openness</u>			
Add Health	.24	.23, .26	<.001
MIDUS	.21	.19, .24	<.001
WLS-G	.34	.32, .37	<.001
WLS-S	.32	.29, .35	<.001
HRS	.28	.26, .30	<.001
NLSY-CY	.08	.05, .11	<.001
Undergrad	-.02	-.04, .00	.080
Meta-analysis	.20	.09, .31	<.001
Heterogeneity			
Q	1282.61	--	<.001
I <sup>2</sup>	99.53		
Total <i>N</i>	67,269		

	$\beta$	95% CI	<i>p</i>
<u>Agreeableness</u>			
Add Health	.20	.19, .22	<.001
MIDUS	-.06	-.09, -.04	<.001
WLS-G	-.01	-.03, .02	.557
WLS-S	.00	-.03, .03	.707
HRS	.06	.04, .08	<.001
NLSY-CY	.05	.02, .08	<.001
Undergrad	-.02	-.04, .00	.076
Meta-analysis	.04	-.04, .11	.346
Heterogeneity			
Q	532.57	--	<.001
I <sup>2</sup>	98.87	--	--
Total <i>N</i>	67,390		
<u>Conscientiousness</u>			
Add Health	.07	.06, .09	<.001
MIDUS	.11	.09, .14	<.001
WLS-G	.03	.01, .06	.014
WLS-S	.04	.01, .07	.018
HRS	.18	.16, .19	<.001
NLSY-CY	.09	.06, .12	<.001
Undergrad	.10	.09, .12	<.001
Meta-analysis	.08	.05, .12	<.001
Heterogeneity			
Q	131.10	--	<.001
I <sup>2</sup>	95.42	--	--
Total <i>N</i>	67,402		

*Note.* Coefficients are standardized beta coefficients controlling for age, sex, and race. CI=confidence interval. Add Health = National Longitudinal Study of Adolescent to Adult Health. MIDUS = Midlife in the United States. WLS-G = Wisconsin Longitudinal Study – Graduate Sample. WLS-S = Wisconsin Longitudinal Study – Sibling Sample. HRS = Health and Retirement Study. NLSY-CY = National Longitudinal Survey of Youth-Children and Young Adults. Undergrad = undergraduate sample.

**Table 4**  
Direct Effects of Parental Educational Attainment on Personality Traits and Indirect Effects Through Offspring Education

Sample	Mother Education						Father Education							
	c	p	c'	p	PE	95% CI	c	p	c'	p	PE	95% CI	p	
	<i>Neuroticism</i>													
Add Health	-.12	<.001	-.05	<.001	-.07	-.07, -.06	<.001	-.11	<.001	-.04	<.001	-.07	-.08, -.06	<.001
MIDUS	-.08	<.001	-.05	<.001	-.03	-.04, -.02	<.001	-.05	<.001	-.01	.341	-.04	-.05, -.03	<.001
WLS-G	-.06	<.001	-.04	.002	-.02	-.03, -.02	<.001	-.06	<.001	-.03	.010	-.03	-.04, -.02	<.001
WLS-S	-.06	<.001	-.03	.057	-.03	-.04, -.02	<.001	-.03	.040	.00	.844	-.03	-.04, -.02	<.001
HRS	-.10	<.001	-.03	.002	-.07	-.07, -.06	<.001	-.09	<.001	-.03	.013	-.06	-.07, -.05	<.001
Meta-analysis	-.09	<.001	-.04	<.001	-.04	-.06, -.02	<.001	-.07	<.001	-.03	.000	-.05	-.06, -.03	<.001
Heterogeneity														
Q	18.17	.001	2.95	.567	71.58	--	<.001	23.91	.000	4.70	.319	63.74	--	<.001
I <sup>2</sup>	77.99	--	.00	--	91.41	--	--	83.27	--	14.90	--	93.72	--	--
Total N	40,982						36,204							
	<i>Extraversion</i>													
Add Health	.05	<.001	.03	<.001	.02	.01, .02	<.001	.03	.008	.01	.420	.01	.01, .03	<.001
MIDUS	.03	.058	.03	.021	-.01	-.02, .00	.135	.00	.901	.00	.872	.00	-.02, .01	.481
WLS-G	.07	<.001	.06	<.001	.01	.00, .02	<.001	.08	<.001	.06	<.001	.02	.01, .02	<.001
WLS-S	.06	<.001	.05	.003	.01	-.00, .02	.155	.08	<.001	.07	<.001	.01	-.01, .02	.275
HRS	.04	<.001	.01	.488	.03	.02, .04	<.001	.04	<.001	.01	.248	.03	.02, .04	<.001
Meta-analysis	.05	<.001	.03	<.001	.01	.00, .02	.038	.04	.001	.03	.025	.01	.00, .02	.019
Heterogeneity														
Q	7.27	.122	12.08	.017	36.98	--	<.001	24.81	<.001	20.99	<.001	25.86	--	<.001
I <sup>2</sup>	44.60	--	66.88	--	89.18	--	--	83.88	--	80.94	--	84.53	--	--
Total N	41,049						36,269							
	<i>Openness</i>													
Add Health	.18	<.001	.10	<.001	.08	.07, .08	<.001	.17	<.001	.10	<.001	.07	.07, .08	<.001
MIDUS	.14	<.001	.08	<.001	.06	.05, .08	<.001	.14	<.001	.07	<.001	.07	.06, .09	<.001
WLS-G	.18	<.001	.09	<.001	.09	.08, .10	<.001	.19	<.001	.09	<.001	.10	.09, .11	<.001
WLS-S	.19	<.001	.11	<.001	.08	.07, .09	<.001	.19	<.001	.10	<.001	.09	.08, .11	<.001

Sample	Mother Education						Father Education							
	c	p	c'	p	PE	95% CI	p	c	p	c'	p	PE	95% CI	p
HRS	.20	<.001	.08	<.001	.12	.10, .13	<.001	.20	<.001	.09	<.001	.11	.10, .12	<.001
Meta-analysis	.18	<.001	.09	<.001	.09	.07, .11	<.001	.18	<.001	.08	<.001	.09	.08, .11	<.001
Heterogeneity														
Q	12.74	.013	6.01	.198	46.80	--	<.001	15.75	.003	4.84	.304	40.60	--	<.001
I <sup>2</sup>	68.61	--	33.48	--	91.45	--	--	74.60	17.36	--	--	90.15	--	--
Total N	40,932							36,170						

Note. Coefficients are point estimates from bootstrap mediation analysis. c is the direct effect of parent educational attainment on personality; c' is the direct effect controlling for mediator (i.e., offspring education). The point estimate is the indirect effect of parent educational attainment on personality through offspring education. PE=point estimate. CI=confidence interval. Add Health = National Longitudinal Study of Adolescent to Adult Health. MIDUS=Midlife in the United States. HRS=Health and Retirement Study. WLS-G = Wisconsin Longitudinal Study – Graduate Sample. WLS-S = Wisconsin Longitudinal Study – Sibling Sample.



**Table 5**  
 Direct Effects of Parental Educational Attainment on Personality Traits and Indirect Effects Through Adolescent IQ

Sample	Mother Education					Father Education						
	c	p	c'	p	PE	95% CI	p	c'	p	PE	95% CI	p
	<u>Neuroticism</u>											
Add Health	-.12	<.001	-.08	<.001	-.04	-.04, -.03	<.001	-.11	<.001	-.07	-.05, -.03	<.001
WLS-G	-.06	<.001	-.04	.001	-.02	-.03, -.01	<.001	-.06	<.001	-.04	-.03, -.01	<.001
WLS-S	-.06	.001	-.04	.026	-.02	-.03, -.01	<.001	-.03	.100	-.01	-.03, -.01	<.001
Meta-analysis	-.08	<.001	-.05	<.001	-.03	-.04, -.02	<.001	-.07	.002	-.04	-.04, -.02	<.001
Heterogeneity												
Q	14.26	.001	5.72	.057	17.56	--	<.001	17.54	<.001	9.64	.008	9.49
I <sup>2</sup>	85.98	--	65.05	--	88.74	--	--	88.60	--	79.26	--	78.93
Total N	22,300							18,850				--
	<u>Extraversion</u>											
Add Health	.05	<.001	.05	<.001	.00	-.01, .01	.850	.03	.006	.03	<.001	.00
WLS-G	.07	<.001	.07	<.001	.00	-.01, .01	.452	.08	<.001	.08	<.001	.00
WLS-S	.06	.001	.06	.001	.00	-.01, .01	.800	.08	<.001	.08	<.001	.00
Meta-analysis	.06	<.001	.06	<.001	.00	-.00, .00	.383	.06	.002	.06	<.001	.00
Heterogeneity												
Q	1.92	.382	2.41	.300	.16	--	.9123	12.42	.002	12.91	.002	.25
I <sup>2</sup>	.00	--	16.88	--	.00	--	--	83.89	--	84.51	--	.00
Total N	22,312							18,864				--
	<u>Openness</u>											
Add Health	.18	<.001	.10	<.001	.08	.07, .09	<.001	.17	<.001	.09	.07, .09	<.001
WLS-G	.18	<.001	.13	<.001	.05	.04, .06	<.001	.19	<.001	.14	.05, .06	<.001
WLS-S	.18	<.001	.13	<.001	.05	.04, .06	<.001	.18	<.001	.13	.04, .06	<.001
Meta-analysis	.18	<.001	.12	<.001	.06	.04, .08	<.001	.18	<.001	.12	.04, .08	<.001
Heterogeneity												
Q	.498	.780	8.89	.012	34.67	--	<.001	2.35	.309	11.20	.004	23.29
I <sup>2</sup>	.00	--	77.51	--	94.23	--	--	14.85	--	82.14	--	91.41
Total N	22,228							12,791				--

Note: Coefficients are point estimates from bootstrap mediation analysis.  $c$  is the direct effect of parent educational attainment on personality;  $c'$  is the direct effect controlling for mediator (i.e., IQ). The point estimate is the indirect effect of parent educational attainment on personality through IQ. PE=point estimate. CI=confidence interval. Add Health = National Longitudinal Study of Adolescent to Adult Health. WLS-G = Wisconsin Longitudinal Study – Graduate Sample. WLS-S = Wisconsin Longitudinal Study – Sibling Sample.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 6**  
Association between Family Income, Parent Education and Personality in Add Health

Model	Mother			Father		
	$\beta$	95% CI	<i>p</i>	$\beta$	95% CI	<i>p</i>
<u>Neuroticism</u>						
Model 1						
Family Income	-.09	-.11, -.07	<.001	-.09	-.11, -.07	<.001
Model 2						
Parent Education	-.11	-.11, -.01	<.001	-.11	-.13, -.09	<.001
Model 3a						
Family Income	-.06	-.08, -.04	<.001	-.05	-.08, -.03	<.001
Parent Education	-.08	-.10, -.06	<.001	-.08	-.11, -.06	<.001
<u>Extraversion</u>						
Model 1						
Family Income	.03	.01, .05	.001	.03	.01, .05	.001
Model 2						
Parent Education	.05	.03, .07	<.001	.03	.01, .05	.008
Model 3						
Family Income	.01	-.01, .03	.197	.03	.01, .06	.011
Parent Education	.04	.02, .06	<.001	.01	-.02, .03	.631
<u>Openness</u>						
Model 1						
Family Income	.11	.09, .13	<.001	.11	.09, .13	<.001
Model 2						
Parent Education	.18	.16, .20	<.001	.17	.16, .19	<.001
Model 3						
Family Income	.05	.03, .07	<.001	.05	.03, .08	<.001
Parent Education	.15	.14, .18	<.001	.15	.12, .17	<.001
<u>Agreeableness</u>						
Model 1						
Family Income	.09	.08, .11	<.001	.09	.08, .11	<.001

Model	Mother			Father		
	$\beta$	95% CI	<i>p</i>	$\beta$	95% CI	<i>p</i>
Model 2						
Parent Education	.12	.11, .14	<.001	.13	.12, .15	<.001
Model 3						
Family Income	.06	.04, .07	<.001	.05	.03, .08	<.001
Parent Education	.10	.08, .12	<.001	.11	.09, .13	<.001
				<u>Conscientiousness</u>		
Model 1						
Family Income	.02	.00, .04	.055	.02	.00, .04	.055
Model 2						
Parent Education	.00	-.02, .02	.812	.00	-.02, .02	.992
Model 3						
Family Income	.02	.00, .04	.038	.02	-.01, .05	.128
Parent Education	-.01	-.03, .01	.437	-.01	-.04, .01	.382

*Note.* Coefficients are standardized beta coefficients controlling for age, sex, and race. Model 1 included family income but not parent education. Model 2 included parent education but not family income. Model 3 included both family income and parent education. CI=confidence interval. Add Health = National Longitudinal Study of Adolescent to Adult Health.

Association Between Mother's and Father's Educational Attainment and Adult Offspring Personality Trait Development

Table 7

	Mother Education			Father Education		
	$\beta$	95% CI	<i>p</i>	$\beta$	95% CI	<i>P</i>
<u>Neuroticism</u>						
MIDUS	-.03	-.06, -.01	.015	-.04	-.06, -.01	.010
WLS-G	-.02	-.04, .00	.067	-.04	-.06, -.02	<.001
WLS-S	-.02	-.05, .01	.205	-.03	-.06, -.00	.035
HRS	-.04	-.06, -.02	<.001	-.05	-.06, -.03	<.001
Meta-analysis	-.04	-.05, -.02	<.001	-.05	-.06, -.03	<.001
Heterogeneity						
Q	3.06	--	.383	.92	--	.820
I <sup>2</sup>	1.79	--	--	.00	--	--
Total <i>N</i>	20,442			19,625		
<u>Extraversion</u>						
MIDUS	.00	-.02, .03	.745	.00	-.03, .02	.800
WLS-G	.02	-.00, .04	.069	.04	.02, .06	.000
WLS-S	.00	-.02, .03	.712	.01	-.01, .04	.269
HRS	.02	.00, .04	.012	.04	.02, .06	<.001
Meta-analysis	.02	.01, .03	.004	.03	.01, .06	.014
Heterogeneity						
Q	1.81	--	.613	9.29	--	.026
I <sup>2</sup>	.00	--	--	67.71	--	--
Total <i>N</i>	20,563			19,746		
<u>Openness</u>						
MIDUS	.02	.00, .05	.043	.02	-.00, .05	.074
WLS-G	.06	.04, .08	<.001	.08	.06, .10	<.001
WLS-S	.06	.04, .09	<.001	.07	.04, .10	<.001
HRS	.05	.04, .07	<.001	.06	.05, .08	<.001
Meta-analysis	.07	.05, .09	<.001	.08	.05, .11	<.001
Heterogeneity						

	Mother Education			Father Education		
	$\beta$	95% CI	<i>p</i>	$\beta$	95% CI	<i>P</i>
Q	6.34	--	.096	13.18	--	.004
I <sup>2</sup>	52.70	--	--	77.24	--	--
Total <i>N</i>	20,492			19,681		
	<u>Agreeableness</u>					
MIDUS	-.03	-.05, -.00	.043	-.04	-.07, -.01	.003
WLS-G	-.02	-.04, .00	.104	.00	-.02, .02	.927
WLS-S	-.03	-.06, .00	.054	-.02	-.05, .01	.174
HRS	.02	.00, .04	.029	.02	.01, .04	.007
Meta-analysis	-.02	-.05, .02	.337	-.01	-.04, .02	.632
Heterogeneity						
Q	14.27	--	.003	18.24	--	<.001
I <sup>2</sup>	78.97	--	--	83.55	--	--
Total <i>N</i>	20,500			19,686		
	<u>Conscientiousness</u>					
MIDUS	.00	-.02, .03	.734	-.01	-.04, .01	.327
WLS-G	-.02	-.04, .00	.125	.00	-.02, .02	.961
WLS-S	.00	-.03, .03	.855	.01	-.02, .04	.682
HRS	.04	.02, .06	<.001	.05	.04, .07	<.001
Meta-analysis	.01	-.03, .04	.633	.02	-.03, .06	.452
Heterogeneity						
Q	18.32	--	<.001	25.97	--	<.001
I <sup>2</sup>	83.62	--	--	88.45	--	--
Total <i>N</i>	20,557			19,744		

*Note.* Coefficients are standardized beta coefficients controlling for age, sex, race, and baseline personality. CI=confidence interval. MIDUS = Midlife in the United States. WLS-G = Wisconsin Longitudinal Study – Graduate Sample. WLS-S = Wisconsin Longitudinal Study – Sibling Sample. HRS = Health and Retirement Study.

**Table 8**

## Association Between Own Educational Attainment and Adult Personality Trait Development

Study	$\beta$	95% CI	p
<u>Neuroticism</u>			
MIDUS	-.04	-.06, -.02	.002
WLS-G	-.05	-.07, -.03	<.001
WLS-S	-.05	-.08, -.03	<.001
HRS	-.05	-.07, -.03	<.001
Meta-analysis	-.06	-.08, -.05	<.001
Heterogeneity			
Q	.90	--	.826
I <sup>2</sup>	0	--	--
Total N	21,029		
<u>Extraversion</u>			
MIDUS	-.01	-.03, .01	.435
WLS-G	.02	-.00, .04	.060
WLS-S	.03	.00, .05	.044
HRS	.03	.02, .05	<.001
Meta-analysis	.02	-.00, .05	.069
Heterogeneity			
Q	9.82	--	.020
I <sup>2</sup>	69.43	--	--
Total N	21,158		
<u>Openness</u>			
MIDUS	.07	.05, .10	<.001
WLS-G	.16	.14, .18	<.001
WLS-S	.13	.10, .16	<.001
HRS	.09	.08, .11	<.001
Meta-analysis	.15	.09, .20	<.001
Heterogeneity			
Q	43.46	--	<.001
I <sup>2</sup>	93.10	--	--
Total N	21,081		
<u>Agreeableness</u>			
MIDUS	-.04	-.07, -.02	<.001
WLS-G	-.01	-.03, .02	.523
WLS-S	.01	-.02, .04	.439
HRS	.04	.03, .06	<.001
Meta-analysis	.00	-.04, .05	.118
Heterogeneity			
Q	34.89	--	<.001
I <sup>2</sup>	91.40	--	--

Study	$\beta$	95% CI	p
Total <i>N</i>	21,089		
	<u>Conscientiousness</u>		
MIDUS	.02	-.01, .04	.202
WLS-G	.04	.01, .06	.002
WLS-S	.06	.03, .09	<.001
HRS	.08	.06, .09	<.001
Meta-analysis	.06	.02, .09	.002
Heterogeneity			
Q	20.24	--	<.001
I <sup>2</sup>	85.18	--	--
Total <i>N</i>	21,150		

*Note.* Coefficients are standardized beta coefficients controlling for age, sex, race, and baseline personality. CI=confidence interval. MIDUS = Midlife in the United States. WLS-G = Wisconsin Longitudinal Study – Graduate Sample. WLS-S = Wisconsin Longitudinal Study – Sibling Sample. HRS = Health and Retirement Survey.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript