Parental involvement and general cognitive ability as predictors of domain-specific academic achievement in early adolescence

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ABSTRACT

Numerous studies showed that general cognitive ability (GCA) is a reliable predictor of academic achievement. In addition, parental involvement in their children’s academic development is of major importance in early adolescence. This study investigated the incremental validity of parental involvement over GCA in the prediction of academic performance within the domains of math and language. We examined four dimensions of perceived parental involvement: autonomy supporting behavior, emotional responsivity, structure, and achievement-oriented control. Results from a sample of 334 adolescents (mean age = 12.4, SD = .9, range = 10–14 years) showed that GCA was the strongest predictor of achievement in both domains. While autonomy support and emotional responsivity had no predictive value over GCA, high levels of achievement-oriented control and structure were detrimental to academic success. These findings provide new evidence for the significance of parental involvement in their children’s achievement in school even after the most powerful predictor of academic success has been accounted for.

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1. Introduction

Achievement in school is considered as a critical prerequisite for subsequent academic and vocational success (e.g., Jimerson, Egeland, & Teo, 1999; Schmidt & Hunter, 1998; Williamson, Appelbaum, & Epanchin, 1991). As a consequence, a lot of research has been dedicated to the identification of factors that contribute to school achievement. This research indicates that academic performance in middle childhood and adolescence is determined by a complex interplay of numerous variables. Most authors distinguish between cognitive predictors, such as general cognitive ability or working memory (e.g., Gathercole, Pickering, Knight, & Stegmann, 2004; Lu, Weber, Spinath, & Shi, 2011) and non-cognitive predictors, such as motivation (e.g., Gottfried, 1985; Gottschling, Spengler, Spinath, & Spinath, 2012; Greven, Harlaar, Kovas, Chamorro-Premuzic, & Plomin, 2009; Schicke & Fagan, 1994; Spinath, Spinath, Harlaar, & Plomin, 2006) or characteristics of the family and the school environment (e.g., Hill & Tyson, 2009; Son & Morrison, 2010). The importance of cognitive variables, particularly the role of general cognitive ability in academic success, is well documented in the literature on individual differences (e.g., Gottfredson, 2002; cf. Gustafsson & Undheim, 1996). Beyond that, the field of educational psychology has increasingly acknowledged the impact of the home environment on students’ learning and developmental processes (e.g., Seginer, 2006; Son & Morrison, 2010). One particular aspect that has received increasing attention over the last years is the degree of parental involvement in their children’s education (for meta-analyses see Fan & Chen, 2001; Hill & Tyson, 2009). Although this research identified parental involvement as a robust predictor of academic success, it is still an open question whether it can explain additional variance after the most powerful predictor of school achievement has been accounted for. This issue is particularly important considering that parental involvement is an influence on children’s academic development that can be considered modifiable, for instance by means of counseling or intervention. Thus, identifying which types of parental involvement are particularly beneficial (or detrimental) to children’s academic success is of major importance in the educational context. Therefore, the aim of our study was to integrate previous findings from research on individual differences and educational science and to investigate the incremental validity of parental involvement over general cognitive ability in the prediction of academic achievement in early adolescence.

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1.1. General cognitive ability and academic achievement

Despite the wide range of definitions of intelligence, most researchers agree that general cognitive ability is well represented by a general factor of intelligence, the g-factor (e.g., Jensen, 1993; Neisser et al., 1996). When it comes to academic success, there is no doubt that g is the single most important predictor (e.g., Deary, Strand, Smith, & Fernandez, 2007; Fraser, Walberg, Welch, & Hattie, 1987; Gottfredson, 2002; Humphreys & Stark, 2002; Kuncel, Hezlett, & Ones, 2004; Laidra, Pullmann, & Allik, 2007; Rhode & Thompson, 2007).

Regardless of the specific academic context, correlations around .50 are typically reported between measures of educational achievement and general cognitive ability (cf. Gustafsson & Undheim, 1996; Neisser et al., 1996), explaining 25% of the total variance in academic performance. The importance of general cognitive ability is also supported by the range of different achievement criteria that can be predicted by one general measure of g from school achievement to academic performance in university students and vocational success in later life. Furthermore, general cognitive ability is related to a number of variables that are associated with academic success, such as socioeconomic status (SES), level of education, and income (e.g., Neisser et al., 1996).

Nevertheless, even though general cognitive ability is the most powerful individual predictor of achievement, it leaves much variance unaccounted for. Given that numerous studies pointed to the importance of parenting practices for achievement in school (for reviews see Desforges & Abouchaar, 2003; Spera, 2005), the present study focuses on one specific aspect of parenting, namely the role of parental involvement in their adolescent children’s academic success.

1.2. Parental involvement and academic achievement

Parental involvement (PI) generally refers to parents’ behavior at home and in school settings meant to support their children’s educational progress (e.g., El Nokali, Bachman, & Votrub-Drzal, 2010; Fan & Chen, 2001; Gonzales-DeHass, Willems, & Holbein, 2005). Consistent with this rather broad definition, the term has been loosely applied to a variety of activities and the parental behavior subsumed under the construct of PI has been very heterogeneous. It ranges from parents’ attendance of school activities to homework assistance and parenting styles (Gonzales-DeHass et al., 2005; Maegi, Lerkkanen, Poikkeus, Rasku-Puttonen, & Nurmi, 2011; Shumov & Miller, 2001), rendering it difficult to compare empirical findings across studies.

In an attempt to provide a classification of involvement strategies, Epstein (1987) and Comer (1995) differentiated between two basic types of PI: School-based strategies, such as the communication between parents and teachers or their attendance of school events, and home-based strategies, such as educational activities and parental supervision, support, and reinforcement of learning at home. In their multidimensional concept Grolnick and Slowiáczek’s (1994) introduced three types of involvement: Behavioral involvement refers to both home-based and school-based involvement strategies, for instance active communication between home and school, volunteering at school, and assisting with homework. Cognitive-intellectual involvement reflects that parents expose their children to educationally stimulating activities and experiences, while personal involvement describes parental attitudes and expectations about the value and the utility of school and education. This definition of PI as a multidimensional concept not only allows the simultaneous assessment of different aspects of parental behavior, but it also facilitates the analysis of differential associations between specific components of involvement and important aspects of academic development, such as motivation and school performance (Fan & Chen, 2001; Gonzales-DeHass et al., 2005).

Over the last decade, there has been increasing interest in the role of PI for academic success in adolescence. Hill and Tyson (2009) studied the effects of different types of involvement on achievement in a meta-analytic approach that differentiated between school-based involvement, home-based involvement, and academic socialization. The latter can be mapped onto Grolnick and Slowiáczek’s (1994) concept of personal involvement: It refers to parent-child communication creating an understanding for the goals and purposes of academic performance, discussing learning strategies, or communicating parental expectations for education and achievement. Results of the meta-analysis showed an overall positive relationship between PI and academic skills (cf. Jeynes, 2007; for similar results in elementary school see Fan & Chen, 2001). Interestingly, the type of involvement parents engaged in modulated this association: Whereas different types of school-based involvement were moderately related to achievement, home-based involvement was not consistently associated with achievement when it pertained to homework assistance. Other types of home-based involvement, however, were positively related to school success. Finally, academic socialization proved to be the best predictor for academic achievement. It subsumes parental behavior that supports the student’s autonomy and independence, builds upon the development of internalized motivation for achievement, and provides a link between school work and future goals.

Yet, it should be noted that not all types of PI seem to foster school success. A number of studies have shown that parental control and achievement-related pressure can have detrimental effects on academic performance (e.g., Levpusek & Zupancic, 2009; Rogers, Theule, Ryan, Adams, & Keating, 2009). In these studies, the use of commands, coercive interactions, criticism or punishment was associated with lower academic performance (e.g., Niggli, Trautwein, Schnyder, Ludtke, & Neumann, 2007; Pomerantz & Eaton, 2001), possibly because this type of behavior is perceived as over-controlling and thereby undermines the students’ sense of competence and autonomy. This effect appears to be particularly strong in adolescence (Gonzales-DeHass et al., 2005).

Age-related changes in the relation between PI and academic achievement are most prominent between elementary and secondary school (Hill & Tyson, 2009; Stevenson & Baker, 1987). School-based involvement is of particular importance in the elementary school context, because parental visits to the classroom and interactions with children’s teachers increase parents’ knowledge about the curriculum and support the effectiveness of involvement at home (Comer, 1995; Hill & Taylor, 2004). In secondary school, however, home-based involvement plays an increasingly important role, providing assistance with homework, enhancing motivation, and structuring free time and homework time (Cooper, 1989; Fan & Chen, 2001) while promoting independence and autonomy (Desforges & Abouchaar, 2003; Hill & Tyson, 2009). This shift away from direct school-based involvement is related to changes in the children’s school environment, which becomes more complex and therefore challenges the parents’ ability to stay actively involved in their children’s school work (e.g., Sanders & Epstein, 2000). In addition, early adolescence is associated with major developments in terms of cognition and self-concept (Adams & Berzonsky, 2003; Lerner & Steinberg, 2004). That is, adolescents are increasingly better able at integrating knowledge derived from own previous successes and failures and at coordinating the way they pursue multiple educational and personal goals (Byrnes, Miller, & Reynolds, 1999). Therefore, they are more and more able to understand how present school achievement is related to future academic success and to make decisions regarding their educational process (e.g., course selections). As the student’s sense of autonomy
increases, direct school-based PI is needed less and becomes less effective (Seginer, 2006).

1.3. The present study

There is growing evidence indicating that multiple aspects of PI can be considered relevant for students’ academic success. Given that PI is neither a unitary nor a consensus concept, it is particularly important to identify the extent to which specific dimensions of PI are most effective in promoting academic achievement in early adolescence. In this study, we relied on a multidimensional framework suggested by Lorenz and Wild (2007) in order to assess the benefits and risks associated with different types and levels of involvement. This framework is based on three assumptions: First, the definition of PI is restricted to home-based learning involving direct parent—child interactions which seem to be more relevant in adolescence than parent—teacher communication (cf. Hill & Tyson, 2009). Second, PI not only incorporates practices that are explicitly supposed to have positive effects on learning and achievement but includes a wide range of activities that can be considered relevant parental behavior. Third, the authors assume that PI is not restricted to direct instructional interactions. Instead, it can provide opportunities for the development of effective study habits and positive attitudes toward learning and education (i.e., to foster self-regulated learning, cf. Deci & Ryan, 1985; Ryan & Deci, 2000).

Based on these assumptions, Lorenz and Wild (2007) proposed four dimensions of PI: (1) Autonomy supportive practices refer to the encouragement of self-initiated learning activities, for instance by means of scaffolding or contingent shift rule (Pratt, Green, MacViar, & Bountrogianni, 1992). (2) Achievement-oriented control and pressure are manifested as controlling teaching strategies, the exertion of excessive pressure on children to complete assignments, extrinsic performance-contingent rewards, or direct instructions that undermine intrinsic motivation and autonomous behavior. It is assumed that achievement-oriented pressure and control is only suited to a limited extent and is otherwise detrimental to learning and achievement (cf. Levpuscek & Zupancic, 2009; Niggli et al., 2007; Pomerantz & Eaton, 2001; Rogers et al., 2009). (3) Structure is related to the parents’ organization of the environment in order to provide clear and consistent guidelines, rules, and expectations regarding learning and school work. According to Lorenz and Wild (2007), a high degree of structure can support achievement if children are able to differentiate between parental structure and control; otherwise, it can also undermine autonomy and thereby have negative effects on achievement. Finally, (4) emotional responsivity describes the parents’ readiness to acknowledge the child’s feelings associated with learning but also to spend conso- lation and to encourage the student in failure situations. In a longitudinal study, Lorenz and Wild (2007) showed that these four components represented distinct but intercorrelated dimensions of PI that were related to student motivation in the domain of Math (see also Knollmann & Wild, 2007).

In summary, general cognitive ability is the strongest predictor for academic achievement (e.g., Deary et al., 2007; Gottfredson, 2002; Gustafsson & Undheim, 1996; Humphreys & Stark, 2002; Neisser et al., 1996) but multiple dimensions of PI may as well contribute to academic success (Fan & Chen, 2001; Hill & Tyson, 2009). Surprisingly, to our knowledge no empirical study has directly assessed their relative predictive value. Although there is no evidence for a close association between both variables, incremental validity of PI over cognitive abilities would strengthen the importance of parental behavior for their children’s achievement in school. Therefore, our aim was to investigate the predictive value of PI for academic achievement in early adolescence after general cognitive ability had been accounted for.

Based on previous findings, we expected cognitive ability to be the strongest predictor for achievement (cf. Deary et al., 2007; Fraser et al., 1987; Gottfredson, 2002; Humphreys & Stark, 2002; Kuncel et al., 2004; Laidra et al., 2007; Rhode & Thompson, 2007) (Hypothesis 1). In terms of PI, we predicted that autonomy-supporting practices (Hypothesis 2) and emotional responsivity (Hypothesis 3) should have positive effects on achievement (cf. Hill & Tyson, 2009), while achievement-oriented control should have detrimental effects on academic performance (cf. Levpuscek & Zupancic, 2009; Niggli et al., 2007; Pomerantz & Eaton, 2001; Rogers et al., 2009) (Hypothesis 4). Finally, parental behavior providing structure—if not perceived as controlling behavior—should be positively related to achievement (cf. Lorenz & Wild, 2007). Nonetheless, considering that our focus was on adolescents, it seemed likely that students would regard rules and guidelines as restrictions of their autonomy and self-determination, in which case parental structure may also be associated with lower achievement scores (Hypothesis 5).

2. Method

2.1. Participants

The sample investigated in this study was part of the twin study on Cognitive Ability, Self-reported Motivation, and School Achievement (CoSMoS, blinded reference) that focused on the prediction of academic performance by means of individual and environmental variables in a genetically sensitive design. The present investigation is based on data from 334 twins that participated in the CoSMoS study in 2009 (mean age = 12.4, SD = .9; age range = 10–14 years; 50.6% female). Most of them (64%) attended university-track secondary school (levels I & II; German ‘Gymnasium’), 24% were in secondary school (level I; German ‘Realschule’), 3% in vocational-track secondary general school (level I; German ‘Hauptschule’), and 9% were enrolled in comprehensive school. The sample predominantly consisted of middle-class families (in 58% of the families at least one parent held a general qualification for university entrance and in 34% of the families at least one parent held a university degree). Most children were from intact two-parent families (85% of the parents were married or shared a residence).

2.2. Procedure

Participants performed the tests at their homes. Parents provided written informed consent, demographic information, and school grades. The children completed a questionnaire assessing child-perceived PI. Prior to testing, the families were given the opportunity to choose whether they preferred to complete the questionnaire in a paper-and-pencil version (in which case the material was mailed to their home address; 14.35% of the participants) or whether they preferred a computerized online version of the questionnaires (which they completed using their home computer; 85.65% of the participants). Regarding the assessment of cognitive abilities, the procedure was different: Given that these tests are time sensitive and because they include specific start and stop criteria, trained experimenters administered them over the phone (cf. Gottschling et al., 2012). This procedure that has previously been shown to yield adequate internal consistencies and to predict general cognitive ability measured in face-to-face testing situations in elementary school children (Petrill, Rempell, Dale, Oliver, & Plomin, 2002), adolescents (Kent & Plomin, 1987), and adults (Legree, Fischl, Gade, & Wilson, 1998). Prior to the assessments, the test sheets were mailed to the families in sealed envelopes but were not to be opened before the experimenter called.
2.3. Measures

2.3.1. Perceived parental involvement

Child-perceived PI was assessed with a 21-item questionnaire modified from Wild and colleagues (e.g., Lorenz & Wild, 2007) and based on the Children’s Perceptions of Parents Scale (Grohnik, Ryan, & Deci, 1991). Given that Lorenz and Wild (2007) had investigated involvement only in the domain of Math and because the present study also included German as a domain of school achievement, several items specifically referring to “grades/performance in Math” were rephrased so that they referred to “grades/performance in school”. The 21 items served as proximal indicators for PI, that is, they referred to the child’s learning context at home. Children were to respond to each one of them on a four-point Likert-type response scale ranging from (1) I don’t agree at all to (4) I completely agree. The following four dimensions of PI were assessed: (1) Autonomy supportive practices (six items, e.g., “When my parents help me with my school work, they always encourage me to find the correct answer by myself.”), (2) achievement-oriented control (three items, e.g., “When I get bad grades, my parents scold me and tell me to study more.”), (3) structure (six items, e.g., “I know exactly how good my parents expect me to do in school.”), and (4) emotional responsivity (six items, e.g., “My parents encourage me and help me if I have problems at school.”). Thus, the PI questionnaire applied in this study included a total of 21 items (in contrast to the one applied by Lorenz and Wild (2007), which included five items for autonomy supportive practices, six items for achievement oriented pressure, five items for structure and three items for emotional responsivity, yielding a total of 19 items).

2.3.2. General cognitive ability

We assessed general cognitive ability (g) by means of two adapted verbal subtests (vocabulary, 25 items, and general knowledge, 18 items) and two adapted nonverbal subtests (figural classification and figural reasoning, 25 items, respectively) from the German Cognitive Ability Test (KFT 4-12-R; Heller & Perleth, 2000) and the Wechsler Intelligence Scale for Children (WISC-III; Wechsler, 1991).

2.3.3. Academic achievement

School grades served as the indicator for academic achievement. Parents provided mid-term and full-term grades for Math and German from 2008 and the mid-term grades from 2009. All grades were initially coded according to the German grade system, ranging from (1) very good to (6) insufficient. In order to facilitate the interpretation of the data analyzed in this study, we reversed the coding of the grades (i.e., higher values represent better performance). Correlations between the grades at the three test occasions were high (German: r = .59-.71; Math: r = .63-.73).

2.3.4. Control variable

We included the level of parental education (i.e., the highest educational degree held both by the mother and the father; 1 = none, 2 = vocational-track secondary school, 3 = secondary school attendance without degree, 4 = secondary school, 5 = university-track secondary school attendance without degree, 6 = university-track secondary school, 7 = university attendance without degree, 8 = university degree) into the model to account for differences in children’s academic achievement that may be due to parental education rather than PI (cf. Jimerson et al., 1999; Neisser et al., 1996; Stevenson & Baker, 1987).

2.4. Data analysis

In order to investigate the predictive value of perceived PI for academic success in the domains of German and Math, we chose a latent variable approach using structural equation modeling. Prior to model fitting, we carefully analyzed the missing data patterns. Little’s MCAR test (missing completely at random; Little & Rubin, 2002) indicated that the missing data in this study occurred completely at random (all p’s >.05). We therefore imputed missing data using the expectation-maximization (EM) algorithm in SPSS 18. Imputations were restricted to the four dimensions of parental involvement. In addition, raw scores were corrected for age and sex effects by means of a regression procedure.

Structural equation modeling was performed with the software package MPlus (Muthén & Muthén, 2004). Given that the power of the chi-square test severely depends on the sample size and the size of the correlations (Byrne, 2001; Kline, 2010), it has been suggested to rely on the chi-square/degrees of freedom ratio instead of the chi-square p-value. This index should be smaller than two (Schermelleh-Engel, Moosbrugger, & Müller, 2003). In addition, we report the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) as measures of incremental fit. For the CFI, values larger than .90 are desirable (Bentler, 1989) and the RMSEA should be smaller than .06 (Hu & Bentler, 1999).

Since our data consisted of twin pairs, it may be argued that standard errors were underestimated in our sample (McGue, Wette, & Rao, 1984). In order to adjust for this potential bias, we applied aggregated analysis under complex sampling according to Muthén and Satorra (1995). This approach assumes that the twin pairs are independent and relies on the means of the values for the members of each pair. Thus, the variances (and standard errors) of the parameter estimates can be calculated by using stratified random sampling formulae (cf. Johnson, Hicks, McGue, & Iacono, 2007).

3. Results

Means, standard deviations, and reliability as well as intercorrelations of PI, general cognitive ability, level of parental education, and academic achievement in the domains of German and Math are shown in Table 1. In order to test the factorial validity of the PI model (cf. Lorenz & Wild, 2007), we first computed a confirmatory factor analysis (CFA). Second, we performed structural equation modeling in order to predict academic achievement by PI and general cognitive ability. In order to control for effects of parental education, we also considered the highest degree held by both fathers and mothers.

3.1. Confirmatory factor analysis for parental involvement

The CFA was based on the 21 items serving as indicators for the four dimensions of PI (autonomy support, emotional responsivity, achievement-oriented control, and structure). Because of the substantial correlations between autonomy support and emotional responsivity (r = .66, p < .001) on the one hand and achievement-oriented control and structure (r = .50, p < .001) on the other hand, we specified a model with four first-order factors (autonomy support, emotional responsivity, structure, and achievement-oriented control) and two second-order factors (support & responsivity and control & structure). The CFA yielded an acceptable model fit ($\chi^2 = 186.94$, df = 53, $p < .01$, $\chi^2$/df = 3.53; CFI = .91; RMSEA = .09, CI = [.07; .10]). All factor loadings were significant (all p’s < .01) and we found a negative correlation between the two second-order factors ($r = -.64$, $p < .001$).

3.2. Prediction of academic achievement

For each one of the achievement domains (Math and German), we specified a model including the four first-order factors of PI
(autonomy support, emotional responsivity, achievement-oriented control, and structure), the two second-order factors of PI (support & responsivity and control & structure), general cognitive ability, parental education, and the dependent variable (achievement) (see Figs. 1 and 2). For this more complex model, we parcelled the PI items according to the item-to-construct balance technique (Little, Cunningham, Shahar, & Widaman, 2002), resulting in three two-item parcels for autonomy support, emotional responsivity, and structure. The standardized scores in the two verbal and the two nonverbal tests served as indicators for general cognitive ability, and the highest educational degree held by the mother and the father and ranged from 1 (no degree) to 8 (university degree). Correlations refer to bivariate correlations on the manifest level. **p < .01 (two-tailed).

3.2.1. German achievement

The full model provided a good fit to the data ($\chi^2 = 324.46$, $df = 182$, $p < .01$, $\chi^2/df = 1.78$, $CFI = .94$, $RMSEA = .05$, CI = [.04; .06]), but the paths for support & responsivity and for the level of parental education failed to reach significance in the full model ($p = .54$ and $p = .94$, respectively). The most parsimonious model is shown in Fig. 1. This model did not fit significantly worse than the full model ($\chi^2_{\text{diff}} = .11$, $df_{\text{diff}} = 2$, $p = .85$). In sum, the latent variables explained 34% of the variance in German achievement. While cognitive ability had the strongest predictive value ($\beta = .52$), control & structure ($\beta = -.26$) also had a significant influence on German achievement.

3.2.2. Math achievement

For Math achievement, the full model also yielded a good fit to the data ($\chi^2 = 336.33$, $df = 182$, $p < .01$, $\chi^2/df = 1.84$, $CFI = .93$, $RMSEA = .04$, CI = [.03; .05]).

RMSEA = .05, CI = [.04; .06]). Consistent with German achievement, the paths for support & responsivity and for the level of parental education were not significant ($p = .66$ and $p = .53$, respectively). The reduced model, which did not fit significantly worse than the full model ($\chi^2_{\text{diff}} = .11, df_{\text{diff}} = 2, p = .76$), is shown in Fig. 2. It explained 33% of the total variance in Math achievement.

Again, cognitive ability was the strongest predictor for academic achievement ($\beta = .54$) and we also found a significant effect for control and structure ($\beta = -.20$).

4. Discussion

The purpose of this study was to examine the incremental validity of perceived PI in the prediction of academic achievement over general cognitive ability. We investigated school achievement in the domains of German and Math in a sample of 334 adolescents between the ages of 10 and 14. The assessment of PI included the dimensions autonomy supporting practices and emotional responsivity as well as achievement-oriented control and structure. Our findings replicated previous research on the relation between general cognitive ability and achievement, and more importantly, extended prior knowledge regarding the role of PI for academic success after cognitive abilities had been controlled for.

4.1. General cognitive ability and academic achievement

Consistent with a variety of previous findings, general cognitive ability was the strongest predictor for both German and Math achievement (Hypothesis 1). It explained 27% of the total variance in German achievement and 29% of the total variance in Math achievement, which is completely consistent with results previously reported in the literature (e.g., Deary et al., 2007; Gottfredson, 2002; Gustafsson & Undheim, 1966; Humphreys & Stark, 2002; Neisser et al., 1996; Rhode & Thompson, 2007). Also in line with prior evidence (e.g., Neisser et al., 1996; Stevenson & Baker, 1987), we found an association between the level of parental education and their children’s academic performance (see Table 1). It is widely acknowledged that children of highly educated parents strive to meet their parents’ expectations regarding their success in school and to reach the same educational level held by their parents. In addition, these parents may have the intellectual and financial resources to provide stimulating and supporting learning environments for their children (Bronstein & Bradley, 2003). Interestingly, the direct association between parental education and school grades disappeared when we predicted achievement in a more complex model allowing correlations between cognitive ability and the level of parental education. Instead, we found an indirect effect of parental involvement via general cognitive ability (see Figs. 1 and 2).

However, the main focus of this study was to investigate the influence of PI on academic success. Since we know that achievement in school is of major importance for adolescents’ further education and career opportunities (e.g., Jimerson et al., 1999; Levpuscek & Zupancic, 2009; Schmidt & Hunter, 1998; Williamson et al., 1991), it seems particularly important to identify variables that have the potential to increase academic success and to explain variance in achievement unaccounted for by intelligence.

4.2. Parental involvement and academic achievement

The present study was the first one to analyze the influence of perceived PI on academic success in early adolescence while controlling for general cognitive ability. Although a number of previous studies have shown that high levels of PI can have substantial effects on school achievement (Fan & Chen, 2001; Hill & Tyson, 2009), they also indicated that it is not only of high relevance how much parents are involved, but also what kind of involvement they engage in. The present study focused on two intercorrelated domains of PI, namely autonomy support and emotional responsivity on the one hand and achievement-oriented control and structure on the other hand. According to Lorenz and Wild (2007), autonomy...
support and emotional responsivity are types of PI that generally refer to parents' willingness and ability to take their children's perspective and respond to their needs. In contrast, control and structure refer to excessive control and pressure on children to complete assignments as well as to clear and consistent guidelines, rules, and expectations regarding learning and school work. The relation between achievement-oriented pressure and structure appears to depend on the way children perceive parental rules and guidelines (Lorenz & Wild, 2007). In the present study, children were apparently not able to differentiate between structure and control ($r = .50$). Although this effect may be specific for the particular age group investigated in this study (in the sense that adolescents are likely to regard rules and guidelines as restrictions of their autonomy), it also suggests that a refinement of the items applied in this study may be needed in order to clearly set the concepts of perceived controlling behavior and supporting structure apart. Nevertheless, as it was, the dimensions assessed in the present study reflected two theoretically opposite dimensions of PI (i.e., support & responsivity vs. control & structure) ($r = -.64$). Importantly, this conceptualization of PI allowed the simultaneous assessment of qualitatively different types of PI, their reciprocal relations, and their relative contribution to domain-specific achievement (cf. Hill & Taylor, 2004).

Our data revealed that for both Math and German achievement, control and structure were the most powerful dimensions of PI explaining variance over general cognitive ability (7% for German and 4% for Math achievement) (Hypotheses 4 and 5). That is, higher levels of control and structure were associated with poorer academic achievement, which is consistent with a number of previous findings (e.g., Koutsoulis & Campbell, 2001; Levpuscek & Zupancic, 2009; Niggli et al., 2007; Pomerantz & Eaton, 2001; Rogers et al., 2009). The fact that certain types of PI – even if they are well meant – may be detrimental to academic success again illustrates the importance of understanding the differential consequences of qualitatively different types of involvement.

In the literature, at least two possible ways to explain this finding are discussed. On the one hand, one may expect an indirect influence of achievement-oriented control and pressure on academic success that is mediated by other variables, such as self-efficacy or motivation (e.g., Levpuscek & Zupancic, 2009; Rogers et al., 2009). That is, perceived parental distrust, criticism, and punishment may be detrimental to the child's beliefs about his or her own ability to learn or to perform certain tasks. As a consequence, negative self-efficacy affects academic performance. On the other hand, parents may be more likely to assert control and provide structure regarding their children's academic development if the children have trouble learning and performing in school. Thus, the increased parental involvement may rather be a response to than a predictor of their child's academic failure (cf. Campbell & Mandel, 1990; Grønli et al., 1991; Levpuscek & Zupancic, 2009; see also Silinskas, Leppänen, Aunola, Parilla, & Nurmi, 2010). While the cross-sectional findings of the present study are generally consistent with both accounts, they certainly call for future longitudinal research in order to clarify the nature of the relation between achievement-oriented control/structure and academic success.

In contrast to our expectations, we found no influence of autonomy and responsivity on academic success after cognitive ability had been accounted for (see Figs. 1 and 2) (Hypotheses 2 and 3). Furthermore, there were only very small or insignificant manifest correlations between autonomy support or emotional responsivity and either one of the achievement variables (see Table 1). These findings are in contrast to a number of previous findings indicating that parental academic support and responsivity had beneficial effects on school achievement (e.g., Hill & Tyson, 2009; Koutsoulis & Campbell, 2001; Rogers et al., 2009). In these studies, it was expected that supporting and encouraging styles of involvement provide the students with a sense of initiative and confidence regarding their academic development. However, the present results suggest that particularly in adolescence, highly supportive parents may have been perceived as overprotective and interfering with the student's need for autonomy (cf. Levpuscek & Zupancic, 2009). As a result, the student's academic initiative and persistence may have decreased (Ginsburg & Bronstein, 1993) and the positive effect of parental support dissolved. This interpretation is supported by the fact that the children in our study perceived their parents as highly supportive ($M = 3.41$ on a scale from 1 to 4) and emotionally responsive ($M = 3.37$ on a scale from 1 to 4). Finally, it should be noted that the majority of previous studies pointing to positive effects was not based on German samples, suggesting that differences with respect to the educational system or culture-specific differences in parental attitudes toward their children's academic development may also have contributed to differences in empirical findings. In addition, previous studies have applied a number of different measures for parental involvement, a fact that probably also hampers their comparability to the results of the present investigation.

Thus, achievement-oriented PI appears to be a type of parental behavior that can be directly related to children's performance in school, indicating that involvement continues to make a difference in secondary school despite the popular stereotype that adolescents might be impervious to the influence of their parents (Steinberg, Lamborn, Dornbusch, & Darling, 1992). It is also consistent with the assumption that in contrast to elementary school, home-based involvement may be more relevant than school-based involvement at this age (cf. Hill & Tyson, 2009; Seginer, 2006). Importantly, the influence of PI on achievement pertained to a negative association between control/structure and academic success (Hypothesis 4 and 5). This pattern, which was consistent across the domains of German and Math, suggests that parents may not be aware of the disadvantageous effects of their controlling, punishing, and pressuring behavior. It therefore seems essential to provide appropriate information for parents addressing the effects of their parenting practices or to implement training interventions that help analyzing and improving parent–child interactions in the context of academic work at home.

4.3. Limitations and outlook

Although the present study yielded important new findings highlighting the importance of PI for school achievement in early adolescence, several limitations may be addressed in future studies. In contrast to the majority of previous studies on PI, we did not analyze parents' self-reported behavior. Instead, we focused on child-perceived PI, reflecting the parental behavior toward the academic development from the child's perspective. However, it may also be worth considering other sources of information (e.g., parent's self-reports, teacher ratings) and to address other relevant factors in order to provide a more comprehensive assessment of the children's individual characteristics and family background. This aspect seems particularly important in the light of recent findings indicating that the influence of PI may also be moderated by the student's self-efficacy (Levpuscek & Zupancic, 2009), their self-concept (Rogers et al., 2009), and the parenting style (Steinberg et al., 1992).

In addition, future studies may want to investigate whether the present findings are valid across different age groups and in samples that are more diverse in terms of SES and cultural background. In terms of cognitive abilities, it may also be worth including measures of basic cognitive processing, such as working memory capacity, executive control, and attention that may be less strongly related to SES than measures of general intelligence.
Finally, longitudinal data are needed in order to determine the causal direction of the relationship between PI and achievement and to test for reciprocal effects. Analyzing data of at least two test occasions would allow addressing the question, whether, for and to test for reciprocal effects. Analyzing data of at least two test occasions would allow addressing the question, whether, for future studies to shed more light on this issue.

4.4. Conclusion

In sum, the results of the present study added to previous evidence indicating that general cognitive ability is a very reliable predictor for academic performance in early adolescence. However, our data also shows that the specific dimensions of home-based parental behavior with respect to their children’s academic development are a major influence on achievement both in the domains of Math and German. Specifically, we found that children perform worse in school if their parents engage in high levels of controlling behavior and if they tend to set strict rules, guidelines and expectations. These findings provide essential insights into the differential effects of parental behavior on their children’s academic development, which is particularly important in order to provide appropriate counseling and to design effective interventions (cf. Rogers et al., 2009).

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