Development of Academic Achievement for Adolescents from Different Socioeconomic Backgrounds: The Mediating and Moderating Role of Self-control.

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Abstract

Parental socioeconomic status (SES) influences adolescent academic achievement. The literature offers two competing hypotheses on the role of self-control in the relation between parental SES and adolescent academic achievement. The *vulnerability* hypothesis states that low parental SES is related to lower self-control, which makes the adolescent vulnerable, because low self-control negatively affects academic achievement. The *temperamental protection* hypothesis purports that high self-control can work as a protective factor for adolescent academic achievement in the context of low SES. This study pitted both hypotheses against each other using three measurement waves from the Tracking Adolescents' Individual Lives Survey (TRAILS). Participants took part between ages 10 and 17 (2001-2008; N = 2230). Linear regression analyses tested the two hypotheses cross-sectionally and longitudinally. Contrary to our expectations, we found no support for either hypotheses. This lack of findings and theoretical implications are discussed in light of development.

Keywords: academic achievement; self-control; socioeconomic status; adolescence

Samenvatting

Ouderlijke sociaal economische status (SES) beïnvloedt schoolprestaties van adolescenten. Uit de literatuur komen twee hypothesen over de rol van zelfcontrole in de relatie tussen schoolprestaties van adolescenten en ouderlijke SES naar voren. De *kwetsbaarheids*-hypothese stelt dat een lage ouderlijke SES gerelateerd is aan lagere zelfcontrole. Dit maakt de adolescent kwetsbaar, aangezien lage zelfcontrole het schools presteren van adolescenten negatief beïnvloedt. De *beschermings*-hypothese stelt dat hoge zelfcontrole beschermend kan werken voor het schools presteren van adolescenten in een lage SES context. Deze studie zet beide hypothesen tegen elkaar af, gebruik makend van drie meetmomenten van de Tracking Adolescents' Individual Lives Survey (TRAILS). Participanten namen deel tussen de leeftijd van 10 en 17 (2001-2008; N = 2230). Lineaire regressie analyses toetsten de twee hypothesen cross-sectioneel en longitudinaal. Tegengesteld aan onze verwachtingen, hebben we geen bewijs gevonden voor beide hypothesen. Het gebrek aan resultaten en theoretische implicaties worden besproken in een ontwikkelingsperspectief.

Trefwoorden: schools presteren; zelfcontrole; sociaaleconomische status; adolescentie

Development of Academic Achievement for Adolescents from Different Socioeconomic Backgrounds: The Mediating and Moderating Role of Self-control.

Academic achievement is recognized as an important factor for educational attainment, employment, income, and health (Pearce et al., 2016). It is generally accepted that parental socioeconomic status (SES) affects academic achievement (Sirin, 2005), with adolescents from lower SES families being outperformed by adolescents from higher SES families (Zwick & Green, 2007). Contextual theorists advocated that the influence of environmental factors may vary due to characteristics of the individual, as temperament (Bronfenbrenner, 1986). It is therefore crucial that the role of adolescent temperamental characteristics is also investigated in the relation between parental SES and academic achievement.

An important temperamental characteristic to examine is self-control, because self-control is proposed to control and inhibit impulses in order to perform effectively at school (De Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012). The importance of self-control for academic performance may be amplified for adolescents, because secondary school is marked by an increase in self-organization, homework, and exam preparation in numerous subjects in comparison to elementary school (Weis, Heikamp, & Trommsdorff, 2013). Two hypotheses about self-control in the relation between parental SES and adolescent academic achievement are adverted in the literature. The *vulnerability* hypothesis, on the one hand, considers self-control as a mediator. In this view self-control is assumed to be malleable and lower for adolescents in low SES families, which makes the adolescent vulnerable because low self-control negatively affects academic achievement (De Ridder et al., 2012). The *temperamental protection* hypothesis, on the other hand, considers self-control as a moderator. In this view self-control is seen as a temperamental disposition, assumed to be rather stable across situations and protective for adolescent academic achievement in a low SES context (De Ridder et al., 2012).

The present study will pit the two hypotheses against each other to provide insight into the relation between parental SES, self-control, and adolescent academic achievement. Insight into these relations is essential, because previous work focused mostly on the *vulnerability* hypothesis and to the authors' knowledge not one study investigated both hypotheses (McLoyd, 1998). Above that, most research included children, while adolescence is the most important developmental time for self-control (Casey & Caudle, 2013; Farley & Kim-Spoon, 2017). Understanding of the relations is vital for the formation of effective

policy and interventions that aim to render academic achievement less vulnerable to parental SES (Conger & Donnellan, 2007; Yoshikawa, Aber, & Beardslee, 2012).

The Relation Between Parental SES and Academic Achievement

It is widely agreed that parental SES influences academic achievement (Bradley & Corwyn, 2002; Heckman, 2006; McLoyd, 1998). Specifically, low parental SES negatively influences adolescent academic achievement and in particular mathematics and language skills (Sarsour et al., 2011). For example, adolescents from lower SES families have fewer years of schooling, and lower test scores, school attendance, and school completion in comparison to adolescents from higher SES families (Brooks-Gunn & Duncan, 1997; Conger & Donnellan, 2007; Zwick & Green, 2007).

Researchers typically conceptualize SES as three indicators of capital (resources, assets): financial capital (material resources e.g., income), human capital (nonmaterial resources e.g., education), and social capital (resources achieved by social connections e.g., occupational status; Bradley & Corwyn, 2002; Conger & Donnellan, 2007). Low parental SES may impair adolescent academic achievement, because it is related to scarcity of these resources and a stressful environment (Bradley & Corwyn, 2002). Scarcity limits resources which influence academic achievement, including cognitive fostering materials and experiences (e.g., books, discussion of school matters), parental stimulation of learning, living standards of the family (e.g., health care, housing), and living in a stimulating neighbourhood (Bradley & Corwyn, 2002; Conger & Donnellan, 2007). A stressful environment arises more often in low SES families, because these families encounter more threatening and uncontrollable life events (e.g., unemployment), which may reduce parental involvement in academic achievement (Bradley & Corwyn, 2002; Conger & Donnellan, 2007). Thus, low parental SES may place the adolescent at risk for lower academic achievement.

Definition of Self-control

Despite considerable debate in the literature on how to define and measure self-control, existing theories acknowledge that self-control can be defined as the capacity to modify or override response tendencies and to regulate behaviour, thoughts, and emotions (De Ridder et al., 2012). Self-control consists of two components (Rothbart, Ahadi, & Evans, 2000). One component is considered more stable, as a disposition. Dispositional theories on self-control hold that people with high self-control can control their impulses better than others despite external influences (e.g., Gottfredson & Hirschi, 1990; Mischel, Cantor, &

Feldman, 1996; Rothbart, Ellis, Rueda, & Posner, 2003). The other component is considered more malleable and less stable across time and context, which may include state self-control (De Ridder et al., 2012). Malleable theories on self-control propose that situational demands and contextual pressure may deplete self-control capacities (e.g., Baumeister & Heatherton, 1996; Baumeister, Heatherton, & Tice, 1994). Taken together, self-control consists of two components: one considered more stable and the other considered more malleable. The literature suggests that these two components play a different role in the relation between parental SES and adolescent academic achievement.

The Relation Between Self-control and Academic Achievement

Previous studies showed the significance of self-control for adolescents to be successful at school. Higher levels of self-control correlated with higher grades (Duckworth & Seligman, 2005; Tangney, Baumeister, & Boone, 2004). Adolescents with high self-control pay more attention in class, double-check their work, finish their work on time, and prevent leisure activities from interfering with the work (e.g., meeting friends, watching television; Duckworth, Gendler, & Gross, 2014). Self-control appeared to be even a stronger predictor for academic achievement than intelligence (Duckworth & Seligman, 2005). Thus, these findings suggest that self-control is promotive for adolescent academic achievement.

The Vulnerability Hypothesis: Self-control as a Mediator

In this hypothesis self-control is considered malleable, argued to fluctuate across time and context (De Ridder et al., 2012). More specifically, the *vulnerability* hypothesis states that living in a low SES family may decrease individuals' capacity and motivation to exert self-control, which in turn negatively affects adolescent academic achievement (see Figure 1a; Farley & Kim-Spoon, 2017).

Low parental SES may impede the growth of self-control due to the absence of resources and the presence of a stressful environment (Evans & Kim, 2013; Oshri et al., 2017). First, scarcity and unpredictability of resources limit or eliminate reinforcement to exert self-control and delay gratification in prospect of larger rewards later (Oshri et al., 2017). Children 'learn' to prefer immediate rewards, resulting in low self-control (Oshri et al., 2017). Second, a stressful environment negatively affects the quality of parent-child interactions. Less responsive and harsher parenting are in turn related to lower levels of self-control (Evans & Kim, 2013). Empirical evidence shows that low parental SES is related to self-control which affects academic achievement. Evans and Rosenbaum (2008) found in a longitudinal study with 97 children at age 9 a positive relation between income (one of the

SES indicators) and self-control, which subsequently accounted for grades at age 13. Another recent longitudinal study with 220 adolescents (age 13-15) showed comparable results (Farley & Kim-Spoon, 2017). Taken together, these findings suggest that self-control may mediate the relation between low parental SES and adolescent academic achievement.

The Temperamental Protection Hypothesis: Self-control as a Moderator

In this hypothesis self-control is considered a disposition, assumed to be rather stable across time and context (De Ridder et al., 2012). The *temperamental protection* hypothesis purports that high self-control can work as a buffer for adolescent academic achievement in the face of risk of low parental SES (see Figure 1b; Wang et al., 2017).

The protective role of self-control is two folded: it promotes recovery from stress associated with low SES (Eisenberg et al., 1997), and it promotes adaptive coping behavior and diminishes negative behavior in response to this stress (Lengua, 2002). For example, stress increases the use of problem-solving strategies and adaptations to changing circumstances among children with high self-control in comparison to children with low self-control (Eisenberg et al., 1997; Lengua, 2002). Using the first data collection of TRacking Adolescents' Individual Lives Survey (TRAILS), a longitudinal study with a large sample of Dutch preadolescents with biennial measurements until adulthood, cross-sectional findings by Veenstra and colleagues (2006) showed that self-control was a protective factor against antisocial behaviour for preadolescents (n = 2230, age 11) from low SES families. A recent longitudinal study with 2236 children and adolescents between ages 0 and 15 demonstrated that self-control could also work as a buffer in the negative relation between low SES families (e.g., low educational and occupational level) and academic achievement (Wang et al., 2017). Children with high self-control from low SES families showed faster academic growth rates than their peers with high self-control from high SES families. Therefore, high self-control appeared protective for children from low SES families. For children with low self-control this buffering effect was not found (Wang et al., 2017). Thus, it seems that self-control can act as a protective factor for academic achievement for adolescents from low SES families.

Current Study

The aim of the present study is to test the explanatory power of the *vulnerability* hypothesis and the *temperamental protection* hypotheses and examine whether one hypothesis is better confirmed by our sample than the other hypothesis. The two hypotheses concur on the beneficial role of self-control but make different predictions on the role of self-

control. The *vulnerability* hypothesis is concerned with the question how self-control exerts effects in the relation between parental SES and adolescent academic achievement (mediation) and the *temperamental protection* hypothesis is concerned with the question under which conditions the relation is amplified versus reduced by self-control (moderation).

To investigate the relations between parental SES, self-control, and adolescent academic achievement, we used three data collections from TRAILS and examined the hypotheses cross-sectionally and longitudinally. Central in this study is the following question: *'What is the role of self-control in the relation between parental SES and adolescent academic achievement: A mediating or a moderating role?'.* Based on theoretical and empirical grounds the following hypotheses were advanced. First, we expected to replicate the direct relation between parental SES and adolescent academic achievement found in the literature. Specifically, the *environment* hypothesis purports that lower parental SES is negatively related to adolescent academic achievement. Second, the *vulnerability* hypothesis states that low parental SES may negatively influence adolescent academic achievement, because it is related to lower self-control, which in turn negatively influences adolescent academic achievement. Finally, the *temperamental protection* hypothesis predicts that high self-control will work as a protective factor for adolescent academic achievement in a low SES context. To exclude alternative explanations, we included gender, ethnicity, and educational level in our analyses, because these factors are related to self-control or academic achievement (e.g., Finkenauer, Engels, & Baumeister, 2005; Johnson, Crosnoe, & Elder, 2001).

This study is the first to investigate the *temperamental protection* hypothesis and the *vulnerability* hypothesis on self-control in the relation between parental SES and adolescent academic achievement using the same sample, enabling to pit the hypotheses against each other. Given the design of the study, the hypotheses will be examined both cross-sectionally and longitudinally. This approach provides more detailed information on the possible effects for different age groups and times of development. In addition, it will yield insight into the development of academic achievement and provide stronger evidence for the influence of parental SES and self-control on adolescent academic achievement, because causality between the variables can be ascribed.

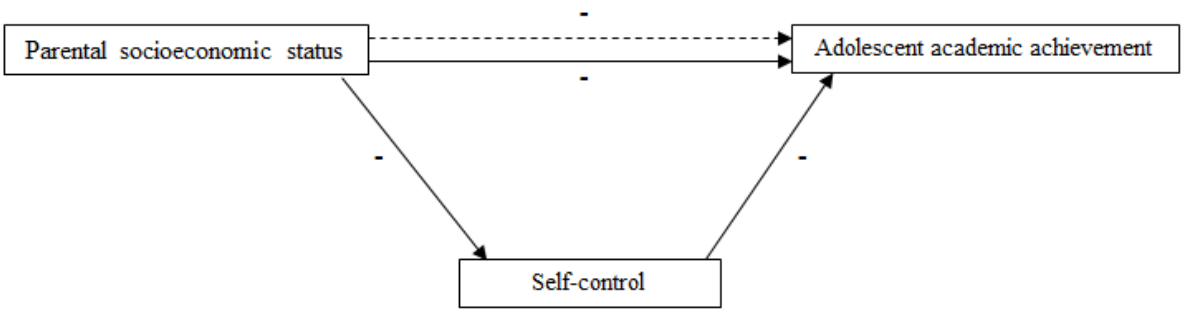

Figure 1a. The influence of parental SES on adolescent academic achievement mediated by self-control.

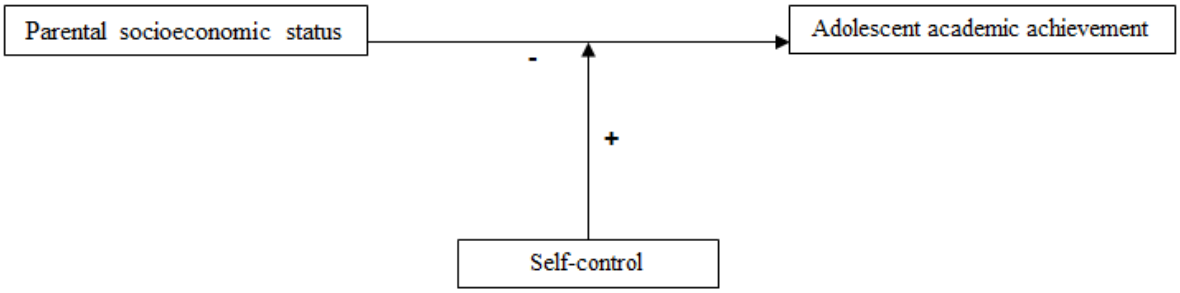

Figure 1b. The influence of parental SES on adolescent academic achievement moderated by self-control.

Method

Sample and Procedure

This study is part of the TRacking Adolescents' Individual Lives Survey (TRAILS), a prospective cohort study of Dutch preadolescents who were measured biennially until the age of 24. The main goal of TRAILS is to chart and explain the development of mental health and social development in the period between preadolescence and adulthood. The TRAILS target sample included preadolescents from five municipalities in the North of the Netherlands, including both urban and rural areas.

The present study used data from the first, second and third waves of TRAILS. Of all children approached to participate in the study (i.e., selected by the municipalities and attending a school that was willing to engage in the study, N = 3145), 6,7% were excluded because of incapability or language problems. At the first measurement wave (T1), 2230 children (mean age = 11.09 years, SD = 0.55; 48.1% boys; 76.0% response rate) were enrolled in the study (for more details about sample selection, see De Winter et al., 2005). From these children, 2149 preadolescents (96,4%; M = 13.56 years, SD = 0.53; 47.9% boys) participated in the second measurement wave (T2), and 1816 adolescents (81.4%; M = 16.28

years, *SD* = 0.73; 46.6% boys) in the third measurement wave (T3). Both parent and child gave consent to participate at the first wave. Adolescents gave written informed consent at the second and third assessment waves. The first assessment wave of TRAILS lasted from March 2001 to July 2002. The first follow-up measurement (T2) ran two to three years after T1 (mean number of months 29.5, *SD* = 5.43; range 17-48). The second follow-up (T3) took place 0.9 to 4.4 years after T2 (mean number of months 32.7; *SD* = 7.07; range 11-53).

The sample was predominantly Dutch (*N* = 1993, 89.4%), the remainder had at least one parent born in a non-Western country. A total of 35.9% (*N* = 800) adolescents attended lower levels of education (VMBO) and 50.4% (*N* = 1125) adolescents attended higher levels of education (Havo and VWO). The remaining 13.7% (*N* = 305) consisted of adolescents not attending school, in primary education, and in special secondary education, and adolescents for whom no educational level was reported. These adolescents were excluded from the analyses, because it was expected that these adolescents have severe (psychosocial) problems preventing attendance of regular secondary education, which could have distorted the results[1].

At T1, parents or guardians (preferably the mother, 95.6%) were interviewed in their homes. The parent was further asked to fill out questionnaires during the three measurement waves. Children, and later the adolescents, filled out questionnaires at school, under supervision of one or more TRAILS assistants. Teachers were asked to fill in a brief questionnaire for all children in their class who participated in TRAILS. The Dutch National Medical Ethics Committee approved the design of each measurement wave of the TRAILS study.

De Winter and colleagues (2005) found that boys, children from lower social strata, and children with worse school performance belonged somewhat more likely to the nonresponse group at T1. For T3, we found that children from lower social strata were significantly more likely to belong to the nonresponse group, $t(2186) = 7.586$, $p < .001$. No significant difference in non-response was found for self-control, $t(1789) = .165$, $p = .869$.

Measures

Parental socioeconomic status. Parental socioeconomic status (SES) was measured at T1 using five items from the parental questionnaire assessing family income level, highest educational level of each parent attained, and the occupational level of both parents (using the International Standard Classification for Occupations; Ganzeboom & Treiman, 1996). The

[1]Excluding these cases led to very small, non-significant differences in the results.

SES scale captured 61.2% of the variance in the five items and had an internal consistency of α = .84. SES was measured as the average of these five items (standardized), with higher values indicating higher SES.

Self-control. Self-control was assessed at all measurement waves (T1-T3) using the Child Behavior Checklist (CBCL; Achenbach, 1991a; Verhulst & Achenbach, 1995). We chose to use parental reports over adolescent self-reports (Youth Self-Report; YSR). Parental reports may be less susceptible to a social desirability bias and more accurate because adolescents may report lower levels due to a decrease in perceived competence during adolescence (Tangney et al., 2004; Vukman & Licardo, 2010). The CBCL contains a list of 112 behavioural and emotional problems, which the parent can rate as 0 = *not true*, 1 = *somewhat or sometimes true*, or 2 = *very or often true in the past six months*. Test-retest reliabilities of the CBCL have found to be good. Eight items of the Achenbach System of Empirically Based Assessment (ASEBA) instruments were recently validated to assess self-control, including the CBCL (Willems et al., 2018). These items are: "Fails to finish things he/she starts", "Can't concentrate, can't pay attention for long", "Breaks rules at home, school or elsewhere", "Impulsive or acts without thinking", "Inattentive or easily distracted", "Stubborn, sullen, or irritable", "Sudden changes in mood or feelings", and "Temper tantrums or hot temper". All items were recoded, so a higher score would indicate a higher level of self-control. Scores were averaged to construct a total self-control scale with an internal consistency of .83 at T1, .83 at T2, and .84 at T3. We calculated the score given three or fewer missing items (Achenbach & Rescorla, 2001).

Academic achievement. Academic achievement in mathematics and language skills was assessed at all measurement waves (T1-T3) with two questions from the teacher questionnaire regarding school performance: "What are the school results of the student in Dutch?" and "What are the school results of the student in mathematics?". Teachers rated these questions on a 5-point scale ranging from 1 = *insufficient* to 5 = *excellent*. Scores were averaged to construct a new scale of academic achievement with an internal consistency of .78 at T1, .62 at T2, and .57 at T3.

Control variables. We controlled for gender (0 = *girl*, 1 = *boy*), ethnicity (0 = *non-native Dutch*, 1 = *Dutch*), and level of education at T2 when the preadolescents had entered secondary school.

Strategy of Analyses

First, descriptive (raw means, *SD*s, minimum and maximum) and correlation analyses were conducted. Second, the hypotheses were tested using hierarchical regression analyses, using the recommendations from Baron and Kenny (1986) for testing mediation and moderation. We examined the hypotheses cross-sectionally and longitudinally to examine possible effects at different ages and times of development and capture the development of self-control and academic achievement. For the concurrent analyses, we averaged the cross-sectional results from the three measurement waves to estimate effect sizes. All analyses were performed with SPSS version 24.

Mediation analyses. For the cross-sectional and longitudinal analyses we included parental SES in the first step of the model. In the second step self-control was included, and in the third step the control variables were included. In the longitudinal mediation analysis we controlled for previous measurements of self-control and academic achievement in step 1. We examined whether the direct effect of parental SES on academic achievement diminished or disappeared when self-control was included in the model as a mediator.

Moderation analyses. Prior to the regression analyses, the variables were standardized and interaction variables were created between parental SES and self-control for the three measurement waves. For the cross-sectional and longitudinal analyses we included parental SES, self-control, and the interaction term in the first step of the model. The control variables were included in the second step. In the longitudinal moderation analysis we controlled for previous measurements of academic achievement in the first step. We examined whether the interaction term was related to academic achievement.

We reported only standardized values from the analyses. Thus, for the mediation analyses we reported beta coefficients and for the moderation analyses b coefficients because the included variables were standardized prior to the analyses.

With the program G*Power we computed that an effect size $\geq .03$ was needed to find a significant relation with a power of .80 for the longitudinal mediation and moderation analyses.

Results

Descriptive Analyses

Descriptive and correlational analyses were conducted to investigate the relations between the study variables and their development. All descriptives of the key variables including outcomes of analysis of variance tests are provided in Table 1. Parents reported

generally low levels of self-control for the adolescents in our sample, indicated by the mean scores and highly skewed distributions. A minimal significant decrease in self-control emerged over time, as can be seen in Table 1. Teachers reported academic achievement generally to be sufficient at T1 and T2, but insufficient at T3. The decrease in academic achievement appeared significant (see Table 1). A great number of reports missed for respondents at T2 and T3, especially for academic achievement.

Correlations between the variables are presented in Table 2. Parental SES was positively related to academic achievement at T1 and T2. However, we found no relation between parental SES and academic achievement at T3. We found a positive association between parental SES and self-control for all measurement waves. Self-control appeared a stable measure, shown by the high correlations over time. Self-control at T1 was only positively related to academic achievement at T1 in our study. We found significant relations for gender, ethnicity, level of education and the study variables. We therefore included these factors as covariates in our analyses. Level of education was measured at T2, for this reason it was only included as a covariate when predicting variables at T2 and T3.

Table 1

Raw means, standard deviations, minimum and maximum values for parental SES, self-control[2]*, and academic achievement per measurement wave*

	N	*M*	*SD*	*Min.*	*Max.*
Variables at T1					
Parental SES	1889	.02	.79	-1.85	1.73
Self-control	1791	.58	.42	0	2
Academic achievement	1635	3.35	.88	1	5
Variables at T2					
Self-control	1653	.46***	.39	0	2
Academic achievement	1258	3.08***	.78	1	5
Variables at T3					
Self-control	1267	.43***	.39	0	2
Academic achievement	693	2.94***	.76	1	5

Note * $p < .05$, ** $p < .01$, *** $p < .001$.

[2]Additional analyses revealed approximately the same levels of self-control reported by the adolescents with the Youth Self-Report (YSR; Achenbach, 1991b; Verhulst & Achenbach, 1995): T1 $M = .50$, $SD = .33$; T2 $M = .58$, $SD = .34$; T3 $M = .59$, $SD = .35$.

Table 2

Pearson and Spearman correlations between variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Parental SES T1									
2. Self-control T1	.10**								
3. Self-control T2	.08**	.66**							
4. Self-control T3	.07*	.59**	.67**						
5. Academic achievement T1	.36**	.08**	.10**	.07*					
6. Academic achievement T2	.11**	.02	.03	.02	.26**				
7. Academic achievement T3	.07	.02	.03	.03	.12**	.32**			
8. Boys	.01	.02	.01	.00	.08**	.11**	.14**		
9. Dutch adolescents	.11**	.03	.00	.01	.15**	.01	.03	.02[3]	
10. Level of education[4][5]			.15**	.09**		.14**	.07	.03	.06**

Note * $p < .05$, ** $p < .01$.

[3]This is a Spearman correlation, the rest are Pearson correlations.
[4] Level of education is measured at T2, therefore it is only presented for variables measured at T2 and T3.
[5]Additional analysis revealed a correlation of .47 between parental SES and educational level.

Testing the Hypotheses

Concurrent analyses.

Mediation analyses. To examine the *vulnerability hypothesis* concurrently, we first conducted mediation analyses for each measurement wave separately. As can be seen from Table 3, we found a direct relation between parental SES and academic achievement for T1 and T2, but no longer at T3. The relation between parental SES and academic achievement remained significant but did not decrease after controlling for self-control at T1 and T2, indicating a lack of mediation effect. Moreover, we found a direct relation between self-control and academic achievement at T1, $\beta = .06$, $p < .05$. Adding the covariates changed only the strength of the results for the relation between parental SES and self-control (see Table 4).

To examine the robustness of these effects across the three measurement waves, we averaged the results. Consistent with the hypothesis, parental SES was positively associated with academic achievement, $\beta = .18$, $p < .05$. Inconsistent with our expectations, parental SES was unrelated to self-control, $\beta = .08$, $p > .05$ (see Table 4). Self-control was unrelated to academic achievement, $\beta = .04$, $p > .05$. The relation between parental SES and academic achievement remained significant but did not decrease after controlling for self-control, indicating a lack of a mediation effect. Taken together, we found no evidence for the *vulnerability* hypothesis, in the concurrent mediation.

Table 3

Hierarchical regression predicting academic achievement at T1, T2, and T3[6]

	Academic achievement T1 (*N* = 1511)		Academic achievement T2 (*N* = 1054)		Academic achievement T3 (*N* = 416)	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
Variable	*β*	*β*	*β*	*β*	*β*	*β*
Parental SES	.35***	.35***	.10**	.10**	.09	.09
Self-control		.06*		.03		.03
R^2	.126	.129	.010	.011	.009	.009

Note * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4

Hierarchical regression predicting self-control at T1, T2, and T3

	Self-control T1 (*N* = 1757)		Self-control T2 (*N* = 1618)		Self-control T3 (*N* = 1242)	
	Step 1	Step 2	Step 1	Step 2	Step 1	Step 2
Variable	*β*	*β*	*β*	*β*	*β*	*β*
Parental SES	.10***	.10***	.08**	.01	.07*	.03
R^2	.009	.010	.006	.023	.005	.010

Note * $p < .05$, ** $p < .01$, *** $p < .001$.

Moderation analysis. To examine the *temperamental protection* hypothesis concurrently, we first conducted moderation analyses for each measurement wave separately. As can be seen from Table 5, we found only an interaction between parental SES and self-control for academic achievement at T2, B = -.06, $p < .05$. The interaction effect is illustrated in Figure 2. The interaction revealed that adolescents from low SES families with low self-control had lower academic achievement in comparison to adolescents with high self-control, but higher academic achievement in a high SES context in comparison to adolescents with high self-control. Adding the covariates did not change the strength and direction of the results.

[6]Additional analyses revealed that educational level explained 1.3% of the variance in academic achievement at T2 and 1% of the variance in academic achievement at T3.

To examine the robustness of the effects across the three measurement waves, we averaged the results. Inconsistent with the hypothesis, we found no interaction between parental SES and self-control for academic achievement, B = -.06, $p > .05$. Thus, we found no evidence for the *temperamental protection* hypothesis, in the concurrent moderation.

Table 5

Hierarchical regression predicting academic achievement at T1, T2 and T3

	Academic achievement T1 (N = 1511)	Academic achievement T2 (N = 1054)	Academic achievement T3 (N = 416)
	Step 1	Step 1	Step 1
Variable	B	B	B
Parental SES	.31***	.08**	.08
Self-control	.05*	-.02	.04
Parental SES x self-control	-.04	-.06*	-.08
R^2	.131	.017	.018

Note * $p < .05$, ** $p < .01$, *** $p < .001$.

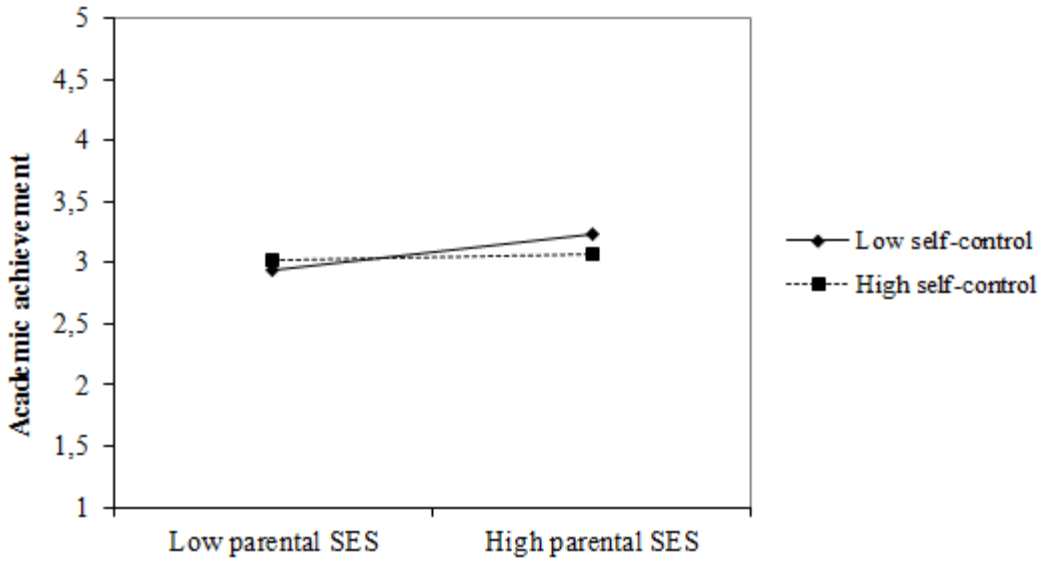

Figure 2. Graphical representation of the interaction at T2 between parental SES and self-control in relation to academic achievement.

Longitudinal analyses.

Mediation analysis. Parental SES did not predict academic achievement at T3, inconsistent with the *vulnerability* hypothesis (Table 6). Thereby the first criterion for

mediation was not fulfilled (Baron & Kenny, 1986). Adding the covariates did not change the strength and direction of the results. Therefore, we found no evidence for the *vulnerability* hypothesis, in the longitudinal mediation.

Table 6

Hierarchical regression predicting academic achievement at T3

	Academic achievement T3 (N = 335)	
	Step 1	Step 2
Variable	*β*	*β*
Parental SES	.03	.04
Self-control T2		.08
R^2	.069	.073

Note * $p < .05$

Moderation analysis. Self-control appeared relatively stable over time, shown by the high correlations of self-control between the different measurement waves (see Table 2). Hence, we included self-control at T1 in the analysis, assuming that the stability reflects the dispositional component of self-control. As can be seen in Table 7, we found no interaction between parental SES and self-control for academic achievement at T3, inconsistent with the *temperamental protection* hypothesis. Adding the covariates did not change the strength and direction of the results. Thus, we found no evidence for the *temperamental protection* hypothesis, in the longitudinal moderation.

Table 7

Hierarchical regression predicting academic achievement at T3

	Academic achievement T3 (N = 382)
	Step 1
Variable	B
Parental SES	.04
Self-control	.05
Parental SES x self-control	-.05
R^2	.098

Note * $p < .05$

Discussion

The present study aimed to provide insight into the role of self-control in the relation between parental socioeconomic status (SES) and adolescent academic achievement, because the literature offered two hypotheses making different predictions about the role of self-control. Extending previous research, we pitted the *vulnerability* hypothesis considering self-control as a mediator, and the *temperamental protection* considering self-control as a moderator, against each other cross-sectionally and longitudinally. Contrary to our expectations derived from the literature, our results did not support the *vulnerability* hypothesis nor the *temperamental protection* hypothesis (e.g., Evans & Rosenbaum, 2008; Farley & Kim-Spoon, 2017; Wang et al., 2017). Surprisingly, we found a promotive effect of self-control on academic achievement for preadolescents (age 11), and high parental SES to be protective for 14-year-olds with low self-control.

The Relation Between Parental SES and Academic Achievement

Teachers reported higher academic achievement for adolescents from higher SES families, than for adolescents from lower SES families, supporting our *environment* hypothesis. These results are in line with other studies showing similar findings (Brooks-Gunn & Duncan, 1997; Conger & Donnellan, 2007; Zwick & Green, 2007). Unexpectedly, the cross-sectional analyses revealed that the relation between parental SES and academic achievement became weaker over time and disappeared when the adolescents were 16 years old.

One could argue that the weakening influence of parental SES on adolescent academic achievement may be due to the Dutch secondary schooling system with separate educational levels. Parental SES may influence the educational level children attend and influence academic achievement indirectly, because adolescents from higher educational levels outperform adolescents from lower educational levels (Schofield, 2010). Although additional analyses revealed a strong correlation between parental SES and educational level (r = .47), educational level explained only a minor proportion of the variance in adolescent academic achievement (1.3% at T2 and 1% at T3), refuting this alternative explanation. This implies that parental SES may no longer influence academic achievement directly nor indirectly through educational levels for older adolescents. Therefore it seems fruitful for future research to include factors such as peers that become more important during adolescence. Peer relations are crucial for adolescents to create and maintain a positive self-image (Becker & Luthar, 2002; Ryan, 2001). Academic achievement can be influenced both positively or negatively by peers, depending on the prevailing value within the peer group

(Becker & Luthar, 2002). Thus, future work should replicate our findings and ideally investigate the influence of peers in addition to parents on adolescent academic achievement.

The Vulnerability Hypothesis: Self-control as a Mediator

The *vulnerability* hypothesis stated that low parental SES is related to lower self-control, which in turn negatively influences adolescent academic achievement. Our results did not support the *vulnerability* hypothesis neither cross-sectionally nor longitudinally, inconsistent with previous findings (Evans & Rosenbaum, 2008; Farley & Kim-Spoon, 2017).

The lack of mediational findings may be caused using the *Child Behavior Checklist* (CBCL) to measure self-control. Self-control appeared a stable disposition, shown by small differences in within-person levels and high correlations over time. Possibly, the CBCL may not be ideal to investigate the malleable component of self-control because it measures the dispositional component of self-control. For future research it might be better to include both task and questionnaire measures, because a behavioral task as the delay of gratification task can assess the malleable component of self-control (Evans & Rosenbaum, 2008). In addition, a composite score of self-control appeared to predict academic achievement better than the use of a single measure (Duckworth & Seligman, 2005; Duckworth & Kern, 2011).

Moreover, we found that self-control functioned as an independent predictor of academic achievement at the first measurement wave. This implies that for the preadolescents in this wave of the study self-control appeared to have a promotive effect (Brumley & Jaffee, 2016). This result expands findings from other longitudinal research showing childhood self-control to be promotive for physical health, substance dependence and criminal offending (Moffitt et al., 2010). The promotive effect disappeared when the preadolescents entered adolescence, what might be explained by the constraints on self-control due to the maturation in adolescence (Casey & Caudle, 2013). It seems fruitful for future work to investigate this preliminary result further by replicating our findings, because this points out until what age self-control would be responsive to external intervention effort.

The Temperamental Protection Hypothesis: Self-control as a Moderator

The *temperamental protection* hypothesis stated that high self-control can work as a protective factor for academic achievement for adolescents from low SES families. Inconsistent with previous studies, we found no support for the hypothesis cross-sectionally nor longitudinally (e.g., Wang 2017). Surprisingly our results showed only in the second measurement wave, that adolescents with low self-control had higher academic achievement than adolescents with high self-control in high SES families. Thus, in contrast to our expectations, the environment appeared protective for adolescents aged 14 with low self-

control in this study.

Despite other research showed SES to be protective for adolescents with low self-control (Lynam, Caspi, Moffitt, Wikström, & Loeber, 2000; Raver, 2004; Veenstra, Lindenberg, Oldehinkel, De Winter, & Ormel, 2006), it is striking that adolescents with low self-control perform even better than adolescents with high self-control in a high SES context. This result is unexpected, because high self-control is assumed to lead to better academic outcomes (Duckworth & Seligman, 2005; Tangney et al., 2004). We have no ready explanation as to why adolescents with low self-control seem to profit more from a high SES context than adolescents with high self-control. We can only speculate that parents from high SES families mobilize more resources as tutoring lessons when they detect their adolescent child to have low self-control, from which the adolescent gains academically. These resources might not be provided to adolescents with high levels of self-control, because parents might not believe this is necessary. Although the result is interesting, it should be noted that the relation is small and cross-sectional of nature. Therefore, a note of caution in interpreting our results is warranted since we found no longitudinal support for the protective effect of high SES. Future work should confirm our preliminary findings.

Strengths and Limitations

The present study is characterized by some notable strengths. To our knowledge it was the first study examining the *vulnerability* hypothesis and the *temperamental protection* hypothesis. The design enabled to pit the hypotheses against each other, which yields information for the formation of effective policy and interventions aimed to render academic achievement less vulnerable to parental SES. Moreover, we performed cross-sectional and longitudinal analyses to gain information on the effects for different age groups and times of development and capture the developmental aspect. The inclusion of three measurement waves enabled rigorous mediation testing, because we could investigate whether change in self-control due to parental SES predicted change in adolescent academic achievement. Finally, our study had a few methodological strengths, including a large sample size, inclusion of control variables, and the use of multiple informants.

Our study also has some limitations. First, our study was characterized by selective attrition and a high number of missings. Children from lower social strata were somewhat less likely to participate in the first measurement wave (De Winter et al., 2005), and more likely to have dropped out at the third measurement wave. This could have reduced the results, because we expected the effects to be the strongest for adolescents from low SES families. One could argue that the selective dropout and high number of missings may have

resulted in the lack of longitudinal findings. However, the study appeared to have sufficient power to find small effects. It is possible that the time interval between the measurement waves was too long, wherefore the effects in our study may have already disappeared, or other events as a divorce may have taken place competing with the effects. Future research including shorter intervals should investigate this explanation. Second, we used parental reports of self-control, which may be more biased than adolescent self-reports (Cook & Goldstein, 1993). Additional analyses revealed approximately the same scores from adolescent self-reports, thus it seems that the use of parental reports did not influence our results. Finally, we did not assess genetics, which are known to affect self-control and academic achievement (Petrill & Wilkerson, 2000; Willems et al., 2018). Future research therefore needs to control for the influence of genetics on adolescent self-control and academic achievement.

Conclusions and Future Prospects

Taken together, these findings provide preliminary support for the suggestion that the role of self-control and the influence of parental SES change over time. Self-control acted as a promotive factor for children, but no longer influenced academic achievement once the children entered adolescence. Above that, high parental SES appeared protective for 14-year-olds with low self-control. Our results are encouraging and should be confirmed by future work to improve our understanding of the pathways to academic achievement. It is further hoped that this work will stimulate research to investigate the *vulnerability* hypothesis and the *temperamental protection* hypothesis, because this approach has the potential to guide effective policy making and subsequently contribute to adaptive development.

References

Achenbach, T. M. (1991a). *Manual for the Child Behavior Checklist/4-18 and 1991 Profile*. Burlington, VT: University of Vermont.

Achenbach, T. M. (1991b). *Manual for the Youth Self-Report and 1991 Profile*. Burlington, VT: University of Vermont.

Achenbach, T. M., & Rescorla, L. (2001). *Manual for the ASEBA school-age forms & profiles: An integrated system of multi-informant assessment.* Burlington, VT: University of Vermont.

Baumeister, R. F., & Heatherton, T. F. (1996). Self-regulation failure: An overview. *Psychological Inquiry, 7*(1), 1–15. doi:10.1207/s15327965pli0701_1

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. San Diego, CA: Academic Press.

Becker, B. E., & Luthar, S. S. (2002). Social-emotional factors affecting achievement outcomes among disadvantaged students: Closing the achievement gap. *Educational Psychologist*, *37*(4), 197–214. doi:10.1207/S15326985EP3704_1

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology*, *53*(1), 371–399. doi:10.1146/annurev.psych.53.100901.135233

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Developmental Psychology, 22*(6), 723–742. doi:10.1037//0012-1649.22.6.723

Brooks-Gunn, J., & Duncan, G. J. (1997). Structural effects of poverty on children. *The Future of Children, 7*(2), 55–71. doi:10.2307/1602387

Brumley, L. D., & Jaffee, S. R. (2016). Defining and distinguishing promotive and protective effects for childhood externalizing psychopathology: A systematic review. *Social Psychiatry and Psychiatric Epidemiology, 51*(6), 803–815. doi:10.1007/s00127-016-1228-1

Casey, B. J., & Caudle, K. (2013). The teenage brain: Self control. *Current Directions in Psychological Science*, *22*(2), 82–87. doi:10.1177/0963721413480170

Conger, R. D., & Donnellan, M. B. (2007). An interactionist perspective on the socioeconomic context of human development. *Annual Review of Psychology*, *58*(1), 175–199. doi:10.1146/annurev.psych.58.110405.085551

Cook, W. L., & Goldstein, M. J. (1993). Multiple perspectives on family relationships: A latent variables model. *Child Development*, *64*(5), 1377–1388. doi:10.2307/1131540

De Ridder, D. T. D., Lensvelt-Mulders, G., Finkenauer, C., Stok, F. M., & Baumeister, R. F. (2012). Taking stock of self-control: A meta-analysis of how trait self-control relates to a wide range of behaviors. *Personality and Social Psychology Review*, *16*(1), 76–99. doi:10.1177/1088868311418749

De Winter, A. F., Oldehinkel, A. J., Veenstra, R., Brunnekreef, J. A., Verhulst, F. C., & Ormel, J. (2005). Evaluation of non-response bias in mental health determinants and outcomes in a large sample of pre-adolescents. *European Journal of Epidemiology*, *20*(2), 173–181. doi:10.1007/s10654-004-4948-6

Duckworth, A. L., Gendler, T. S., & Gross, J. J. (2014). Self-control in school-age children. *Educational Psychologist*, *49*(3), 199–217. doi:10.1080/00461520.2014.926225

Duckworth, A. L., & Kern, M. L. (2011). A meta-analysis of the convergent validity of self-control measures. *Journal of Research in Personality*, *45*(3), 259–268. doi:10.1016/j.jrp.2011.02.004

Duckworth, A. L., & Seligman, M. E. P. (2005). Self-disciplice outdoes IQ in predicting academic performance of adolescents. *Psychological Science*, *16*(12), 939–944. doi:10.1111/j.1467-9280.2005.01641.x

Eisenberg, N., Guthrie, I. K., Fabes, R. A., Reiser, M., Bridget, C. M., Holgren, R., … Losoya, S. (1997). The relations of regulation and emotionality to resiliency and competent social functioning in elementary school children. *Child Development*, *68*(2), 295–311. doi:10.2307/1131851

Evans, G. W., & Kim, P. (2013). Childhood poverty, chronic stress, self-regulation, and coping. *Child Development Perspectives*, *7*(1), 43–48. doi:10.1111/cdep.12013

Evans, G. W., & Rosenbaum, J. (2008). Self-regulation and the income-achievement gap. *Early Childhood Research Quarterly*, *23*(4), 504–514. doi:10.1016/j.ecresq.2008.07.002

Farley, J. P., & Kim-Spoon, J. (2017). Parenting and adolescent self-regulation mediate between family socioeconomic status and adolescent adjustment. *Journal of Early Adolescence, 37*(4), 502–524. doi: 10.1177/0272431615611253

Finkenauer, C., Engels, R. C. M. E., & Baumeister, R. F. (2005). Parenting behaviour and adolescent behavioural and emotional problems: The role of self-control. *International Journal of Behavioral Development*, *29*(1), 58–69. doi:10.1080/01650250444000333

Ganzeboom, H. B. G., & Treiman, D. J. (1996). Internationally comparable measures of occupational status for the 1988 International Standard Classification of Occupations. *Social Science Research*, *25*(3), 201–239. doi:10.1006/ssre.1996.0010

Gottfredson, M. R., & Hirschi, T. (1990). *A general theory of crime*. Stanford, CA: Stanford University Press.

Heckman, J. J. (2006). Investing in disadvantaged children. *Social Sciences*, *312*(June), 2005–2007. doi:10.1016/j.adolescence.2005.09.001

Johnson, M. K., Crosnoe, R., & Elder, G. H. (2001). Students' attachment and academic engagement: The role of race and ethnicity. *Sociology of Education*, *74*(4), 318–340. doi:10.2307/2673138

Lengua, L. J. (2002). The contribution of emotionality and self-regulation to the understanding of children's response to multiple risk. *Child Development, 73*(1), 144–161. doi:10.1111/1467-8624.00397

Lynam, D. R., Caspi, A., Moffitt, T. E., Wikström, P. H., & Loeber, R. (2000). The interaction between impulsivity and neighborhood context on offending: The effects of impulsivity are stronger in poorer neighborhoods. *Journal of Abnormal Psychology*, *109*(4), 563–574. doi:10.1037//0021-843X.109.4.563

McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *The American*

Psychologist, *53*(2), 185–204. doi:10.1037/0003-066X.53.2.185

Mischel, W., Cantor, N., & Feldman, S. (1996). *Principles of self-regulation: The nature of willpower and self-control.* In E. T. Higgins & A. W. Kruglanski (Eds.), *Social psychology: Handbook of basic principles*. New York, NY: Guilford.

Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., … Caspi, A. (2010). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, *108*(7), 2693–2698. doi:10.1073/pnas.1010076108

Oshri, A., Kogan, S. M., Kwon, J. A., Wickrama, K. A. S., Vanderbroek, L., Palmer, A. A., & MacKillop, J. (2017). Impulsivity as a mechanism linking child abuse and neglect with substance use in adolescence and adulthood. *Development and Psychopathology*, 1–19. doi:10.1017/S0954579417000943

Pearce, A., Sawyer, A. C. P., Chittleborough, C. R., Mittinty, M. N., Law, C., & Lynch, J. W. (2016). Do early life cognitive ability and self-regulation skills explain socio-economic inequalities in academic achievement? An effect decomposition analysis in UK and Australian cohorts. *Social Science and Medicine*, *165*, 108–118. doi:10.1016/j.socscimed.2016.07.016

Petrill, S. A., & Wilkerson, B. (2000). Intelligence and achievement: A behavioral genetic perspective. *Educational Psychology Review*, *12*(2), 185–199. doi:10.1023/a:1009023415516

Raver, C. C. (2004). Placing emotional self regulation in sociocultural and economic contexts. *Child Development*, *75*(2), 346–353. doi:10.1111/j.1467-8624.2004.00676.x

Rothbart, M. K., Ahadi, S. A., & Evans, D. E. (2000). Temperament and personality: Origins and outcomes. *Journal of Personality and Social Psychology*, *78*(1), 122–135. doi:10.1037/0022-3514.78.1.122

Rothbart, M. K., Ellis, L. K., Rueda, M. R., & Posner, M. I. (2003). Developing mechanisms of temperamental effortful control. *Journal of Personality*, *71*(6), 1113–1143. doi:10.1111/1467-6494.7106009

Ryan, A. M. (2001). The peer group as a context for the development of young adolescent motivation and achievement. *Child Development*, *72*(4), 1135–1150. doi:10.1111/1467-8624.00338

Sarsour, K., Sheridan, M., Jutte, D., Nuru-Jeter, A., Hinshaw, S., & Boyce, W. T. (2011). Family socioeconomic status and child executive functions: The roles of language, home environment, and single parenthood. *Journal of the International Neuropsychological Society*, *17*(1), 120–132. doi:10.1017/S1355617710001335

Schofield, J. W. (2010). International evidence on ability grouping with curriculum differentiation and the achievement gap in secondary schools. *Teachers College Record*, *112*(5), 1492–1528.

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research, *75*(3), 417–453. doi:10.3102/00346543075003417

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*, *72*(2), 271–324. doi:10.1111/j.0022-3506.2004.00263.x

Veenstra, R., Lindenberg, S., Oldehinkel, A. J., de Winter, A. F., & Ormel, J. (2006). Temperament, environment, and antisocial behavior in a population sample of preadolescent boys and girls. *International Journal of Behavioral Development*, *30*(5), 422–432. doi:10.1177/0165025406071490

Verhulst, F. C., & Achenbach, T. M. (1995). Empirically based assessment and taxonomy of psychopathology: Cross-cultural applications. A review. *European Child and Adolescent Psychiatry*, *4*(2), 61–76. doi:10.1007/BF01977734

Vukman, K. B., & Licardo, M. (2010). How cognitive, metacognitive, motivational and emotional self-regulation influence school performance in adolescence and early adulthood. *Educational Studies*, *36*(3), 259–268. doi:10.1080/03055690903180376

Wang, Z., Soden, B., Deater-Deckard, K., Lukowski, S. L., Schenker, V. J., Willcutt, E. G., … Petrill, S. A. (2017). Development in reading and math in children from different SES backgrounds: The moderating role of child temperament. *Developmental Science*, *20*(3). doi:10.1111/desc.12380

Weis, M., Heikamp, T., & Trommsdorff, G. (2013). Gender differences in school achievement: The role of self-regulation. *Frontiers in Psychology*, *4*(JUL), 1–10. doi:10.3389/fpsyg.2013.00442

Willems, Y. E., Dolan, C. V., Van Beijsterveldt, C. E. M., De Zeeuw, E. L., Boomsma, D. I., Bartels, M., & Finkenauer, C. (2018). Genetic and environmental influences on self-control: Assessing self-control with the ASEBA Self-Control Scale. *Behavior Genetics*, *48*(2), 135–146. doi:10.1007/s10519-018-9887-1

Yoshikawa, H., Aber, J. L., & Beardslee, W. R. (2012). The effects of poverty on the mental, emotional, and behavioral health of children and youth. *American Psychologist*, *67*(4), 272–284. doi:10.1037/a0028015

Zwick, R., & Green, J. G. (2007). New perspectives on the correlation of scholastic assessment test scores, high school grades, and socioeconomic factors. *Journal of Educational Measurement*, *44*(1), 1–23. doi:10.1111/j.1745-3984.2007.00025.x