

THE EFFECTS OF EDUCATIONAL EXPERIENCES ON PERSONALITY TRAIT DEVELOPMENT

BY

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DISSERTATION

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ABSTRACT

Recent research suggests that educational experiences lead to positive outcomes for reasons other than gains in cognitive abilities. Specifically, non-cognitive skills (i.e. personality traits) may change as a result of educational experiences (Heckman et al., 2010). To date, the idea that educational experiences contribute to changes in personality traits has received very little empirical support. The current study examines the relationship between educational experiences and personality trait development in a large German sample across four waves beginning in high school and throughout college. Findings suggest that personality traits in high school predict the type of educational experiences students have in college. Secondly, a number of educational experiences are associated with changes in personality traits. For example, going to class and spending more time on one's homework is associated with increases in conscientiousness while having fewer stressful experiences are associated with decreases in neuroticism. Similarly, changes in educational experiences are associated with changes in personality traits, suggesting a reciprocal relationship between educational experiences and personality traits. Finally, a series of auto-regressive and auto-regressive latent trajectory (ALT) models found evidence that educational experiences can lead to changes in personality traits and vice-versa. Overall, this study suggests that educational contexts are important for the development of personality traits. Viewed in this light, one learns more in school than just class material.

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TABLE OF CONTENTS

LIST OF TABLES.....	vi
LIST OF FIGURES.....	vii
CHAPTER 1: INTRODUCTION.....	1
1.1 How do Experiences Change Personality Traits?.....	3
1.2 Selection Effects in Educational Experiences.....	6
1.3 Educational Experiences and Personality Trait Change.....	9
1.4 Do Educational Experiences Cause Personality Change?.....	13
1.5 Current Study.....	17
CHAPTER 2: METHOD.....	20
2.1 Participants.....	20
2.2 Measures of Personality.....	22
2.3 Measures of Educational Experiences.....	23
2.4 Data Analytic Plan.....	25
CHAPTER 3: RESULTS.....	30
3.1 Preliminary Analysis.....	30
3.2 Change in Personality Traits.....	31
3.3 Educational Experiences During Young Adulthood.....	33
3.4 Do Personality Traits Predict Educational Experiences?.....	34
3.5 Are Educational Experiences Associated with Changes in Personality Traits?.....	36
3.6 The Joint Development of Educational Experiences and Personality Traits.....	40
3.7 High School Personality Traits Predict Changes in Educational Experiences.....	41
3.8 Correlated Change Between Educational Experiences and Personality Trait Change...41	
3.9 Do Educational Experiences Cause Changes in Personality Traits?.....	42

3.10 Auto-Regressive Cross-Lag Analyses.....	43
3.11 Auto-Regressive Latent Trajectory Models.....	44
CHAPTER 4: DISCUSSION.....	49
4.1 Personality Guides the Selection into Educational Experiences.....	49
4.2 Educational Experiences are Associated with Changes in Personality.....	51
4.3 Identifying Causal Experiences.....	54
4.4 Implications for Personality Trait Development.....	58
4.5 Limitations and Future Directions.....	61
4.6 Conclusion.....	64
TABLES AND FIGURES.....	66
REFERENCES.....	89
APPENDIX: MPlus Script for Auto-Regressive Latent Trajectory Models.....	104
VITA.....	107

LIST OF TABLES

Table 1. <i>Fit Indices for Measurement Invariance Tests for Big Five Personality Factors</i>	66
Table 2. <i>Descriptive Statistics for Personality Traits Across 4-Waves</i>	67
Table 3. <i>Univariate Latent Growth Model for Personality</i>	67
Table 4. <i>Correlations between Measures of School Satisfaction</i>	68
Table 5. <i>Correlations between Measures of Academic Performance</i>	68
Table 6. <i>Correlations between Measures of School Stressors and Setbacks</i>	69
Table 7. <i>Correlations between Peers and Teacher Relations</i>	69
Table 8. <i>Correlations between Study Habit Measures</i>	70
Table 9. <i>Selection Effects of Personality and Educational Experiences</i>	71
Table 10. <i>Socialization Effects for personality and educational experiences</i>	72
Table 11. <i>Latent Growth Models for Educational Experiences</i>	73
Table 12. <i>Dual Process Growth Models</i>	74
Table 13. <i>Cross-lag Analysis for Personality and Educational Experiences</i>	75

LIST OF FIGURES

Figure 1. <i>Sociogenomic Model of Personality Traits</i>	76
Figure 2. <i>Second Order Latent Growth Model</i>	77
Figure 3. <i>Auto-Regressive Cross Lag-Model</i>	78
Figure 4. <i>Auto-Regressive Latent Trajectory (ALT) Model</i>	79
Figure 5. <i>90% Confidence Interval for Personality Trait Change</i>	80
Figure 6. <i>Changes in Conscientiousness at Different Levels of School Satisfaction</i>	81
Figure 7. <i>Changes in Neuroticism at Different Levels of Stress During College</i>	82
Figure 8. <i>Changes in Extraversion as a Function of Dropping Out of College</i>	83
Figure 9. <i>Changes in Conscientiousness at Different Levels of Procrastination</i>	84
Figure 10. <i>Changes in Openness at Different Levels of Cultural Activities</i>	85
Figure 11. <i>ALT Model for Conscientiousness and School Satisfaction</i>	86
Figure 12. <i>ALT Model for Neuroticism and School Satisfaction</i>	87
Figure 13. <i>ALT Model for Openness and Cultural Activities</i>	88

CHAPTER 1

INTRODUCTION

Education is one of the most critical determinants of success for both individuals and society. Individuals who are highly educated earn more, are healthier, and are more likely to contribute to civic organizations, whereas individuals with lower amounts of education are more likely to commit crimes, suffer unemployment, default on loans, and be incarcerated (Lochner & Moretti, 2004; Sewell & Hauser, 1975). As such, education is associated with economic growth and progress and is considered one of the main sources of prosperity for both individuals and nations (Goldin & Katz 2008; Marshall & Tucker, 1993).

The benefits from education are thought to be attributable to gains in knowledge and skills. Borrowing from the economic literature, these skills are used in the labor market and life to garner better and higher paying occupations, stability in one's life, and access to health care (Heckman, 2007). Education, traditionally, is thought to lead to the accrual of information that can be applied to problems, while also contributing to independent thinking. In psychological terms, educational experiences are thought to impact cognitive skills, such as critical reasoning and crystallized intelligence (Rutter, 1983). The focus on cognitive abilities can be seen in the evaluation of the current American school system. Success for both individuals and institutions is judged by achievement tests that assess knowledge of facts and the ability to think critically.

One idea that has not been given much attention is that schooling experiences also change non-cognitive factors, such as personality traits (Heckman, 2007). Recent findings from the Perry Preschool Project provide an example of this possibility (Heckman, Malofeeva, Pinto & Savelyev, 2010). The Perry Preschool Project intervention program was intended to promote cognitive skill development in at-risk children. While the intervention had little long-

term effect on academic or cognitive skills, intervention participants outperformed non-participants on a number of important life outcomes, such as employment and low criminal behavior – suggesting that the benefits of the Perry Preschool Project were associated with personality factors, rather than cognitive abilities. Thus, psychological factors other than cognitive ability, such as personality traits, are potentially influenced by experiences within an educational context.

It is surprising that the effect of educational experiences on personality development has not received more attention. In terms of sheer time and resources, education can be considered one of the longest and most intense efforts created by societies to change psychological functioning. Moreover, since the educational system is in place to provide skills and abilities to navigate the world, school experiences should influence the development of personality. In fact, one of the main emphases of education during the middle of the 19th century was the development of “character” and a “mature personality” (DeRaad & Schouwenburg, 1996).

The present study investigates the effect of educational experiences on personality traits. Personality traits are defined as neurophysiological structures, underlying relatively enduring patterns of thoughts, feelings, and behaviors that represent a readiness to respond in particular ways to specific environmental cues (Roberts & Jackson, 2008; Tellegen, 1991). By now, it is well established that personality traits are not set in stone but are prone to change throughout the lifespan (Baltes, 1997; Roberts, Wood & Caspi, 2009). Late adolescence and early adulthood is the time when personality traits tend to change the most. Specifically, individuals tend to increase in the personality traits of social dominance (a facet of extraversion), conscientiousness, agreeableness, emotional stability, and openness (Donnellan et al., 2007; Roberts et al., 2006; Robins et al., 2001). The most salient environment during

this time period, the educational environment, is thus likely to contribute to these changes in personality. The present study sought to identify what specific educational experiences were related to personality trait change during late adolescence and early adulthood.

The research described here will rely on a longitudinal data set from Germany and will focus on two goals at the interface of personality and educational experiences. First, the present study will examine the predictive relationship between personality assessed in high school and a number of educational experiences. Personality traits are thought to guide individuals into specific experiences through a variety of selection processes. These selection processes, however, may bias estimates of personality trait change because not everyone will encounter the same experience. Accordingly, it is necessary to examine and account for these selection biases to examine changes in personality traits.

Second, the present study will test the associations between a wide array of educational experiences and personality changes that occur during the transition into and throughout the university experience. Furthermore, this study will employ advanced longitudinal models that permit the combination of latent growth models with autoregressive structures that better examine the influence of educational environments on personality development. This allows for a stronger test of the hypothesis that educational experiences can lead to or promote changes in personality traits, by examining the direction of relationship between changes in educational and changes in personality traits.

1.1 How do Experiences Change Personality Traits?

Changes in personality traits are thought to involve transactional processes, where certain experiences have the power to affect changes in personality traits (Fraleigh, & Roberts, 2005). A prevailing difficulty, however, is identifying what types of experiences are important and how these experiences are able to change personality traits. A recently proposed model of

personality trait change, the sociogenomic model of personality traits (Roberts, 2009; Roberts & Jackson, 2008), describes the type of experiences that may change personality traits. The sociogenomic model differs from past models of personality traits by focusing on the state-level manifestations of personality traits (see Figure 1). Traits are manifested through stable, enduring patterns of states (thoughts, feelings, and behaviors) and are responsible for future states (Path A in Figure 1). Of course, traits are not the only cause of our state-level behaviors, thoughts, and feelings. These states may be partly due to the specific situation or experience that a person is embedded in (Path B), such as an extraverted person not talking as much because they are in class. As a result, the focus on states due to both traits and experiences provides a straightforward explanation for variability in behavior (Roberts, 2009).

Importantly, such variability in states does not invalidate the existence of a trait because the experiences do not directly influence personality traits. Instead, experiences can affect personality traits only indirectly, mediated through personality states (Paths A & B). Specifically, experiences can only affect personality traits if changes in state-level manifestations exist for a prolonged period of time (Roberts & Jackson, 2008). Trait change is thus thought to occur by relatively consistent experiences that lead to lasting changes in the way one behaves, thinks, or feels. If these shifts in states are prolonged, changes in the neurophysiology of personality traits may occur through a bottom-up fashion. That is, by observing one perform behaviors different than normal, these behaviors become internalized and may lead to changes in personality traits (Kohn & Schooler, 1978). Moreover, long-term shifts in states may not even occur consciously. For example, being around industrious colleagues may act as a contagion, where your productivity increases due to one's desire to fit in and not stand out. An example of this type of change process due to persistent states is found in the effects of stress and the neurophysiological structures associated with memory.

Interestingly, continued stressful experiences over time lead to changes in the actual structure of the hippocampus and the amygdala, which results in changes in memory processes (Lupien, McEwen, Gunnar & Heim, 2009; Roozendaal, McEwen & Chattarji 2009).

In contrast to prevailing views about changes in personality traits, the sociogenomic model suggests that life transitions or life events are not the main catalysts of change. Much like one stressful experience would not change memory processes, a single or short term event likely will not lead to changes in personality traits. As such, the sociogenomic model is able to integrate findings from longitudinal studies that demonstrate changes in personality traits occur in a relatively slow manner over long periods of time (Roberts & Jackson, 2008) and that a major life transitions, such as leaving home to go to college, does not drastically shape one's personality (Caspi & Moffitt, 1993). Thus, in terms of educational experiences, it is unlikely that a single experience say, being bullied once or going to a specific party, would greatly shape personality trait development. Instead, the model suggests that long-standing changes in trait-related states should lead to changes in the trait. That is, having sustained thoughts feelings and behaviors associated with the trait over a long period of time, and likely at levels that are greater than your latent trait level, will lead to changes in personality traits.

An important relationship exists between experiences and traits, however, where individuals with certain traits are more likely to enter into particular experiences. These experiences, because they are related to the trait can, in turn, lead to greater trait-related thoughts, feelings and behaviors. This third path is identified as Path C in Figure 1 and suggests that not all people are likely to end up in the same experience. As a consequence these experiences lead to prolonged changes in states; states that are related to the personality traits because the personality trait was partially responsible for bringing someone

to the experience in the first place. Overtime, these prolonged changes in states may eventually lead to changes in personality traits.

The sociogenomic model suggests two important characteristics of personality trait change that will guide the current study's examination of educational experiences and personality trait change. First, this model suggests a reciprocal path where personality traits predict experiences and that these experiences are the ones most likely to lead to changes in personality traits (Roberts, Wood & Caspi, 2008). Secondly, the model suggests that the important experiences for personality trait development are closely aligned to trait-related states. That is, experiences that change one's behaviors, thoughts and feelings overtime are the most likely experiences to change personality traits. As such, a focus on the typical behaviors and emotional experiences that students have will be stressed, as well as broader experiences that likely reflect changes in these state-level variables.

1.2 Selection Effects in Educational Experiences

Individuals often seek out, create, evoke, respond to, or are selected into experiences that are compatible and correlated with their personality (Caspi & Bem, 1990; Roberts, 2007; Scarr & McCartney, 1983; Snyders & Ickes, 1985). This pattern, generally referred to as selection effects, is consistent with a life-course perspective that suggests early emerging personality traits influence the experiences that people encounter in adolescence and young adulthood (Baltes, 1997). Niche-building processes such as these are thought to exist for a broad range of personality traits and experiences. For example, highly conscientious people are more likely to prefer conventional jobs, and individuals higher in extraversion prefer, and obtain, more social jobs (Ackerman & Heggstad, 1997; Gottfredson et al., 1993).

Selection effects for personality traits are quite pervasive, spanning many different educational contexts and continuing to exist even after controlling for other important

psychological factors. Conscientiousness is the Big Five trait most closely associated with achievement experiences. Specifically, childhood levels of conscientiousness are associated with academic achievement across educational levels both concurrently and prospectively (Abe, 2005; Bratko et al., 2006; Hair & Graziano, 2003; Heaven et al., 2002; Laidra et al., 2007; Shiner, 2000; Shiner, 2003). For example, conscientiousness assessed at age 10 by parental reports is associated with academic performance both concurrently and prospectively 10 years later (Shiner, 2000). Additionally, conscientiousness is associated with SAT scores and college grades (Nofle & Robins, 2007; Poropat, 2009; Wagerman & Funder, 2007).

The remaining Big Five traits are also associated with academic achievement in adolescence and young adulthood (Barbarelli et al., 2003; Furnham, & Chamorro-Premuzic, 2004; Hair & Graziano, 2003; Graziano et al., 1997; Lounsberry et al., 2003; O'Conner & Paunonen, 2007; Shiner, 2000; Wagerman & Funder, 2007), though not always. A recent meta-analysis indicates that high levels of conscientiousness, agreeableness, and openness are positively associated with academic achievement (Poropat, 2009). In contrast, emotional stability and extraversion demonstrate more complex relationships, such that extraversion appears to be positively associated with better performance in elementary school but decreased levels of performance during college. Similarly, emotional stability is helpful early on but is not predictive of achievement during college (Poropat, 2009).

The effect of personality on academic performance is likely mediated by specific school experiences that help promote better academic performance (DeRaad & Shouwenburg, 1986). For example, conscientiousness predicts early completion of assignments, better attendance and study habits, and better teamwork skills that, in turn are associated with higher grades (Biderman et al., 2008; Conard, 2006; Crede & Kuncel, 2008; Chamorro-Premuzic & Furnham, 2003; Dollinger & Orf, 1991; Johnson & Bloom, 1995; Lay et al., 1998; Robbins, Allen, Casillas,

Peterson, & Le, 2006; Nofle & Robins, 2007). Agreeableness is also associated with these academic experiences such that individuals higher in agreeableness are more likely to attend class and spend more time studying (Lounsberry et al., 2003; Lubbers et al., 2010).

Additionally, agreeableness is associated with following teacher instructions and staying focused on learning tasks (Vermetten, Lodewijks, & Vermunt, 2001). Studying harder and attending to instructions are, in turn, associated with better achievement (Crede & Kuncel, 2008; Chamorro-Premuzic & Furnham, 2003; 2008; Diseth, 2003). These studies suggest that personality is related to better grades and performance through greater involvement in the school process, as well as performing behaviors in accordance with teacher expectations.

In addition to achievement-related experiences, experiences within interpersonal relationships are also associated with personality traits. For example, people with high levels of agreeableness tend to have better interpersonal relations with peers and teachers (Jensen-Campbell, 2002; Vermetten et al., 2001), which lead to fewer behavioral problems in school (Cooper et al., 2003; Markey et al., 2005). Similar to agreeableness, extraversion is also associated with interpersonal experiences. Extraverts tend to have larger peer groups and are more accepted by their peers (Jensen-Campbell et al., 2002), which lead them to have lower levels of peer victimization (Malcolm et al., 2006) and less overall interpersonal conflict (Jensen-Campbell & Graziano, 2001). In contrast to these predominantly positive effects, high levels of extraversion may also lead to negative outcomes. For example, extraversion is associated with difficulties paying attention in class (Graziano, Jensen-Campbell, Todd, & Finch, 1997; Jensen-Campbell et al., 2002) and more behavioral problems (Chen et al., 2002).

Individuals higher in neuroticism are less able to cope with difficulties that arise in the school (Shiner, 2006) and have a greater likelihood of getting along with teachers (Lounsbury et al., 2003). Neuroticism also tends to be associated with greater exam-related and school-

related stress (Moutafi, Furnham, & Tsaousis, 2006; Murberg & Bru, 2006). However, low levels of neuroticism are not always positive. Individuals low on neuroticism tend to study less and procrastinate more than people high in neuroticism (Lubbers et al., 2010). Overall, it appears that low levels of neuroticism safeguard against school stressors, but low levels of neuroticism might also lead to neglecting responsibilities.

The studies reviewed above leave little doubt that personality traits reflect a niche-building process wherein people tend to select into, create, evoke, and respond to experiences that are associated with their personality. These selection effects are found to exist across the Big Five personality traits and predict a variety of educational experiences. However, a number of important educational experiences have yet to be investigated. Currently, it is not clear if personality traits play a role in the decision to switch majors, drop out of college, or the balance of time spent between academic, extra-curricular, and job-related activities. Moreover, most of these reported selection effects reviewed above are cross-sectional rather than prospective. As such, the first goal of this study will examine prospective selection effects of personality across a number of educational experiences. Specifically, does personality assessed in high school lead to specific educational experiences in college? Moreover, selection effects are especially important to assess because they provide clues as to what experiences are likely to result in trait related thoughts, feelings and behaviors, which can lead to changes in personality traits (Roberts & Jackson, 2008).

1.3 Educational Experiences and Personality Trait Change

In no other period of the lifespan do greater changes in personality traits occur than during late adolescence and young adulthood (Roberts, Walton, & Viechtbauer, 2006). During the college period, young adults become more dominant (a facet of extraversion), more conscientious, and more emotionally stable (Roberts, Walton, & Viechtenbauer, 2006). There

is also evidence that agreeableness, social vitality (also a facet of extraversion), and openness to experience increase during young adulthood (Donnellan et al., 2007; Robins et al., 2001; Srivastava, John, Gosling, & Potter, 2003; Vaidya et al., 2008).

However, not everyone undergoes changes in personality traits during this time period. The general trends for personality trait change come about because a disproportionate number of individuals change in the direction found in the overall pattern of mean-level change (Roberts & Mroczek, 2008). The existence of a large number of individuals that do not undergo personality trait change opens up that possibility that changes in personality traits may result from having life experiences that pull for changes in personality (Roberts, Wood, & Caspi, 2009). If a large number of people go through an experience that change personality traits, then normative mean level changes will occur. Similarly, not having the experiences will also lead to individual differences in personality trait change compared to people that do have those experiences. This pattern of normative and individual differences in personality trait change invites the question of what experiences are associated with personality trait change in young adulthood.

Presumably, life experiences impart some change in the personalities of individuals living through those experiences—a process typically described as socialization. Past research suggests that socialization and selection effects are intimately related. There is a strong overlap between the experiences selected through personality traits and the changes that result from those same experiences (Neyer & Lehnart, 2007; Roberts et al., 2003; Robins et al., 2005). That is, life experiences do not impinge themselves on people in a random fashion causing widespread transformation. Rather, selection effects set in motion socialization effects, wherein the personality traits that people already possess are deepened and elaborated by trait-correlated experiences (See Figure 1). This pattern is described as the

corresponsive principle and has been proposed as the most probable type of personality change that occurs over the life course (Roberts, Wood, & Caspi, 2008). Specifically, experiences that are in line with one's dispositions (selection) will be viewed as validating and rewarding, thus resulting in changes in the traits (socialization) that brought the person to the experience in the first place. For example, individuals who behave counterproductively in their jobs are low in conscientiousness. In turn, engagement in these counterproductive behaviors is associated with changes in conscientiousness such that people become less conscientious over time when performing these behaviors (Roberts et al., 2006).

A number of studies have attempted to link life experiences with changes in personality traits (Allemand, Gomez & Jackson, 2010; Costa, Herbst, McCrae, & Siegler, 2001; Löckenhoff, Terracciano, Patriciu, Eaton, & Costa, 2009; Magnus, Diener, Fujita, & Pavot, 1993; Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Lüdtke et al., 2011; Roberts et al., 2003; Vaidya, Gray, Haig, & Watson, 2002). For example, being fired from a job is associated with increases in neuroticism (Costa et al., 2001), whereas positive work experiences are associated with decreases in neuroticism (Roberts & Chapman, 2000; Scollon & Diener, 2006). However, these studies predominantly focused on life events associated with work and marriage. The relation between educational experiences and personality trait change has not received similar attention.

Specifically, only a handful of studies have examined the relationship between *educational* experiences and personality trait change. These studies offer a starting point for identifying educational experiences that may play a role in personality trait change. For example, one study found that college students who received higher grades were initially higher in conscientiousness in a longitudinal study across four years of college (Robins et al., 2005). In turn, students who achieved higher grades increased more in conscientiousness

between their freshman and senior years (Robins et al., 2005). Presumably, individuals were rewarded for their behavior, and this led to further deepening of the characteristics first responsible for the grades. Interestingly, the subjective responses people had about their grades were also related to changes in personality. Feeling good about one's grades was related to increases in extraversion, agreeableness, conscientiousness, and emotional stability.

Changes in perceptions of the university from freshman to senior year were also related to changes in personality. Individuals who had a more positive view of the university increased in agreeableness and emotional stability (Robins et al., 2005). In contrast, if students' interactions with the university environment worsened over time, this was associated with decreases in emotional stability and extraversion (Robins et al., 2005). Other variables not directly related to academic achievement were also associated with changes in personality. For example, individuals who went to the doctor more often during college were more likely to decrease in extraversion and emotional stability. Similarly, students who had good friends and were popular tended to increase in extraversion. Also, higher overall levels of well-being were associated with increases in extraversion, agreeableness, conscientiousness, emotional stability, and openness. Increases in well-being over time were, in turn, also associated with increases in these traits. This suggests, albeit indirectly, that being happy with one's educational role, which likely relates to personality at baseline, is associated with further positive personality trait change—in a cyclical fashion.

A second study that examined the relationship between educational experiences and personality trait change used the same sample used in the current study (Ludtke, Roberts, Trautwein, & Nagy, 2011). In this study, a broad list of life experiences were examined, which also included a few experiences related to education. A number of specific life experiences, such as taking a trip abroad, starting or breaking off a relationship, and changes in one's social

circle, were associated with changes in personality. In terms of educational experiences, failing an important academic exam was associated with increases in neuroticism.

These initial studies suggest that grades, performance on exams, and satisfaction with one's university are all associated with changes in personality traits. Given that these initial studies only identify a small number of salient educational experiences, the current study will examine a number of additional experiences associated with personality traits change. Specifically, the experiences that are subject to selection effects are especially likely to be associated with changes in personality, due to the corresponsive principle. For example, given that personality traits are associated with class attendance, class attendance is likely to be associated with subsequent changes in personality traits.

1.4 Do Educational Experiences Cause Personality Change?

Based on studies reviewed above, personality trait change should be associated with educational experiences. There are at least two possible interpretations for these hypothesized findings. First, life experiences may actually lead to changes in personality traits. For example, working hard in school *is* the reason why changes in conscientiousness occur; without the experience there would be no change. The second interpretation is changes in personality may be leading people to receive good grades, for example. That is, the experiences themselves do not cause changes in personality but are merely associated with personality changes. For example, becoming more conscientious may lead to working harder through increased studying and, therefore, be associated with good grades. Unfortunately, this distinction is difficult to disentangle due to the designs that the previous research has employed.

A recent statistical model (the auto-regressive latent trajectory model; ALT) has been proposed to be better able to tease apart these different interpretations to get at the direction

of the association. The ALT model builds upon two partially distinct traditions of longitudinal data analysis: latent trajectory models (McArdle, 1986; Meredith & Tisak, 1984, 1990) and auto-regressive models (Humphreys, 1960; Joreskog, 1979). Each of these methods of longitudinal data analysis conceptualizes development differently and has different shortcomings in disentangling the causes of development. However, by combining these two traditions, the ALT model is able to capture the strengths of the different methods (Bollen & Curran, 2006). By doing so, the ALT model provides a much stronger test of whether educational experiences actually cause personality change or are merely associated with changes.

The latent trajectory model that makes up one half of the ALT model identifies individual growth trajectories for each participant (Bollen & Curran, 2006). Latent factors that represent an intercept and a growth factor are modeled to capture the development of a construct (see Figure 2). The intercept can be modeled to represent the starting value for the first occasion of measurement or the average value over time, whereas the growth factor represents the rate of change over time. The latent trajectory model can also be easily extended to incorporate multiple constructs over time to test for different developmental phenomena. Intercepts are used to address selection effects, whereas growth factors may be used to examine socialization effects.

A number of difficulties arise when using latent trajectory models to examine whether or not experience causes changes in personality traits. First, there is a tendency to treat experiences as single events or average levels of experience (e.g. Löckenhoff, et al, 2009; Lüdtke et al., 2010; Vaidya, et al, 2002). Often this is done to obtain a more valid assessment of the experience, as experiences are, ironically, more difficult to measure than psychological constructs. In support of this practice, the continuity of experiences across time is somewhat

high (e.g. Roberts, 1997). However, despite moderate test-retest correlations, general day to day experiences may, of course, change. Moreover, evidence suggests that changes in these experiences are related to personality trait change above and beyond average levels (Harms et al., 2006; Robins et al., 2005). These findings imply that the development of both experience and personality must be simultaneously incorporated.

Secondly, and most importantly, while the latent trajectory model can include the development of both constructs simultaneously, it cannot address the direction of association (Hertzog & Nesselroade, 2003). That is, do changes in the experience precede changes in personality or vice versa? In a latent growth model where changes are estimated across all repeated measures, correlating the growth factor with an experience addresses only associations with the experience. Thus, testing a causal effect of experience on personality change necessitates a more proximal measurement of the process of change in which the experience is antecedent to change in personality. This type of data structure is typically captured and examined using auto-regressive approaches.

The second half of the ALT model – the auto-regressive model – at first blush appears to be better suited to examine time-specific relations between two different constructs and thereby better suited to draw causal inferences from these relations. In contrast to the latent trajectory models, the auto-regressive model only depends on the immediately preceding time point ($t-1$). In a multivariate sample, this results in cross-lagged paths that allow for the prediction of one construct (z) to another (y), above and beyond the preceding value (y_{t-1} ; Figure 3). An interpretation of these findings is that changes in y are attributable to z . Thus, the auto-regressive approach allows a more time specific analysis of when changes occur (Rogosa, 1980).

For example, a recent study examined the joint development of personality traits and adjustment in a classroom setting across four waves in middle school using an auto-regressive cross-lagged design. Increases in conscientiousness and agreeableness were associated with increases in teacher reported student adjustment for all waves. Teacher reported student adjustment was also associated with future levels of conscientiousness and agreeableness (Heaven et al., 2009). The reciprocal influence of personality and educational experiences in this study, suggests that students evoked responses from the teacher based on their behavior, which, in turn, led to a reinforcement of that trait overtime.

Reciprocal processes between personality and experiences such as these are consistent with the corresponsive principle and highlight the need to study experiences over time. Selection effects lead a person to have an experience whereby the experience then leads to changes in personality traits. However, as a person changes in response to an experience, they are likely to select into and evoke different experiences consistent with their personality. The bi-directional development seen here reflects a process where changes in one construct (a personality trait) leads to changes in another (an experience), and then back again (personality trait change).

Though the auto-regressive approach better captures this bi-directional development compared to latent trajectories, a number of limitations prevent the explicit interpretation that z causes changes in y (Rogosa, 1980). For example, even if the environmental experience occurred prior to growth, the relationship may be spurious because of unmeasured experiences or unmeasured growth processes (Heckman, 2005). In addition to these third variable confounds, the auto-regressive model assumes that the $t-1$ measurement point is a meaningful point in time (Gollob & Reichardt, 1987). Because the model is unable to examine whether changes in one variable predict changes in another, this initial point in time may

reflect an arbitrary starting point in a more complex bi-directional process (Hertzog & Nesselroade, 2003). Some researchers have suggested that embedding the auto-regressive approach in a broader model that accounts for these shortcomings offers a stronger test of causal relations (Heckman, 2005; Heckman et al., 2006).

The ALT model accomplishes this goal by merging the latent trajectory and autoregressive approaches (see Figure 4). Doing so offers a stronger test of experiential influences on the development of personality traits by capitalizing on the advantages of both types of models. Specifically, the ALT model can be used to examine cross-lagged influences of personality traits and educational experiences while simultaneously estimating growth. It is therefore possible to separate the influence of educational experiences on personality trait change from the overall growth trajectory, which may be the result of other, unmeasured variables. Testing intercepts and growth parameters with cross-lagged effects simultaneously provides stronger causal inferences to be made when using correlation data structures (Heckman et al., 2006). The ALT model is able to examine discrete life events while controlling for average environmental experiences and growth across time, thereby controlling for a common underlying shared trajectory between education and personality traits. Controlling for overall level and growth over time provides a much stronger test by which to examine how educational experiences cause changes in personality. Despite the potential contributions of this method, the ALT model has yet to be applied to the development of personality traits.

1.5 Current Study

Given the recent evidence that educational experiences impart not only cognitive skills but also skills that fall under the rubric of personality traits (Heckman et al., 2010), the current study examines the effect of educational experiences on personality trait

development. In doing so, two different dynamics will be examined. First, this study will examine selection processes that create an association between personality and educational experiences. Second, this study will also examine socialization processes in order to identify experiences associated with personality change. Finally, through advanced statistical models, the directionality of socialization processes will be examined. That is, do changes in personality occur in response to educational experiences or merely along with them?

This study will build upon and extend previous studies of personality development and educational experiences in a number of ways. First, the proposed study will utilize a 4-wave study that tracks students from high school to college using sophisticated modeling techniques to better understand the causal pathways between personality and educational experiences. Previous research linking life experiences and personality development has relied disproportionately on 2-wave designs (e.g. Neyer & Asendorpf, 2001; Roberts et al., 2003; Vadiya et al., 2001). Two waves of data are not well suited to distinguish true changes from measurement error (Cronbach & Furby, 1970; Watson, 2005). As such, the current study will utilize four waves of data spanning from high school to university.

Second, this study will focus on the joint development of personality traits and educational experiences. Past studies have tended to treat experiences as single, static variables that do not themselves change. In contrast, this study incorporates the development of both the environment and personality overtime. Doing so makes it possible to test a reciprocal model between environmental experiences and personality traits that is closer to the proposed processes underlying personality trait development. Furthermore, while it is difficult to infer causality using passive longitudinal designs, the ALT model is able to examine cross-lagged influences of personality and educational experiences while simultaneously estimating growth. Testing overall intercepts and growth parameters with cross-lagged

effects simultaneously helps to increase confidence in the potential causal relationships one identifies in correlational data (Heckman et al., 2006).

Given that these methods have not been used with personality trait data in the past, the current study will examine change in a number of separate analyses that reflect each component of the overall ALT model. Specifically, after testing for selection effects, analyses will test whether growth in personality traits are associated with static forms of educational experiences. This set of analyses will allow the examination of a large set of educational experiences, some of which were not measured more than once. Then, multivariate latent growth models estimating intercepts and growth parameters for both changes in educational experiences and personality traits will examine the effect of changes in educational experiences on personality trait change. Third, auto-regressive cross-lagged models will be used to test the reciprocal relation between educational experiences and personality change over time, as this reflects the most common approach when researchers desire to infer causal associations. Finally, I will test the full ALT model, which combines the multivariate latent growth and auto-regressive models into a single model. By necessity, the ALT models will be tested on a limited set of variables as, at a minimum, the ALT model requires four waves of high quality data in order to converge. The latter restriction eliminated a number of variables from being examined. By progressing through the various ways of testing change, the results across techniques can be compared to see if specific approaches provide biased or problematic conclusions.

CHAPTER 2

Method

2.1 Participants

The data come from a large, ongoing study based in Germany. Transformation of the Secondary School System and Academic Careers (TOSCA) is conducted by the Max Planck Institute for Human Development, Berlin, and the Institute for Educational Progress at the Humboldt University of Berlin. The main purpose of the TOSCA project is to examine the effects of educational experiences on individuals. For example, the TOSCA study examines the educational opportunities open to students from different backgrounds, the educational standards attained in German education, and the comparability of the school-leaving qualifications awarded across German schools. A benefit of using the TOSCA study to examine psychological questions is the ability to examine self-selection and social causation processes during this important period in an individual's life.

Participants were obtained from 149 randomly selected upper secondary schools (high schools) in Germany. Schools are representative of the traditional ($N = 90$) and vocational ($N = 49$) college-bound tracts. Schools and students were randomly selected. Participation rate at the school level was 99%, and a satisfactory participation rate of more than 80% was achieved for students.

At Time 1 (T1), the students were in their final year of upper secondary schooling; their mean age was 19.51 years ($SD = 0.77$). Two trained research assistants administered materials in each school between February and May 2002. Students participated voluntarily, without any financial incentive. At T1, all students were asked to provide written consent to be contacted again later for a second wave of data collection. More than 60% of these students consented to be re-contacted for follow-up studies. At Time 2 (T2), two years after graduation

from high school, participants completed an extensive questionnaire in exchange for €10 (about U.S. \$12). The third wave (T3) took place from February to May 2006, and again, participants completed an extensive questionnaire taking about 2 hours in exchange for a financial reward of €10. Similarly, the fourth wave (T4) took place in 2009 and again participants completed an extensive questionnaire in exchange for a financial reward of €10.

The number of participants varied depending on the scales assessed. Since personality is the focal point of this study, the number of participants that completed a Big Five measure at each time point represents the maximum number of participants for each analysis. At the initial testing at T1, 4544 students completed the Big Five personality measure (55.3% female). Two years later 2307 students (62.0% female) completed it at T2, 1908 students (62.4% female) completed it at T3, and 1842 participants (63.7% female) completed it at T4 (approximately 6-8 years after T1). The number of students for each of the educational experience measures was similar to the Big Five measure across waves. Attrition analyses found that drop-outs and continuers differed significantly in some domains at T1, most notably for conscientiousness and agreeableness. Conscientiousness ($d = .14$) and Agreeableness scores ($d = .11$) were higher for those that continued in the study than those that dropped out. Differences in extraversion ($d = .01$), neuroticism ($d = .07$) and Openness ($d = .03$) were more modest. The magnitude of these differences were rather small (d 's $< .15$) and are consistent with attrition findings of past longitudinal studies of personality trait development.

Two previous analyses of this data set also examined the development of personality during this time period, and it is necessary to distinguish the previous studies from the present one. The first study examined the development of personality and goals across the first two waves of data collection in the TOSCA study (Ludtke et al., 2009) and found evidence

for mean-level increases in personality traits during this time period. The second study was reviewed above and focused on life experiences and personality trait change across the first three waves of assessment (Ludtke et al., 2011). The focus was on a set broad of life experiences and the emotional reaction individuals had to each of these experiences. Neither of these studies thoroughly examined the impact of educational experiences on personality development. Moreover, the experiences were not examined across time. That is, the experiences thought to be important for personality trait changes were modeled as static, non-reciprocal processes. Furthermore, the previous studies used a maximum of three time points whereas the present study uses the fourth wave of data collection. This latter time point allows a better assessment of growth in personality traits over time and the ability to fit auto-regressive structures within latent growth models. In sum, the present study extends the previous studies using this data set by focusing on educational experiences and by analyzing the data utilizing different techniques.

2.2 Measure of Personality

The Big Five personality dimensions of extraversion, agreeableness, conscientiousness, emotional stability, and openness to Experience were measured using the German version of the NEO-FFI (Borkenau & Ostendorf, 1993; Costa & McCrae, 1992). Extensive work on the German translation has demonstrated the instrument's high reliability, validity, and comparability with the English original (e.g., Borkenau & Ostendorf, 1993). In our study, items were rated on a 4-point scale ranging from 1 = *strongly disagree* to 4 = *strongly agree*. Alpha reliabilities at the four points of measurement were above .70 for each personality trait at each time point.

2.3 Measures of Educational Experiences

2.3.1 School Satisfaction.

Overall satisfaction with school was measured at each time point by an 8-item scale (Saldern, Littig & Ingenkamp, 1986). Reliability at all time points was greater than .82. Satisfaction with major was measured with a single item at wave 2 and wave 3 with a 4 item scale (Alpha = .73). A 4-item scale measured students' perceptions of school support (e.g. "If I fall behind in class there are ways to get back ahead") was measured only at the second wave (alpha = .73). Parental satisfaction with their child's school was measured with an 8-item scale at wave 2, adapted from the self report of school satisfaction (Alpha = .78).

2.3.2 Achievement

Self-reported GPA was assessed at each time point by the participant. Parent report of their child's GPA was self reported for wave 1 only. A 4-item measure assessed living up to academic standards (alpha = .70; e.g., "If I would have tried harder I could have done better") was assessed in waves 2-4. A single-item measure assessed performance in relationship to peers: "Percentage of other students with better academic achievements" in waves 2 -4. Proficiency in one's major was assessed through a single item ("How do you feel about your scholastic performance within your major classes") and was assessed during wave 2 and 3.

2.3.3 Stressors

School stress was assessed through a 3-item measure (alpha > .64) in waves 2-4. Difficulties dealing with parental separation due to the transition to college were measured in Wave 2 and 3 with a 1 item measure "was it difficult to move out of your parent's house". Intentions to drop out of school were measured in waves 2-4 with a 3 items scale (alpha > .71). The number of students who dropped out of college was assessed with a single item

("Are you still enrolled in college?" N =93). The number of students who changed majors was also assessed with a single item (N =213).

2.3.4 Peer, Teacher and Parent Relationships

Three different school-based relationships were examined. The relationship with one's teacher was measured using a 8-item teacher satisfaction scale wave 1 only ($\alpha = .87$). Parent problems measured how often one got into arguments with parents and was measured with a single item in Waves 2 and 3. Relationship with one's classmates was measured using a 5-item scale that focused on helpfulness of students (e.g., "Students at this school are friendly"; $\alpha = .72$) at wave 1. A four item scale that assessed the level of competitiveness among students (e.g., "Students will do anything to succeed") was assessed in wave 2 ($\alpha = .62$).

2.3.5 Study Habits

Study habits were measured by time spent doing homework, time spent studying, time attending class, and levels of procrastination. Time spent doing homework, studying per week and class attendance were measured by average number of hours. Procrastination was measured by a 12-item scale (Helmke & Schrader, 2000, $\alpha = .92$). Study time was assessed at all 4 waves, while homework, class attendance, and levels of procrastination were assessed in waves 2-4.

2.3.6 Hours Spent Working at a Job

The average number of hours spent working weekly in the last semester was collected through self reports. Hours spent in a job were collected in all four waves.

2.3.7 Cultural Activities

Various cultural activities (visiting an art museum, reading poetry, and attending the opera) that reflect intellectual or aesthetic experiences in the last 12 months were assessed.

These cultural activities were measured with a 12-item measure, on a 1-4 scale ($\alpha = .62$) spanning from did not participate to very often participated (i.e, more than 4 times). Cultural activities were assessed at all four waves.

2.4 Data Analytic Plan

Analyses in the present study use a number of latent growth models to investigate inter-individual differences in intra-individual change in personality and educational experiences (Bollen & Curran, 2006). Analyses were performed using Mplus (Muthen & Muthen, 2008).

The simple latent growth model can be formally expressed as:

$$y_{it} = \alpha_i + \beta_i \lambda_t + \varepsilon_{it} \quad (1)$$

Variability in developmental trajectories are expressed by treating α_i and β_i as random variables and expressed as with equations

$$\alpha_i = \mu\alpha + \zeta\alpha_i \quad (2a)$$

$$\beta_i = \mu\beta + \zeta\beta_i \quad (2b)$$

where $\mu\alpha$ and $\mu\beta$ reflect the sample mean intercept and slope, respectively, and $\zeta\alpha_i$ & $\zeta\beta_i$ reflect deviations from these means. These models are related to longitudinal multi-level models and are identical under certain conditions (Curran, 2003).

In addition, repeated measures of personality and educational experiences will be modeled latently as opposed to manifest scale scores. An advantage of this approach is that change is modeled at the latent level and thus reduces the affect of measurement error. This model is referred to as a multiple indicator latent growth model or a second order latent growth model (Bollen & Curran, 2006). The difference between the basic latent growth model and a second order latent growth model is an addition of a measurement model. The resulting unconditional second order latent growth curve model can be seen in Figure 2.

The basic unconditional model defines two latent factors (intercept and slope) that describe the starting value of the first occasion of measurement (though this can be modeled differently) and the rate of change. The latent intercept is the result of fixing all loadings to 1 whereas the latent slope factor is scaled by fixing the loading at T1 to 0, T2 to 1, T3 to 2 and T4 to 3. This corresponds to a linear function with time such that the changes are expected to occur evenly across data points. Relaxations of this parameterization can be done such that T2 and T3 may be estimated according to the data (Meredith & Tisak, 1990). Doing so allows a non-linear trajectory that may more closely reflect the data.

Parcels were used as indicators rather than items. Parcels tend to be more reliable and more normally distributed compared to single items and are thus better at meeting the assumptions of maximum likelihood estimation (Allemond, Zimprich & Hertzog, 2007; Jackson et al., 2009). Additionally, parcels reduce the number of estimated parameters and, therefore, reduce the complexity of the second order latent growth model, resulting in better model fit. Selecting the three highest loading items from a factor analysis created three parcels. These three items anchored each of the three parcels. The remaining items were distributed into each parcel by adding the fourth highest loading item to the first parcel, the fifth highest to the second parcel, and so on until all the items were used (Little et al., 2002).

Second-order growth models require measurement equivalence across time points to make sure that the changes at the latent level correspond to actual changes in the construct (Meredith & Horn, 2001). Although personality traits usually show measurement equivalence across time and age (Allemand, Zimprich & Hendriks, 2008; Allemand, Zimprich, & Hertzog, 2007; Jackson et al., 2009; Mrocek & Spiro, 2003), this is not always the case (Tackett et al., 2009). To test for factorial invariance one analyzes a series of nested models, starting with the least restrictive model (no invariance constraints imposed) and ending with the most

restrictive model (total invariance) in which all parameters are constrained to be the same across time. If the introduction of increasingly stringent invariance constraints results in little or no change in goodness of fit, there is evidence in support of the invariance of the factor structure. Following Meredith (1993), we adopt the terms *strong* and *strict* invariance. Strong invariance holds when factor loadings (metric equivalence) and the intercepts (scalar equivalence) of the manifest indicators are invariant across time so that across time differences in average indicator scores reflect differences in latent means. Strict invariance holds when measured variables uniqueness are invariant across time. Nested models were compared by chi-square difference tests, differences between CFI, and overlap of 95% confidence intervals around RMSEA estimates (MacCallum, Browne, & Sugawara, 1996).

In order to facilitate interpretation of the latent means the latent growth models were reparametrized using a non-arbitrary method for the identification and scale setting of latent variables (Little, Slegers, & Card, 2006). This method allows the estimation of latent means in a non-arbitrary metric that reflects the metric of the measured indicators. The non-arbitrary metric is set by identifying the loadings of the repeated measures not at 1, as is usually done, but with the mean of the parcel.

Two growth models can also be incorporated simultaneously to test the joint development of two constructs. In the full multivariate latent growth model the correlation between latent intercept and latent slopes of each growth model test whether the starting values of each construct are related and if the slopes of each growth model are correlated. For example, to test whether changes in personality are related to changes in educational experiences, the correlation between the growth parameters is examined.

One disadvantage of these models is that they do not allow for an examination of sensitive time-specific cross-lagged effects between the two domains (Bollen & Curran, 2006;

Curran & Bollen, 2001). That is, an assumption made in multivariate latent growth models is that the trajectory is solely governed by underlying processes and does not explicitly examine time-specific influences. The ALT model attempts to address this issue by embedding traditional autoregressive structures into a latent growth model framework (see Figure 4). Doing so allows an examination of both time specific influences and underlying growth processes that are not captured by these time specific predictors.

The present study will use all of the available data, even for students who only completed the Big Five measure at T1. This procedure is supported by recent methodological research on missing data (Schafer & Graham, 2002), which suggests that powerful algorithms for substituting missing values, such as the expectation-maximization algorithm and multiple imputation procedures, produce accurate parameter estimates if data are missing at random. Even if data are not missing at random, using these procedures results in less biased estimation than list wise deletion. In the present study, full information maximum likelihood (FIML) estimator was used to deal with missing values. Rather than missing values being imputed, model parameters were estimated using all available information even for those participants who have missing observations on some of the variables.

Selection effects were examined by correlating the intercept of the personality growth model (reflecting levels of personality at high school) with average level of educational experiences assessed in college. Socialization effects were tested by using conditional univariate and multivariate growth models. For the univariate models, a conditional growth model incorporates predictor or covariates that can be correlated or regressed on the latent trajectory factor. These are suited to test time-invariant predictors, predictors only assessed once and predictors that do not have an underlying latent trajectory (e.g., changing one's major). A multivariate latent growth model was used to investigate socialization effects when

educational experiences are time-varying and assessed multiple times. Specifically, the personality growth factor was regressed on the intercept parameter of educational experiences, which was scaled to reflect average levels of experience in college. The joint development of educational experiences and personality were tested using a multivariate latent growth model where the growth factors were correlated with one another.

An auto-regressive cross lag model was also used to examine the direct effect of educational experiences and personality trait development and vice-versa (See Figure 3). Of primary interests are the cross lag paths of personality on later educational experiences. These paths represent either the effect of personality at T_n on educational experiences at T_{n+1} , controlling for experience at T_n or the effect of experience at T_n on personality at T_{n+1} , controlling for personality at T_n .

The ALT model combine the latent growth model with the auto-regressive cross lag model to better examine the association between educational experiences and personality trait development. Specifically, an auto-regressive structure was added to the multivariate latent growth model (Figure 4). Here the prospective cross-lagged predictors are of main interest. The cross-lagged predictors test the relationship between educational experiences after the influence of the underlying growth processes have been partialled out.

CHAPTER 3

RESULTS

The results comprise four sets of analyses. In the first section, measurement properties and general trends for personality trait change were examined. In the second section, the relationship between personality traits in high school and educational experiences in college are examined to test for selection effects. The next set of analyses examines the association of educational experiences and changes in personality in personality traits. The final section goes beyond previous research to explore the processes that may lead to changes in personality trait development. As a first step, an auto-regressive cross lag panel model will be examined. Then, the auto-regressive structure will be added to a latent growth model to better test the causal effect of educational experiences on personality trait development.

3.1 Preliminary Analysis

As a preliminary step, longitudinal measurement invariance was examined through mean and covariance structure analyses (Meredith, 1993). These analyses examine whether or not the latent construct of personality is measured similarly across waves. Establishing measurement invariance is necessary before interpreting changes and, ultimately to identifying the causes responsible for change in personality traits. Model comparisons of different levels of measurement invariance are summarized in Table 1. The fit of each unconstrained model was good, indicating that one factor captures each of the Big Five. Next, the factor loadings were constrained to be equal across measurement points. Overall fit of this model was good across all Big Five traits. Furthermore, there was not a significant decrement in fit between these two models when examining change in CFI or likelihood ratio tests. As a result, each of these models demonstrates metric invariance, indicating that the loadings of each indicator were similar across time. In the next step, the intercept of indicator parcels

were constrained across each wave to test for scalar measurement invariance. Again, each of the Big Five models fit adequately. Differences between the metric invariance models and scalar invariance models are minimal for each of the Big Five traits, except for openness. While the overall fit of the model is adequate (CFI = .95, RMSEA = .05), the change in fit assessed by both the likelihood ratio test and the change in CFI indicates a worse fitting model compared to the metric model. Given that the overall fit of the model is still above the acceptable threshold, we retain openness in subsequent analyses, but note that the findings may be somewhat biased because of measurement issues. Finally, covariances for the repeated measures of personality were constrained to be equal across time points. The resulting models yielded acceptable fits for each of the Big Five. Comparing these models with scalar measurement invariance models for each of the Big Five traits indicates no significant loss in fit. Given the overall good fit statistics for each measurement invariance model, strict measurement invariance was attained (Vandenberg & Lance, 2000). As a result, the second-order latent growth models were constrained to strict measurement equivalence by fixing the parcel loadings, parcel means, and the latent covariance to be equal across waves.

3.2 Change in Personality Traits

Next, average changes in personality from age 19 to 25 were examined. Latent means and rank order consistency for each of the Big Five are listed in Table 2. The rank-order consistency for personality was quite high, with all correlations above .60. Correlations were in general lower as the time interval increased, consistent with past findings. Openness was the most stable trait, with correlations above .80 across all time points.

In addition to rank order stability, there were mean level differences across each wave in a manner consistent with past research (Table 2). Changes in personality traits across young adulthood were investigated more thoroughly by fitting a second-order latent growth

model (Table 3). Latent intercepts represent the initial level of a personality trait for each person at Time 1 and are the same as the latent mean at Time 1 in Table 2. The variance of the intercept indicates the amount of individual differences at Time 1. The latent slope represents the average rate of change across the four-year period in the transition from high school to college. Overall, each model fit the data well (see Table 3). The findings are consistent with the previously reported mean-level findings (e.g., Robins et al., 2001; Soto et al., 2011; Watson & Humrichouse, 2006; Vaidya et al., 2008; Vollrath, 2000). Students increased the most in conscientiousness (slope estimate = .27; $d = .73$) and agreeableness (.19; $d = .48$) during young adulthood and decreased in neuroticism (- .17; $d = .51$) during this time period. Students, on average, also changed in their levels of extraversion (.07; $d = .17$) and openness (.08; $d = .19$) during this time period, though not as quickly as the remaining traits. The slope estimates can be interpreted as the average amount of change on a 4-point scale over the 6 year study period.

A significant slope variance component for each trait revealed that not everyone changed in the same direction or at the same rate. That is, all Big Five personality traits had reliable individual differences in intra-individual change. Constructing 90% confidence intervals for these intra-individual trajectories reveals the large variability in personality trait development. While the general trend for conscientiousness is to increase across young adulthood (.27), according to the estimates of the 90% confidence intervals a number of individuals also decreased during this time period ($.27 - 1.67 \times .06^{.5} = -.14$. and $.27 + 1.67 \times .06^{.5} = .68$). Similarly, the 90% confidence intervals for extraversion (-.26, .40), agreeableness (-.09, .47), neuroticism (-.60, .26), and openness (-.16, .32) suggest great variability in intra-individual change in personality trait during young adulthood. Figure 5

visualizes the range of personality trait change that is possible when beginning the study at the average level for each personality trait. While most individuals increased in extraversion, agreeableness, conscientiousness, and openness, and decreased in neuroticism, there were substantial individual differences in these changes. Comparing the range of possible values indicates over a standard deviation difference for the lower and upper ends of the distribution, despite starting with the same levels of personality.

Gender (1 = female, 0 = male) was included in the model to test differences in intercept and changes in personality. Females tended to be higher in neuroticism (.17), agreeableness ($r = .16$), and openness ($r = .13$). Changes in personality were more pronounced for females on neuroticism ($r = -.15$), and agreeableness ($r = .08$), indicating that, on average, women showed less decreases in neuroticism and increased more in agreeableness across the 6-year period. Controlling for gender did not significantly modify any of the subsequent results.

3.3 Educational Experiences During Young Adulthood

Next, the association between personality traits and educational experiences were examined. Experiences were grouped within seven different categories: School satisfaction, Achievement, School stressors, Relationships, Study habits, Jobs, and Cultural experiences. If multiple assessments of experiences were collected, the average of the educational experience was calculated. The relationship between educational experiences across the 7 categories was minimal, with the exception for the small association with achievement and study habits (e.g., correlation between grades and study time; $r = .13$). Overall these experiences assess relatively distinct domains at multiple levels of analysis.

Indices of school satisfaction are listed in Table 4. Overall there was minimal overlap between the different measures of school satisfaction. Parent and student reports of satisfaction were not highly correlated, while school support is slightly correlated with the

other measures of satisfaction. The strongest correlation comes from School satisfaction and Satisfaction with major ($r = .38$).

Correlations between different achievement variables are listed in Table 5. Overall, self report GPA, parent report GPA, performance compared to peers, proficiency within their major, assessments of living up to expectations were strongly correlated.

School stressors were only modestly related with one another (Table 6). Overall school stress was related to intentions to leave the university ($r = .42$), though not strongly with actually dropping out of the university ($r = .05$). As expected, intentions to leave the university are associated with leaving the university ($r = .18$) and with changing majors ($r = .12$). Student feelings about being separated from one's parents were only modestly related to overall stress levels ($r = .15$) and not related to leaving school or changing majors.

In the relationship domain (Table 7), getting along with teachers was negatively associated with competitive peers ($r = -.27$). Peer helpfulness was related to peer competitiveness ($r = -.23$), teacher satisfaction (.11) and problems with parents ($r = -.12$). Measures of study habits are listed in Table 8. Positive study conditions were associated with less procrastination ($r = -.20$) and going to class more ($r = .12$). Individuals who procrastinated spent less time in class ($r = -.21$), less time devoted to studying ($r = .20$), and felt that they needed less overall time to succeed in school ($r = -.21$).

3.4 Do Personality Traits Predict Educational Experiences?

To test whether high school levels of personality traits predicted educational experiences during college a series of latent growth models were tested. The intercept parameter of the latent growth models for each personality trait (reflecting high school levels of personality) predicted average levels of college educational experiences. For educational experiences assessed three or more times, average college experiences were assessed as the

intercept parameter of educational experiences, scaled to reflect average levels of educational experiences during college (See Table 9).

As hypothesized, all the Big Five traits were associated with overall levels of school satisfaction, replicating the findings found in Robins et al., (2005). Higher levels of extraversion ($r = .15$), agreeableness ($r = .13$), conscientiousness ($r = .19$), openness ($r = .14$) and lower levels of neuroticism ($r = -.17$) predicted higher levels of school satisfaction in college four years later. Similarly, satisfaction with one's major was predicted by high school levels of extraversion ($r = .12$), agreeableness ($r = .17$), conscientiousness ($r = .14$) and lower levels of neuroticism ($r = -.18$). Agreeableness ($r = .19$) and neuroticism ($r = -.20$) both predicted feelings of school support. In contrast, high school personality traits did not predict parent school satisfaction.

High school levels of personality traits also predicted better self-reported achievement experiences in college. High-school levels of conscientiousness predicted self report GPA ($r = .21$), living up to one's academic standards ($r = .16$), proficiency in one's major ($r = .33$) and achievement compared to peers ($r = .21$). Consistent with past findings (Nofle & Robins, 2007), the only other Big Five trait to predict GPA was openness ($r = .15$). High school levels of neuroticism were negatively associated with self-assessments of achievement in college. For example, neurotic individuals were more likely to experience feelings of not performing up to one's academic standards ($r = -.13$), not succeeding in one's major ($r = -.15$) and felt like they were underperforming when compared to peers ($r = -.12$).

Stressful college experiences were also predicted by high school levels of personality traits. High levels of neuroticism in high school led to high levels of stress in college ($r = .41$), stronger negative feelings about the separation from their parents and greater intentions to drop out ($r = .14$). Interestingly however, neuroticism did not predict changing one's major or

dropping out of college. Instead, conscientiousness was associated with both intentions to drop out ($r = -.24$) and not dropping out of college ($r = -.13$). Openness is the only trait associated with changing majors ($r = .16$), which is consistent with the view that open individuals like to try many different experiences (McCrae & Sutton, 2008).

Personality traits also played a role with respect to college social relationships. Age-19 personality traits predicted satisfaction with one's teachers, except for the trait of openness. Higher levels of conscientiousness ($r = -.15$) and agreeableness ($r = -.25$) were related to having fewer problems with one's parents. High levels of agreeableness ($r = .21$) and low levels of neuroticism ($r = -.26$) were associated with having friendly peers.

As expected, personality traits predicted study habits in college. In particular, individuals high in conscientiousness created better study conditions ($r = .14$), procrastinated less ($r = -.51$), devoted more time to studying ($r = .17$), attended class more often ($r = .22$), and spent more time completing their homework ($r = .11$). Students higher in neuroticism were also less likely to procrastinate ($r = -.19$). Presumably, the anxiety and worries that occur in individuals with high levels of neuroticism lead to completing assignments on time. Extraversion was associated with more time spent in class ($r = .16$) whereas openness was associated with less time spent in class ($r = -.16$).

Having a job outside of one's class responsibilities was associated with higher levels of extraversion and openness. High school levels of extraversion ($r = .12$) and openness ($r = .14$) predicted participating in cultural activities during college, such as going to the opera.

3.5 Are Educational Experiences Associated with Changes in Personality Traits?

Personality traits and educational experiences are related through selection processes, but do socialization processes associated with educational experiences lead to personality trait change? Using a series of multivariate latent growth models, personality trait slope

parameters were regressed on average levels of educational experiences. These models test whether changes in personality traits are associated with having certain educational experiences.

School satisfaction was associated with changes in each of the Big Five traits during college, except for agreeableness (see Table 10). Changes were in the normative direction, such that higher levels of school satisfaction were associated with increases in extraversion ($r = .17$), conscientiousness ($r = .15$) and openness ($r = -.14$) and decreases in neuroticism ($r = -.25$). Figure 6 plots the relationship for conscientiousness at satisfaction one standard deviation above and below the mean. On average, people tend to increase in conscientiousness across time, however, individuals that are more satisfied in their school experiences increase at a greater rate. None of the other satisfaction variables were associated with changes in personality traits. These findings indicate that people who are satisfied with their schooling experience become more outgoing, harder working, open to new ideas and less anxious during young adulthood.

Students with higher levels of achievement, as assessed through self-reported GPA, tended to increase in conscientiousness from age 19 to 25 ($r = .12$). Similarly, individuals who received higher grades decreased more in neuroticism ($r = -.14$). Performing well compared to one's peers was also associated with increases in conscientiousness ($r = .13$), while living up to self-defined standards was associated with changes in all traits except agreeableness. Again, the direction of the association was in the normative direction, with living up to self-defined standards being associated with greater increases in extraversion ($r = .15$), conscientiousness ($r = .24$) and openness ($r = .19$) and decreases in neuroticism ($r = -.25$).

Stressful school experiences were also associated with changes in personality traits. As seen in Figure 7, students who were less stressed during college were more likely to decrease

in neuroticism ($r = .38$). Students that experienced higher levels of stress, on the other hand, were more likely to not demonstrate normative decreases in neuroticism. Overall, students who experienced high levels of stress were more likely to change in the non-normative direction. For example, high levels of school stress were associated with decreases in extraversion ($r = -.14$), conscientiousness ($r = -.17$) and openness ($r = -.14$). Similarly, people who thought about dropping out were more likely to increase in neuroticism ($r = .23$). Having thoughts about dropping out of school also were more likely to occur in individuals who decreased in extraversion ($r = -.18$) and conscientiousness ($r = -.13$). Interestingly, changing majors was not associated with any changes in personality. However, dropping out of college did lead to lower levels of extraversion ($r = -.12$) and openness ($r = -.12$). Figure 8 indicates that students who stayed in college were more likely to increase in extraversion, while dropping out of college was associated with decreases in extraversion.

Social relationships in college also were associated with personality trait change. Individuals who had higher levels of teacher satisfaction were more likely to increase in extraversion ($r = .16$), conscientiousness ($r = .09$) and decreases in neuroticism ($r = -.22$). Interestingly, parents only played a role in the development of neuroticism and not with any other personality trait. Individuals that had problems with their parents were more likely to increase in neuroticism ($r = .14$). In general, peer relationships played a less important role than hypothesized, where the only significant relationship was that individuals who had helpful peers were more likely to increase in agreeableness ($r = .13$). Interestingly, across all educational experiences, having helpful peers was the only experience associated with changes in agreeableness.

As expected, study habits in college were associated with changes in personality traits, most notably in the domain of conscientiousness. Individuals who created better study

conditions ($r = .10$), studied more ($r = .12$) and spent more time doing homework ($r = .24$) were more likely to increase in conscientiousness. Students that procrastinated less were also more likely to increase in conscientiousness, whereas students that procrastinated more often did not increase in conscientiousness (Figure 9). The only study habit domain not associated with changes in conscientiousness was time spent in class. Time spent in class, however, was associated with extraversion. Individuals who went to class more often were more likely to increase in extraversion ($r = .11$). Changes in neuroticism were also related to study habits. Individuals who created worse study conditions ($r = -.19$) and procrastinated ($r = .27$) more were more likely to increase in neuroticism. Overall, participating in activities that lead to higher levels of achievement were associated with increases in conscientiousness (Nofle & Robins, 2007).

Experiences outside the classroom were also related to changes in personality traits. Spending time working for pay was associated with increases in extraversion ($r = .12$), but not with changes in any other personality traits. As expected, individuals who participated in more cultural activities were more likely to increase in openness from 19 to 25 ($r = .15$; Figure 10).

Overall, changes in personality associated were most likely to occur in experiences associated with selection processes. These findings are consistent with the corresponive principle, which suggests that the personality traits in high school that were predictive of college educational experiences would be the traits to change in response to those same educational experiences. Overall our findings were quite consistent with this principle of development. Out of the 34 experiences associated with personality trait change, 28 (83%) evidenced selection processes for the very same trait. Interestingly, the 6 experiences that did not show a corresponive pattern were experience associated with achievement (grades, self-

defined proficiency) and stressful experiences. Despite the tendency for responsiveness, these findings suggest leave open the possibility that unexpected achievement or stressful experiences can change personality traits.

3.6 The Joint Development of Educational Experiences and Personality Traits

The previous section found evidence that average levels of educational experiences were associated with changes in personality traits. Next, *changes* in educational experiences were assessed to see if changes in experience are also associated with changes in personality traits. As seen in Table 11, changes in educational experiences assessed more than twice were examined using latent growth models. In these models, the latent intercepts represent the average level of educational experience across waves, consistent with the previous analyses of educational experiences. The variance of the intercept indicates the amount of individual differences in average levels of educational experiences. The mean of the slope factors indicates the average rate of change in these experiences, while the variance around this mean represents individual differences in intra-individual change.

Latent growth models for three experiences that were assessed at four time points (grades, time devoted to studying, hours spent working) did not converge. Dropping the initial high school assessment at wave 1, so the latent growth models were modeled using just three time points, led to models that converged. Overall, each final model for all educational variables converged, and the models adequately fit the data (CFIs > .90, RMSEAs < .10).

On average, individuals tended to decrease in school satisfaction (-.06), obtain better GPAs (.25), rate their performance more positively (.09), attend class less (-.12), procrastinate less (-.11), work more hours per week (2.78) and devote more time to study (2.29). However, these averages must be qualified by the large variance in slopes. All educational experiences showed reliable individual differences in intra-individual change except for class attendance,

suggesting differences between individuals in educational experiences across college.

Constructing 90% confidence intervals around the slopes revealed a wide margin of possible developmental trajectories. For example, while the general trend was to obtain better grades (.25), a 90% confidence interval suggests that individual slopes range from .85 to -.35.

Similarly, school satisfaction decreased slightly on average, but the 90% CI suggest that people increase as well as decrease in almost equal numbers on school satisfaction across college (-.73, .61).

3.7 High school Personality Traits Predict Changes in Educational Experiences

The relationship between personality traits and individual differences in changes in educational experiences were next examined. As seen in Table 12, age 19 personality traits predicted a small number of changes in educational experiences in college, with the number of statistically significant associations was close to what would be expected at chance ($6/55 = 11\%$). High school levels of extraversion and neuroticism did not predict any changes in educational experiences during college. Conscientiousness, on the other hand, predicted the most changes in educational experiences, as individuals high in conscientiousness during high school were more likely to decrease in levels of satisfaction during college ($r = .20$), decrease in time spent procrastinating ($r = -.33$) and increase in their desire to leave college ($r = .19$). Agreeableness and openness both predicted fewer changes in cultural activities ($r = -.22$ & $-.30$, respectively).

3.8 Correlated Change Between Educational Experiences and Personality Trait Change

The relationship between changes in educational experiences and changes in personality traits were next examined. Again, a bivariate latent growth model was used where the slopes for educational experiences and personality traits are examined simultaneously.

The correlation between changes in personality and for changes in each educational experience is listed in Table 12.

Again, school satisfaction was associated with changes in personality traits. Increases in school satisfaction was associated with increases in extraversion ($r = .35$), agreeableness ($r = .22$), conscientiousness ($r = .40$) and openness ($r = .47$), as well as decreases in neuroticism ($r = -.47$). Changes in achievement experiences were also associated with changes in personality traits. Increases in self-defined performance were associated with increases in extraversion ($r = .18$) and conscientiousness ($r = .37$), and decreases in neuroticism ($r = -.26$).

A number of changes in educational experiences related to study habits were associated with changes in personality traits. Individuals who studied more across college were more likely to decrease in extraversion ($r = -.18$) and increase in both conscientiousness ($r = .31$) and neuroticism ($r = .29$). Similarly, increases in how much one procrastinated across college was associated with decreases in extraversion ($r = -.21$), agreeableness ($r = -.26$), conscientiousness ($r = -.88$) and increases in neuroticism ($r = .37$).

Changes in stressful experiences across college were associated with changes in each personality trait. Becoming more stressed during college was associated with increases in neuroticism ($r = .66$) and decreases in extraversion ($r = -.33$), agreeableness ($r = -.19$), conscientiousness ($r = -.28$) and openness ($r = -.23$). Changes in cultural activities did not have as widespread effects. Changes in the frequency of cultural activities that the students participated across college was only associated with increases in openness ($r = .64$).

3.9 Do Educational Experiences Cause Changes in Personality Traits?

Despite the associations between educational experiences and personality trait change, it is still unclear whether or not personality trait change results from educational experiences or is merely associated with them. To examine this question, two additional longitudinal

change models were tested. First, an auto-regressive cross lag tested the direct effects between educational experiences and personality traits. Next, the ALT model tested the direct effects between educational experiences and personality traits while accounting for unmeasured growth processes.

3.10 Auto-Regressive Cross-Lag Analyses

An auto-regressive cross lag model can be seen in Fig 2. Personality traits were measured latently, while educational experiences were treated as manifest variables. Each of the fifty-five bivariate latent growth models presented above was rerun. Of primary interest were the cross lag paths from personality to educational experience and the path from educational experience to personality trait. These paths thus represent the effect of experience on personality trait change or the effect of personality traits on changes in experience. Cross-lag paths were constrained to be equal across time points and residuals were correlated within wave. Relaxing these constraints did not significantly change the results. Table 13 lists the results for each cross lag path, as well as the correlation between the residuals of personality and educational experiences within each time point.

Personality traits predicted change in educational experiences, consistent with the view that personality traits are involved in selection processes. Conscientiousness and neuroticism were the traits associated with most changes in educational experiences. Higher levels of conscientiousness predicted increases in self defined performance ($b = .05, p < .05$), study time $b = .06, p < .05$), and decreases in procrastination $b = -.14, p < .05$) and intentions to leave college ($b = -.10, p < .05$). Higher levels of neuroticism predicted lower levels of school satisfaction ($b = -.07, p < .05$), lower grades ($b = -.06, p < .05$), greater intentions to leave the university ($b = .18, p < .05$) and more school related stress ($b = .08, p < .05$).

Educational experiences also predicted changes in personality traits. For example, higher levels of school satisfaction predicted increases in conscientiousness ($b = .08, p < .05$). Similarly, cultural experiences lead to higher levels of openness at later time points ($b = .16, p < .05$). Also, school stress led to higher levels of neuroticism ($b = .17, p > .05$). Each of these experiences was hypothesized to be important for changes in the corresponding trait. As such, these predictive relationships are evidence for these experiences leading to changes in personality traits.

Overall, however, the correlated errors were more pronounced than any of the cross-lag relationships (Table 14), consistent with past accounts (Neyer & Asendorpf, 2001). These findings indicate that changes in personality traits and educational experiences co-occur with one another, similar to the correlated slopes in the multivariate latent growth models reported above.

3.11 Auto-Regressive Latent Trajectory Models

Auto-regressive latent trajectory models were next examined to better account for unmeasured confounds in the association between educational experiences and personality trait change. A prerequisite of the ALT model is for the two growth processes to be measured at four time points (Bolles¹ & Curran, 2004). The current study had five educational experiences that satisfied this requirement: school satisfaction, GPA, time devoted to studying, hours spent working and cultural experiences. However, grades, time devoted to studying and hours working did not converge when all waves of data were included (see above) and were therefore not examined further¹. Models were fit for each personality trait for which a significant association between school satisfaction or cultural experiences and changes in

¹ Rerunning the analyses excluding participants that did not consent to be followed up after Wave 1 did not significantly change the results of the Latent Growth Models nor the ALT models.

personality trait were found. Personality traits were again fit latently, while educational experiences were measured with manifest variables

Before complete bivariate models were fit, univariate ALT models were examined. These models are a simple extension of the latent growth model, except for the inclusion of an auto-regressive path between each repeated measure. For example, in Figure 2, T1 personality would predict T2 personality, which predicts T3, etcetera. These univariate models capture both latent change processes (assessed through the slope parameter) and more time specific processes (the auto-regressive parameters). For personality traits, these ALT models fit somewhat poorly (CFIs > .85, RMSEAs < .11). Interestingly, the auto-regressive parameters for the T1 to T2 relation were non-significant for every trait. The remaining paths (T2 to T3; T3 to T4) were either non-significant (extraversion, neuroticism) or significant in a negative direction (agreeableness, conscientiousness and openness). These findings suggest that a latent growth model adequately captures continuity and change in personality traits absent of auto-regressive paths, and that the univariate ALT model is not well suited for estimating changes in personality traits, at least in this study with assessments 2 years apart.

The univariate ALT model for school satisfaction and for cultural experience evidenced good fit (CFI = .94, RMSEAs = .04; CFI = .99, RMSEAs = .02, respectively. However, both models evidenced nonsignificant auto-regressive paths ($b = -.15$, $se = .17$, $p > .05$; $b = .00$, $se = .04$, $p > .05$), suggesting that the latent growth model sufficiently captures continuity and change over time.

Next, a multivariate ALT model was constructed that included the latent growth models for personality traits and educational experiences, as well as cross lag paths between educational experiences and personality traits. The effect of school satisfaction on personality trait change was examined for the traits of conscientiousness, neuroticism, extraversion, and

openness. Each ALT model for school satisfaction fit adequately with CFIs $> .90$ and RMSEAs $< .06$.

The results for ALT model consisting of conscientiousness and school satisfaction are presented in Figure 11. High school levels of conscientiousness and satisfaction did not significantly predict the other at T2. These initial levels are not included in the overall growth model but are used as predetermined starting values (Bollen & Curran, 2004). The intercept for each growth processes (representing T2, the first assessment within college) were significantly associated ($r = .30, p < .05$). The correlation among the slopes was no longer significant ($r = -.08, p > .05$) compared to in the bivariate latent growth model ($r = .40$; See table 12). Consistent with the idea that educational experiences lead to changes in personality, higher levels of satisfaction predicted increases in conscientiousness at the following time point ($b = .06, se = .02, p < .05$). In contrast, conscientiousness did not predict higher levels of school satisfaction at later time points ($b = -.01, se = .01, p > .05$).

Taking out the correlations between satisfaction and conscientiousness at each time point resulted in significant correlation between the slopes ($r = .51, p > .05$). However, taking out these correlations also changed the auto-regressive parameters such that there was no longer a significant effect of satisfaction on changes in conscientiousness. The fit of the models were nearly identical, making it unclear which model is the optimal for capturing the relation between these educational experiences and personality traits.

Significant cross-lagged paths were also found for neuroticism and school satisfaction (Figure 12). The latent intercepts for school satisfaction and neuroticism were not correlated with one another ($r = -.12, p > .05$), nor were the latent slopes ($r = -.21, p > .05$). High school levels of school satisfaction negatively predicted neuroticism at T2 ($b = -.06, se = .02, p < .05$) whereas high school levels of neuroticism did not predict satisfaction at T2 ($b = -.06, se = .05$,

$p > .05$). Interestingly, while in college, significant cross-lag effects were found in both directions. School satisfaction predicted decreases in neuroticism at subsequent time points ($b = -.06$, $se = .03$, $p < .05$). On the other hand, neuroticism predicted decreases in school satisfaction ($b = -.02$, $se = .01$, $p < .05$). These joint predictors suggest a true reciprocal relationship between the development of school satisfaction and neuroticism. As with conscientiousness, significant correlations between the residuals of satisfaction and neuroticism existed for each time point. Removing these correlations resulted in non-significant cross-lag paths for neuroticism on changes in school satisfaction ($b = -.01$, $se = .01$, $p > .05$), while the path from school satisfaction on changes in neuroticism remained significant ($b = -.04$, $se = .02$, $p < .05$).

Extraversion and openness models did not evidence significant cross-lag paths. For extraversion, high school levels of personality and satisfaction did not significantly predict the other at T2. Correlations among the intercept replicated the bivariate latent growth model for extraversion and openness ($r = .24$, $p < .05$; $r = .23$, $p < .05$, respectively), but the correlation among the slopes for both traits were no longer significant ($r = .05$, $p > .05$; $r = .17$, $p > .05$). No cross lag paths were significant. Higher levels of satisfaction did not predict changes in extraversion or openness ($b = .02$, $se = .02$, $p > .05$; $b = .01$, $se = .01$, $p > .05$). Extraversion and openness also did not predict higher levels of school satisfaction at subsequent time points ($b = -.01$, $se = .01$, $p > .05$; $b = -.02$, $se = .01$, $p > .05$).

The ALT model for cultural experience and personality traits was only examined for openness, given the previous analyses. As seen in Figure 13, the latent intercepts for cultural experiences and openness were correlated ($r = .53$, $p < .05$), as were the latent slopes ($r = .15$, $p < .05$). High school levels of cultural experiences did not predict openness at t2 ($b = .01$, $se = .02$, $p > .05$) whereas high school levels of openness predicted lower levels of cultural

experiences in the first years of college ($b = -.12$, $se = .03$, $p < .05$). For the cross lag paths, cultural experiences predicted increases in openness at subsequent time points ($b = .08$, $se = .04$, $p < .05$). Openness, however, did not predicted changes in cultural experiences ($b = -.04$, $se = .03$, $p > .05$).

CHAPTER 4

DISCUSSION

The current study examined one potential reason as to why education is associated with positive life outcomes (Goldin & Katz 2008; Marshall & Tucker, 1993): educational experiences lead to changes in personality traits. Traditionally, education is thought to benefit an individual through the attainment of greater cognitive skills and access to resources (Heckman, 2008). However, it has been suggested that the skills and resources gained through higher education may additionally affect the development of personality traits (Oreopoulos & Salvanes, 2011). The present study examined this hypothesis in a 4-wave longitudinal study of young adults. Results indicated that personality traits were associated with educational experiences through both selection and socialization processes. That is, personality traits lead individuals to have certain experiences in college and, in turn, educational experiences were associated with changes in personality traits. This corresponsive relationship between educational experiences and personality traits was further examined to better understand the causal precedence of one over the other. Overall, the results suggest that educational experiences play an important role in shaping personality trait development during young adulthood and provide some of the strongest evidence to date that educational experience contributes to personality trait change. An overview of the findings, plus the implications of the results to theories of personality trait development, is discussed below.

4.1 Personality Guides the Selection into Educational Experiences

Personality traits were found to shape the type and frequency of important experiences within college. Thus, experiences within college cannot be considered completely random because they result, in part, from personality traits. Personality traits are thought to influence the selection of educational experiences because personality traits lead individuals

to seek out experiences in a manner that is compatible with their personality (Caspi & Bem, 1990; Roberts, 2007). Experiences that come about through these person-environment transactions are likely to result in feelings of familiarity, satisfaction, and/or validation (Caspi & Bem, 1990; Roberts, 2007). In essence, it is more comfortable and enjoyable to be in trait affording situations than not. For example, conscientious individuals are more likely to work hard because the thought of not getting work done brings about negative feelings.

Consistent with this view, a broad swath of educational experiences were predicted by high school levels of personality traits, even though these educational experiences were assessed years later and in an entirely new educational context. For example, high school levels of personality traits were associated with overall college satisfaction four years later. Specifically, individuals who were more extraverted, agreeable, conscientious, open to experience, and lower on neuroticism were more likely to enjoy college. In accordance with the idea that people select into trait-affording situations, these findings indicate that college experiences reward individuals who are more extraverted, agreeable, conscientious and open to experiences, and lead to negative consequences for those that are high in neuroticism. Of course, not all experiences during college can be actively selected into because a number of experiences are shared across all students, such as taking an exam. In situations like these, personality traits likely still play an important role, though instead of actively seeking out or evoking experiences, individuals can shape their response to the situation. For example, neurotic individuals were more likely to have stressful experiences during college, likely due to neuroticism being associated with viewing objectively similar situations more negatively (Gallagher, 1990).

Many of the prospective relations between personality traits and subsequent educational experiences were consistent with hypothesized relationships. As expected, the

trait of conscientiousness predicted achievement related experiences. Individuals who were more conscientiousness were more likely to go to class, spend more time studying, and seek out better study spaces. Moreover, conscientiousness predicted higher GPA, self-assessments of performance, and a lower likelihood of dropping out. These findings are consistent with previous research demonstrating the importance of conscientiousness for selecting experiences within achievement related domains, such as work (Judge et al., 1999; Roberts et al., 2003).

The remaining Big Five personality traits also played a role in the experiences students had during college. As hypothesized, extraverted students experienced more social and positive interpersonal experiences such as getting along with teachers, having an outside job, going to more extra-curricular activities, and showing up to class more often. Agreeableness was associated with positive interpersonal relationships, such that individuals higher in agreeableness got along better with their teachers and had fewer problems with their classmates. Individuals high in openness also had a tendency to attend class less, spend more hours at their par-time job, and participate in cultural extra-curricular activities. As expected, neuroticism predicted stressful experiences, lower self-assessments of achievement, and poorer interpersonal relationships during college. Interestingly, neuroticism was also associated with less procrastination, indicating that neuroticism may be beneficial in some contexts (e.g., Roberts, Smith, Jackson & Edmonds, 2009).

4.2 Educational Experiences are Associated with Changes in Personality

Consistent with the hypothesis that students learn more than facts and figures in college, educational experiences were associated with changes in each Big Five personality trait. Educational experiences were associated with changes in personality traits through both average levels of educational experiences throughout college, as well as through changes in

educational experiences. These findings suggest that merely attending school does not lead to personality trait change during young adulthood (Robins et al., 2001; Roberts et al., 2001; Donnellan et al., 2007) but, rather, that the experiences one has within the schooling context are important in enacting this change. The view of schooling as a monolithic enterprise is often espoused in the economic literature, where schooling is thought to operate as a unitary construct on cognitive and personality traits such that merely going to school (as opposed to not) would lead to changes in personality traits (Oreopoulos & Salvanes, 2011). Likely, this assumption stems from economic research focusing on the effects of education on IQ, which has neglected to examine the specific experiences embedded within the educational domain and, instead, has assumed that the overall act of attending additional school is the most important factor in development of skills. For personality traits, though, the specific experiences that take place within college were found to be important for personality trait development. However, it remains to be seen whether the importance of experiences within an educational context are more important for personality trait development than obtaining more years of school (Oreopoulos & Salvanes, 2011).

Nevertheless, results from the present study found that a number of educational experiences were associated with changes in personality traits during young adulthood. The most pervasive experiences were school satisfaction, GPA, perceptions of one's performance, school stress, and intentions to drop out, with all of these experiences associated with changes in multiple personality traits. Moreover, a number of experiences had an effect only on a single, hypothesized trait. For example, individuals who devoted more time to studying and doing homework increased in the personality trait of conscientiousness. Individuals who interacted more with others – either through their job or in a class setting – also increased in extraversion. Changes in openness were associated with participation in intellectually

engaging and aesthetically appealing activities. Individuals who experienced greater stress throughout college and also had low levels of satisfaction were more likely to increase in neuroticism. Interestingly, agreeableness is the only trait that did not change in response to multiple experiences. Namely, individuals who experienced better peer relationship were more likely to increase in agreeableness, but no other experiences were associated with changes in agreeableness.

In general, educational experiences that are thought to be positive or adaptive were associated with normative patterns of personality trait development in young adulthood (i.e., increases in extraversion, agreeableness, conscientiousness, and openness, and decreases in neuroticism). For example, being satisfied within the educational context, having lower stress levels, having better relationships with one's teachers, and getting a higher GPA were all associated with normative changes in personality traits. Similarly, *changes* in these educational experiences across college were also associated with normative changes in personality traits. For example, increases in agreeableness, conscientiousness, and decreases in neuroticism were associated with increases in school satisfaction and decreases in stress.

On the other hand, not having these aforementioned positive experiences may lead to non-normative changes in personality traits. Experiencing positive outcomes likely indicate whether or not a student is "on track" and thus demonstrates normative personality trait development. Therefore, it is not surprising that thoughts about leaving school were associated with non-normative changes in extraversion, conscientiousness, and neuroticism. Presumably, having intentions to leave school is a way of identifying dissatisfaction with one's role as a student, indicating a de-investment in the educational process. A result of this de-investment is the decreased likelihood of having experiences that are associated with positive personality trait changes in the first place, a process that may be self-reinforcing. Similar

findings are thought to occur in the labor market, where experiences that denote de-investment in the occupational role, such as drinking on a job or stealing, are associated with non-normative personality trait change (Roberts et al., 2006).

4.3 Identifying Causal Experiences

Although this study involved multiple assessments of both personality and educational experiences across a number of different contexts, the causal relationship between educational experiences and personality trait change must be carefully considered, especially given the pervasive selection and corresponsive processes at hand. These processes can bias the interpretation that certain educational experiences lead to changes in personality traits by virtue that everyone is not equally likely to have those experiences. For example, studying is less likely to occur for those low on conscientiousness, and, accordingly, it is difficult to ascribe causal status to the experience because people who study more are different from the people who do not. Thus, it is difficult to rule out alternative explanations (e.g., unobserved variables) that may actually cause changes in personality.

The observational nature of the current study and the corresponsive relationship between educational experiences and personality does not fit neatly into traditional treatments of causality in the social sciences (West & Thoemmes, 2010). Despite this difficulty, a number of statistical models attempt to circumvent or control for selection biases in observational, longitudinal data (Heckman, 2005). The ALT model used in the current study is one such model and the current findings suggest some success of the ALT model. Specifically, school satisfaction prospectively predicted increases in conscientiousness and neuroticism, and cultural experiences prospectively predicted increases in openness to experiences. These findings indicate that increasing school satisfaction and having more cultural experiences led to changes in conscientiousness, neuroticism, and openness, while

controlling for unmeasured change processes. The results also indicated that increases in neuroticism led to lower levels of school satisfaction. As such, there is evidence of a reciprocal relationship between educational experiences and neuroticism, such that changes in this personality trait can also lead to changes in educational experiences.

However, the ALT model is likely not the key to uncovering which experiences lead to personality trait changes for two reasons. First, a number of difficulties emerged in the implementation of the models. The ALT model, like all statistical models, necessitates certain assumptions about the relationship between variables. Changing these assumptions or relaxing specific a priori constraints on the model changed the resulting interpretation for each of the ALT models, calling into question the overall validity of the claims. Of most importance were the correlations between residual terms within each time point. Leaving these in resulted in non-significant correlations among the latent change parameters such that the relationship between educational experiences and personality were more likely to be found in the cross lags. Removing these constraints allowed the relationship between variables to occur in the latent slopes. It is currently unclear as to what is the correct parameterization for the ALT model (Bollen & Curran, 2003), or even for the simpler autoregressive cross-lag models.

Secondly, the cross-lagged effect sizes of educational experiences on personality trait change were small, and, for that matter, so were the cross-lagged effect sizes for personality traits on changes in educational experiences. These findings likely highlight a more general principle of personality development: that change in personality traits resulting from a single experience will be quite small. The relationship is especially likely to be small given the co-occurrence of other experiences that may change personality traits. Moreover, observational studies, such as these, average over many diverse types of experiences that may or may not

occur at the same time and duration for each person. As such, the ALT model may have difficulty identifying changes in personality traits due to experiences that are not shared across individuals.

The utility of the ALT model, or other longitudinal models that have recently been introduced to offer stronger tests of causal hypotheses – such as HLM models examining within-in individual variation (e.g, Duckworth, et al., 2010), propensity score models that create groups that are conditioned on observed covariates (e.g., Jackson, Thoemmes, Jonkman, Ludtke, & Trautwien, 2011), or econometric approaches (Heckman, 2005; Heckman et al., 2010) – need to be replicated across different samples, with different measures and, most importantly, with different intervals between assessments before an overall judgment of the model can be made. Ultimately, experiences that are important for personality trait change will have to be examined through natural experiments (e.g., Perez-Arce, 2011) or intervention studies (Jackson, Hill, Payne, Roberts, & Stine-Morrow, 2011). One could easily take the current study as a framework for future intervention work (e.g., examining whether interventions aimed to decrease stress level and increase satisfaction can stop the cycle of worry and anxiety that lead to higher levels of neuroticism)

An especially promising experience to focus on is engaging in cultural or intellectual activities. In the current study, getting out of the classroom and experiencing the theater, art museums, or the opera was associated with increases in openness. Similarly, increases in the tendency to participate in such activities across young adulthood were associated with increases in openness. Moreover, as our ALT model results suggest, it is likely that engaging in cultural activities such as visiting museums, libraries, and theaters could lead to increases in openness. These results mirror a recent intervention study which found that increasing the frequency with which older adults perform cognitively engaging tasks leads to increases in

openness (Jackson et al., in press). Together, these findings suggest that experiencing intellectually engaging activities may lead to changes in openness.

If the advanced longitudinal models and interventions are able to identify causal experiences of personality trait change, then the question remains as to how to best measure these meaningful educational experiences. Multiple levels of analysis will likely be necessary given the difficulty inherent in objectively studying the environment (Funder, 2006). It is often argued that experiences have such idiosyncratic effects on people that one cannot capture their impact on psychological functioning. At one level, an event that happens to you is by definition wholly unique because it is happening to the person—no one else can experience it the same way in which you experience it. At a broader level, people may be able to have the same type of experience (e.g., a positive teacher), but the experience will be different in a number of important (e.g., teaching philosophy) and not so important ways (e.g., hair color). At some point, however, one must abstract the measurement of these unique experiences to concrete, measurable behaviors (Furr, 2009), though it is currently unclear what is the best level of measurement to do so.

Another topic that has no direct answer is the best way to examine and conceptualize changes in personality traits. The current study focused on two traditional ways to conceptualize changes in personality: latent growth models that capture an average trajectory of change and an auto-regressive cross-lag model that focuses on direct effects between two time points. Each of these methods makes assumptions about the mechanisms involved in change that are not equally consistent with one another. Indeed, there were differences among the approaches in our overall findings. For example, GPA was associated with changes in conscientiousness using a latent growth model but was not associated with any cross-lag paths in the auto-regressive model. Instead, the relationship between GPA and

conscientiousness was constrained to the correlated residuals. Moreover, school satisfaction was associated with changes in openness using latent growth models but not with autoregressive or ALT models. These findings highlight the slightly different questions that each method assesses, even though each method is examining personality trait change.

The two approaches that are combined in the ALT model are also combined in another recent hybrid of direct effects and latent growth processes: the latent change model (LCM; McArdle, 2001). There are also additional models of change that differ from the above methods, such as state trait models and multi-level models. While there is a lot of overlap among these methods, there are slight advantages over others depending on one's data structure. More importantly, however, is that each conceptualizes the processes responsible for change and continuity slightly differently. Given the current results and the overall state of the field, it is not clear if there is a correct way to conceptualize change in personality traits. Moreover, in the service of identifying causally important experiences, it is not immediately clear what modeling techniques for observational data should be utilized.

4.4 Implications for Personality Trait Development

The current findings, along with a growing body of work on the experiences that change personality traits (Roberts, Wood & Caspi, 2008), suggest three features of personality trait change that may not be immediately intuitive, and are often overlooked in the field:

First, the most important experiences for personality trait change are not random. There was a strong correspondence between educational environments predicted by high school levels of personality and the educational experiences that were associated with changes in personality. That is, selection and socialization processes were found to work in tandem to change personality. This combination suggests that educational experiences, in general, do not change personality traits in a random fashion. For the most part, educational

experiences, such as school stress, getting along with peers, or the amount one studies, do not happen by chance. Rather, the personality traits that people possess influence their selection into these experiences and are then deepened and elaborated upon by being a part of these experiences. For example, conscientious high school students were more likely to spend time doing homework and devote additional time to studying. Performing these activities, in turn, led to increases in conscientiousness. This corresponsive relationship occurs because such trait-consistent experiences are likely to be viewed as validating and rewarding (e.g., an extraverted individual will be more content to spend time around people than someone who is introverted). Overtime, these experiences likely lead people to see themselves in a different light and lead to changes in their identity, which, in turn, can result in a change in their personality.

While the current findings generally conform to this pattern, not all educational experiences demonstrated a corresponsive pattern. A number of random experiences – in the sense that they were not predicted by personality traits – were also associated with changes in personality traits. However, almost all of the experiences associated with personality trait change were predicted by some personality trait, suggesting that cross-trait selection processes may influence personality trait change for these “random” experiences. For example, while lower grades were associated with increases in neuroticism, neuroticism did not prospectively predict receiving lower grades. Class grades were predicted by conscientiousness, however, which may have in turn led to indirect changes in neuroticism. These types of processes likely contribute to a pattern of correlated changes found between personality traits (Allemond et al., 2008; Jackson, Fraley, Vicary & Brumbaugh, 2011). For example, if a person decreases in neuroticism, they are more likely to increase in

conscientiousness. These findings suggest that these correlated changes amongst personality traits may reflect cross-trait corresponsive effects.

Second, once in the experience, changes in personality occur from repeated exposure (Roberts & Jackson, 2008). That is, changes take time occur. This can be seen when comparing the effects of the latent growth models with the cross-lag analyses. Associations between variables are more likely to occur as time passes, and these small, reciprocal effects combine over time. Moreover, abrupt shifts of the environment do not necessarily lead to personality trait change. In fact, there is some evidence to suggest that these abrupt shifts are more likely to lead to consistency in personality (Caspi, & Moffitt, 1993). For example, romantic couples that stay together are more likely to experience personality trait change, whereas individuals who form multiple romantic partnerships (i.e., shift their environment) actually demonstrate greater personality trait stability (Lehnart & Neyer, 2006). Simple life events, such as entering college and demographic transitions such as retiring, are therefore not thought to be the experiences that drive personality trait change.

Similarly, an isolated stressful experience would not be hypothesized to lead to changes in personality traits. However, if that experience has large ramifications that result in other stressful experiences across time, then changes in personality traits may occur. In the current study, this is likely seen in the effect that dropping out of college has on extraversion and openness. The actual act of not signing up for class, or the event that led up to deciding to leave likely did not greatly change personality. However, the prolonged changes in one's physical or psychological environment (e.g., loss of a social structure; stressed about one's future) were more than likely responsible for the changes.

The third overlooked aspect in the study of personality development is that personality trait change involves reciprocal processes, suggesting that the joint interplay of

experience and personality traits should be examined simultaneously. Indeed, the present results indicate that selection effects lead a person to have an experience whereby the experience then leads to changes in personality traits. As a person changes in response to an experience, they are likely to select into and evoke different experiences consistent with their personality. This bi-directional development seen here reflects a reciprocal process where changes in one variable drive changes in another. Further evidence for this reciprocal association is found in the correlated changes among educational experiences and personality, as well as the correlated residuals in the auto-regressive cross-lag analyses.

4.5 Limitations and Future Directions

In light of the multiple assessments of personality and educational experiences during an important juncture in the life course, there are still a number of limitations of the current study that suggest future research. First, the measurement of educational experiences was less than ideal. Despite the multiple assessments at multiple levels of analyses there were still a number of important experiences not assessed (e.g., friend relationships, partying habits, cheating prevalence, exercising) and not all experiences were measured at all time points. Moreover, more observer measures or aggregate experiences at the school level could likely overcome the mostly mono-method assessment in the current study. Parent reports were collected for one wave, but did not overlap significantly with self-reports on the two variables that were obtained.

Relatedly, assessments of educational experiences ranged from broad, general assessments of functioning (e.g., school satisfaction) to specific activities (e.g., number of hours studying per week). A shortcoming of assessing broad experiences, like school satisfaction, is that broad experiences may simply be markers of normative personality trait change as opposed to developmental antecedents of this change. On the other hand, though,

broad assessments of functioning are also important because they capture a number of more specific experiences that are unique to an individual and thus difficult to measure nomothetically. For example, receiving an award or winning a sporting event are likely to be important to an individual's overall level of school satisfaction. However, these types of experiences are rare and thus difficult to assess. Accordingly, collapsing these idiosyncratic experiences under the broad umbrella term of "school satisfaction" allows one to better capture the varying and more unique experiences specific to an individual

The current study also does not address whether changes in personality traits lead to better outcomes life outcomes, such as increased income, interpersonal relationships, or health. Future studies are needed to follow students into the labor market to see if those who changed in personality reaped the rewards of those changes. It is possible that individuals who did not change personality levels in college changed during entrance to the work force, thereby negating any possible benefits from changing in personality at an earlier time point.

Despite the successful use of the ALT model, more longitudinal assessments would be beneficial to understand the causal precedence of each variable, make sure that the results are stable across time, and better examine changes across major transition points. It would have been interesting to examine the transition into college in more detail, but given that the current study only included one assessment in high school, the ALT model could not examine this question. Future follow-up studies of this sample would allow for the examination of the transition into the workforce from college. If the cross-lag analyses are any indication of how the ALT model operates, there may not be many differences across transition points, as the cross lag analyses in the current study did not find different associations for the transition into college and the two years in college.

Current results indicate that changes in personality traits due to educational experiences may lead to positive outcomes in one's life course. Future experiences and outcomes need to be tested to verify whether or not personality trait change during this time period actually matters. Given the documented effects of personality traits on significant life outcomes such as occupational success, longevity, and health (Kern & Friedman, 2009; Roberts et al., 2007), any change in these attributes may lead to benefits for those individuals who do change. It is quite possible that even small changes in personality traits may have profound effects on work and health across the life course (Mrozcek & Spiro, 2007).

These findings also have broad implications for policy that attempts to shape personality through educational experiences (Heckman, 2007). Often, policy impacts experience through a top down change such as mandating a specific number of hours needed to be spent in the classroom. Moreover, approaches that are focused on more proximal experiences, such as getting students to study or read more, may not lead to changes in personality because of the corresponsive principle. Changes are more likely to occur if a student performs these activities on their own and values the experience. These features of personality trait development could be incorporated through interventions aimed at not only increasing the specific experiences associated with changes in personality, but also the enjoyment and desire to engage in these activities. If these experiences are seen as important and fulfilling, then they are more likely to continue after the intervention is complete.

Selection processes also need to be further examined, because selection processes may provide insights on which experiences are important for personality trait development. That is, if selection and socialization work together in the development of personality traits, experiences associated with personality traits may be more likely to be associated with changes in personality traits. Furthermore, knowing the specific type of person-environment

transactions that create selection effects may uncover the mechanisms associated with personality trait change. Person-environment transactions may involve different processes, such as active selection into specific environments (extraverts selecting to join a social club), evocative transactions (disagreeable individuals get harsher feedback), or even reactive transactions wherein the objective environment is the same but a person interprets that situation differently (neurotic individual's assessment of the feedback (Caspi & Bem, 1990)). Each of these person-environment transactions suggests a different mechanism responsible for changes in personality.

4.6 Conclusion

Overall, the current study suggests that the experiences responsible for personality trait change can be summed up as: "You become what you do". That is, participating in activities associated with a personality trait, leads to changes in the latent level of that trait. Changes in personality traits occur much like regularly running increases the ability to run farther and longer. In the current study, increases in conscientiousness occurred when performing activities that were associated with conscientiousness. Presumably, working hard—in the form of studying or performing well in class—leads to the ability to work even harder overtime, if one conceptualizes conscientiousness as a latent ability to exert effortful control (Carver et al., 2008). Much like exercising, performing activities that lead to higher achievement (e.g., studying, going to class) increases the latent ability to obtain high levels of achievement. Similarly, being stressed out leads one to become more stress-prone, or in other terms, more neurotic. It is in this sense that *you become what you do*. If you work hard, you become a hard worker. If you go to the opera and art museums you are more likely to enjoy going to those and other aesthetic experiences. If you are stressed and worry a lot, you are

likely to become an anxious worrywart. Viewed in this light, one learns more in college than just class material.

Accordingly, the present study provides important information regarding the relationship between educational experiences and personality trait development. In particular, although education is associated with a number of positive life outcomes (e.g., earning more money, being healthier), personality traits themselves also predict a number of these same outcomes (e.g., individuals who are more conscientious tend to live longer). The current findings provide some insight as to why these analogous associations with life outcomes occur: the personality traits that are associated with and develop from particular educational experiences are likely to generalize to other life domains. For example, doing well on an exam is rewarding and is likely to lead one to increase in conscientiousness. This increase in conscientiousness is likely to result in an increase in one's desire to lead a healthy lifestyle, by maintaining a balanced diet and exercise routine. That is, learning the skill in one domain (e.g., college) transfers to other domains (e.g., health). Although such findings provide evidence for the responsive association between education and personality trait development, additional research is needed to clarify the specific experiences, as well as the causal direction, that underlie this association.

TABLES AND FIGURES

Table 1. *Fit Indices for Measurement Invariance Tests for Big Five Personality Factors*

	χ^2	<i>df</i>	CFI	RMSEA
Extraversion				
Model 1	107.92	74	.99	.01
Model 2	123.16	83	.99	.01
Model 3	150.33	92	.99	.02
Model 4	213.91	107	.99	.02
Agreeableness				
Model 1	101.58	74	.99	.01
Model 2	106.77	83	.99	.01
Model 3	392.42	92	.98	.02
Model 4	434.42	107	.98	.03
Conscientiousness				
Model 1	148.87	74	.99	.01
Model 2	199.56	83	.99	.02
Model 3	456.39	92	.98	.03
Model 4	533.22	107	.98	.03
Neuroticism				
Model 1	328.42	74	.99	.03
Model 2	472.95	83	.98	.03
Model 3	686.70	92	.98	.04
Model 4	936.12	107	.97	.04
Openness				
Model 1	317.33	74	.99	.03
Model 2	353.96	83	.99	.03
Model 3	1004.88	92	.95	.05
Model 4	1045.84	107	.95	.04

Note. χ^2 = Chi-square, *df* = degrees of freedom, CFI = Comparative Fit Index, RMSEA = Root Mean

Square Error of Approximation, M1 = Unconstrained model, M2 = factor loadings invariant, M3 = factor loadings and intercepts invariant (strong invariance), M4 = factor loadings, intercepts and uniquenesses invariant (strict invariance).

Table 2. *Descriptive Statistics for Personality Traits Across 4-Waves*

	<i>Means</i>				<i>SD</i>	<i>Rank-Order</i>					
	T1	T2	T3	T4		r_{12}	r_{23}	r_{13}	r_{14}	r_{24}	r_{34}
Extraversion	2.85	2.88	2.90	2.92	.41	.81	.81	.76	.69	.78	.83
Agreeableness	2.92	3.01	3.06	3.10	.39	.77	.81	.72	.68	.80	.83
Conscientiousness	2.89	3.02	3.10	3.16	.38	.79	.78	.73	.64	.73	.78
Neuroticism	2.27	2.17	2.14	2.10	.33	.70	.74	.67	.63	.73	.78
Openness	2.76	2.83	2.84	2.85	.43	.87	.87	.85	.82	.85	.88

Note. All correlations are statistically significant at $p < .01$.

Table 3. *Univariate Latent Growth Model for Personality*

	<i>Intercept</i>		<i>Slope</i>			<i>Fit Statistics</i>		
	<i>M</i>	<i>Var</i>	<i>M</i>	<i>Var</i>	r_{IS}	<i>CFI</i>	<i>RMSEA</i>	χ^2
Extraversion	2.85	.11	.07	.04	-.14	.99	.02	335.77 (112)
Agreeableness	2.92	.08	.19	.03	-.15	.98	.03	502.08 (112)
Conscientiousness	2.89	.14	.27	.06	-.25	.98	.03	722.06 (112)
Neuroticism	2.27	.12	-.17	.07	.18	.97	.04	887.84 (112)
Openness	2.77	.13	.08	.02	-.17	.95	.04	1123.77 (112)

Note. All bold values are statistically significantly different from zero, $p < .05$. r_{IS} represents the correlation between slope and intercept.

Table 4. *Correlations between Measures of School Satisfaction*

	School Satisfaction	Satisfaction with Major	School Support
School Satisfaction	--		
Satisfaction with major	.38	--	
School Support	.13	.12	--
Parent report School Satisfaction	.04	.06	.13

Note. All bold values are statistically significantly different from zero, $p < .05$

Table 5. *Correlations between Measures of Academic Performance*

	GPA	Living up to standards	Performance compared to peers	Proficiency in major
GPA	--			
Living up to standards	.47	--		
Performance compared to peers	.55	.67	--	
Proficiency in major	.47	.41	.58	--
Parent Report GPA	.28	.15	.11	.24

Note. All bold values are statistically significantly different from zero, $p < .05$

Table 6. *Correlations between Measures of School Stressors and Setbacks*

	School Stress	Parent Separation	Intentions to leave	Left University
School stress	--			
Parent separation	.15	--		
Intentions to leave	.42	.08	--	
Left University	.05	.03	.18	--
Changed majors	.04	.00	.12	.03

Note. All bold values are statistically significantly different from zero, $p < .05$

Table 7. *Correlations between Peers and Teacher Relations*

	Teacher Satisfaction	Competitive Peers	Parent Problems
Teacher satisfaction	--		
Competitive peers	-.27	--	
Parent Problems	-.09	.04	--
Helpful peers	.11	-.23	-.12

Note. All bold values are statistically significantly different from zero, $p < .05$

Table 8. *Correlations between Study Habit Measures*

	Study Conditions	Procrastination	Study Time	Class Attendance
Study Conditions	--			
Procrastination	-.20	--		
Study time	.01	-.21	--	
Class Attendance	.12	-.20	-.09	--
Homework Time	.03	-.21	.20	.08

Note. Correlations are average levels in college. All bold values are statistically significantly different from zero, $p < .05$

Table 9. *Selection Effects of Personality and Educational Experiences*

Educational Experiences	Age 19 Personality Traits				
	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
School Satisfaction					
School Satisfaction	.15	.13	.19	-.17	.14
S. with major	.12	.17	.14	-.18	-.06
S. Satisfaction (P)	.00	.02	.03	-.06	.02
School support	.01	.19	-.04	-.20	.01
Achievement					
GPA	.08	-.02	.21	-.05	.15
Living up to standards	.14	.22	.16	-.13	-.14
Performance compared to peers	.02	-.18	.21	-.15	.03
Proficiency in major	.07	.10	.33	-.12	.15
Stressors					
School stress	-.19	-.21	-.09	.41	.08
Parent separation	.00	.03	-.05	.16	.08
Intentions to drop out	-.13	-.10	-.24	.14	-.02
Dropped out	-.04	-.03	-.13	.02	.06
Changed majors	-.03	.00	-.03	.05	.16
Relationships					
Teacher satisfaction	.30	.14	.29	-.24	.08
Parent Problems	.05	-.15	-.25	.10	-.08
Helpful peers	.12	.21	.08	-.26	.04
Competitive peers	.04	.03	-.14	.02	-.04
Study habits					
Study Conditions	.07	.06	.14	-.21	-.09
Procrastination	-.12	-.11	-.51	-.19	.13
Study time	-.06	-.10	.17	.07	.12
Class Attendance	.16	-.06	.22	.00	-.16
Homework time	.07	.08	.11	.11	.00
Hours spent in job	.13	.06	.03	.03	.11
Cultural Activities	.12	.10	-.05	.04	.14

Note. Correlations are average levels in college. All bold values are statistically significantly different from zero, $p < .01$

Table 10. *Socialization Effects for personality and educational experiences*

Educational experiences	Changes in personality from age 19 to 25				
	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
School Satisfaction					
School Satisfaction	.17	.04	.15	-.25	.14
S. with major	.06	.09	.04	-.05	.02
S. Satisfaction (P)	.00	.04	-.09	.01	-.03
School support	.02	.05	.10	-.05	.00
Achievement					
GPA	-.08	.00	.12	-.14	.07
Living up to standards	.15	.06	.24	.25	.19
Performance compared to peers	.08	-.08	.13	-.09	.00
Proficiency in major	.14	.04	.04	.05	-.07
Stressors					
School stress	-.14	-.09	-.17	.38	-.14
Parent separation	.01	-.04	-.01	-.07	.11
Intentions to drop out	-.18	-.05	-.13	.23	-.03
Dropped out	-.12	-.06	.05	.02	-.12
Changed majors	.05	.06	.00	-.03	.03
Relationships					
Teacher satisfaction	.16	.01	.09	-.22	.07
Parent Problems	-.03	-.07	.06	-.14	.05
Helpful peers	-.04	.13	.04	.00	-.02
Competitive peers	.07	.05	-.07	.09	.05
Study habits					
Study Conditions	.00	.02	.10	-.19	.05
Procrastination	-.06	.00	-.32	.27	-.04
Study time	.00	.03	.12	.09	.00
Class Attendance	.11	-.06	.05	-.03	-.03
Homework time	-.09	-.12	.24	.09	.06
Hours spent in job	.12	-.04	.08	.03	.07
Cultural Activities	.05	.02	.06	-.04	.15

Note. Correlations are average levels in college. All bold values are statistically significantly different from zero, $p < .01$

Table 11. *Latent Growth Models for Educational Experiences*

	Intercept		Slope	
	<i>M</i>	<i>Var</i>	<i>M</i>	<i>Var</i>
School Satisfaction	3.16	.20	-.06	.16
GPA	2.26	.27	.25	.13
Standards	2.63	.24	.09	.25
Performance	29.88	193.42	-1.33	58.42
Intentions to leave	1.55	.18	-.14	.17
School Stress	2.09	.20	.01	.18
Study conditions	2.62	.29	-.21	.34
Procrastination	2.57	.47	-.11	.26
Study time	13.26	50.53	2.29	4.96
Class Attendance	21.85	22.8	-12.14	0*
Hours in a Job	4.23	41.16	2.78	30.74
Cultural Activities	1.96	.32	.01	.10

Note. Slope variances of 0* were constrained to 0 to achieve adequate model fit. Class attendance is in hours per week. Cultural activities are on a scale from 1-4. Grades range from 1 to 6 with 1 being the best. Study time is in hours per week.

Table 12. *Dual Process Growth Models*

Changes in educational experiences	Extraversion		Agreeableness		Conscientiousness		Neuroticism		Openness	
	I	S	I	S	I	S	I	S	I	S
School Satisfaction	-.04	.35	-.07	.22	-.20	.40	.04	-.42	-.11	.47
Grades	.00	.00	.02	.16	.04	.10	.00	-.09	.03	.06
Standards	.00	.18	-.06	.14	-.10	.37	.03	-.26	.03	.15
Performance	.00	-.09	-.03	-.05	.00	-.24	-.06	.07	.03	-.07
Intentions to leave	.08	-.17	.10	-.13	.19	-.29	-.14	.31	.03	-.09
School stress	.02	-.33	.09	-.19	.09	-.28	-.06	.66	.08	-.23
Study conditions	-.03	.10	-.10	.31	-.06	.13	-.08	.29	.00	.12
Procrastination	.06	-.21	.07	-.26	-.33	-.88	-.14	.37	.03	-.01
Study time	.08	-.18	-.17	-.12	-.12	.31	-.08	.29	.09	-.11
Hours in a Job	-.01	.02	-.02	-.05	-.04	-.10	.00	.10	.10	.15
Cultural Activities	-.14	.13	-.19	.16	-.20	.11	.04	-.04	-.30	.64

Note. Correlations are average levels in college. All bold values are statistically significantly different from zero, $p < .05$

Table 13. *Cross-lag Analysis for Personality and Educational Experiences*

Educational experience	Path	Extraversion	Agreeableness	Conscientiousness	Neuroticism	Openness
School Satisfaction	P→E	.09	.05	-.03	-.07	.00
	E→P	.02	.00	.08	-.02	.00
	r ^{change}	.32	.36	.33	.52	.16
Grades	P→E	-.03	-.02	.00	-.06	-.04
	E→P	.00	.00	.03	-.01	.00
	r ^{change}	.02	.15	.18	.02	.09
Standards	P→E	.03	.02	.06	.02	-.01
	E→P	.00	.00	-.02	.02	.00
	r ^{change}	.14	.04	.37	-.40	.09
Performance	P→E	-.01	-.05	-.09	-.03	.00
	E→P	-.01	.00	.02	.00	-.02
	r ^{change}	-.08	-.04	.30	.09	-.08
Intentions to leave	P→E	-.10	-.12	-.10	.18	.03
	E→P	-.03	-.01	.02	.02	.00
	r ^{change}	-.29	-.27	-.36	-.59	-.04
School stress	P→E	-.08	-.06	.00	.08	.05
	E→P	-.02	-.02	.01	.17	.00
	r ^{change}	-.30	-.31	-.22	.74	-.06
Study conditions	P→E	-.01	-.02	.00	-.09	-.04
	E→P	.00	.00	.05	-.02	.00
	r ^{change}	.15	.18	.15	-.43	-.06
Procrastination	P→E	.02	.03	-.14	.01	.06
	E→P	-.04	.01	.02	-.03	.01
	r ^{change}	-.21	-.15	-.83	.42	.04
Study time	P→E	.02	-.06	.06	.00	.06
	E→P	.00	-.00	.00	-.03	.02
	r ^{change}	-.04	.09	.16	.13	.07
Hours in a Job	P→E	.02	.00	.02	-.03	.04
	E→P	.03	-.00	-.02	-.02	.00
	r ^{change}	.10	.07	-.04	.11	.12
Cultural Activities	P→E	.02	-.04	.04	.00	.09
	E→P	.02	.01	.02	-.07	.16
	r ^{change}	.24	.10	.04	-.07	.41

Note. All values are standardized. Bold values are statistically significantly different from zero, $p < .05$

Figure 1. *Sociogenomic Model of Personality Traits*

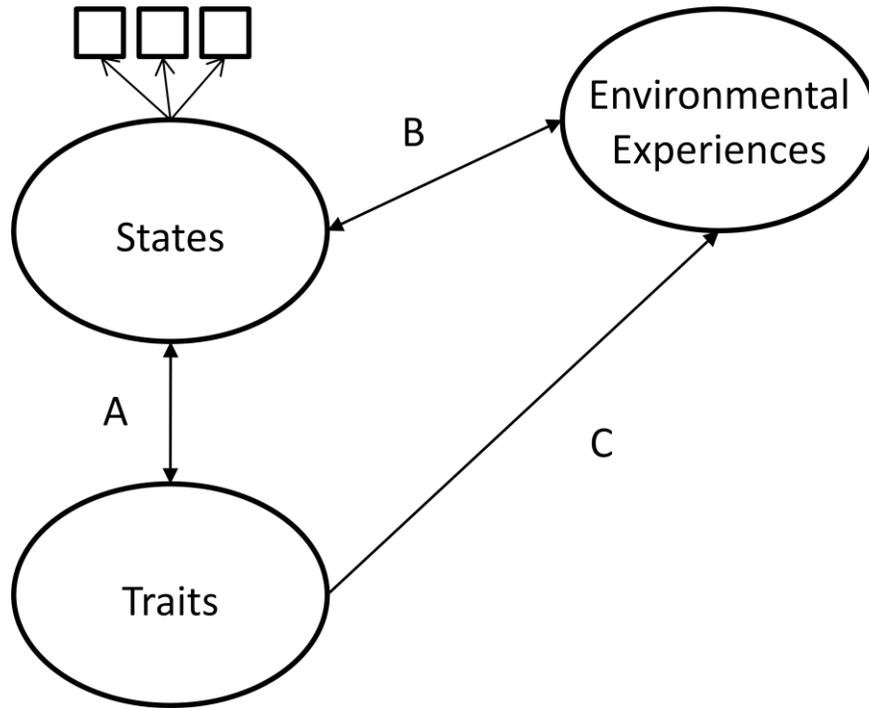


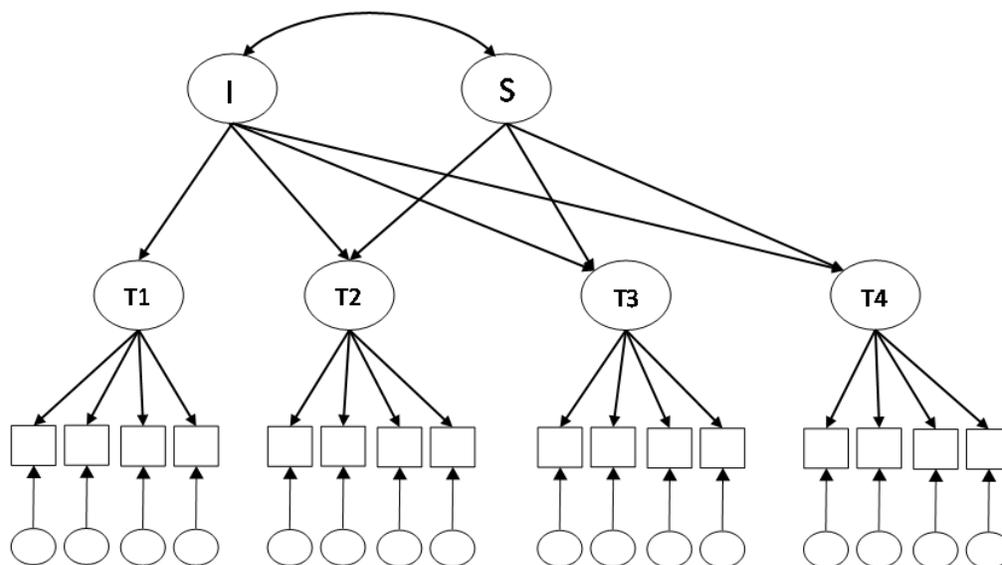
Figure 2. *Second Order Latent Growth Model*

Figure 3. *Auto-Regressive Cross Lag-Model*

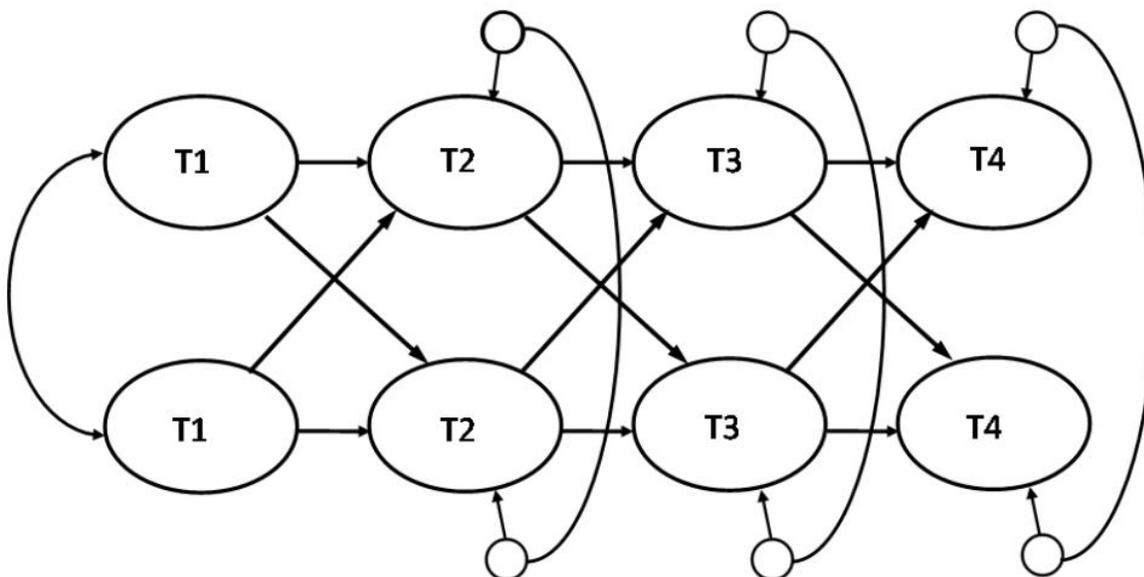


Figure 5. 90% Confidence Interval for Personality Trait Change

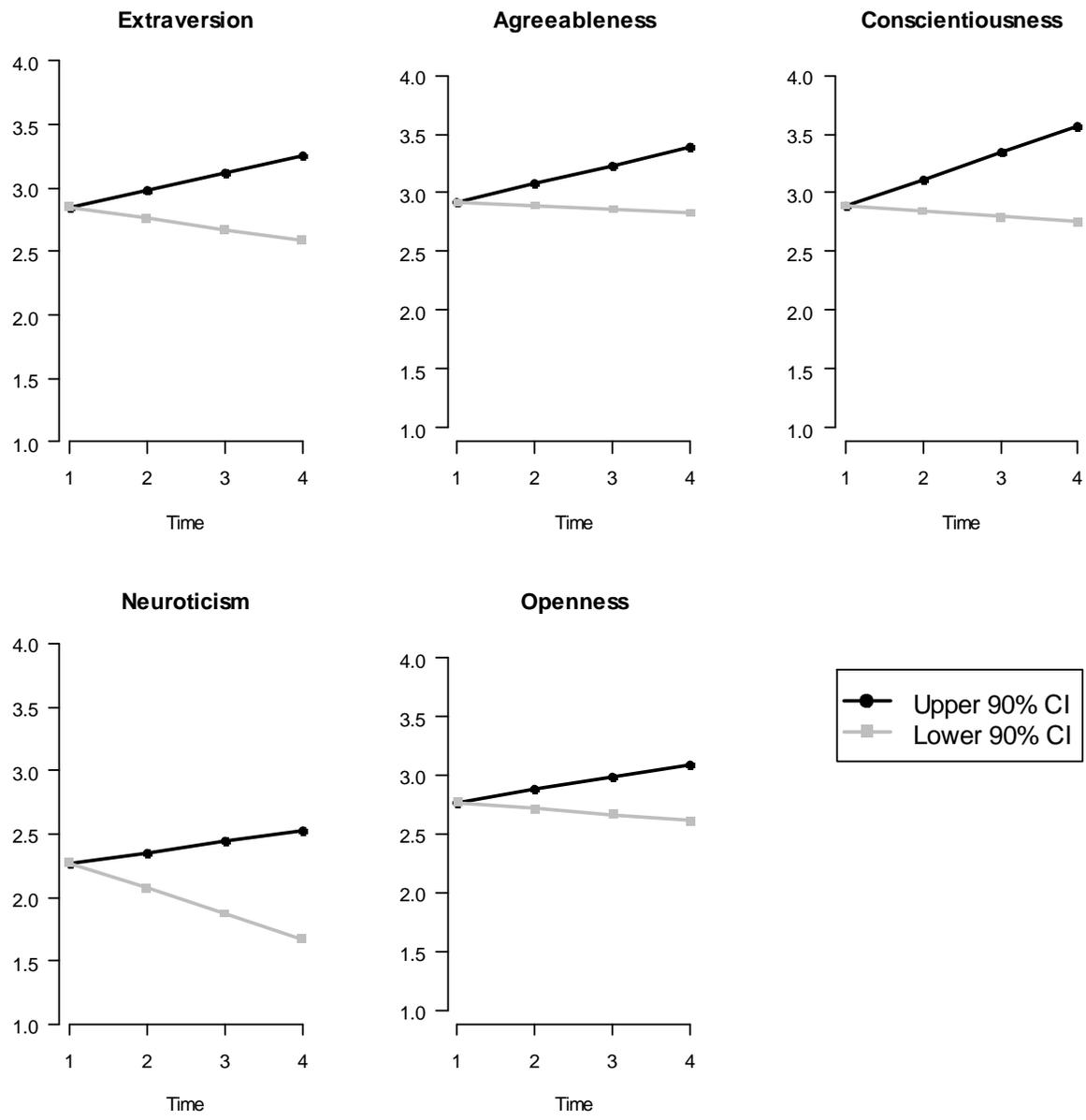


Figure 6. *Changes in Conscientiousness at Different Levels of School Satisfaction*

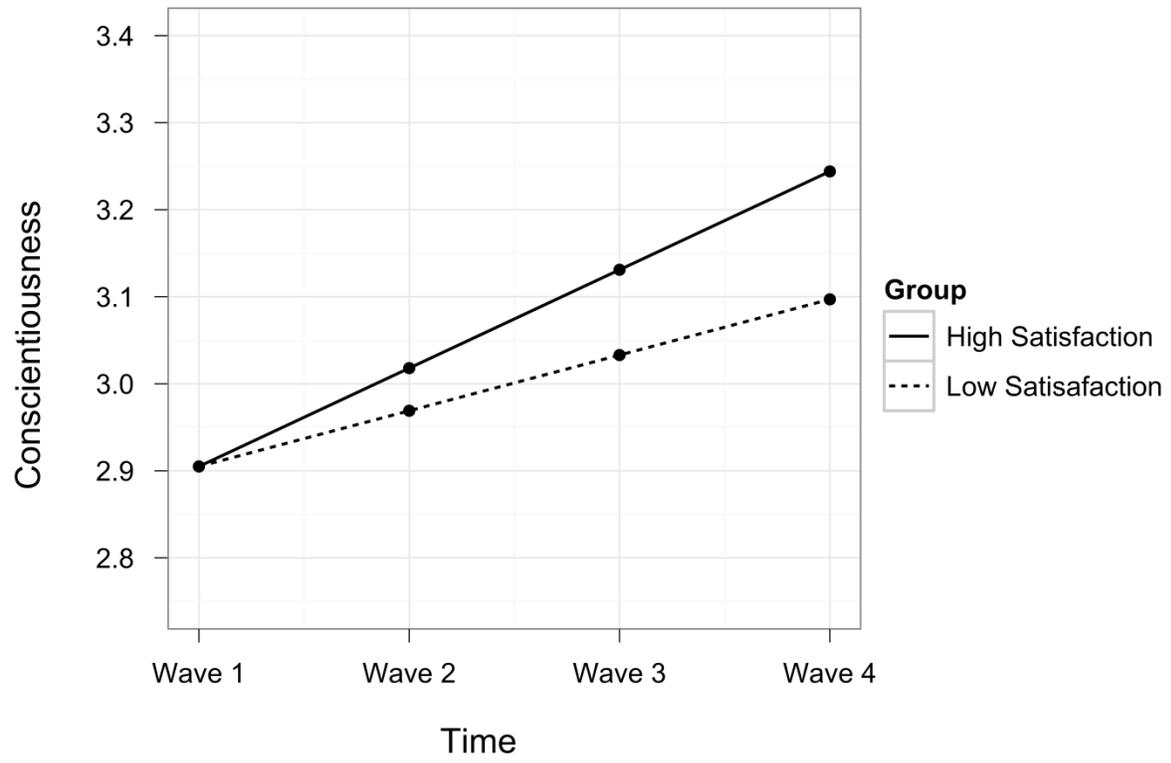


Figure 7. Changes in Neuroticism at Different Levels of Stress During College

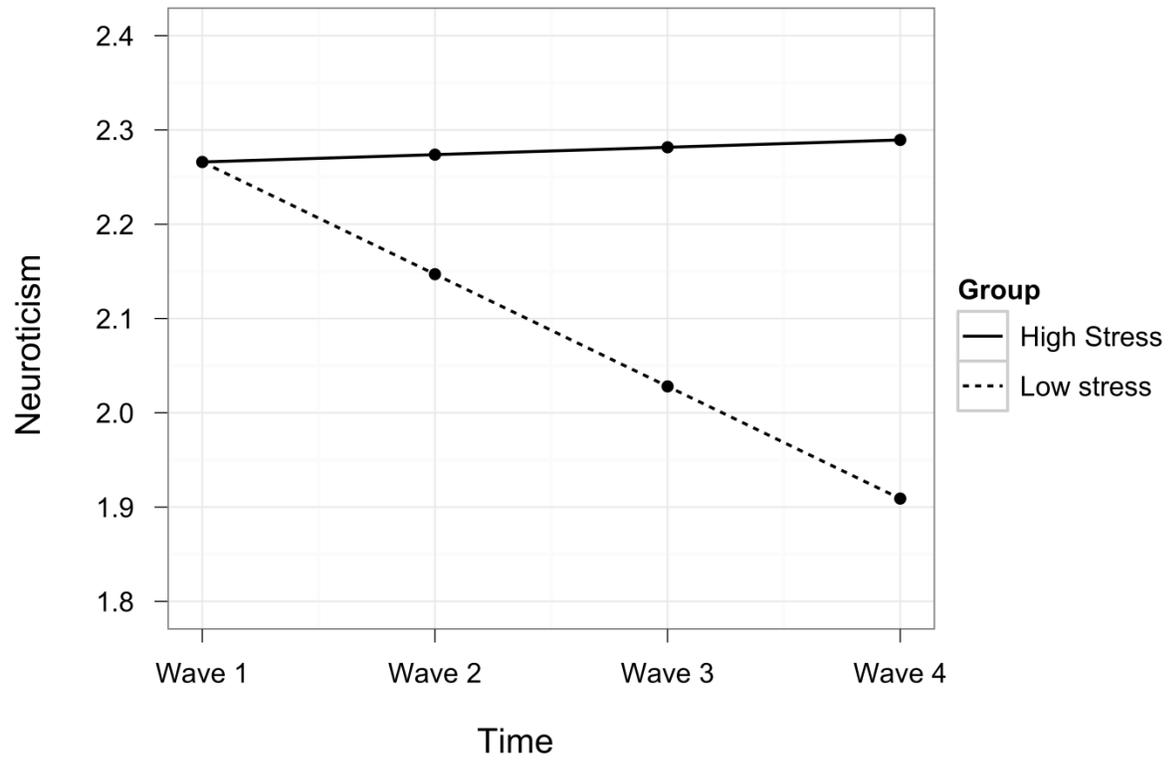


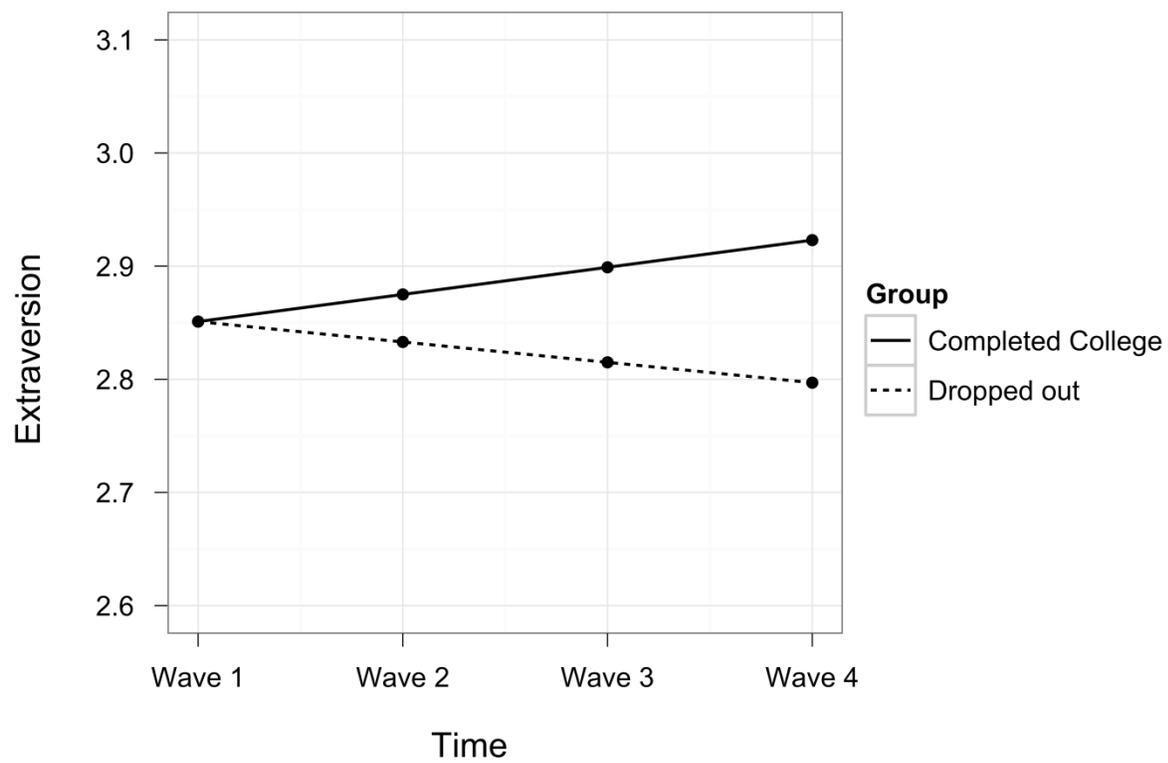
Figure 8. *Changes in Extraversion as a Function of Dropping Out of College*

Figure 9. *Changes in Conscientiousness at Different Levels of Procrastination*

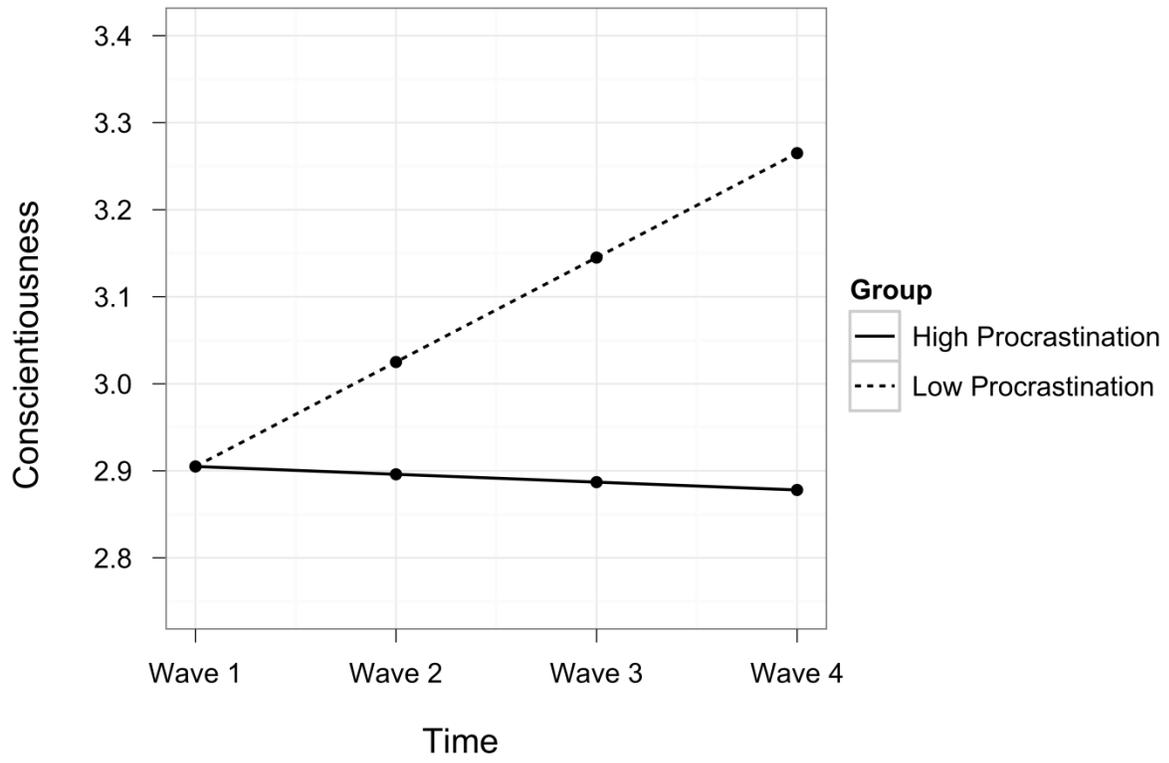


Figure 10. *Changes in Openness at Different Levels of Cultural Activities*

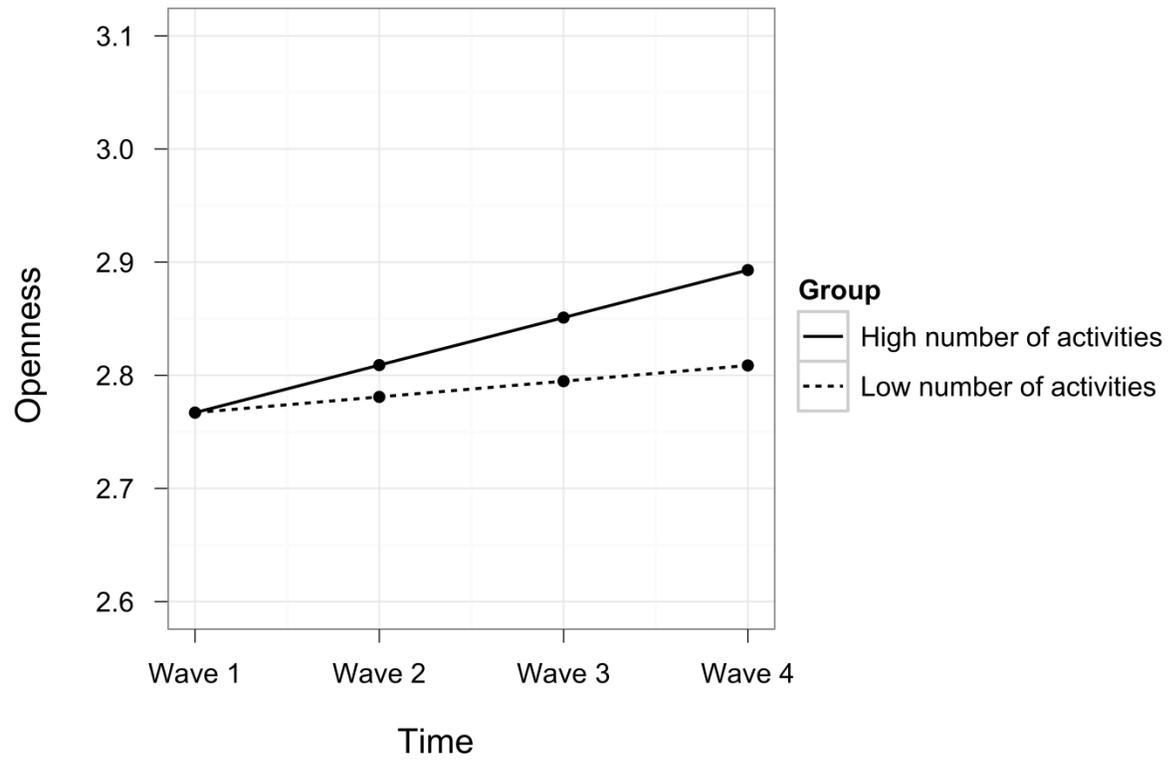


Figure 11. ALT Model for Conscientiousness and School Satisfaction

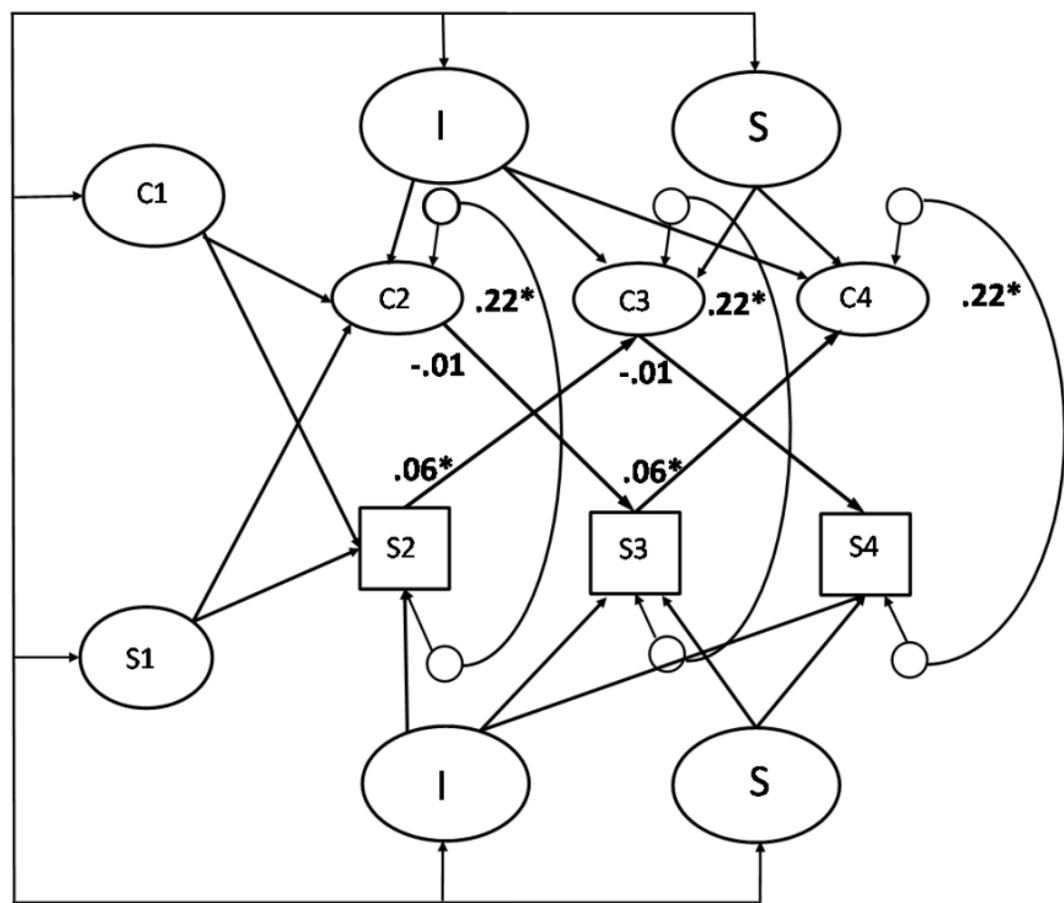


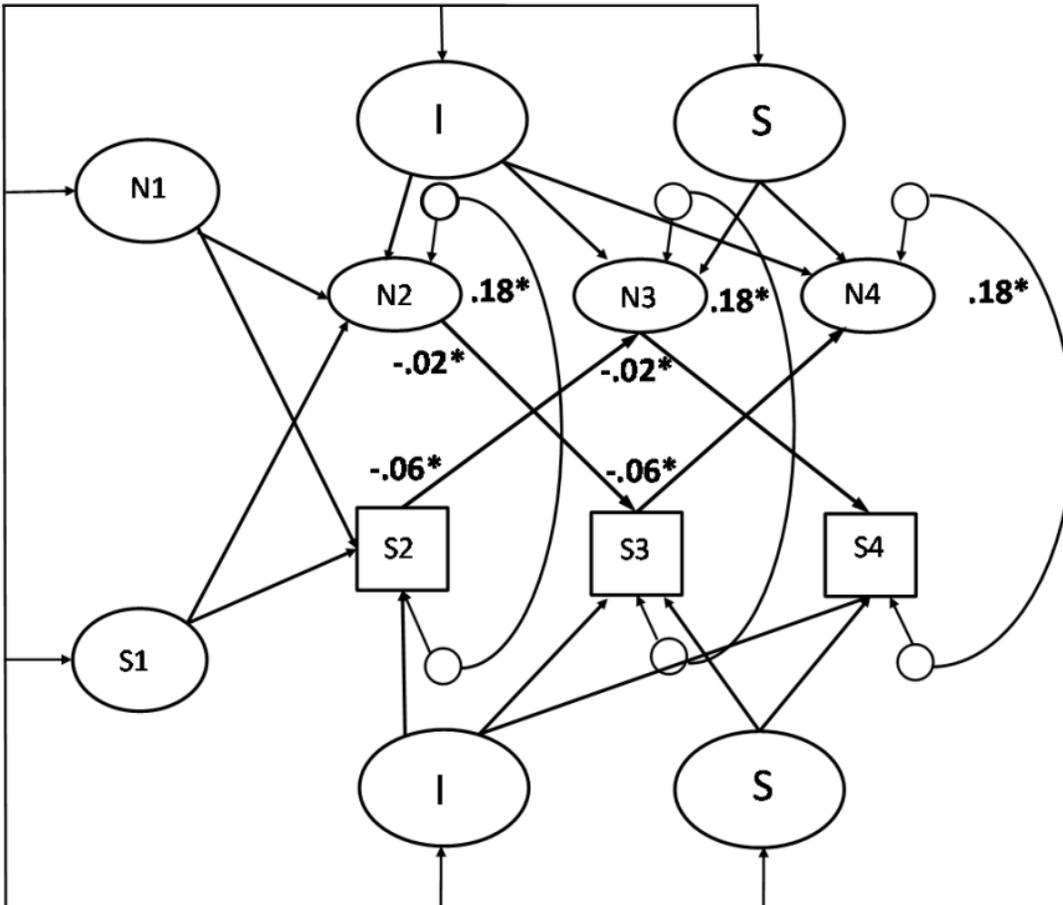
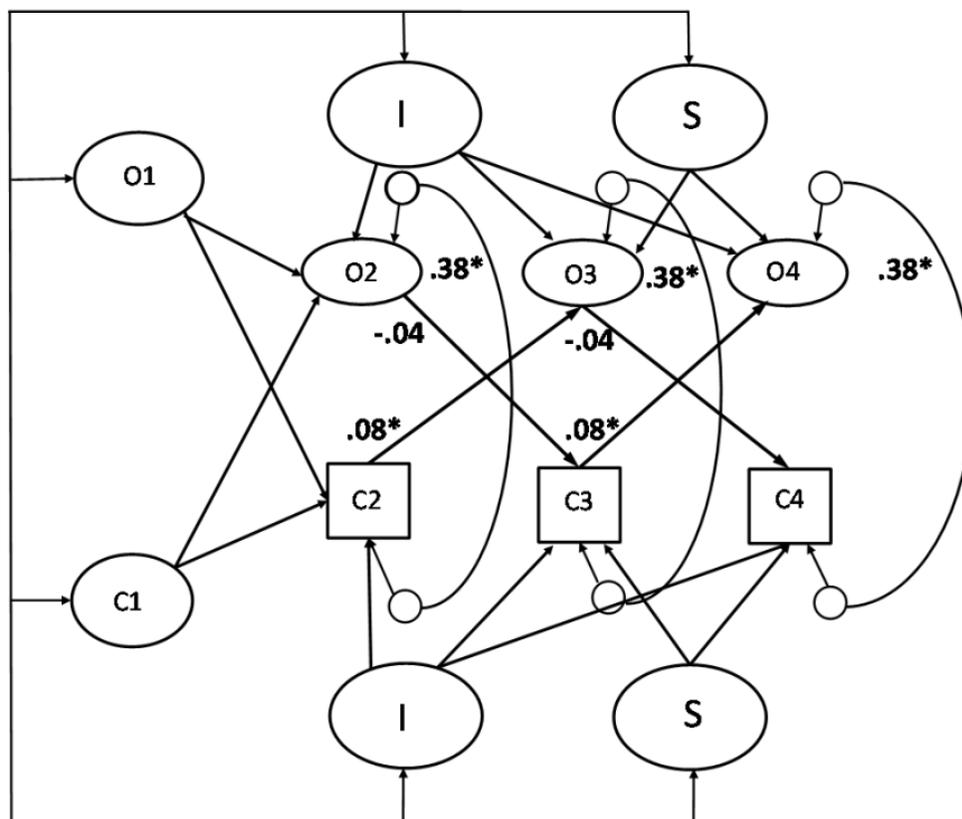
Figure 12. *ALT Model for Neuroticism and School Satisfaction*

Figure 13. *ALT Model for Openness and Cultural Activities*

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APPENDIX

MPLUS SCRIPT FOR AUTO-REGRESSIVE LATENT TRAJECTORY MODELS

Title: ALT model of openness and cultural activities (all paths estimated)

Data: FILE IS "C:\Desktop\TOSCA_ALT.dat";

Variable: names are

AFAKULT BFAKULT CFAKULT DFAKULT
 a_N_P1 a_N_P2 a_N_P3 a_N_P4 b_N_P1 b_N_P2 b_N_P3 b_N_P4
 c_N_P1 c_N_P2 c_N_P3 c_N_P4 d_N_P1 d_N_P2 d_N_P3 d_N_P4
 a_E_P1 a_E_P2 a_E_P3 a_E_P4 b_E_P1 b_E_P2 b_E_P3 b_E_P4
 c_E_P1 c_E_P2 c_E_P3 c_E_P4 d_E_P1 d_E_P2 d_E_P3 d_E_P4
 a_O_P1 a_O_P2 a_O_P3 a_O_P4 b_O_P1 b_O_P2 b_O_P3 b_O_P4
 c_O_P1 c_O_P2 c_O_P3 c_O_P4 d_O_P1 d_O_P2 d_O_P3 d_O_P4
 a_A_P1 a_A_P2 a_A_P3 a_A_P4 b_A_P1 b_A_P2 b_A_P3 b_A_P4
 c_A_P1 c_A_P2 c_A_P3 c_A_P4 d_A_P1 d_A_P2 d_A_P3 d_A_P4
 a_C_P1 a_C_P2 a_C_P3 a_C_P4 b_C_P1 b_C_P2 b_C_P3 b_C_P4
 c_C_P1 c_C_P2 c_C_P3 c_C_P4 d_C_P1 d_C_P2 d_C_P3 d_C_P4;
 missing are all (999);

usevariables are

AFAKULT BFAKULT CFAKULT DFAKULT
 a_o_P1 a_o_P2 a_o_P3 a_o_P4 b_o_P1 b_o_P2 b_o_P3 b_o_P4
 c_o_P1 c_o_P2 c_o_P3 c_o_P4 d_o_P1 d_o_P2 d_o_P3 d_o_P4;

idvariable is idstud;

ANALYSIS:

ESTIMATOR IS MLR;
 ITERATIONS = 1000;
 CONVERGENCE = 0.0005;
 COVERAGE = 0.10;

Model:

o1 by a_o_P1* (p1a); o1 by a_o_P2 (p1); o1 by a_o_P3 (p2);
 o1 by a_o_P4 (p3);
 o2 by b_o_P1* (p1a); o2 by b_o_P2 (p1); o2 by b_o_P3 (p2);
 o2 by b_o_P4 (p3);
 o3 by c_o_P1* (p1a); o3 by c_o_P2 (p1); o3 by c_o_P3 (p2);
 o3 by c_o_P4 (p3);
 o4 by d_o_P1* (p1a); o4 by d_o_P2 (p1); o4 by d_o_P3 (p2);
 o4 by d_o_P4 (p3);

[a_o_P1] (p20); [a_o_P2] (p21); [a_o_P3] (p22); [a_o_P4] (p23);
 [b_o_P1] (p20); [b_o_P2] (p21); [b_o_P3] (p22); [b_o_P4] (p23);
 [c_o_P1] (p20); [c_o_P2] (p21); [c_o_P3] (p22); [c_o_P4] (p23);
 [d_o_P1] (p20); [d_o_P2] (p21); [d_o_P3] (p22); [d_o_P4] (p23);

!correlated uniqueness

a_o_P1 a_o_P2 a_o_P3 a_o_P4 pwith b_o_P1 b_o_P2 b_o_P3 b_o_P4;
 a_o_P1 a_o_P2 a_o_P3 a_o_P4 pwith c_o_P1 c_o_P2 c_o_P3 c_o_P4;
 a_o_P1 a_o_P2 a_o_P3 a_o_P4 pwith d_o_P1 d_o_P2 d_o_P3 d_o_P4;
 b_o_P1 b_o_P2 b_o_P3 b_o_P4 pwith c_o_P1 c_o_P2 c_o_P3 c_o_P4;
 b_o_P1 b_o_P2 b_o_P3 b_o_P4 pwith d_o_P1 d_o_P2 d_o_P3 d_o_P4;
 c_o_P1 c_o_P2 c_o_P3 c_o_P4 pwith d_o_P1 d_o_P2 d_o_P3 d_o_P4;

!Openness Growth Model

int_o by o1@1 o2@1 o3@1 o4@1;
 slope_o by o1@0 o2@1 o3@2 o4@3;

[o1@0 o2@0 o3@0 o4@0];
 [int_o];
 [slope_o];

!Cultural activities growth model

I S |AFAKULT@0 BFAKULT@1 CFAKULT@2 DFAKULT@3;

!Autoregressive

o2 on o1 (1);
 o3 on o2 (1);
 o4 on o3 (1);

BFAKULT on AFAKULT (2);
 CFAKULT on BFAKULT (2);
 DFAKULT on CFAKULT (2);

!Cross lags

BFAKULT on o1 (4);
 CFAKULT on o2 (4);
 DFAKULT on o3 (4);

o2 on AFAKULT (5);
 o3 on BFAKULT (5);
 o4 on CFAKULT (5);

!Correlated errors

BFAKULT WITH c2 (3);
 CFAKULT WITH c3 (3);
 DFAKULT WITH c4 (3);

MODEL CONSTRAINT:

!non-arbitrary metric

$$p1a = 4 - (p1 + p2 + p3);$$

$$p20 = 0 - (p21 + p22 + p23);$$

Output: stand tech4;

VITA

Education

Ph.D., Personality Psychology, 2011
 Minor in Quantitative
 University of Illinois, Urbana-Champaign

B.S., Psychology and Philosophy, 2005
 University of Wisconsin, Madison

Honors and Awards

Seymour Sudman Dissertation Award, University of Illinois	2010
Hirshberg Award, University of Illinois	2009
Rising Star Award, Association for Research in Personality	2009
SPSP Student Travel Award	2009
Lyle Lannier Travel Award, University of Illinois	2008
Research Grant, LaVonne A. Straub Student Research Award	2008
Incomplete List of Teachers Ranked as Excellent by Their Students	2007
National Science Foundation Graduate Research Fellowship	2007-2010
Hilldale Undergraduate Research Fellowship, University of Wisconsin	2005

Publications

Payne B. R., **Jackson, J.J.** Hill, P. L., E. Stine-Morrow, Roberts, B. W. (in press). Inductive reasoning and memory self-efficacy. *Journals of Gerontology, Series B: Psychological Sciences and Social Science*

Jackson, J.J., Hill, P.L., & Roberts, B.W. (in press). Integrating sociogenomic theory within personality psychology. *European Journal of Personality Psychology*,

Spain, S., **Jackson, J.J.** & Edmonds, G. (in press). Extending the actor-partner interdependence model to include binary outcomes: multilevel logistic regression with SAS PROC GLIMMIX and HLM6. *Personal Relationships*

Payne B. R., **Jackson, J.J.** Noh, S. R., & Stine-Morrow, E. L (in press). In the zone: Flow state and cognition in older adults. *Psychology and Aging*

Roberts, B.W. **Jackson, J. J.**, & Duckworth, A. L. & Von Cullan, K. (2011). Personality measurement and assessment in the Health and Retirement Study (HRS). *Forum for Health Economics and Policy*, 14.

Hill, P. L. **Jackson, J. J.**, Roberts, B. W., Lapsley, D.K., & Brandenberger, J. W. (2011). Change you can believe in: Prosocial goal increases during college predict adult well-being. *Social and Personality Psychological Science*, 2, 123- 131.

- Jackson, J. J.**, Wood, D., Bogg, T., Walton, K., Harms, P. & Roberts, B.W. (2010). What do conscientious people do? Development and validation of the behavioral indicators of conscientiousness scale (BICS). *Journal of Research in Personality, 44*, 501-511
- Allemand, M., Gomez, V., & **Jackson, J. J.** (2010). Personality Trait Development in Midlife: Exploring the Impact of Psychological Turning Points. *European Journal of Ageing, 7*, 1-10.
- Jackson, J.J.**, Hill, P.L., & Roberts, B.W. (2010). Interactionism in personality and social psychology: A whole that is less than the sum of its parts. *European Journal of Personality Psychology, 24*, 489-493.
- Sadeh, N., Javdani, S., **Jackson, J. J.**, Reynolds, E.K., Potenza, M.N., Gelernter, J., Lejuez, C.W., & Verona, E. (2010). Serotonin Transporter Gene Associations with Psychopathic Traits in Youth Vary as a Function of Socioeconomic Resources. *Journal of Abnormal Psychology, 119*, 604-609.
- Lodi-Smith, J. L., **Jackson, J. J.**, Bogg, T., Walton, K., Wood, D., Harms, P. D., & Roberts, B. W. (2010). Mechanisms of health: Education and health-related behaviors partially mediate the relationship between conscientiousness and self-reported physical health. *Psychology and Health, 25*, 305-319.
- Jackson, J. J.**, Bogg, T., Walton, K., Wood, D., Harms, P. D., Lodi-Smith, J. L., & Roberts, B. W. (2009). Not all conscientiousness scales change alike: A multi-method, multi-sample study of age differences in the facets of conscientiousness. *Journal of Personality and Social Psychology, 96*, 446-459.
- Roberts, B. W., Smith J., **Jackson, J. J.**, & Edmonds, G. (2009). Compensatory conscientiousness and health in older couples. *Psychological Science, 20*, 553-559.
- Roberts, B. W. & **Jackson, J. J.**, Berger, J., & Trautwein, U. (2009). Conscientiousness and externalizing psychopathology: Overlap, developmental patterns, and etiology of two related constructs. *Development and Psychopathology, 21*, 871 - 888.
- Roberts, B. W., **Jackson, J. J.**, Fayard, J. V., Edmonds, G., & Meints, J. (2009). Conscientiousness. In M. Leary & R. Hoyle (Eds.), *Handbook of individual differences in social behavior*. (Chapter 25, pp 369-381) New York, NY: Guilford.
- Roberts, B. W., & **Jackson, J. J.** (2008). Sociogenomic personality psychology. *Journal of Personality, 76*, 1523-1544.
- Edmonds, G., **Jackson, J. J.**, Fayard, J. V., & Roberts, B. W. (2008). Is character fate, or is there hope to change my personality yet? *Social and Personality Psychology Compass, 2*, 399-413.

Other Publications

Roberts, B.W., Lejuez, C., Krueger, R.F., Richards, J., Collado, A., Sixkiller, K., & **Jackson, J. J.** (2010). Conscientiousness: Definition, Methods of Assessment, Neurophysiology, and Genetics. Technical Report for National Institute on Aging (NIA).

Manuscripts Under Review

Jackson, J. J., Hill, P. L., Roberts, B. W., Payne, B.R., & E. Stine-Morrow (under review). Can an old dog learn (and prefer to experience) new tricks? Evidence that an intervention can change the personality trait of openness in older adults. (Revision requested at Psychology and Aging).

Jackson, J. J., Thoemmes, F., Jonkmann, K., Lüdtkke, O., & Trautwien, U. (under review). Military training and personality trait development: Does the military make the man or does the man make the military? (Revision requested at Psychological Science)

Takahashi, Y., Edmonds, G., **Jackson, J. J.** Roberts, B.W. (Under review) Longitudinal Correlated Changes in Conscientiousness, Preventative Health-related Behaviors, and Physical Health

Invited Talks

Jackson, J. J. (October, 2010). You are what you do: Educational Experiences Affect Personality Trait Change. Washington University

Jackson, J. J. (July, 2010). Current questions in the study of personality trait development. University of Tübingen

Symposiums Chaired

Jackson, J. J. & Roberts, B.W. (February 2010). What is below the Big Five? Symposium chaired at the annual meeting of the Society for Personality and Social Psychology, Las Vegas, Nevada

Conference Presentations

Chui, H., Gao, X., Payne, B. R., Hill, P. L., **Jackson, J. J.**, Kramer, A. F., Morrow, D. G., Morrow, D. G., Roberts, B., & Stine-Morrow, E. A. L. (2011, August). Social support moderates the effect of cognitive inconsistency on fluid ability in older adults. Poster presented at the annual meeting of the American Psychological Association. Washington, DC.

Stine-Morrow, E. A. L., Payne, B. R., Gao, X., Chui, H., **Jackson, J.J.**, & Hill, P. (2011, August). Engagement as an organizing principle for cognitive resilience. In P. Hartman-Stein (Chair), Innovative interventions for cognitive enhancement. Symposium presented at the annual meeting of the American Psychological Association. Washington, DC.

- Jackson, J. J.** (February 2011). You are what you do: Educational Experiences Affect Personality Trait Change. Talk to be presented at the annual meeting of the Society for Personality and Social Psychology, San Antonio, Texas
- Jackson, J. J.** (February 2011). Using propensity score matching and latent growth models to study personality trait change. Talk to be presented at the first annual New Methods in Personality and Social Psychology preconference, San Antonio, Texas
- Jackson, J. J.,** Hill, P. L., Roberts, B. W., Payne, B.R., & E. Stine-Morrow (July, 2010). Can an old dog learn (and prefer to experience) new tricks? Evidence that an intervention can change the personality trait of openness in older adults. Poster Presented at the bi-annual European Conference for Personality, Brno, Czech Republic
- Jackson, J. J.** & Roberts, B.W. (February 2010). Lower order levels of conscientiousness: Implications for development and health. Talk presented at the annual meeting of the Society for Personality and Social Psychology, Las Vegas, Nevada
- Sixkiller, K., Takahashi, Y., Edmonds, G.W., **Jackson, J. J.**, Bogg, T., Walton, K. E. Wood D., Harms, P., Lodi-Smith, J., & Roberts, B. W (January, 2010) Conscientiousness & health behaviors: Considerations of lower order facets and observer ratings of conscientiousness. Poster presented at the annual meeting of the Society for Personality and Social Psychology, Las Vegas, Nevada
- Edmonds, G. E., Takahashi Y, **Jackson, J. J.**, & Roberts, B. W. Predicting physical health using prospective measures of personality (January, 2010). Poster presented at the annual meeting of the Society for Personality and Social Psychology, Las Vegas, Nevada
- Edmonds, G.W., **Jackson, J.J.**, Spain, S., & Roberts, B.W., (November, 2009). Conscientiousness and neuroticism as predictors of discreet physical health outcomes, Poster presented at the annual meeting of Gerontology Society of America, Atlanta, Georgia.
- Jackson, J. J.** (July, 2009). Variation in the serotonin transporter gene moderates the effect of family environment on negative emotionality. Talk given at the biannual meeting of the Association for Research in Personality, Evanston, Illinois.
- Edmonds, G.W., **Jackson, J.J.**, & Roberts, B.W., (July, 2009). Changes in conscientiousness predict changes in physical health. Talk given at the biannual meeting of the Association for Research in Personality, Evanston, Illinois.
- Sixkiller, K., Edmonds, G.W., **Jackson, J. J.**, Bogg, T., Walton, K. E. Wood D., Harms, P., Lodi-Smith, J., & Roberts, B. W (July, 2009). The relationship between lower order structure of conscientiousness and health behaviors. Poster given at the biannual meeting of the Association for Research in Personality, Evanston, Illinois.
- Jackson, J. J.**, Sadeh, N., Javdani, S., & Edelyn Verona (February, 2009). Variation in the serotonin transporter gene moderates the effect of family environment on negative

- emotionality. Poster presented at the annual meeting of the Society for Personality and Social Psychology, Tampa, FL.
- Sadeh N, Javdani S, **Jackson J J.**, Edelyn Verona (2008, September) Serotonin transporter polymorphism predicts psychopathic tendencies in youth as a function of socioeconomic status. Poster presented at the annual meeting of Society for Research in Psychopathology, New Orleans, LA.
- Spain, S.M, **Jackson, J.J.**, Edmonds, G.W., & Roberts, B.W., (2008, June). Hierarchical polynomial regression for modeling interaction effects with dyadic data. Poster presented at the annual meeting of the Association for Psychological Science, Chicago, IL.
- Jackson, J.J.**, Berger, J.M., & Roberts, B.W. (2008, February). Pathways to normal and abnormal personality. Poster presented at the annual meeting of the Society for Personality and Social Psychology, Albuquerque, NM
- Human, L. J., **Jackson, J. J.**, & Biesanz, J. C. (2008, February). How do impressions change over time? Length of exposure and changes in differential and stereotype accuracy. Poster presented at the annual meeting of the Society for Personality and Social Psychology, Albuquerque, NM.
- Spain, S.M, **Jackson, J.J.**, Edmonds, G.W., & Roberts, B.W., (2008, February). Modeling personality complementarily in dyads using polynomial regression and response surfaces. Poster presented at the annual meeting of the Association for Research in Personality, Albuquerque, NM.
- Jackson, J.J.** & Roberts, B.W. (2007, January). The construction of the Conscientiousness Act Frequency Scale. Poster presented at the annual meeting of the Society for Personality and Social Psychology, Memphis, Tennessee
- Jackson, J.J.** & Roberts, B.W. (2006, January). Age changes in conscientiousness: self and observer reports of lower order facets. Poster presented at the annual meeting of the Association for Research in Personality, Palm Springs, California.
- Biesanz, J. C., & **Jackson, J.J.** (2005, January). Identifying the good judge: Revisiting Cronbach's critiques. In D. C. Funder (Chair), The accuracy of interpersonal judgment. Symposium conducted at the meeting of the Society for Personality and Social Psychology, New Orleans, Louisiana.

Research Interests

Personality development, gene-environment interplay, behavioral manifestations of personality, longitudinal methods, psychometrics

Association Memberships

American Psychological Association (APA)
 Society of Personality and Social Psychology (SPSP)
 American Psychological Society (APS)
 Association for Research in Personality (ARP)

Quantitative Skills

Statistical Software: R, Mplus, SAS, SPSS, AMOS
 Statistics: Structural equation modeling, multi-level modeling, longitudinal analysis, dyadic analysis, meta-analysis

Training in Quantitative Methodology

ANOVA/Regression
 Graduate statistics (probability theory, general linear models)
 Multivariate statistics
 Experimental methods
 Mean and Covariance Structure Analysis (SEM)
 Psychometrics (classical test theory, generalizability theory, item response theory)
 Hierarchical Linear Models (HLM)
 Meta-Analysis

Teaching Experience

Lab Instructor, Research Methods in Personality Psychology	Spring, 2006
Lab Instructor, Research Methods in Personality Psychology	Spring, 2007
Instructor, Personality Psychology	Summer, 2007
Instructor, Personality Psychology	Summer, 2008
Guest Lecturer, Personality Psychology	Fall, 2008
Guest Lecturer, Personality Psychology	Fall, 2009
Guest Lecturer, Personality Psychology	Spring, 2011