Self-regulation in ethnic minority children : associations with academic performance and the transition to formal schooling

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Behavioral regulation is associated with educational attainment through self-efficacy in ethnic minority preadolescents

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ABSTRACT

In the current study we investigated whether self-efficacy mediated the relation between self-regulation (effortful control and executive function) and educational attainment in secondary school tracks in 70 Turkish minority preadolescents in the Netherlands. Family SES and host language (Dutch) vocabulary were also included as predictors for educational attainment. Self-efficacy fully mediated the relation between effortful control and educational attainment, indicating that behavioral regulation provides children with self-confidence regarding their academic abilities and motivation, which in turn facilitates academic performance. Executive function, on the other hand was not linked to self-efficacy or educational attainment. Family socioeconomic status and Dutch vocabulary showed direct and indirect associations with educational attainment via self-efficacy. Overall, behavioral self-regulation contributes to positive academic adaptation and resilience in ethnic minority students in early adolescence.

Keywords: effortful control, executive function, self-regulation, achievement, education, ethnic minority

INTRODUCTION

Self-regulation is a broad construct consisting of cognitive and behavioral processes such as executive functions and temperamental effortful control that enable people to manage their attention, emotion, and cognition for adaptive and purposeful behaviors (Blair & Diamond, 2008). In recent years, self-regulation has received increasing attention as one of the important contributors to learning-related behavior such as working independently (Neuenschwander, Rothlisberger, Cimeli, & Roebers, 2012) and academic achievement (Blair & Razza, 2007; McClelland et al., 2007). There is some evidence showing that children's gains in cognitive skills that form the basis for self-regulation shape the way they perceive their academic efficacy (Hughes & Ensor, 2011; Roebers, Cimeli, Rothlisberger, & Neuenschwander, 2012), which in turn predicts their academic achievement (Marsh, Ellis, & Craven, 2002).

A significant gap in academic achievement between ethnic minority and majority children has been documented (Luyten, Bosker, Dekkers, & Derks, 2003; Magnuson & Duncan, 2006; McLoyd, 1998). Despite accumulating evidence showing a link between self-regulation and school success, previous research focusing on the role of these capacities for achievement in ethnic minority children is limited (McClelland, & Wanless, 2012; Welsh, Nix, Blair, Bierman, & Nelson, 2010). In addition, the number of studies focusing on the relation between self-regulation and achievement in middle childhood and adolescence is relatively small (Best, Miller, & Naglieri, 2011). In the current study we test the hypothesis that children's self-efficacy mediates the relation between self-regulation and educational attainment in secondary school in Turkish minority preadolescents in the Netherlands. Since socioeconomic risk factors (Garcia Coll et al., 1996) and difficulties in the host language (Morrison, Bachman, & Connor, 2005) are seen as important reasons for educational disadvantage of ethnic minority children, we include family SES and Dutch vocabulary as additional predictors for achievement. The current study might provide insight in the potential mechanisms to mitigate the educational disadvantage of minority children.

Formal schooling requires good self-regulatory skills involving attentional, emotional, cognitive and behavioral processes. Poor self-regulatory skills might make school challenging and unpleasant for children as they have difficulties focusing, sustaining and regulating their attention, motivation and behavior in class to accomplish assignments or other school tasks. As Blair and Diamond (2008) stated, teachers and classmates usually get frustrated with these children since they are unable to comply with school rules or meet school demands to the same extent as children with good self-regulatory skills. Repeated negative experiences at school resulting from poor self-regulation could lead these children to hold more negative perceptions of themselves as students, and decrease their sense of self-worth (Crocker, 2002). They may become less committed and more resistant about school. Thus, individual differences in self-regulation may shape the way these children are viewed by others and,

therefore, the way they view themselves (Hughes & Ensor, 2011). Students with high perceived competence are inclined to see a new task as challenging rather than threatening, which may promote their success on performance-based tasks tapping into cognitive control and monitoring (Roebers et al., 2012). From this perspective, a positive self-concept may help children to regulate their attention, emotion and behavior in novel tasks. However, due to limited research, the exact nature of the relations between self-regulation, self-efficacy and academic achievement remains unclear. Therefore, it is important to examine these associations more closely, particularly in children at-risk for academic failure (Luyten et al., 2003; Magnuson & Duncan, 2006; McLoyd, 1998).

The construct of self-regulation has been studied from different research perspectives, including a behavioral/ temperamental approach focusing on effortful control, or a neurocognitive approach focusing on executive functions. Effortful control (EC) refers to voluntary control on behavioral activation or inhibition tendencies via attention (Rothbart & Bates, 2006). Executive functions (EF), on the other hand, are cognitive processes that we use in planning, problem solving and goal-directed action via inhibitory control, cognitive flexibility, and working memory (Miyake et al., 2012). Although the two concepts have some similarities, they have been rarely studied together, mostly because they resulted from traditionally different methods of measurement (for exceptions see Blair & Razza, 2007; Neuenschwander et al., 2012). Effortful control is generally assessed through parent or teacher reports whereas executive functions are generally measured using performance-based tasks (Neuenschwander et al., 2012). Research assessing both constructs revealed low to moderate intercorrelations, indicating that the constructs have some commonality, but that they are distinct kinds of regulatory mechanisms (Liew, 2012). In this regard, it has been argued that they should be considered complementary and studied together to obtain a clearer picture of children's self-regulation skills (Zhou, Chen, & Main, 2012).

There is a body of research showing that effortful control (e.g., Valiente et al., 2011; Zhou, Main, & Wang, 2010) and executive functions (e.g., Best et al., 2011; Jacobson, Williford, & Pianta, 2011; Van der Sluis, De Jong, & Van der Leij, 2007) are linked to school success in middle childhood and early adolescence. One of the very few studies focusing on both aspects of self-regulation revealed that effortful control and executive function predict different aspects of school adaptation in 7-year-old children (Neuenschwander et al., 2012). Effortful control was linked to achievement via learning-related behavior in class (i.e., listening to instructions, following directions, and accomplishment of tasks), whereas the relation between executive function and academic achievement was only partially mediated by learning-related behavior. The direct link between executive function and academic performance was explained by the domain-general role of EF in mastering novel tasks (i.e., standardized achievement tests) which is in line with previous arguments in literature (e.g., Yeniad, Malda, Mesman, Van IJzendoorn, & Pieper, 2013). Overall, these findings point to

the importance of including both aspects of self-regulation in predicting academic outcomes in children.

Children from socioeconomically disadvantaged backgrounds are more likely to obtain lower scores on academic tests, go through more grade repetitions, and have a higher school dropout risk than those from socioeconomically advantaged backgrounds (McLoyd, 1998). The link between family socioeconomic status and academic achievement is explained by multiple mechanisms. Children from families with (more than) sufficient economic resources and highly educated parents are exposed to high cognitive stimulation and learning experiences at home (Bradley & Corwyn, 2002; Entwisle & Alexander, 1993), they have good role models who inspire their motivation for achievement (McLoyd, 1998), and their school-related needs are monitored well as their parents are more involved with children's school work (Barnard, 2004). All of these factors are known to promote children's success at school (Davis-Kean, 2005). In addition, there is accumulating evidence showing that sociodemographic factors may have effects on behavioral (Li-Grinning, 2007; Mezzacampa, 2004; Sektnan, McClelland, Acock, & Morrison, 2010) and cognitive regulation (Hughes, Ensor, Wilson, & Graham, 2010; Lipina, Martelli, Vuelta, & Colombo, 2005; Noble, Norman, & Farah, 2005). Exposure to poverty-related risks may hamper children's stress regulation, which limits their flexibility in attentional, emotional and behavioral competence (Evans, 2003). Furthermore, there is substantial evidence that the educational disadvantage of ethnic minority children is for a large part due to their generally higher levels of socioeconomic disadvantage (Magnuson & Duncan, 2006), pointing to the importance of accounting for family SES when examining predictors of achievement in these children.

Children's verbal ability is also linked to academic achievement (Duncan et al., 2007). There is a vast amount of evidence showing that children with better language-related skills outperform children with lower language-related skills on a variety of academic tasks (e.g., Kastner, May, & Hildman, 2001, McClelland, Morrison, & Holmes, 2000). Most ethnic minority children generally receive less exposure to the host language than children from monolingual families at home (Hoff et al., 2012). On the other hand, in many countries (including the Netherlands), schools do not provide education in the ethnic language and many schools even apply a rule stating that the children should speak the host language with each other when at school (Cummins, 2003; NLVF, 2006; Skutnabb-Kangas, 1995). Thus, for minority children, host language proficiency is critical for academic achievement as it influences children's capacity to understand lessons and assignments in school as well as to express themselves to their classmates and teachers. Therefore, we assessed host-language (i.e., Dutch) vocabulary, as an indicator of children's verbal ability and investigated its associations with academic achievement.

In the current study, we test the hypothesis that children's self-efficacy mediates the association between self-regulation in the last year of primary school and starting level in

the secondary school tracks in 70 Turkish minority preadolescents in the Netherlands. We aim to extend previous research in several ways. First, our focus on ethnic minority children adds to the predominantly ethnic majority samples in most studies in this research area. Ethnic minority children are overrepresented in the lower tracks of secondary school in the Netherlands (Andriessen & Phalet, 2002), yet they are underrepresented in research examining the role of self-regulation in predicting academic achievement. Second, we examine whether children's perceptions about their efficacy in the transition to secondary school mediate children's self-regulatory capacities and their school success in the long run. There is very limited research focusing on the role of self-efficacy for the relation between self-regulation and achievement (Roebers et al., 2012). To the best of our knowledge, our study is the first one that is conducted in preadolescents. Third, we include both effortful control and executive function as indicators of self-regulation to examine whether self-regulation on the behavioral and cognitive level show different associations with child outcomes, which has been rarely studied in previous literature. We believe that this study will be helpful to obtain more insight regarding the potential factors related to minority children's performance in education.

We hypothesize that (1) self-efficacy mediates the association between self-regulatory capacities (i.e., effortful control and executive functions) and school attainment; (2) self-regulatory capacities, verbal ability and self-efficacy mediate the association between family SES and school attainment.

METHOD

Participants and Procedure

The sample consisted of 70 Turkish minority preadolescents (M = 12.34 years, SD = 0.43, range: 11.64-13.43) and their mothers in the Netherlands. All children were in the 6th and final grade of Dutch primary school. Forty-eight percent of the sample consisted of boys. The mothers had a mean age of 37.04 years (SD = 4.03). More than half of the mothers (51.5%) had a low education level (i.e., basic primary school education or low-status vocational education), 37.5% of them had a middle education level (i.e., high-status vocational education), and 8.9% had a high education level (i.e., university degree or above). Similarly, 50% of fathers were low educated, 31.8% of them were middle-educated and 18.1% were high educated. Most children lived in two-parent families with both their biological parents (84%). The majority of children had one (48%) or two (43%) siblings. Fifty-five percent of the children were firstborns.

The mothers were recruited from municipal registers of several cities and towns in the western and middle region of the country. To ensure the homogeneity of the sample, mothers

who were born in the Netherlands (with at least one of their parents born in Turkey) or moved to the Netherlands before the age of 11, were selected. Furthermore, if the child's father's background was not Turkish, the family was excluded. Forty-three percent of the mothers were born in the Netherlands and 36% of the mothers migrated to the Netherlands before the age of seven. Twenty percent of them migrated after the age of seven. The majority of the fathers (95%) were born in Turkey.

Eligible families were informed about the research project through an introduction letter and a brochure. All correspondence was in Turkish and Dutch. Families who did not respond the letters were visited personally. In total, 454 families were reached of whom 72 (15.9%) agreed to participate. A subgroup of mothers who did not want to participate (N = 116) provided some general information about their families by filling out a form. These families did not differ significantly from the participating families in age of mother, father and child, country of birth of mother and father, child's gender, mother's marital status, and the number of siblings (ps .45 to .91).

Participating families were visited at home for two hours by two trained research assistants to conduct interviews, child testing, and video observation of mother-child interaction as well as to let parents and children fill out questionnaires. The tasks of interest for the current study were administered to the child in a quiet room in the following order: the Expressive One Word Picture Vocabulary Test, Digit Span Backward and Hearts and Flowers. Children took a snack-break for 10 minutes. After the break, they were asked to fill out the questionnaires designed to assess self-efficacy.

Measures

School attainment. During the interview, mothers were asked to report the track advice of the primary school that their children received for secondary school as well as the score their children obtained on the national achievement exam (CITO) that they take at the end of primary school. The advice for secondary school is predominantly based on the score that children obtain on the CITO, which assesses children's language, math performance, interpretation abilities (i.e., graphs, tables and maps) and world knowledge (i.e., geography, history, biology). In addition to this exam score, the primary school administration takes into account the parents' and child's ideas about which school track fits his or her interests and capacities (Luyten et al., 2003). Academically least promising children usually continue to lower vocational education (LWOO). Most of the children move on to the vocational education track (VMBO). The group that is evaluated higher than this group follows the track of higher or professional education (HAVO). Academically most promising students enter the track of advanced scientific education (VWO + gymnasium). For eighteen children, the advice was not known at the time of the home visit. Mothers of these children were contacted

by telephone when children started secondary school to obtain the information about their children's track. Twelve of these mothers were reached. For the remaining six children, the secondary school tracks were estimated based on their CITO scores, because these were highly correlated with children's attainment in the secondary school education track, $r(50) = .83$, $p < .01$. The tracks of the secondary school education were rated on a 10-point scale from (1) lower vocational (LWOO) to (10) advanced scientific education (VWO + gymnasium).

Self-efficacy. Child's self-efficacy was based on three scales assessing psychological stress, school motivation and commitment, and academic pressure.

Psychological stress was measured by the adolescent version of the Strengths and Difficulties Questionnaire (SDQ, Goodman, 1997) which is a brief behavioral screening questionnaire originally designed to be filled out by parents and teachers. In the current study, the self-report version of the SDQ that was designed for eleven- to sixteen-years-olds, was used. The psychological distress scale consists of five items (e.g., *I am nervous in new situations; I get easily scared; I worry a lot*) rated on a 3-point scale (not true, somewhat true, certainly true). Scores were reverse coded so that higher scores reflected lower psychological stress. The internal consistency of the scale was adequate (Cronbach's $\alpha = .70$).

School motivation was assessed by the What I Think About School (WITAS) measure that was obtained from the NICHD Study of Early Child Care and Youth Development (NICHD-SECCYD, 2000-2004). The WITAS consists of fifteen statements such as "*I do not do well in school", "My teacher thinks that I am good in school", "Learning subjects is easy for me"* which are rated on a scale from (1) *Not true* to (4) *Very true* by children. The negative items were reversely coded so that higher scores reflected higher levels of motivation and school commitment. The internal consistency of the scale was high (Cronbach's $\alpha = .87$).

Academic pressure was measured by six items reflecting children's difficulties at school that were obtained from the Daily Hassles Scale (Oppedal & Røysamb, 2004). Children were asked to indicate how often they had problems such as *feeling not smart enough*, *having difficulty to understand the teacher, having pressure to do well in school* on a 4-point scale from (1) *never* to (4) *very often.* Scores were reversely coded so that higher scores reflected lower level of academic pressure. The internal consistency of the scale was marginal (Cronbach's $\alpha = .60$).

Psychological stress (SDQ) was highly correlated with school motivation, $r(68) = .44$, $p < .01$, and academic problems $r(68) = .57$, $p < .01$). School motivation was also related to academic pressure, $r(68) = .40$, $p < .01$. A Principal Component Analysis (PCA) was performed on the total scores of the three scales, showing that all three measures loaded on a single component (loadings .74 - .85). The sum of the standardized scores of these three scales was computed and used as an indicator of self-efficacy in further analyses. The internal consistency of the scale was high (Cronbach's $\alpha = .88$).

Effortful control. Children's temperamental effortful control was measured by mothers' ratings on three subscales of the Early Adolescent Temperament Questionnaire-Revised (EATQ-R, Putnam, Ellis, & Rothbart, 2001): activation control, inhibitory control and attentional focusing. The activation control subscale, consisting of seven items, assesses the children's ability to perform an action despite an impulse to avoid it (e.g., "*My child puts off his/her projects until due date*."). The inhibitory control subscale consisting of five items taps into the children's capacity to suppress inappropriate responses (e.g., "*My child has a hard time to wait for his/her turn.*"). The attentional focusing subscale consists of six items and measures children's capacity to sustain attention (e.g., "*My child forgets what he/she is doing when interrupted*."). The negative items were reversely coded so that higher scores reflected better effortful control. Activation control was highly correlated with inhibitory control, $r(59) = .41$, $p < .01$, and attentional focusing $r(59) = .57$, $p < .01$. Inhibitory control was also related to attentional focusing, $r(59) = .61$, $p < .01$. A PCA showed that the scores of the three subscales loaded on one factor (loadings .79 - .88). The internal consistency of the total scale was high (Cronbach's $\alpha = .85$).

Cognitive flexibility. The Hearts and Flowers task (Diamond, Barnett, Thomas, & Munro, 2007) was used to measure cognitive flexibility. The task was presented on a Dell laptop computer using E-prime 2 (Schneider, Eschman, & Zuccolotto, 2007) to present the stimuli and record responses for each trial. There were two types of stimuli; a red heart and a red flower appearing either on the right or the left side of the screen. Each stimulus was presented for 750 msec. The response button for the left side was the ''Z'' key on the computer keyboard, and the response button for the right side was the ''M'' key. The response buttons were indicated with a colored sticker.

The task consisted of three blocks: congruent-only, incongruent-only, and mixed. The first block (congruent-only) involved 12 trials in which the stimulus (a heart) appeared randomly on the right or left side of the screen. Participants were instructed to press the key that matched the side of the screen on which the heart appeared. The second block (incongruent-only) consisted of 12 trials, in which the stimulus was a flower. In this block, the participants were asked to press the key on the side opposite of the flower. The third and last block (mixed) included 16 congruent and 16 incongruent trials, which were semi-randomly mixed. Thus, participants performed the same task across trials in single blocks (i.e., only hearts or only flowers are shown), whereas they alternated between the two tasks (the same side and the opposite side) in the mixed block. In this regard, the mixed block requires working memory (i.e., keeping the two goals in mind), inhibition (i.e., suppressing congruent response when incongruent stimuli appear or vice versa), and cognitive flexibility (i.e., switching the tasks flexibly in response to unpredictably changing stimuli). For each block, instructions were presented on the computer screen and read aloud by the researcher

to ensure that the child understood the requirements. Each of the first two blocks started with a block of four practice trials. Prior to the third block, no practice trials were conducted.

In the statistical analyses, responses faster than 200 msec were excluded from the analyses as they indicate a failure to wait for the upcoming stimulus or to release the button following the previous trial (Davidson, Amso, Anderson, & Diamond, 2006). Accuracy and reaction time of the practice items and the first trial in each block, which was considered as a warm-up, were excluded from the analyses. Trials following an error were not excluded from the analyses due to the limited number of trials in the blocks. Efficiency scores (the mean accuracy divided by median reaction time for correct responses) for the mixed block were used.

Working Memory. Digit Span Backward (Wechsler, 2003) was used as a verbal working memory test, in which the child hears a series of digits that were audio-recorded at a rate of one digit per second and is asked to repeat the digits in the opposite order. The digit clusters range from two to nine digits, and there are eight trials. Each trial contains two items with similar numbers of digits. The task is terminated when the child fails to repeat both items of a trial correctly. The total number of correct responses was used. The split-half sample reliability was .66. Items with zero variance were divided evenly across the two halves.

Dutch vocabulary. The Expressive One Word Picture Vocabulary Test (EOWPVT, Brownell, 2000) was translated into Dutch to measure Dutch expressive vocabulary. In this test, a picture is shown to the child on a computer screen and he or she is asked to name the picture in one word. The child's answers were recorded on a score sheet. In addition, the administration was audio-recorded to be able to decide on the scoring afterwards in case of ambiguous answers. Based on pilot assessments of the Dutch translation of this test, the map of the United States was replaced with a map of the Netherlands and the items 118 (*reel*), 146 (*prescription*) and 160 (*monocular*) were deleted since there were no appropriate Dutch translations. Item-response analyses (Furr & Bacharach, 2008) revealed that the increase in difficulty level of the items is similar to the increase in difficulty level of the items in the original English version. The raw scores that were computed according to the test manual were used. The split-half (odd/even) sample reliability was .99.

Socioeconomic status (SES). Family SES was based on the family's annual gross income and the highest completed educational level of both parents. The annual gross income was measured on a 7-point scale (1 = no income to 7 = more than €50,000). Parents' highest completed education was also measured on a 7-point scale (1 = no qualification to 7 = university level degree). Parental education level was recoded according to the international standard classification of education (ISCED; UNESCO, 2011). Because the factor analysis showed that maternal and paternal educational levels and annual family gross income loaded on a single factor (loadings of .71, .76, and .76 respectively), SES was computed as the mean

of the standardized values of the income and education variables. For single mother families (n = 11), mother's educational level was counted twice. The missing values for mother education (n = 4), father education (n = 6), and family income (n = 13) were imputed through regression in which the available values for the SES variables were used as predictors.

Statistical analyses

There were no missing data on the outcome variable. Missing values on family SES (4.3%), self-efficacy (2.9%), vocabulary (11.4%), and effortful control (15.7%) were estimated by regression in which the available values for the variables of interest (family SES, child working memory, cognitive flexibility, effortful control, vocabulary, self-efficacy, and school attainment) were used in the Missing Value Analysis in IBM SPSS Statistics, version 19.0 for Windows. To answer our main research question we first computed correlations to explore the relations among the variables of interest. Second, a hierarchical regression analysis was conducted to investigate unique predictions of the predictors for school attainment. Third, path analysis was performed in EQS 6.1 (Bentler, 2001) to test the hypothesized model. The chi-square goodness of fit test, the Bentler-Bonnett Normed Fit Index (NFI), Comparative Fit Index (CFI), and Root Mean Square Error of Approximation (RMSEA) were used to evaluate the model fit. Finally, the Preacher and Hayes approach to test mediation was applied using the macro package for SPSS available on line to check the direct and indirect effects of the predictors on the outcome (Hayes, 2013). The Preacher and Hayes approach provides the option to test a mediation model including a single mediator and multiple predictors. It adopts the bootstrapping approach that does not assume that the sampling distributions of the indirect effects are normal, unlike the traditionally used Sobel test (Preacher & Hayes, 2004). Sampling distributions are estimated from random samples taken from the original data. Five thousand bootstrap resamples based on of the original data were computed and 95% confidence intervals that corrected for biases in the sampling distribution were used (Preacher & Hayes, 2008).

RESULTS

Descriptive statistics

Descriptive statistics of the main variables based on the original (nonimputed) data are reported in Table 1. All variables were inspected for possible outliers that were defined as values larger than 3.29 *SD* above or below the standardized mean (Tabachnick & Fidell, 2001). There were no outliers on any of the variables of interest. No gender differences were found on any of the variables (ps .26 to .95).

Table 1
Descriptive Statistics

	n	Range	M	SD
Family SES	67	-1.51 – 2.00	0.00	0.74
Cognitive flexibility	70	0.07 – 0.22	0.14	0.03
Working memory	70	5.00 – 13.00	8.41	1.69
Effortful control	59	2.31 – 4.53	3.44	0.55
Vocabulary	62	56.00 – 135.00	93.92	14.40
Self-efficacy	68	1.00 – 10.30	5.79	2.42
School attainment	70	1.00 – 10.00	5.64	2.45

Associations among the variables

Bivariate correlations among the variables of interest (Table 2) showed that family SES, child vocabulary, effortful control, and self-efficacy were all related to educational attainment in the expected direction. Family SES, child vocabulary, and effortful control were positively related to child self-efficacy. Working memory and cognitive flexibility scores were not related to any of the other variables. In the hierarchical regression analyses we entered child age, and family SES (step 1), working memory (step 2), cognitive flexibility (step 3), effortful control (step 4), vocabulary (step 5) and self- efficacy (step 6) as predictors of educational attainment. As shown in Table 3, family SES, child vocabulary and self-efficacy were significant predictors of school attainment in the final step. Effortful control was a significant predictor of educational attainment in the fifth step, but was no longer significant when self-efficacy was added in the final step.

Table 2
Correlations among Child Age, Background Characteristics, Self-regulatory Capacities, Vocabulary, Self-efficacy and Achievement

	1	2	3	4	5	6	7	8	9
1. Child age	-								
2. Generational status (mother)	-.20	-							
3. Family SES	-.18	.17	-						
4. Cognitive flexibility	.14	.07	.10	-					
5. Working memory	-.20	.12	.12	.01	-				
6. Effortful control	.04	.01	.12	-.17	.13	-			
7. Vocabulary	-.21	.17	.18	.21	.22	.10	-		
8. Self-efficacy	-.22	.17	.31*	.13	.07	.47**	.31**	-	
9. School attainment	-.23	.15	.41**	.19	.15	.33**	.63**	.56**	-

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

Table 3
Hierarchical Regression Analysis Predicting School Attainment

Step and predictor variable	R^2	ΔR^2	β	*sr*
Step 1:	.19	.19**		
Child age			-.16	-.17
Family SES			.38**	.38
Step 2:	.20	.01		
Child age			-.14	-.15
Family SES			.37**	.38
Working memory			.08	.09
Step 3:	.23	.03		
Child age			-.17	-.19
Family SES			.35**	.36
Working memory			.07	.08
Cognitive flexibility			.18	.20
Step 4:	.34	.11**		
Child age			-.22*	-.24
Family SES			.30**	.34
Working memory			.03	.03
Cognitive flexibility			.25*	.28
Effortful control			.34**	.37
Step 5:	.56	.22**		
Child age			-.11	-.15
Family SES			.26**	.35
Working memory			-.05	-.08
Cognitive flexibility			.12	.17
Effortful control			.28**	.38
Vocabulary			.52**	.58
Step 6:	.60	.04*		
Child age			-.06	-.08
Family SES			.21*	.30
Working memory			-.03	-.04
Cognitive flexibility			.07	.10
Effortful control			.16	.20
Vocabulary			.48**	.56
Self-efficacy			.25*	.29

Note. *sr* = semipartial correlation.
*$p < .05$, **$p < .01$.

Testing the mediation model

Based on the hierarchical regression, we expected that effortful control might be linked to educational attainment via self-efficacy. Figure 1 shows the model that was tested. This model fit the data well, $\chi^2(2, 70) = 2.39$, $p = .30$, NFI = .98, CFI = 1.000, RMSEA = .05. The paths from SES to effortful control and vocabulary were not significant and were removed to obtain a more parsimonious model. Figure 2 shows the final model, which also fit the data well $\chi^2(4, 70) = 5.70$, $p = .22$, NFI = .94, CFI = .98, RMSEA = .08. Family SES , child effortful control and vocabulary were linked to educational attainment via self-efficacy. The direct paths from SES and vocabulary to educational attainment were also significant.

Using the SPSS macro package (Hayes, 2013), we tested whether family SES, child effortful control, and vocabulary (the independent variables) had indirect effects on school attainment (the dependent variable) via self-efficacy (the mediator). The indirect paths from

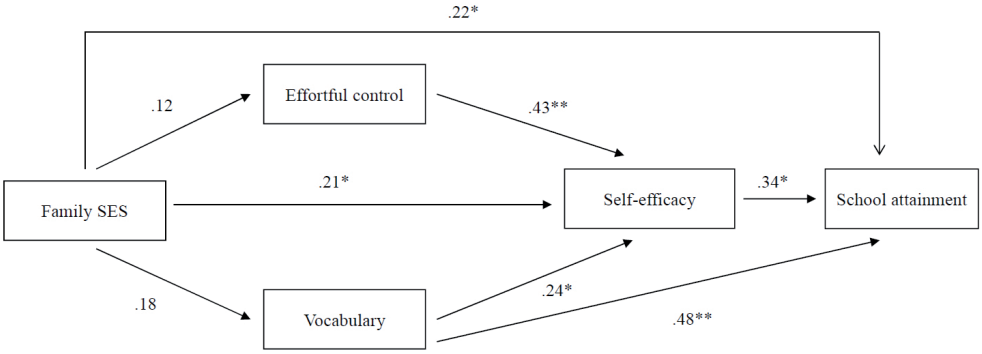

Figure 1. Path analysis on the associations between family SES, child effortful control, vocabulary, self-efficacy and school attainment (*N*= 70).
*$p < .05$, **$p < .01$.

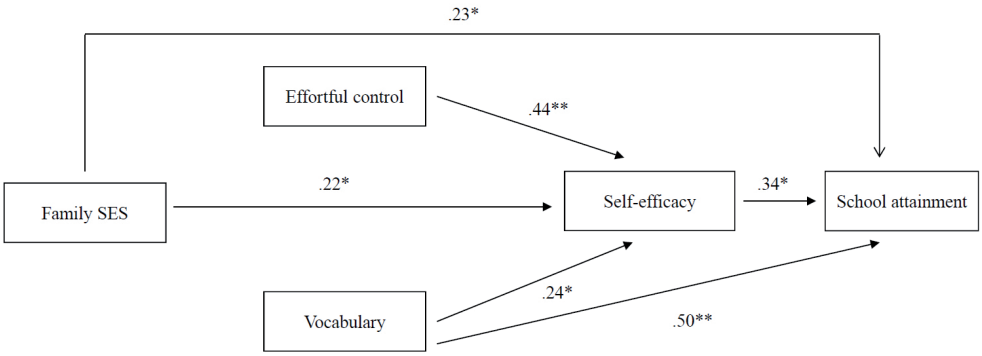

Figure 2. Path analysis on the associations between family SES, child effortful control, vocabulary, self-efficacy and school attainment (*N*= 70)
*$p < .05$, **$p < .01$.

SES [b = 0.20, SE = 0.12, CI = 0.002, 0.48], effortful control [b = 0.52, SE = 0.23, CI = 0.13, 1.02], and vocabulary [b = 0.01, SE = 0.006, CI = 0.0007, 0.022] through self-efficacy were significant. In addition, direct effects of SES [b = 0.73, SE = 0.28, $p < .05$], vocabulary [b = 0.07, SE = 0.01, $p < .001$], and self-efficacy [b = 0.28, SE = 0.10, $p < .01$] on school attainment were also significant.

DISCUSSION

Our findings showed that in a sample of ethnic minority children, temperamental effortful control (EC) was related to educational attainment via children's self-efficacy, whereas executive function (EF) was not associated with self-efficacy or academic attainment. Family SES and children's host language vocabulary had both direct effects and indirect effects on achievement through self-efficacy.

Consistent with our first hypothesis, children's self-efficacy fully mediated the relation between effortful control and educational attainment in terms of their future track in secondary school. Our findings are in line with previous studies showing that academic performance is predicted by effortful control (Blair & Razza, 2007; Liew, McTigue, Barrois, & Hughes, 2008; Valiente, Lemery-Chalfant, & Castro, 2007) and self-efficacy (Pajares, 1996; Zimmerman, Bandura, & Martinez-Pons, 1992). It appears that effortful control provides children with self-confidence regarding their academic abilities and motivation, which in turn facilitates academic performance. One previous study investigated whether effortful control predicted math and reading performance two years later via self-efficacy in children with low literacy scores, but failed to find support for a mediation model (Liew et al., 2008). The self-efficacy measure used in the current study reflects a broader construct than the one used by Liew and colleagues, involving not only perceived academic competence, but also motivation and psychological well-being, which contribute to self-efficacy in adolescence and adulthood (Jerusalem & Schwarzer, 1992; Luszczynska, Gutierrez-Dona, & Schwarzer, 2005). Consequently, in line with Blair and Diamond (2008), we suggest that self-regulation on the behavioral level may shape the way how preadolescents are viewed by their significant others. This affects how they view their capabilities (i.e., self-efficacy), which in turn is linked to the extent to which they are engaged in learning opportunities at school.

Contrary to our expectations, EF was not related to self-efficacy or academic outcomes. Previous research regarding the link between EF and self-efficacy is limited and inconclusive. Whereas one study reported that *gains* in EF skills predicted perceived academic competence across the school transition (Hughes et al., 2010), another study found no relation between the two constructs in second graders (Roebers et al., 2012). Our findings also did not support such an association in preadolescence. It is striking that mother-reported EC was closely

related to self-efficacy, whereas performance-based EF was not. Given the close association between effortful control and social functioning (Valiente et al., 2011), it is possible that children with high effortful control are perceived as more competent by their parents, and receive positive feedback for showing behavioral control. In contrast, EF skills that require conceptual thinking (updating mental representations and switching between them) may not be easily noticed and encouraged by others. Given the fact that self-efficacy is highly dependent on the feedback coming from parents and teachers in childhood and adolescence (Bandura, 1997), we suggest that behavioral regulation is more likely to be rewarded and internalized as a part of a child's self image, compared to cognitive regulation.

Previous research shows clear links between EF performance (i.e., cognitive control) and academic outcomes in early adolescence (Best et al., 2011; Latzman, Elkovitch, Young, & Clark, 2010; Van der Sluis et al., 2007). The lack of significant relations between executive function scores and academic attainment in our study may be due to the specific EF measures that were used. Some have suggested a domain-general relation between complex EF tasks and academic achievement (Best et al., 2011). In our study, EF performance was assessed by the mixed block of Hearts and Flowers, which taps into the ability to switch between two simple tasks (i.e., pressing on the same side with the heart and opposite side with the flower) and digit span backward, which requires the ability to manipulate digits in mental space. Compared to complex EF tasks such as the Wisconsin Card Sorting Task, requiring plan generation, deductive reasoning and problem solving, the tasks used in our study might be cognitively less demanding, and therefore not clearly related to achieving a high secondary educational track, which requires good performance on reasoning and problem solving by using multiple sources of knowledge. Using a battery of EF tasks with a great deal of variety in terms of their nonexecutive requirements (i.e., intelligence) may provide more robust findings.

In line with our second hypothesis, children from higher SES backgrounds had higher levels of self-efficacy, which was in turn related to higher secondary school tracks. Highly educated parents might be more inclined to provide a supportive environment in which they encourage their children's curiosity and effort to succeed that stimulates children's sense of mastery and self-efficacy (Pajares, 1996). These children are generally more exposed to and involved in learning opportunities, which positively affects their performance in academic settings. Based on previous studies it seems likely that factors on the parent level (e.g., parental academic aspirations, parental involvement with school, parental sensitivity) that were not measured in the present study could account for the direct effect of SES on children's achievement (e.*g.,* Barnard, 2004; Bradley & Corwyn, 2002; Entwisle & Alexander, 1993).

Contrary to our expectations, children's vocabulary did not mediate the relation between family SES and academic achievement. Specifically, family SES was not related to vocabulary and effortful control. There is clear evidence that family SES is closely linked to

young children's vocabulary through maternal communication (Hoff, 2003), home literacy (Leseman & De Jong, 1998; Prevoo et al., 2013), maternal attitudes towards parenting and knowledge about child development (Bornstein, Haynes, & Painter, 1998). Although research focusing on this relation in older children is limited, the existing findings support the fact that children from socioeconomically disadvantaged backgrounds stay behind their peers in receptive and expressive language skills in early adolescence (Chorny & Webbink, 2010; Spencer, Clegg, & Stackhouse, 2012; Walker, Greenwood, Hart, & Carta, 1994). Despite the nonsignificant association between family SES and vocabulary, our finding is in the expected direction and not far from significance, and can thus be seen as consistent with previous results. Previous results regarding the link between family SES and child (parent-reported) temperamental effortful control in early adolescence are limited and mixed (Lengua, 2006). Some reported small to moderate correlations between SES and parent or teacher reports of effortful control in preadolescents (e.g., Eisenberg et al., 2005; Veenstra et al., 2006). Others argued that demographic risk might be linked to effortful control in early years but not in adolescence due to decreased time spent with parents and intense school-based and peer-group experiences in this period (Lengua, 2006). Overall, we are inclined to be tentative in interpreting the effect of family SES on self-regulatory capacities for ethnic minority children in the way that has been done for ethnic majority, middle class children as SES may not fully account for the risk or resilience that ethnic minority children may experience (Garcia Coll et al., 1996; Raver, 2004). Families with a comparable SES but from different ethnic backgrounds might be exposed to different life experiences. For instance, even if ethnic minority families are able to move up on the social status ladder with an increased income, they may still live in socially and psychologically segregated contexts that brings a number of other stressors (Garcia Coll et al., 1996). These children might still be at-risk in several domains of life as a result of their minority-specific experiences rather than socioeconomic adversity. In the same vein, there is some evidence showing that ethnic minority students may perform better than majority students, particularly in academic tasks, despite their higher socioeconomic risk (Garcia Coll & Marks, 2011; Motti-Stefanidi, & Mastern, 2013). Consequently, a cumulative account of risk and protective factors including minority-specific factors may provide a more nuanced understanding regarding developmental competence of ethnic minority children.

Differences in language skills are known to be an important reason for achievement gaps between ethnic minority and majority children (Oller & Eilers, 2002). Our findings show that children's verbal ability in Dutch (the host language) showed the strongest association with academic achievement, which is not surprising given the monolingual education system in the Netherlands (Extra, 2010). Dutch studies with ethnic minority groups revealed that there were no deficits in minority preschoolers' domain-general abilities (i.e., fluid intelligence, visuospatial working memory) compared to their majority peers (Scheele, Leseman, &

Mayo, 2010; Messer, Leseman, Boom, & Mayo, 2010). However they still lagged behind majority children in language skills even at the age of six despite their fast acquisition of Dutch vocabulary by the time they were enrolled in primary school (Scheele et al., 2010). Thus, compensatory *language-focused* education programs that are accessible to low-income, ethnic minority families could be a promising avenue to ameliorate academic trajectories of minority students (Leseman, 2002). In addition, vocabulary was related to achievement via children's self-efficacy, indicating that strong oral language skills play a very positive role in ethnic minority children's lives, enabling them to have positive beliefs about their capabilities, which in turn strengthen their academic achievement. A previous study with a Turkish ethnic minority adolescent sample showed that self-reported psychological well-being contributed to socioeconomic status in adulthood (Van Oort et al., 2007). Given that Turkish minority adolescents have also been found to be more anxious and withdrawn than their Dutch peers (Murad, Joung, Van Lenthe, Bengi-Arslan, & Crijnen, 2003), programs promoting language skills may not only be helpful for minority adolescents' academic trajectories but also for their self-esteem, which in turn can contribute to their long-term quality of life.

Implications

This study has several theoretical and practical implications. Theoretically, our findings support the assertion that behavioral and cognitive aspects of self-regulation are distinct processes relating differently to child outcomes (Blair & Razza, 2007; Neuenschwander et al., 2012). This may partly reflect the different methods of measurement of effortful control and executive function (questionnaire versus performance-based tasks). Assessing both aspects of self-regulation appears to be productive in uncovering their specific contributions to child development. As for the practical implications of the study, we suggest that promoting self-regulatory mechanisms may help academically at-risk children such as ethnic minorities who dramatically lag behind their ethnic majority peers (Andriessen & Phalet, 2002). Although ethnic minority children are considered to face a higher number of socioeconomic risks than ethnic majority children (Duncan, Brooks-Gunn, & Klebanov, 1994; Magnuson & Duncan, 2006), self-regulation has been shown to predict academic achievement regardless of such risk factors (McClelland & Wanless, 2012). Given some evidence demonstrating that positive teacher-student relationships may help children with low effortful control to perform as well as those with high effortful control (Liew, Chen, & Hughes, 2010), programs might aim at improving teachers' ability to accurately observe the needs of children with difficulties in behavioral regulation and offer timely academic support. This may maximize these children's academic progress, which is likely to result in better long-term academic outcomes.

Limitations

It is important to note some limitations of the current study. First, the study was based on data at one time point, limiting clear inferences about the direction of effects. Although the outcome variable indicates secondary school tracks, we obtained this information at the home visits that were conducted when children were in the last year of primary school, at a point that tracking was already decided upon. Second, despite the effort that was put in the recruitment process (e.g., personally visiting families who did not react to initial attempts), the response rate was low, which resulted in a rather small sample size. However, our low response rate is in line with those found in other studies of ethnic minorities in the Netherlands, especially families from low SES backgrounds (Feskens, 2007). Third, our study did not include an ethnic majority comparison sample, so we could not examine to what extent our ethnic minority sample's abilities and school performance differs from majority children. It should be noted however that it is a methodological challenge to recruit ethnic majority children who are comparable to minority children in terms of family background due to the disparity in family SES between ethnic minority and majority families (Suárez-Orozco & Suárez-Orozco, 2001).

Conclusion

In sum, behavioral self-regulation (i.e., effortful control) is related to academic achievement through self-efficacy, indicating that effortful control contributes to resilience in ethnic minority preadolescents. Children with high effortful control had more positive perceptions about their capabilities, which in turn promoted their academic performance enabling them to start at a higher level in secondary school. Thus, fostering behavioral self-regulation may encourage more demanding academic trajectories of at-risk groups.

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