Parental Styles, Conscientiousness, and Academic Performance in High School: A Three-Wave Longitudinal Study

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This article assesses whether perceived parental style influenced the extent to which adolescents became increasingly conscientious and whether changes in conscientiousness influenced academic grades 1 year later. Parental styles, conscientiousness, verbal, and numerical ability at Time 1 were measured. One year later conscientiousness was again assessed, and 1 year after that end-of-year exam results were obtained. More than 784 students (mean age = 12.3 years, SD = 0.49) participated in the 1st year. The data of 563 students were matched across the 3 years. Conscientiousness tended to decrease from Time 1 to Time 2. Structural equation modeling showed that adolescents with more authoritative parents experienced less of a decrease in conscientiousness at Time 2 than did students with less authoritative parents and the same baseline level of conscientiousness at Time 1. Additionally, the decrease in conscientiousness at Time 2 predicted worse grades at Time 3, even after controlling for baseline levels of academic achievement.

Keywords: *conscientiousness; parental styles; academic achievement; adolescence; mental ability*

The present research sought to address two related questions. First, do perceptions of parental styles affect the child's later personality, specifically, levels of conscientiousness? The stability of personality over the course of the life span continues to intrigue researchers (e.g., Caspi, Roberts, & Shiner, 2005; Fraley & Roberts, 2005; Lewis, 2002; McCrae et al., 2000; Roberts & DelVecchio, 2000). According to Roberts and DelVecchio (2000), personality consistency during the teenage years is not only lower than from ages 18 to 21.9 years (college years) and from ages 3 to 5.9 years, but it is also far from unity. They found, for example, that the trait consistency of the major personality dimensions was less than .50 during the teenage years, whereas it was greater than .60 for 30- to 39-year-olds. This suggests that "personality traits in particular, remain open systems that can be influenced by the environment at any age" (Roberts & Wood, 2006, p. 19).

Our second question follows from the first. If parental influences do indeed shape children's conscientiousness, what implications if any does this have for children's observable behavior? We hypothesized that changes in conscientiousness would affect adolescent school performance. Many studies have found a link between parental styles and academic performance (e.g., Chen, Dong, & Zhou, 1997; Lamborn, Mounts, Steinberg, & Dornbusch, 1991; Steinberg, Lamborn, Dornbusch, & Darling, 1992). However, none have examined the possibility that conscientiousness mediates this relationship.

Past research on parenting style and academic performance has, to a large extent, been cross-sectional. A strength of the present study is its longitudinal design. We examined whether parenting style when students were in Grade 7 (the first year of high school in New South Wales, Australia) affected students' levels of conscientiousness when in Grade 8, and whether Grade 8

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conscientiousness, in turn, affected Grade 9 grades. Our design controls for Grade 7 levels of conscientiousness and verbal and numerical ability, thereby ruling these out as potential confounds. Importantly, this 3-year design allows us to measure the hypothesized cause (parenting style) before the hypothesized change in conscientiousness, and the hypothesized mediator (change in conscientiousness) before the hypothesized consequence (grades). Past mediational analyses, especially cross-sectional research, has rarely been able to establish temporal precedence of the variables in a mediational model.

Personality Consistency and Change

One can look at the research evidence on personality consistency in two ways. First, one can focus on the stability component, arguing for example that personality traits "follow intrinsic paths of development essentially independent of environmental influences" (McCrae et al., 2000, p. 173) and that the influences on personality of some environmental forces such as parental styles are "subtle indeed" (p. 176). Alternatively, one can focus on instability, arguing that behavior is largely determined by situational forces. For instance, in their classic study, Mischel and Peake (1982) suggested that "behavior is highly discriminative and . . . broad cross-situational consistencies remain elusive" (p. 735). Other researchers have argued for a more balanced view, suggesting that behavior is both stable and situationally sensitive and that stability does not preclude the possibility of situational sensitivity (Funder & Colvin, 1991). Our research sought to look at both personality stability and situational influences over a 3-year period.

Personality development is said to be influenced by several factors, including stochastic mechanisms, person–environment transactional mechanisms, and developmental constancy factors (Fraley & Roberts, 2005). The last focuses on genetic influences, with most studies now suggesting that heritability rates for all of the Big Five factors are in the order of .50 (Caspi et al., 2005), leaving considerable opportunity for the influence of environmental factors. Stochastic mechanisms refer to the influence of random events on development (such as the loss of a parent). Our focus is on person–environment transactional mechanisms in which attention is paid to parent–child interactions. Although it can be argued that children react to their environment (e.g., a particular and consistent parental style), it has also been demonstrated that children elicit or "draw out" behaviors from their parents (Donnellan, Trzesniewski, & Robins, 2006). Thus, an aggressive or delinquent child may elicit an undesirable parenting style, which in turn elicits further negative behaviors from the child such that "bad" parenting results from unacceptable behaviors on the part of the child. For example, when mothers were paired with either conduct-disordered or normal children, mothers made more negative responses to the conduct-disordered than to the normal children (Anderson, Lytton, & Romney, 1986; see also Bell, 1968; Ge et al., 1996; Halverson & Wampler, 1997).

The Influence of Parental Styles

Numerous studies over many years have illustrated the extent to which particular parental styles are associated with psychological and academic outcomes in children. In her classic work, Baumrind (1971, 1991) suggested that parental styles can be described as permissive, authoritarian, or authoritative, a conception that is still reflected in some recent measures of parental styles (e.g., Buri, 1991). The authoritative style is regarded as the most optimal style of the three. Baumrind (1971) described these parents as controlling and demanding, yet able to combine this with warmth and rationality as well as appropriate receptiveness to the child's communication. These parents exert "firm control" without being too restrictive (p. 22) and the children are well adjusted, showing high levels of autonomy and independence. In contrast, a permissive style was described as nondemanding and noncontrolling but also relatively warm. These children were found to be low on self-reliance and were the least self-controlled and explorative. Finally, parents manifesting an authoritarian style were described as being detached from their children, yet controlling. These parents require obedience from their children and disallow discussion or expression by the child of his or her own view (Rudy & Grusec, 2006). Not surprisingly, Baumrind found these children to be "discontent, withdrawn, and distrustful" (p. 2).

Following Baumrind (1971, 1991), we argue that parental styles have a direct effect on adolescent conscientiousness. Although she did not assess conscientiousness in her children, Baumrind (1971) concluded that an authoritative parenting style is strongly associated with characteristics similar to contemporary ideas about conscientiousness. For example, the children of authoritative parents, compared to those of other parents, were much more likely to be achievement oriented, socially responsible, independent, and friendly and cooperative. Conscientiousness comprises elements such as achievement motivation, self-discipline, and responsibility (Costa & McCrae, 1992), which could be construed as being similar to Baumrind's (1971) conceptions. Being socially responsible, it could be argued, requires some element of self-discipline, dutifulness, orderliness, reliability, and low fickleness, characteristics that typically constitute conscientiousness (e.g., Costa & McCrae, 1992; John, 1990; Kohnstamm, Zhang, Slotboom, & Besevegis, 1998; Norman, 1963).

Parental Styles and Academic Achievement

Based on many cross-sectional studies, it is believed that parental styles influence academic achievement and that authoritativeness is the best predictor of academic success. The importance of authoritativeness holds across several U.S.-based ethnic, family type, and socioeconomic groups (Baumrind, 1991; Dornbusch, Ritter, Liederman, Roberts, & Fraleigh, 1987; Steinberg & Morris, 2001); some second-generation rather than first-generation migrant groups in the United States (Chao, 2001); and Australians (e.g., Leung, Lau, & Lam, 1998) but not Hong Kong Chinese (Leung et al., 1998; McBride-Chang & Chang, 1998). Baumrind (1991) reasoned that authoritative parents are not only more challenging but also agentic and communal. Consequently, she argued, these children emulate their parents' general competence and "cognitive motivation" (p. 72).

Permissive and authoritarian parenting practices are associated with low academic competence, at least among Western samples. Dornbusch et al. (1987) found significant negative correlations for both these parenting styles among a large U.S. sample of more than 7,000 respondents, with larger effect sizes for authoritarianism than permissiveness. Using a smaller sample, Glasgow, Dornbusch, Troyer, Steinberg, and Ritter (1997) found no significant relationship for authoritarianism. There are, however, noteworthy cultural differences with respect to authoritarianism. Leung et al. (1998) found general parental authoritarianism to predict academic success among Hong Kong students, concluding that Chinese children are less resentful toward parental authoritarianism than their Western counterparts. This has been echoed by Rudy and Grusec (2006), who concluded that authoritarianism in collectivist cultures is not associated with parental negativity (but see Chen et al., 1997).

Conscientiousness and Academic Achievement

Part of the five-factor taxonomy of personality description (e.g., Costa & McCrae, 1992; Goldberg, 1999; Norman, 1963), conscientiousness has been found to have strong links with academic achievement. In fact, some writers have referred to conscientiousness as the "main psychological resource in learning and education" (De Raad & Schouwenburg, 1996, p. 325). De Fruyt and Mervielde (1996, p. 420) suggested that "conscientiousness can perhaps be conceived of as the non-cognitive counterpart of the cognitive *g* factor, explaining part of the variance in different educational outcome measures across academic curricula." Some have claimed that conscientiousness is a better predictor of academic outcomes than psychometric intelligence (Furnham, Chamorro-Premuzic, & McDougall, 2003).

Recent research and meta-analyses support these general conclusions. On the basis of their review, Chamorro-Premuzic and Furnham (2005) concluded that conscientiousness is the personality factor most consistently associated with academic achievement. Using four samples, Noftle and Robins (2007) found conscientiousness to be the most consistent predictor of college GPA and school GPA after controlling for gender, SAT scores, and GPA obtained in high school. Moreover, increases in conscientiousness across 4 years of college predicted higher GPA scores after controlling for mean levels of conscientiousness. A recent meta-analysis of the impact of the Big Five personality factors on post-secondary academic achievement by O'Connor and Paunonen (2007) found conscientiousness to have the most consistent and pervasive effect on outcomes. For instance, the mean population correlation between conscientiousness and academic achievement was .24, whereas the correlations for the other personality domains did not exceed .06.

Why should conscientiousness be important for academic achievement? One possibility at the school level may simply be that some teachers reward effort. Thus, conscientious students who typically expend much effort and time on their schoolwork may receive inflated grades from teachers, notwithstanding the possibility that they have not completely mastered the material in question. Indeed, conscientiousness implies a well-developed sense of discipline with respect to learning (Blickle, 1996) and such students are high on attention, good organization, rehearsal, and effort, which accords with other findings in which conscientiousness has been found to be related to a "strategic learning" approach. That is, high-conscientious individuals attempt to achieve the best results they can through good time management and good organization of the learning environment (Diseth, 2003). Noftle and Robins (2007) maintained that it is the achievement-striving, persevering, and self-controlled facets of conscientiousness that underpin college and school achievement rather than being orderly and organized. O'Connor and Paunonen (2007) concluded that being achievement oriented, self-disciplined, and diligent are crucial for academic achievement. Other evidence indicates that high-conscientious individuals actively pursue their goals, value achievement and excellence, are purposeful, and adhere to plans, whereas low-conscientious individuals are lazy (McCrae & Costa, 1987). As Costa and McCrae (1998, p. 123) put it, high-conscientious people are "hard-working, goal-oriented people" and are likely to carry tasks through to completion. They require very little supervision and "get things done" (p. 127).

Aims and Rationale of the Present Study

Evidence shows that school achievement is predicated on several factors, including parental styles, the adolescent's conscientiousness, and academic ability. As these variables are often examined in isolation, our research extends previous work by examining the extent to which these sets of variables copredict school performance. In particular, we examine to what extent these variables directly affect school achievement. We hypothesize that parenting style will predict future conscientiousness, and future conscientiousness, in turn, will predict future grades (Baumrind, 1971, 1991; Blickle, 1996; De Raad & Schouwenburg, 1996; Diseth, 2003; Furnham et al., 2003). We also expect that academic ability at Time 1 will be a strong predictor of grades at Time 3 but that conscientiousness will predict outcomes over and above ability (De Fruyt & Mervielde, 1996; Noftle & Robins, 2007).

We focused on adolescent-reported parenting style as we believe that teenagers' perceptions of their parents' behavior have important influences on their own behaviors. Although it is possible that these perceptions might be inaccurate and may not reflect how parents actually behave, our research is predicated on the belief that even inaccurate beliefs can be powerful shapers of development (Bruner & Tagiuri, 1954). We also assessed self-reported conscientiousness, which raises the possibility that links between parenting style and conscientiousness may be due to common method variance. Our design dealt with this in two ways. First, parenting style and conscientiousness acted as covariates in predicting future conscientiousness, which would likely covary out method variance (Lindell & Whitney, 2001). Second, our final outcome variable, grades, was grounded in observable tests rather than in self-reports. This allowed us to determine whether perceived parenting style and changes in conscientiousness had a meaningful impact on important life outcomes.

Method

Participants

The students were all participants in the Wollongong Youth Study and attended five high schools in a Catholic Diocese of the State of New South Wales, Australia. The Diocese is centered on the city of Wollongong (population approximately 250,000) but also reaches into southwestern metropolitan Sydney, thereby ensuring that the socioeconomic and cultural mix of the participants is diverse. In Australia 33% of all students attend nongovernment (including Catholic) schools, a proportion that continues to grow (Australian Bureau of Statistics [ABS], 2004a).

At Time 1 our sample represented a diverse range of key demographic indicators. For example, the spread of some occupations of the fathers of our participants closely resembled national distributions (ABS, 2004b): for example, professionals, 20.4% (16.5% nationally); associated professionals, 15.1% (12.7%); intermediate production and transport, 11.2% (13.4%); tradespersons, 34.3% (21%); managers, 4.8% (9.7%); laborers, 3.3% (10.8%); advanced clerical, 1.2% (0.9%); intermediate clerical, 5.5% (8.8%); and elementary clerical, 4.3% (6.1%). Additionally, 22% lived in nonintact families, whereas the national divorce rate is 29% (ABS, 2005), and 19.77% were exposed to a language other than English in the home, whereas the national figure is 15.8% (ABS, 2006).

Students were surveyed in the middle of their 1st year of high school (Year 7), 1 year later (Time 2), and 1 year after that (Time 3). At Time 1, more than 784 students (modal age = 13 years) completed the questionnaire (382 males, 394 females; 8 did not indicate their gender). We were able to directly match the data of 563 students across each of the 3 years, representing a 72% follow-up rate.

Materials

A wide variety of instruments was included in our survey across the 3 years. Those listed next are germane to the present report.

Time 1 Instruments

Parental Authority Questionnaire (PAQ; Buri, 1991). This scale has demonstrated reliability and validity and assesses adolescents' perceptions of parental permissiveness, authoritarianism, and authoritativeness. In the initial development of the scale, items were selected following judgments by independent raters that the items represented Baumrind's (1971) prototypes of the various parenting styles. Several subsequent studies have attested to the PAQ's validity. For example, using a parental version of the instrument, researchers found scores on the authoritativeness scale to be significantly related to parents' reports of effective parent–child communication using the parent–child relationship inventory, authoritarianism to be related to overreactivity, and permissiveness to be related to a "lax" disciplinary style (Reitman, Rhode, Hupp, & Altobello, 2002, p. 125). In a study of parents and their offspring, Peterson, Smirles, and Wentworth (1997) found that parents who obtained high scores on a measure of right-wing authoritarianism not only reported high levels of authoritarian parenting but were also viewed by their children as manifesting an authoritarian parenting style. Additionally, authoritative parenting was associated with parental generativity; that is, these parents took

care in the establishment and guidance of the next generation. Because of space pressures in our questionnaire, we used a shortened version of the PAQ (containing 15 of the original 30 items). Each of the three parenting styles for mother and father was measured with 5 items scored on a 5-point Likert-type scale (1 = *disagree* to 5 = *strongly agree*). Alpha coefficients for both parents were as follows: permissiveness = .71, authoritarianism = .80, and authoritativeness = .76.

Conscientiousness (Heaven, Ciarrochi, & Vialle, 2007; Mak, Heaven, & Rummery, 2003). We used a measure of conscientiousness specifically designed for use with Australian high school students. It comprises 16 items derived from self-descriptors of this personality dimension provided by John (1990) and Norman (1963). Sample items are "I am a well organised person"; "I am a responsible person"; "I am careless." This measure has demonstrated good internal consistency and validity. For instance, students high on this measure were more likely (mean $r = .22$, $p < .01$) to identify with a so-called studious crowd at school than with so-called rebels (mean $r = -.20$, $p < .01$; Mak et al., 2003).[1] Responses were indicated on a 5-point Likert-type scale (1 = *not at all like me* to 5 = *a lot like me*), and negative items were reverse-scored. Alpha coefficient was .83.

Verbal and numerical ability. A few weeks after transferring into high school, all students completed standardized numerical and verbal assessments. These are not intelligence tests but are classified as aptitude or ability tests, even though they assess the learning that has occurred up to the time of administration. They are therefore curriculum-based, criterion-referenced tests and are administered by the Department of Education and Training in the State of New South Wales. There are six numerical (numeracy, number, measurement, space, data, and numeracy problem solving) and three verbal (writing achievement, reading achievement, and language achievement) subtests. Cronbach's alpha coefficient was .95 for the numerical tests and .87 for the verbal tests.

Time 2 Measure

We used the same measure of conscientiousness as at Time 1. On this occasion the alpha coefficient was .87.

Time 3 Measure

End-of-year grades were obtained for each student in each subject. We focus in this report on subjects with the largest enrollments, namely, English, math, science, history, and religious studies. Because the grading system in the subjects varied slightly across schools, grades in each subject were converted to z scores.

Procedure

After obtaining consent from schools and parents, students were invited at each time of testing to participate in a study on "Youth Issues." At all times, administration of the questionnaires took place during regular classes under the supervision of the authors and teachers. Students completed the questionnaires anonymously and without any discussion. Questionnaires were coded to enable questionnaires to be matched using enrollment numbers and not student names. At the conclusion of the sessions students were thanked for their participation and debriefed.

Results

Preliminary Analyses

Although conscientiousness was highly correlated at both times, $r(559) = .61$, $p < .001$, mean scores dropped significantly (Time 1: $M = 65.57$, $SD = 9.21$; Time 2: $M = 64.06$, $SD = 9.19$), $t(558) = 4.39$, $p < .001$. This seems to support Funder and Colvin's (1991) assertion that personality is both stable and situationally sensitive. Students' perceptions of mother's and father's parenting styles were highly correlated (all rs, $p < .001$). For authoritarianism the correlations exceeded .60, for authoritativeness they ranged from .54 (boys) to .57, and for permissiveness they ranged from .53 (girls) to .61. Given these high levels of association across all parenting styles, we decided to combine perceptions of mother's and father's parenting styles for further analysis.

Correlational and Regression Analysis

As shown in Table 1, family authoritativeness was not significantly related to outcomes in math or science, but was significantly related to outcomes in religious studies, English, and history (all ps < .01). The correlations involving math and science were significantly smaller than the correlations involving religious studies, English, and history (all ts > 2.6, ps < .05).

Authoritativeness was also significantly related to conscientiousness at Times 1 and 2. Family permissiveness was significantly and negatively related to math achievement ($p < .01$) and significantly and negatively related to conscientiousness at both times (both ps < .05). There were no significant relationships between family authoritarianism and school grades or between authoritarianism and conscientiousness. Family authoritativeness was significantly and positively related to verbal ability ($p < .05$).

As expected, Time 1 verbal and numerical ability were significantly related to all school grades (all ps < .01). Verbal and numerical ability were also significantly

Table 1: Intercorrelations Among Variables at Times 1, 2, and 3

Period	1	2	3	4	5	6	7	8	9	10	11	12
Time 1												
1. Family permissiveness	—											
2. Family authoritarianism	–.22**	—										
3. Family authoritativeness	–.11*	.20**	—									
4. Verbal ability	–.07	–.06	.09*	—								
5. Numerical ability	–.06	–.07	–.00	.75**	—							
6. Conscientiousness	–.12*	–.03	.32**	.19**	.12*	—						
Time 2												
7. Conscientiousness	–.10*	–.06	.34**	.16**	.11*	.61**	—					
Time 3												
8. Math	–.12**	–.01	.05	.50**	.63**	.18**	.21**	—				
9. Religious studies	–.05	–.01	.20**	.55**	.45**	.29**	.33**	.48**	—			
10. English	–.04	–.03	.16**	.68**	.55**	.26**	.27**	.56**	.68**	—		
11. Science	–.02	–.05	.07	.65**	.67**	.21**	.23**	.65**	.58**	.65**	—	
12. History	.01	.03	.16**	.56**	.49**	.24**	.29**	.54**	.62**	.67**	.64**	—

NOTE: *N*s vary from 522 to 563.
*$p < .05$. **$p < .01$.

related to conscientiousness at both times, although the strength of this relationship was weaker over time.

There were no correlations involving authoritarianism. There were weak correlations involving permissiveness and conscientiousness, but permissiveness did not predict changes in conscientiousness. Permissiveness was also unrelated to all grades except for a weak correlation with math. In general, given the lack of significant relationships between family permissiveness and authoritarianism and all other measures, we decided to focus on authoritativeness in all further analyses.

Structural Equation Modeling (SEM) of Parenting Style, Conscientiousness, and Grades in Grades 7, 8, and 9

We used SEM to test our key mediational hypotheses. The latent verbal ability variable was based on the three verbal tests (or indicators) at Grade 7, whereas the latent numerical ability variable was based on six tests. The latent grade variable was based on the three scales that were significantly related to parenting style in the correlational analysis, namely, English, religious studies, and history. We did not include science and math because these were not related to parenting style and therefore there was no need to estimate whether conscientiousness mediated the (nonexistent) link between parenting style and grades.

We represented measurement error in other parts of the model by using item parcels as indicators of each latent variable. Items were placed into parcels to reduce the parameters estimated and ensure sufficient power in modeling and especially estimating correlated errors (Hau & Marsh, 2004). Following Hau and Marsh (2004), we used a minimum of three item parcels for each variable. Parenting style was based on six item parcels (three for mother's styles and three for father's). Conscientiousness was based on three item parcels. Verbal ability had three items. Numerical ability had six items and was initially entered in all analyses. However, numerical ability was not found to significantly improve the fit of the key SEM models over and above verbal ability and was removed from further analyses. Inclusion or exclusion of this variable did not alter the results.

Missing values were dealt with using full information maximum likelihood estimation (FIML) in Amos (Arbuckle & Wothke, 1999). The FIML procedure has been shown to produce estimates that are unbiased and more efficient than other methods, such as pairwise deletion or mean imputation (Arbuckle & Wothke, 1999; Enders & Bandalos, 2001).

As suggested by Kline (1998), several goodness-of-fit measures were used to assess the models. We considered a model to provide reasonable fit if the χ^2/df was approximately 3 or less (Carmines & McIver, 1981), the normed fit index was above .90 (Bentler & Bonett, 1980), and the root mean square error of approximation was below .08 (Browne & Cudeck, 1993). We also followed the procedure outlined by Cole and Maxwell (2003) to test mediational models.

We first evaluated the fit of a pure measurement model. This involves allowing every latent variable to correlate with every other latent variable (and not taking into account our knowledge that some variables preceded other variables in time). This model tests the extent that manifest variables relate only to the latent variables they are supposed to represent, and disturbance terms relate to one another in ways that have been anticipated (Cole & Maxwell, 2003). As can be seen in Table 2, the measurement model provided an adequate fit to the data. We next assessed factorial

Table 2: Model Fit Indices for Structural Equation Models With Grade 7 Ability, Parenting Style, and Conscientiousness Predicting Grade 8 Conscientiousness and Grade 9 Grades

Model	χ^2	*df*	χ^2_{diff}	χ^2 /*df*	NFI	NNFI	RMSEA
Measurement model/full model	380.48	125	—	3.04	.92	.93	.060
Model 1 and conscientiousness assumed to have invariant factor structure	385.00	127	4.52	3.03	.92	.93	.061
Mediational model	385.58	129	5.00	2.99	.92	.93	.059
Mediational model with correlated error involving repeated measures	311.19	126	69.29*	2.47	.94	.95	.051

NOTE: NFI = Bentler–Bonett normed fit index; NNFI = Bentler–Bonett non-normed fit index (Tucker–Lewis); RMSEA = root mean square error of approximation.
[a]The full model and measurement model are statistically equivalent (Cole & Maxwell, 2003). The full model includes paths that are not construed as part of the mediational model.
*$p < .05$.

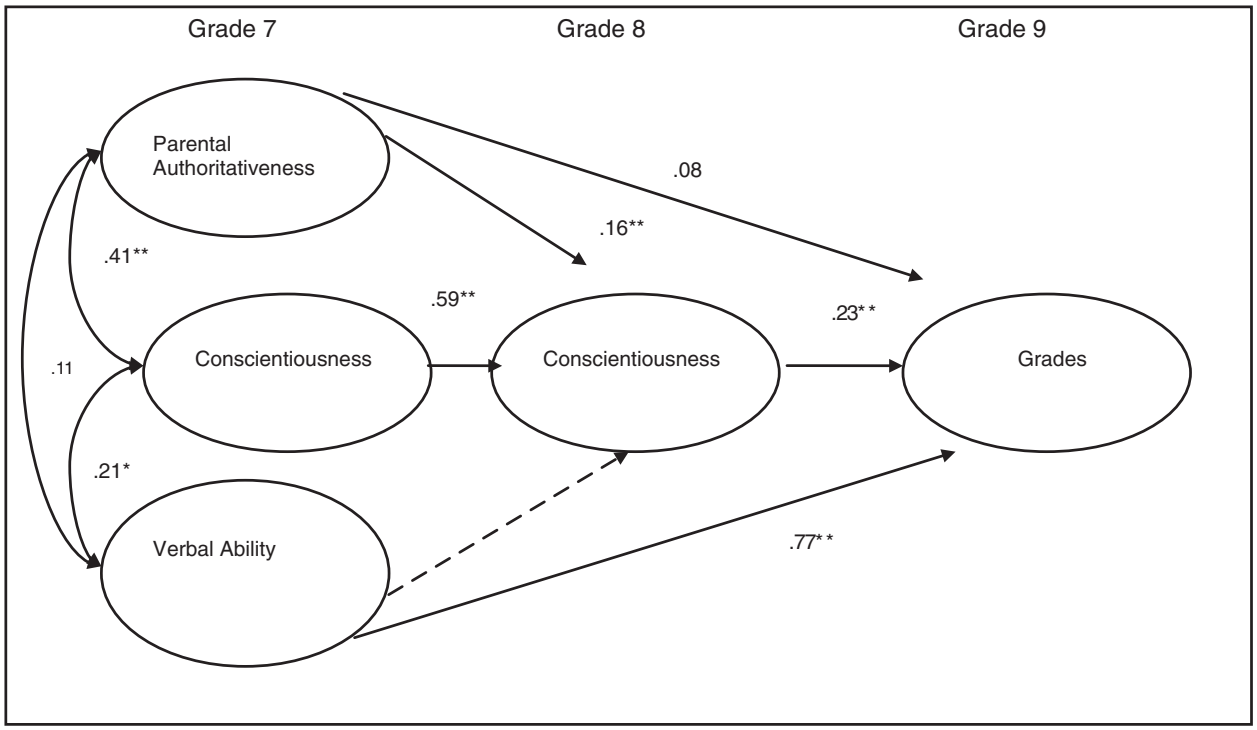

Figure 1 Final model showing influences of parental authoritativeness and conscientiousness on school achievement.
NOTE: Only paths that were significant in both parametric and nonparametric analyses were considered significant here.
*$p < .05$.**$p < .01$.

invariance (i.e., that the relations of the latent variables are constant over time). The model that assumed factorial invariance (Table 2, Model 2) did not significantly reduce the fit of the model, suggesting that factorial invariance was a reasonable assumption.

We next compared a reduced mediational model to the full path model, which is statistically equivalent with the measurement model (Cole & Maxwell, 2003). The full model specifies directional relationships between all upstream (earlier in time) and downstream variables, and contains two paths that are not contained in the mediational model: a path from ability to conscientiousness at Time 2, and a direct link between conscientiousness at Time 1 and grades at Time 3. As can be

seen in Table 2, there was not a significant drop in fit between Model 2 (full model with invariant factor structure) and Model 3, suggesting that the additional paths in the full model did not improve the fit.

Finally, we tested a model that included measurement error correlations between Time 1 and Time 2 observed variables. This pattern of correlated measurement errors is a relatively common feature of longitudinal data (Kline, 1998). Assuming correlated measurement error resulted in a significant improvement to the fit of the model (Table 2, Model 4).

The path component of the final mediational model is presented in Figure 1. Parental authoritativeness predicted conscientiousness at Time 2, even when controlling for conscientiousness at Time 1. In addition, Time 2 conscientiousness predicted grades at Time 3. There was a significant direct effect of parental authoritativeness on grades ($p < .05$). There was also a significant indirect (mediated) effect between parental authoritativeness, Time 2 conscientiousness, and Time 3 school grades according to Baron and Kenny's (1986) expansion of Sobel's (1982) test (unstandardized indirect effect = .013, $SE = .0047$, $t = 2.7$, $p < .01$).

Normality analysis suggested that the assumption of multivariate normality was violated (critical ratio = 23.78). We thus conducted nonparametric bootstrap analysis and used a biased corrected percentile method to evaluate whether the effects remained significant when normality was not assumed (Arbuckle & Wothke, 1999; Mooney & Duval, 1993). We took 1,000 bootstrap samples; there were no unused samples because of singular covariance matrix or because a solution was not found. Consistent with Figure 1, the results of this analysis indicated that parental authoritativeness at Grade 7 predicted conscientiousness at Grade 8 ($\beta = .061 < .163 < .257$, $p = .002$). When controlling for Grade 7 conscientiousness, Grade 8 conscientiousness predicted Grade 9 grades ($\beta = .151 < .230 < .313$, $p = .002$). Unlike the parametric analysis, the nonparametric analysis suggested there was no reliable direct effect between parental authoritativeness and grades ($\beta = -.003 < .08 < .157$, $p = .063$).

The SEM suggests that change in conscientiousness is predictable from parental authoritativeness when holding baseline conscientiousness constant. Our earlier analysis suggested that conscientiousness, on average, decreased from Grade 7 to Grade 8. The SEM in Figure 1 suggests that when parental authoritativeness goes up by 1 *SD*, Grade 8 conscientiousness goes up by .16 *SD* (or by 1.50 units). The sample on average went down by approximately 1.5 units in conscientiousness (see Preliminary Analyses section). This indicates that adolescents who were 1 *SD* above average in parental authoritativeness stayed about the same in conscientiousness from Grade 7 to Grade 8, whereas other adolescents tended to decrease in conscientiousness.

Our final analyses examined the possibility that mother's authoritativeness and father's authoritativeness might have had different effects on conscientiousness and grades. We conducted separate SEMs for ratings of mother and father using the model in Figure 1. We found virtually identical effects, with parenting style predicting future conscientiousness ($\beta_{mothers} = .16$, $\beta_{fathers} = .16$), conscientiousness in Grade 8 predicting future grades ($\beta_{mothers} = .22$, $\beta_{fathers} = .24$), and little direct (unmediated) effect of parenting style on grades ($\beta_{mothers} = .09$, $\beta_{fathers} = .06$).

Assessing the Generality of Effects Using Multilevel Modeling

We next evaluated the extent that our effects generalized across schools. MLwiN 2.02 (Rashbash, Steele, Browne, & Prosser, 2004) was used to conduct multilevel random coefficient modeling with students nested within schools. We compared a standard equation with an equation that assumed the mean level of variables differed across schools (random intercept) and an equation that assumed the relationships between variables differed across schools (random slope). We used unstandardized grades and the likelihood ratio statistic to compare models.

The first analysis involved parental authoritativeness, conscientiousness at Grade 7, and verbal ability at Grade 7 acting as covariates in the prediction of conscientiousness at Grade 8. Assuming a random intercept or random slope for each of the variables did not improve the model ($\chi^2_{diff} < .1$, $p > .1$). The same coefficients that were significant in the SEM analysis (Figure 1) were significant in the MLwiN analysis. Specifically, conscientiousness at Grade 7 ($B = .55$, $SE = .035$, $p < .001$) and parenting style ($B = .030$, $SE = .007$, $p < .001$) predicted future levels of conscientiousness, whereas verbal ability did not predict future conscientiousness ($B = .004$, $SE = .004$, $p > .1$).

We next examined school grades using a variance components model. The likelihood ratio test suggested that the random intercept model (–2*loglikelihood = 1255.178) was a better fit than the model that did not assume a random intercept (–2*loglikelihood = 1654.351, $\chi^2_{diff} = 393.75$). The random intercept model was thus used for the remaining analysis. In this model, each school has its own intercept, B_{0j}, similar to fitting a set of parallel lines, one for each school.

We next predicted total grades in Grade 9 using Grade 7 conscientiousness, Grade 7 parental authoritativeness, and Grade 7 verbal ability. We found that the random slope model for grades significantly improved the fit of the model ($\chi^2_{diff} = 19.10$), indicating that the

impact of ability varied for different schools. None of the other random slope models were significant. The remaining models assumed a random slope for grades.

The MLwiN analyses indicated that all three variables significantly predicted grades (B_{con} = .206, SE = .039, $B_{ability}$ = .088, SE = .01, B_{parent} = .20, SE = .007, all ps < .01). Finally, we added the main mediator (Grade 8 conscientiousness) to the model. Consistent with what was found in Figure 1, Grade 8 conscientiousness predicted future grades (B = .222, SE = .045), whereas Grade 7 conscientiousness (B = .082, SE = .045, $p > .05$) and parenting style (B = .13, SE = .007, $p > .05$) ceased to be significant in the presence of Grade 8 conscientiousness. In summary, the results of the MLwiN analyses suggest that the key effects shown in Figure 1 generalize across schools.

Discussion

Using data from a three-wave longitudinal study, the main aim of this research was to assess the extent to which parental styles at Time 1 explained changes in conscientiousness at Time 2 and the extent to which changes in conscientiousness in turn predicted school performance. We expected academic ability as indicated by the student's previously established verbal and numerical ability at Time 1 to have a direct effect on school grades at Time 3. We also expected conscientiousness at Time 1 to predict conscientiousness at Time 2, which in turn would predict school grades at Time 3 (Blickle, 1996; De Raad & Schouwenburg, 1996; Diseth, 2003; Furnham et al., 2003). Finally, we expected parental styles at Time 1 to affect conscientiousness at Time 2 (Baumrind, 1971; Fraley & Roberts, 2005; Lewis, 2002; Roberts & DelVecchio, 2000) and, following cross-sectional evidence, to have a direct effect on school achievement (e.g., Dornbusch et al., 1987; Steinberg & Morris, 2001).

Unexpectedly, parental authoritativeness at Time 1 was not significantly related to science and math achievement at Time 3, although it was significantly related to outcomes in English, religious studies, and history. Thus, authoritativeness differs in its ability to predict across different academic areas, at least for this sample. Why might this be the case? If authoritativeness is linked to conscientiousness-like characteristics as suggested by Baumrind (1971), it may be that performance in science and math relies more on innate academic ability and acumen, and less on characteristics normally associated with conscientiousness and, by extension, less on authoritativeness.

As expected, and in line with earlier studies (e.g., Caspi et al., 2005; McCrae et al., 2000), conscientiousness scores were highly correlated across time, even though mean scores dropped significantly during the same period. This accords with Roberts and Wood's (2006) observation that personality traits are consistent over time (a consistency that increases with age) while showing statistically significant mean level changes across time.

We found that parents' authoritativeness at Time 1 predicted an increase in adolescent-reported conscientiousness at Time 2 once Time 1 conscientiousness was controlled. This supports the plasticity principle (Roberts & Wood, 2006), namely, that traits have a capacity for change. Our data show the extent to which conscientiousness is linked to parental authoritativeness, but it is not possible to infer from our results whether, and to what extent, participants' levels of conscientiousness evoke, or are the result of, parental authoritativeness. It is also not possible to ascertain from our study the extent to which our results are reflective of possible shared genetic influences between children with elevated levels of conscientiousness and their parents with elevated levels of authoritativeness. Future research needs to explore these issues.

The Effects of Increases in Conscientiousness

The results of our SEM lend support to the views of Baumrind (1971, 1991). She concluded that the offspring of authoritative parents are more likely to be imbued with characteristics we might today label as conscientiousness, specifically singling out achievement orientation and social responsibility, and suggested that these children are "motivated to excel" (p. 72). Our results show that authoritativeness had a direct impact on conscientiousness at Time 2 after controlling for Time 1 conscientiousness. Our results also indicate that although mean levels of conscientiousness decreased over time, this happened to a significantly lesser extent to teenagers in highly authoritative families.

That conscientiousness predicts school grades (English, religious studies, and history) after accounting for parental styles and student's ability supports many previous studies on the importance of conscientiousness for academic achievement. Our results fit with the view that conscientiousness is the noncognitive counterpart of the g factor (De Fruyt & Mervielde, 1996). Our data also clearly show that conscientiousness bestows added benefits above and beyond those imparted by authoritative parents and high verbal and numerical skills and that personality factors such as conscientiousness are linked in important ways to adolescents' school outcomes.

Once students' prior academic ability and their levels of conscientiousness were controlled for, the influence of authoritativeness on grades was found not to be

direct but rather to be mediated by conscientiousness. Thus, our results call into question previous studies that have suggested a direct link between parental authoritativeness and school achievement (e.g., Dornbusch et al., 1987; Gray & Steinberg, 1999; Leung et al., 1998; Steinberg & Morris, 2001). On the contrary, we suggest that once preexisting verbal ability and changes in conscientiousness have been taken into account, the effects of parental styles on academic achievement are indirect.

Limitation and Conclusion

One weakness of our study is the reliance on students' reports of parental styles; it is possible that conscientious teenagers may have viewed their parents as authoritative. It would be desirable to obtain parental reports in the future, although they too might be biased. Perhaps the best approach would be to observe parents and children interacting. However, that would be difficult to achieve in longitudinal studies with large samples. Although we found that increases in conscientiousness over time were associated with higher academic grades in school, it is not yet clear how powerful the long-term effects of conscientiousness on academic achievement are. Our expectation is that conscientiousness will continue to be an important long-term predictor of school outcomes. We will be able to test this hypothesis as we continue tracking our participants.

NOTE

1. In subsequent data we collected from our participants, scores on the conscientiousness scale correlated .62 ($p < .001$) with a five-item adult version of conscientiousness (Goldberg, 1999).

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