

**Behavioral Inhibition as Moderator of the Relation between
Parenting and Academic Skill Development in First Grade -
Students**

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TIIVISTELMÄ

Siirtyminen kouluun on tärkeä vaihe lasten elämässä. Useat tekijät määrittelevät kuitenkin sitä, millaiset mahdollisuudet lapsella on läpikäydä tuo vaihe. Tämä tutkimus keskittyy vanhempien kasvatustyylien (lämpimyys, behavioraalinen kontrolli, psykologinen kontrolli) vaikutukseen lasten lukemisen ja matematiikan taitojen kehittymiseen ensimmäisen kouluvuoden aikana ja siihen, missä määrin tämä yhteys on erilainen riippuen lapsen behavioraalisen inhibition (BI) tasosta. Perustuen haavoittuvuus-stressi malliin ja sen laajennuksiin (Pluess & Belsky, 2013) oletettiin lasten, joilla on korkea BI:n taso, olevan muita alttiimpia kasvatustyylien vaikutukselle. Lukuvuoden alussa opettajat arvioivat lasten (n = 152) BI:n tasoa; äidit (n = 152) ja isät (n = 118) taas arvioivat itse omia kasvatustyyliään. Lasten lukemisen ja matematiikan taitoja arvioitiin kykytesteillä loka- ja huhtikuussa. Tulokset osoittivat, että isän lämpimyydellä oli negatiivinen vaikutus lapsen lukemisen taitojen kehittymiseen silloin, kun lapsen BI:n taso oli matala. Äidin lämpimyydellä taas oli positiivinen vaikutus matematiikan ja lukutaidon kehitykseen pojilla, joilla oli matala BI, kun taas äidin psykologinen kontrolli edisti lukemisen taitoja pojilla, joilla oli korkea BI. Riippumatta lapsen BI:n tasosta äidin psykologisella kontrollilla oli viitteellinen negatiivinen vaikutus poikien lukutaidon kehitykseen, kun taas äidin behavioraalisella kontrollilla oli viitteellinen positiivinen vaikutus tyttöjen lukutaidon kehittymiseen, mutta negatiivinen vaikutus poikien matematiikan taitojen kehitykseen. Tulokset kertovat siitä, että vanhemmuustyylien vaikutukset lapsen akateemisten taitojen kehitykseen ovat monessa suhteessa riippuvaisia lapsen BI:n tasosta. Vaikutukset ovat erilaiset myös riippuen vanhemman ja lapsen sukupuolesta. Tulokset osoittavat tarvetta kehittää jokaiselle lapselle omanlainen, sopiva kasvuympäristö vastaten hänen spesifeihin tarpeisiinsa koulusiirtymän aikana.

Avainsanat: Behavioraalinen inhibitio, vanhemmuustyylit, akateemisten taitojen kehittyminen, ensimmäinen kouluvuosi, haavoittuvuus-stressi malli

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ABSTRACT

Transition to school is an important period of children's lives, but several factors moderate how individuals are able to go through that period. This study focuses on the effects of parent's parenting styles (affection, behavioral control, psychological control) on children's reading and math skill development in the first grade, and the moderating effects of child's behavioral inhibition (BI). Establishing on the ideas of differential susceptibility, diathesis-stress and vantage sensitivity models (Pluess & Belsky, 2013), children with high BI were hypothesized to be more susceptible to parental influence. At the beginning of first school year, teachers rated children's (n = 152) level of BI, and mothers (n = 152) and fathers (n = 118) evaluated their parenting styles via questionnaires. Reading and math skills were evaluated via skill tests in October and April. The results showed that paternal affection had a negative effect on children's reading skill development among children showing low BI. Maternal affection, in turn, had a positive effect on math and reading skill development among boys with low BI, whereas maternal psychological control had a positive effect on math skills for boys with high BI. There were also some parental influences unrelated to the level of child's BI. Maternal psychological control had a marginally negative effect on boys' reading skill development, whereas maternal behavioral control had a marginally positive influence on girls' reading skill development but a negative effect on boys' math skill development. The results indicate that the effects of parenting styles on children's academic skill development are in many ways related to the level of children's BI. The effects differ also in relation to the gender of parent and child. Results showcase the need to develop a suitable rearing environment for each child, responding to their specific needs at the period of school transition.

Keywords: Behavioral inhibition, parenting styles, academic skill development, first grade, differential susceptibility model, diathesis-stress model, vantage sensitivity model

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INTRODUCTION

During the school transition period children learn various new skills and develop their self-concept of ability (Bouffard, Marcoux, Vezeau, & Bordeleau, 2003; Spinath & Spinath, 2005) and there are rapid changes not only in cognitive but also in social abilities and roles (Entwisle & Alexander, 1998; Entwisle, Alexander, Pallas, & Cadigan, 1988). However, there are differences between children's ability to successfully go through this transition. It has been suggested that transition to school is particularly challenging for children who are behaviorally inhibited: the presence of a large group of peers, increased academic demands with the requirement of verbal participation, and a high child-to-staff ratio may exacerbate shy children's feelings of social fear and self-consciousness (Arbeau, Coplan, & Weeks, 2010; Coplan, Arbeau, & Armer, 2008). Parents may also play a role in how well the child adjusts to school and proceeds in his/her skill development. For example, parental supportiveness has consistently been associated with children's better math and reading skills (Martin, Ryan, & Brooks-Gunn, 2007). Although a lot is known about the role of parenting styles in children's school performance and academic skill development, less is known about the joint effects of parenting styles and children's behavioral inhibition: Do behaviorally inhibited children benefit or suffer more from different kind of parenting than other children during the period of school transition? Or are they, as suggested by the Differential susceptibility theory (Belsky & Pluess, 2009), more susceptible to parental influences overall than others? The present study aims to explore these questions by examining the moderating role of children's behavioral inhibition in the relation between parenting and academic skill development in first grade -students.

The Role of Behavioral Inhibition in Academic Skill Development

The concept of temperament refers to individual differences in emotional and behavioral tendencies and responses (Thomas & Chess, 1977). These temperamental tendencies to react are evident already in infancy and they also are moderately stable along life-span (Thomas & Chess, 1977). One of these temperamental traits along to which individuals differ from each other is inhibition

versus non-inhibition, which Kagan, Reznick and Snidman (1988) define as relating to child's initial reaction to unfamiliar events, especially other people. In these events, behaviorally inhibited children consistently become quiet, vigilant and affectively subdued whereas non-inhibited children react more spontaneously. According to Kagan et al., behavioral inhibition occurs in 10 to 15 percent of children and it is also moderately stable from early to middle childhood (see also, Hirshfeld-Becker et al., 2008). Behavioral inhibition has also been defined as representing "the persistent tendency to show extreme reticence, fearfulness, or avoidance in novel situations or with unfamiliar people" (Hirshfeld-Becker et al., 2008, p. 357). One closely similar concept with behavioral inhibition is shyness, which can be seen as a part of behavioral inhibition. Shyness refers to child's anxiety and withdrawal from novel social situations (Coplan & Armer, 2007) whereas behavioral inhibition refers to withdrawal and reticence in novel situations in general.

In previous studies, carried out among kindergarteners and elementary school students, behavioral inhibition has been linked with various negative outcomes, such as various kinds of anxiety disorders and phobias (Biederman et al., 2001; Clauss & Blackford, 2012; Nigg, 2006), and also dysthymia and depression (Nigg, 2006). Studies have also shown that socially withdrawn children are prone to face rejection and victimization from their peers by middle to late childhood (Hanish & Guerra, 2000; Hymel, Bowker, & Woody, 1993). Fox et al. (2005) suggested that behavioral inhibition may be an antecedent of social withdrawal, and that might lead to a negative cycle, where rejection causes inhibition and isolation to go even further.

Also shyness (behavioral inhibition in social situations) has been associated with various negative outcomes, such as internalizing problems (Coplan et al., 2008; Sanson, Pedlow, Cann, Prior, & Oberklaid, 1996), peer rejection (Arbeau et al., 2010; Coplan et al., 2008; Nelson, Rubin, & Fox, 2005), and problems with school adjustment (Coplan et al., 2008; Coplan, Gavinski-Molina, Lagacé-Séguin, & Wichmann, 2001). However, according to Sanson et al. (1996) shyness is associated with a *lack* of externalizing problems.

Although behavioral inhibition and shyness have been related to various social and emotional problems among children, fewer studies have examined their role in academic achievement and skill development. Those studies carried out have been focused on shyness and indicate that shy children may be at risk to low achievement. For example, Coplan et al. (2001) found that reticent behavior in kindergarten (closely related to shyness) was negatively associated not only with social but also with academic competence measured with tests and teacher ratings. Valiente, Lemery-Chalfant and Swanson (2010) found in their study that teacher-reported shyness in kindergarten was negatively associated with children's math skills but parent-reported shyness had no effect. Hughes and Coplan (2010) found with children aged between 9-13 that shyness was negatively associated

with academic engagement and teacher-rated reading and math skills. However, it was not related to standardized tests of reading comprehension. It has been suggested that the negative association between shyness and teacher-rated academic skills, in particular, is due to the fact that shy children experience social fear and anxiety in novel social settings, they have problems with language performance, they are less academically engaged or that they are more hesitant to take risks (Coplan & Evans, 2009; Coplan et al., 2001; Hughes & Coplan, 2010; Valiente et al., 2010).

The Role of Parenting Styles in Academic Skill Development

Parents play an important role in their children's life, and thus also in their academic skills. One aspect of parenting being studied in the context of children's academic performance is parenting styles (Aunola & Nurmi, 2004). Parenting style has been defined as a "constellation of attitudes toward the child that are communicated to the child and create an emotional climate in which the parent's behaviors are expressed" (Darling & Steinberg, 1993, p. 493). In the previous literature, three parenting style dimensions, in particular, have been under focus. Parental *affection* refers to parental responsiveness, supportiveness and connectedness to the child (Galambos, Barker & Almeida, 2003). *Behavioral control*, in turn, refers to parent's attempts to regulate child's behavior through firm and consistent discipline (Barber, 1996; Galambos, et al., 2003). *Psychological control* refers to control attempts using psychological means, such as control through guilt, expressions of disappointment or love withdrawal (Barber, 1996). According to Barber, Olsen and Shagle (1994), parents may support their children's optimal development by providing (a) sufficient amount of psychological autonomy in order for a child to retain a clear identity and a sense of agency and (b) sufficient amount of behavioral regulation in order for a child to socialize as a valid member of society. The former can be supported by avoiding psychological control, whereas the latter can be supported by behavioral control.

Research carried out on the role of parenting styles in children's academic skill development has shown that parental supportiveness/affection is associated with good academic outcomes, such as preschoolers' better math and reading skills (Martin et al., 2007) and academic skills overall (Roisman & Fraley, 2012). Similar kind of association has been found also during later school years. For example, Fraley, Roisman and Haltigan (2013) found that maternal sensitivity was

associated with children's high level of academic skills and this association was fairly stable from kindergarten to grade 5. Similarly, parental autonomy support (the opposite of psychological control) has been linked with general high academic achievement, academic adjustment, and reading skills both in preschool and in primary school (Joussement, Koestner, Lekes, & Landry, 2005; Mattanah, Pratt, Cowan, & Cowan, 2005). Also, Bean, Bush, McKenry and Wilson (2003) found that maternal psychological control was negatively associated with academic achievement in the European American adolescent sample, whereas maternal and paternal behavioral control was associated with better academic achievement. Furthermore, Gray and Steinberg (1999) found that all three variables - parental acceptance-involvement, psychological autonomy granting and behavioral control - were positively associated with academic competence in adolescent population. Studies focusing on the combinations of parenting style variables rather than their unique impacts have further shown that authoritative parenting style characterized by a high level of behavioral control and affection and low level of psychological control is positively linked with spelling skills development during the transition to primary school (Kiuru et al., 2012). Similarly, high levels of maternal psychological control have been linked with lower progress in math skills, especially when combined with high levels of maternal affection (Aunola & Nurmi, 2004).

The Joint Effects of Behavioral Inhibition and Parenting in Academic Skill Development

It has been suggested that the role of parenting is not the same for all children or that children with different kind of temperament benefit from different kind of parenting (see Nigg, 2006). Thomas and Chess (1977, p. 11) introduced the concept "goodness-of-fit" which refers to the accordance of "the properties of the environment and its expectations and demands with the organism's own capacities, characteristics, and style of behaving". Furthermore, they add that when this consonance is present it makes optimal development possible, but dissonance can lead to distorted development and maladaptive functioning. In accordance with goodness-of-fit theory the present study also takes the view that environmental factors (in this case parenting styles) can have enhancing or deteriorating impact on children's development depending on child's temperamental characteristics. However, there are several approaches to explain this interaction between children's characteristics and environmental influence.

First of these approaches is diathesis-stress model. According to Belsky and Pluess (2009), the central idea of diathesis-stress model is that some individuals, due to a behavioral/temperamental, endophenotypic or genetic vulnerability, are more likely than others to be affected adversely by an environmental stressor. More recently another model has been introduced according to which the interaction between temperament and environment could be solely beneficial. According to this vantage sensitivity model (see Pluess & Belsky, 2013) some individuals, due to their temperamental traits, are more sensitive and positively responsive to the environmental advantages to which they are exposed, with no negative side-effect.

In addition to diathesis-stress and vantage sensitivity models, two distinct evolutionary-inspired theories have been posed to explain the interaction between temperament and environment: Biological-sensitivity-to-context (BSC) thesis proposed by Boyce and Ellis (2005) and differential-susceptibility hypothesis (see Belsky, 1997; Belsky & Pluess, 2009). Both of these theories suggest that higher reactivity equals susceptibility to environmental influence overall, and that reactivity moderates the relations between environmental effects and developmental outcomes. However, there are few differences between these two theories. According to the BSC model (Boyce & Ellis, 2005) the reactivity is seen in the context of neurobiological stress response systems, whereas the differential susceptibility thesis sees it at behavioral level. The differential susceptibility theory (according to Belsky and Pluess 2009), is based on the idea of inclusive fitness: natural selection would have preferred children with varying developmental plasticity, because parents could not have known, what child-rearing practices would be most effective. In this case high developmental plasticity would be beneficial when parenting is suitable to children's needs and low developmental plasticity when it's not. Also, according to Boyce and Ellis (2005), BSC emphasizes more the gene-environment interactions, whereas differential susceptibility focuses more on the heritable variation in susceptibility. Furthermore, BSC sees that highly reactive phenotypes do well in the environment of high social resources and support, but not in other situations whereas differential susceptibility theory sees reactive children as malleable and capable of fitting into wide range of developmental environments. This is also one of the main reasons that the differential susceptibility is used over the BSC thesis in this study.

There have been some empirical studies examining the joint effects of child's temperament and parenting styles on child's developmental outcomes. For example, Bradley and Corwyn (2008) showed in their study that difficult temperament - in terms of negative emotionality and mood, high reactivity, and fearfulness - together with high maternal sensitivity was negatively associated with externalizing problem behavior (see also Mesman et al., 2009; Pitzer, Jennen-Steinmetz, Esser, Schmidt, & Laucht, 2011). Stright, Gallagher and Kelley (2008) showed that high quality maternal

parenting styles characterized by high emotional and autonomy support were associated with children's higher academic competence, better social skills, and better relationships with teachers and peers in first grade. These effects were stronger when children had difficult temperament (i.e., negative emotional expression, low adaptability, high activity, low emotional regulation) than when they had not such temperament, suggesting that children with difficult temperament may be more prone to parental influences than others. Morris et al. (2002) found that child's high irritable distress together with maternal psychological control was associated with internalizing problems. Also, Williams et al. (2009) found that mothers' permissive parenting (high affection combined with low behavioral control) together with child's behavioral inhibition was associated with child's internalizing problems at the age of 4. Coplan et al. (2008) found that shyness together with maternal fretful parenting (combination of neuroticism, behavioral inhibition system sensitivity, and overprotective parenting style) was associated with more internalizing problem behavior and social dissatisfaction. According to the researchers this result may be due to the fact that fretful mothers highlight dangers in children's environment and tend to be overprotective, which may cause that children are not able to develop proper coping strategies. They also found out that high levels of shyness together with low level of maternal support was associated with more internalizing problem behavior, peer difficulties and lower school adjustment, whereas low levels of shyness together with high maternal support predicted (somewhat surprisingly) lower school adjustment. According to researchers, maternal support can help children develop social skills and emotion regulation, which means that lack of support would be exceptionally detrimental for shy children. They also hypothesize that since non-shy children normally have more externalizing problems, too much maternal support can be harmful to school adjustment, if it is shown at the expense of discipline.

Overall, although some studies have been carried out on the joint effects of shyness or behavioral inhibition and parenting styles in children's developmental outcomes, this earlier research has one major limitation: all of the previous studies have focused on children's school adjustment and socioemotional development and none have focused on children's academic skill development. Moreover, most of the previous studies on the topic have focused on the role of mothers and less is known about the joint effects of fathers' parenting styles and children's inhibition/shyness. Consequently, the present study focused on the joint effects of children's behavioral inhibition and mothers' and fathers' parenting styles on children's academic skill development during the first grade. Because boys and girls may react differently to parenting styles (see e.g. Lengua, 2008; Pitzer et al., 2011), the present study also investigated the role of child's gender in the examined associations. For example, Lengua (2008) showed that among boys with high anxiousness parental inconsistent discipline was negatively associated with internalizing and

externalizing behavior problems, whereas among boys with low anxiousness the effects of inconsistent discipline were opposite. Among girls anxiousness didn't moderate the connection of parental inconsistent discipline and problem behavior.

In the present study, the three alternative models, i.e. diathesis-stress, vantage sensitivity, and differential susceptibility models, were used as theoretical frameworks, when examining the joint effects of behavioral inhibition and parenting styles on children's skill development.

The research questions were:

- a) To what extent child's behavioral inhibition predicts his/her math and reading skill development at first grade?
- b) To what extent do mothers' and fathers' parenting styles (i.e., affection, behavioral control, and psychological control) predict their offspring's math and reading skill development at first grade?
- c) Are children high in behavioral inhibition differently influenced by parenting styles than those with low behavioral inhibition?
- d) Are there differences between boys and girls, or respectively between mothers and fathers, in the aforementioned associations?

METHODS

Participants

This study is a part of the LIGHT study (Aunola, Nurmi & Viljaranta, 2006-2009), which focuses on the development of children's academic skills and motivation in school and family environment during the first school year. During three year period the teachers of every first grade class in three middle-sized Finnish towns were contacted and asked to participate to the study. The amount of contacted teachers was 334 of which 166 agreed to participate. From each classroom, one child was randomly selected to the study. If parents did not give consent for the child's participation, another child was randomly selected to the study and the procedure was continued until there was a child from every classroom in the study. A total of 114 consents were given in the first round, 33 in the second, 15 in the fourth and 4 in the fourth round. The data of 14 children were excluded from the

study due to them being in a special education class, so there were 152 children (79 girls, 73 boys) in the final sample. Data was gathered from children and their teachers ($n = 152$), mothers ($n = 152$) and fathers ($n = 118$).

The data from children's academic skills was gathered with tests in school environment two times within a school year (October, Time 1 and April, Time 2). Each child was tested individually in a separated room. The data from teachers (i.e., teacher-report of child's temperament) and parents (i.e., mother- and father-reports of parenting styles) used in the present study was gathered at the beginning of the school year (September-October, Time 1) via mailed surveys. Both parents were paid 50 Euros and teachers 100 Euros for participating the study. The children's socioeconomic background was fairly representative of the general Finnish student population. 23% of the mothers had a university or college degree, 41% had a technical college degree, 26% had a vocational school degree, and 10% had no vocational degree. The corresponding percentages of the fathers were 16; 30; 45; and 10, respectively. 78% of the children lived in nuclear families, 12% with remarried parents and 10% in a single-mother household. The average age of children at the beginning of the study was 7.5 years.

Measurements

Parenting styles. Parenting styles were measured with the Finnish version (Aunola & Nurmi, 2004) of Block's Child Rearing Practices Report (CRPR; Roberts, Block, & Block, 1984) at the beginning of the school year (Time 1). The survey consisted of 24 items measuring the three parenting style dimensions. Parents were asked to rate the items using five-pointed (1 = not at all, 5 = very much) likert-scale. *Behavioral control* consisted of five items (e.g. My child must learn that there are specific rules in our family). *Psychological control* consisted of four items (e.g. I let my child see how disappointed and ashamed I am, if he/she misbehaves). *Affection* consisted of nine items (e.g. I often show my child that I love him/her). The Cronbach's alpha reliability for behavioral control was .66 for mothers and .61 for fathers. The corresponding coefficients for psychological control were .81 and .79, and for affection .77 and .80, respectively.

Child's behavioral inhibition. Children's behavioral inhibition was rated by their teachers at the beginning of the school year (Time 1). Scale for behavioral inhibition was part of the broader temperament survey including four scales from the Temperament Assessment Battery for Children

– Revised (TABC-R; Martin & Bridger, 1999; Presley & Martin, 1994) and two scales from the Revised Dimensions of Temperament Survey (DOTS-R; Windle & Lerner, 1986). The survey included a total of 41 items, each rated on a 5-point scale (1 = not at all; 5 = very much or very often). The four scales from the TABC-R measured activity, inhibition, negative emotionality, and persistence. The two scales from the DOTS-R measured distractibility and mood. The scale for inhibition consisted of seven items (e.g., “*The student takes a long time to become comfortable in a new situation*”; “*The student is shy when meeting new students*”). The Cronbach's alpha reliability coefficient for inhibition was .90. The score for inhibition correlated with mother-reported inhibition ($r = .35, p < .01$).

Reading skills. Children's reading skills were measured with a test that was divided into two subtests:

(1) In the *word reading subtest* children were asked to read aloud 20 words of increasing difficulty (difficulty was increased mainly by word length). If a child was unable to read four words in succession correctly, the test was stopped. Every word read correctly scored one point, so the maximum result was 20 points. The split-half reliability of the test was .80. This subtest is known to be a good measurement of early reading evaluation (Leppänen, Niemi, Aunola, & Nurmi, 2004).

(2) In the *reading aloud fluency subtest* children were asked to read a short story (57 words) aloud. The scores of the test were calculated by dividing the amount of correctly read words with the amount of the time spent reading the story (in seconds). This subtest is known to be a good measurement of more advanced reading evaluation (Leppänen et al., 2004).

The complete scores of children's reading skills at Time 1 were formed by calculating a mean of standardized scores from the results of two subtests. The correlation between the reading skill score and teacher-evaluated reading skills was .70 ($p < .01$) at Time 1 and .74, ($p < .01$) at Time 2.

Math skills. Children's math skills were also measured with two subtests:

First, child's understanding of cardinal numbers and basic concepts of mathematics (e.g. equal, more, less) were measured with 11 tasks of increasing difficulty. In every task the child was shown a picture with a certain amount of circles. Then the child was asked to draw equal amount of circles (e.g., “Draw as many balls as there are in the model”) or certain amount more or less (e.g., “Draw four balls more than there are in the model”, “Draw five balls less than there are in the model”). For every right answer child got one point. The test is a part of the diagnostic test battery of basic math concepts (Ikäheimo, 1996).

Second, child's basic arithmetical skills were evaluated with visually presented addition (e.g. "8 + 6 = _"; "_ + 26 = 75") and subtraction tasks (e.g. "4 - 1 = _"; "_ - 39 = 43"). There were a total of 20 tasks. Every right answer was counted as one point.

Sum score for math skills was calculated as a sum of the first and the second subtest. The Cronbach's alpha reliability coefficient for the math skill variable was .85 both at Time 1 and Time 2. The correlation between the test score and teacher-evaluated child's level of math skill was .57 ($p < .01$) at Time 1 and .55 ($p < .01$) at Time 2

Analyses strategy

The analyses were carried out using hierarchical regression analyses, and regions of significance analyses (Roisman et al., 2012). In hierarchical regression analyses, children's skill level at Time 2 was predicted by their behavioral inhibition (BI) and parenting style variables at Time 1, and by the joint effects of BI and parenting style variables (interaction terms), after controlling for the impact of their skill level at Time 1. In order to test, whether the associations of BI and parenting styles with children's skill level would be different depending on child's gender, variables gender, gender X BI, gender X parenting style, and gender X BI X parenting style interaction terms were also included into analyses as independent variables. The independent variables were set on the analyses in the following order: Skill level at Time 1 (Step 1), gender (Step 2), BI (Step 3), parenting style variables (Step 4), Gender x BI (Step 5), Gender x Parenting style variable (Step 6), Gender x BI x Parenting style variable (Step 7). All analyses were carried out separately for reading and math skills as dependent variables. Similarly, analyses were carried out separately using mothers' and fathers' parenting style variables as independent variables. If some of the interaction terms child's Gender X BI, Gender X Parenting, or Gender X BI X Parenting, was found to be statistically significant ($p < .05$), follow-up analyses were carried out separately for boys and girls.

The statistically significant interaction terms between BI and parenting styles (BI X Affection; BI X Behavioral control; BI X Psychological control) were first interpreted using Aiken and West's (1991) procedure. In this procedure, simple slopes of parenting style variables in the prediction of children's academic skill development were calculated and presented using standardized scores, separately for children who showed low (-1 SD) or high (+1 SD) levels of BI.

Then, regions of significance (RoS) analyses were carried out to test whether the interaction effects supported either diathesis-stress, vantage sensitivity, or differential susceptibility model (for an example of similar kind of analyses, see Zarra-Nezhad et al., in press). In this study, RoS-z indicates the range of values of BI (z) in which the parenting style variable (x) and academic skill variable (y) are significantly associated. In turn, RoS-x indicates the specific values of the parenting style variable (x) below which and above which the regression lines for the children showing high and low BI (z) differ significantly in terms of academic skill variable (y). Thus, RoS-x value provides the means to evaluate, which of the three theoretical models the interaction effect most support. If the association is significant both at low and high ends of the parental variable, it suggests differential susceptibility. Significance only at a low end of parental variable, in turn, suggests diathesis-stress model and only at the high end vantage sensitivity. According to Roisman et al. (2012), RoS-x values between -2 and +2 indicate that the interaction effect is close to differential susceptibility model. PoI indices and cross-point values were also calculated. According to Roisman et al. (2012), PoI-values close to zero indicate that the effect is close to diathesis-stress model and values close to 1.00 indicate vantage sensitivity. Values between 0.40-0.60 indicate that the interaction effect is close to a differential susceptibility model. However, if the x variable (parenting variable) represents more of a negative than positive effect on children's academic skills, the interpretation of PoI index is inverted (Zarra-Nezhad et al., in press). In these cases, PoI-values close to zero represent vantage sensitivity and values close to 1.00 diathesis-stress.

RESULTS

Table 1 provides information of the means and standard deviations and the correlations of study variables. Table 2 shows the standardized beta-coefficients in the hierarchical regression analyses. Table 3 shows the regions of significance values, PoI indices and crossover points for the found statistically significant interaction effects.

In hierarchical regression analyses (see Table 2) skill level at Time 1 was a significant predictor in both math and reading skills at Time 2, suggesting that children's skill level in reading and in math is relatively stable during the first grade: Previous reading skill level was positively associated with skill level at Time 2 for boys ($\beta = .70$, $p < .001$) and girls ($\beta = .65$, $p < .001$).

Similarly, math skills level at Time 1 was positively associated with skills level at Time 2 for boys ($\beta = .76, p < .001$) and girls ($\beta = .54, p < .001$).

Effects of BI and parenting styles on children's math skill development

The research questions in this study were whether children's BI and parents' parenting styles would impact on the development of children's math and reading skills at grade 1 and also whether BI and parenting styles would show any joint impacts on skill development. The results of hierarchical regression analyses for math skill development (see Table 2) showed, first, that children's BI and their mothers' parenting styles had no main effects on children's math skills at Time 2, after controlling for the impact of children's skill level at Time 1. However, the interaction effect Gender X Behavioral control was statistically significant ($p < .05$) when predicting math skills at Time 2. Moreover, three-fold interaction term Gender X BI X Affection was statistically significant ($p < .05$) and Gender X BI X Psychological control was marginally significant ($p < .10$). Consequently, the analysis was next run separately for boys and girls. The results showed that mothers' behavioral control had a significant negative effect on boys' math skills at Time 2 ($\beta = -.22, p < .05$), but had no significant effect to girls' math skills: the more behavioral control mothers showed, the lower the level of boys' math skills at Time 2, after controlling for the level of math skills at Time 1. The joint effect of the children's BI and maternal affection was also associated with the development of boy's mathematical skills, but not that of girls. The results concerning the interaction effect BI X mothers' affection among boys are shown in Figure 1.

Table 1

Correlations, Means (M) and Standard Deviations (SD) of Study Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
1. Child gender												
2. Math skills, T1	.08											
3. Math skills, T2	.16*	.70**										
4. Reading skills, T1	-.14	.49**	.47**									
5. Reading skills, T2	-.13	.46**	.42**	.61**								
6. Behavioral inhibition	-.05	-.17*	-.22**	-.12	-.00							
7. Maternal affection	-.00	.02	.02	.11	.13	-.06						
8. Paternal affection	-.12	-.10	-.04	.09	-.04	-.09	.23*					
9. Maternal behavioral control	.01	-.01	-.12	-.14	-.06	-.04	.02	-.02				
10. Paternal behavioral control	.00	.00	-.06	-.07	-.08	-.08	-.16	-.00	.31**			
11. Maternal psychological control	.07	-.23**	-.18*	-.23**	-.23**	.03	-.14	-.09	.49**	.16		
12. Paternal psychological control	-.25**	-.19*	-.16	-.13	-.02	.03	-.17	-.12	.21*	.35**	.19*	
<i>Mean</i>	1.49	15.38	20.08	-.18	.04	2.58	4.27	4.02	3.81	3.72	2.77	2.77
<i>Standard deviation</i>	.50	4.48	4.38	.82	.84	.85	.48	.51	.49	.45	.69	.72

Note 1. *** $p < .001$, ** $p < .01$, * $p < .05$

Table 2

The Results of Hierarchical regression Analyses for Children Math and Reading Skill Development: Children's Behavioral Inhibition (BI) and Parenting Styles as Predictors

	Math skills, T2 mothers			Math skills, T2 fathers			Reading skills, T2 mothers			Reading skills, T2 fathers		
	β	r	ΔR^2	β	r	ΔR^2	β	r	ΔR^2	β	r	ΔR^2
Skill level at time 1	.70***	.70***	.49***	.70***	.70***	.49***	.68***	.68***	.47***	.68***	.68***	.47***
Child gender (G)	.10†	.16*	.01†	.10	.16*	.01	-.03	-.12	.00	-.03	-.12	.00
BI	-.11†	-.22**	.01†	-.11	-.22**	.01	.07	-.02	.00	.07	-.02	.00
Affection	.00	.02	.00	.03	-.04	.00	.01	.08	.00	-.10	-.04	.01
Behavioral control	-.11†	-.12	.01†	-.07	-.06	.00	.04	-.06	.00	-.02	-.07	.00
Psychological control	-.04	-.18*	.00	-.00	-.16†	.00	-.06	-.21*	.00	.07	-.02	.01
G x BI	.18	-.20*	.00	.19	-.19*	.00	-.21	-.03	.01	-.21	-.03	.01
G x Affection	.28	.06	.01	.12	-.04	.00	.08	.09	.00	.02	-.04	.00
G x Behavioral control	-.40*	-.15†	.02*	-.40†	-.09	.02†	-.38*	-.10	.02*	.06	-.05	.00
G x Psychological control	-.32†	-.24**	.01†	-.50*	-.20*	.03*	-.37†	-.26**	.01†	.02	-.03	.00
BI x Affection	-.07	-.20*	.00	-.02	.08	.00	-.14*	-.18*	.02*	.12†	.11	.01†
BI x Behavioral control	.06	-.07	.00	-.00	.03	.00	.06	-.01	.00	.07	.07	.00
BI x Psychological control	.10†	.13	.01†	-.06	-.08	.00	.08	.08	.01	.00	.01	.00
G x BI x affection	-.55**	-.23**	.03**	.22	.11	.00	-.40*	-.20*	.02*	.08	.09	.00
G x BI x behavioral control	.17	-.04	.00	.36†	.09	.01†	-.03	.02	.00	.06	.11	.00
G x BI x psychological control	.36†	.19*	.01†	.05	-.03	.00	.18	.15†	.00	-.02	.04	.00

Note. *** $p < .001$, ** $p < .01$, * $p < .05$, † $p < .10$

Note 2: Independent variables were set on the analyses in the following order: Step 1: Skill level at time 1, step 2: gender, step 3: BI, step 4: parenting style, step 5: G x BI, step 6: G x parenting style, step 7: G x BI x parenting style

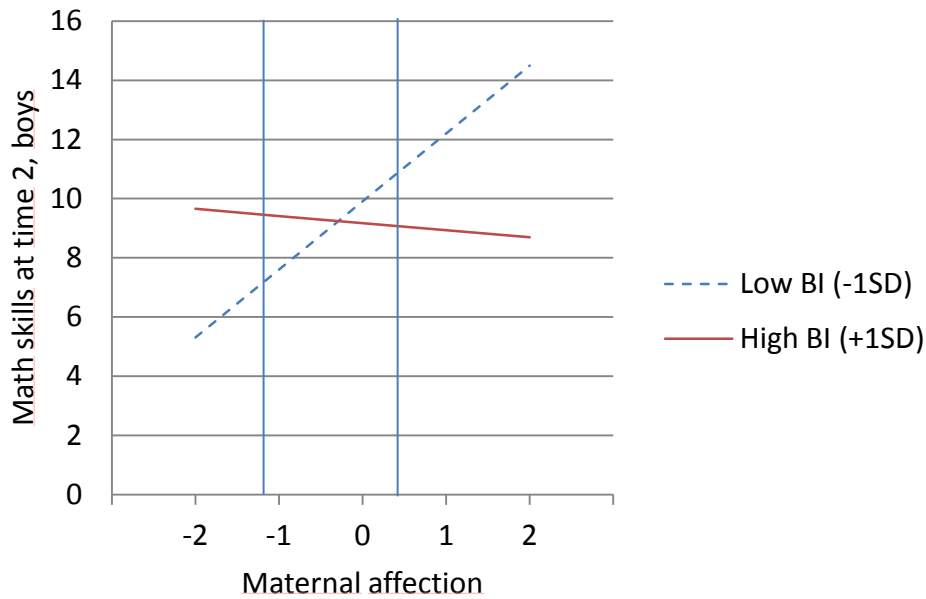


Figure 1. The role of mothers’ affection in relation to boys’ math skills, regarding children showing a high level of behavioral inhibition (+1SD, high) and children showing a low level of behavioral inhibition (-1SD, low). The vertical lines showcase the borders above and below which the two lines statistically significantly differ

The results (Figure 1) showed that among the boys who had high BI, maternal affection had no effect ($B = -.24$, $p = .61$) on boys’ math skill development. Within the boys who had low BI, maternal affection was positively associated with the development of mathematical skills ($B = 2.30$, $p < .01$): the higher the level of maternal affection, the higher the level of boys’ math skills at Time 2, after controlling for the level of math skills at Time 1. Regions of significance (see Table 3) supported differential susceptibility -model and the PoI index was also very close on suggesting that the found interaction is differential susceptibility -like: boys with low levels of BI benefited more from high maternal affection, but also were more vulnerable to the negative effects of low levels of maternal affection than other children.

Table 3

Regression Estimates, Regions of Significance (RoS), and Proportion of Interaction Index (PoI) for Statistically Significant ($p < .05$) Behavioral inhibition X Parenting Style Variable Interactions

Outcome	Differential Susceptibility/Diatheses-Stress/ Vantage Sensitivity Indices									
	Regression Estimates				RoS Z		RoS X			
	b_0	b_1	b_2	b_3	Lower Bound	Higher Bound	Lower Bound	Higher Bound	PoI	Crossover
Mothers										
Math skills (boys)	9.54	1.03 ¹	-.36	-1.27	0.19	2.03	-1.22	0.37	0.64	-0.29
Math skills (girls)	9.53	.33 ²	-.05	1.26	-1.48	0.64	-2.83	0.23	0.48	0.04
Reading skills (boys)	.14	.08 ¹	-.05	-.21	-0.78	1.35	-1.27	0.71	0.61	-0.22
Fathers										
Reading skills	0.18	-.08 ¹	.06	.09	-0.35	14.99	-11.18	0.74	0.78	-0.61

Note. b_0 = intercept, b_1 = main effect of parenting style variable X: ¹affection ²psychological control, b_2 = main effect of moderator variable behavioral inhibition Z, b_3 = interaction effect between moderator behavioral inhibition variable Z and parenting style variable X; RoS, regions of significance (see visualization in Figures 1-4), RoS Z refers to the RoS with respect to temperament and RoS X refers to RoS with respect of parenting; PoI, proportion of interaction; Cross-over represents the value of parenting variable (X) at which the regression lines intersect.

Also, BI and maternal psychological control were associated with the development of boy's mathematical skills but not with those of girls. The results of this interaction are shown in Figure 2.

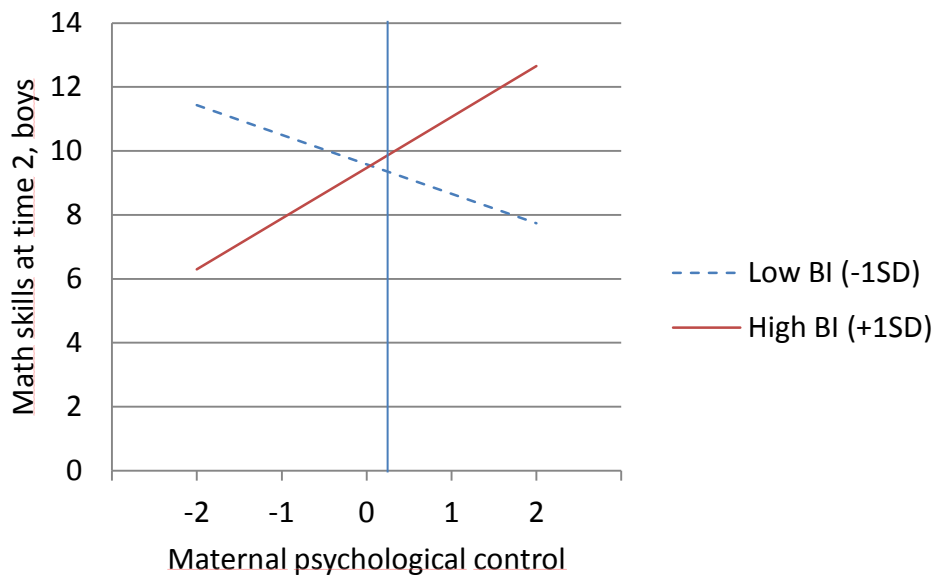


Figure 2. The role of mothers' psychological control in relation to boys' math skills, regarding children showing a high level of behavioral inhibition (+1SD, high) and children showing a low level of behavioral inhibition (-1SD, low). The vertical line showcases the border above which the two lines statistically significantly differ.

The results (Figure 2) showed that boys who had low BI were not affected by maternal psychological control ($B = -.92, p = .14$). Among the boys who had high BI, high level of maternal psychological control predicted better math skills at Time 2 ($B = 1.59, p < .05$). Regions of significance (Table 3) was in line with vantage sensitivity model: boys with high BI benefitted from maternal affection in terms of math skill development more than other boys. However, PoI index (Table 3) suggested differential susceptibility –model: boys with high BI not only benefitted from high level of maternal psychological control but also suffered from low levels of maternal psychological control more than other boys.

Next, similar analyses were carried out using fathers' parenting styles as predictors of children's math skill development (see Table 2). Similarly as for mothers, after controlling the skill level at Time 1, fathers' parenting styles had no significant main effects on children's math skill development. However, the interaction term Gender X Psychological control was statistically significant. Furthermore, the three-fold interaction term Gender X BI X Behavioral control was

marginally significant ($p < .10$). Consequently, the analyses were next carried out separately for boys and girls. Further analyses, however, found that when tested separately for boys and girls, neither of the main effect of psychological control nor the interaction term BI X Behavioral control were statistically significant among boys or among girls.

Effects of BI and parenting styles on children's reading skill development

The results of hierarchical regression analyses for reading skills showed (see Table 2), first, that BI and mothers' parenting styles had no significant main effects on children's reading skills development, after controlling for reading skill level at Time 1. However, the joint effects of Gender X Behavioral control, Gender X Psychological control, and Gender X BI X Affection were found to be statistically significant. Consequently, the analysis was next run separately for boys and girls. The results showed that mothers behavioral control had a marginally positive main effect on girls' reading skills at Time 2 ($\beta = .16, p < .10$). However, it had no effect on boys' reading skills. On the other hand, mothers psychological control had a marginally negative main effect on the boys' reading skills at Time 2 ($\beta = -.16, p < .10$), but it had no effect on girls' reading skills. Furthermore, the joint effect of child's BI and maternal affection on the development of child's reading skills was only significant among boys. The results of this interaction are shown in Figure 3.

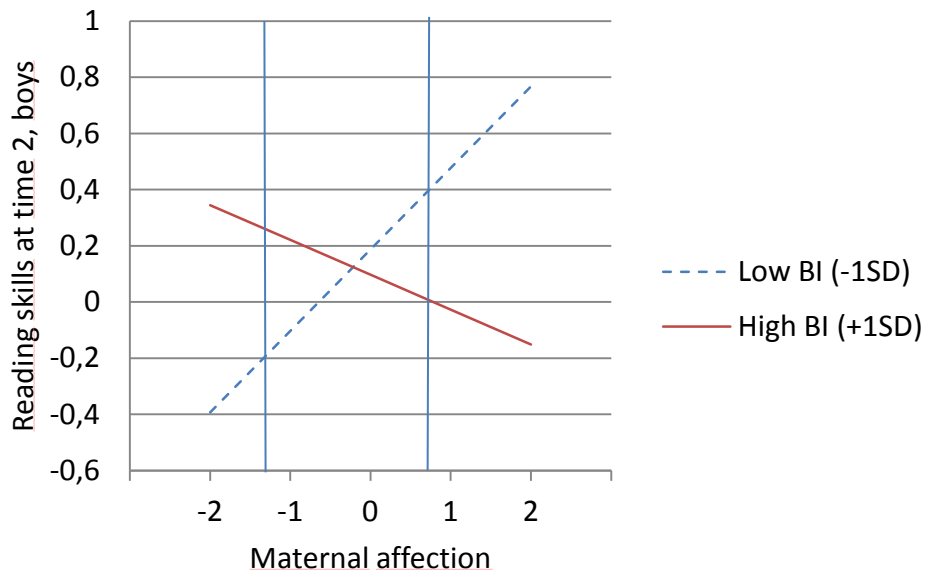


Figure 3. The role of mothers' affection in relation to boys' reading skills regarding children showing a high level of behavioral inhibition (+1SD, high) and children showing a low level of behavioral inhibition (-1SD, low). The vertical lines showcase the borders above and below which the two lines statistically significantly differ.

The results showed (Figure 3) that among the boys with high BI, maternal affection had no effect on reading skill development ($B = -.12, p = .14$). However, among the boys who had low BI, maternal affection was positively associated with boy's subsequent reading skills ($B = .29, p < .05$): the higher the level of maternal affection, the better the subsequent reading skills among boys showing low BI. Regions of significance (see Table 3) supported differential susceptibility -model and the PoI index (Table 3) was also very close on suggesting that the interaction is differential susceptibility -like: boys with low levels of BI benefited more from high maternal affection, but also were more vulnerable to the negative effects of low levels of maternal affection than other children.

Similarly as for mothers, fathers' parenting styles (see Table 2) had no significant main effects on children's reading skill development after controlling reading skill level at Time 1. However, the joint effect of BI and paternal affection was marginally significant ($p < .10$). The results of this interaction are shown in Figure 4.

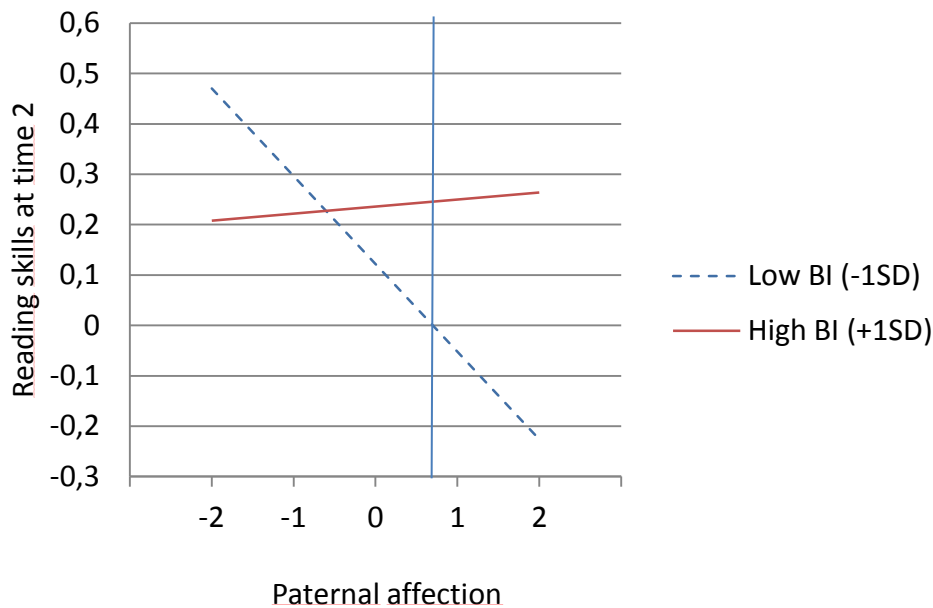


Figure 4. The role of fathers' affection in relation to their children's reading skills regarding children showing a high level of behavioral inhibition (+1SD, high) and children showing a low level of behavioral inhibition (-1SD, low). The vertical line showcases the border above which the two lines statistically significantly differ.

The results (Figure 4) showed that the greater amount of paternal affection predicted lower reading skills at Time 2 when child had low amount of BI ($B = -.17, p < .05$). The regions of significance and PoI index (Table 3) supported the vantage sensitivity model. However, because the effect of paternal affection was rather negative than positive, this result can be interpreted in terms of diathesis-stress model: children with low amount of BI were particularly vulnerable to the *negative* effects of high paternal affection. Among the high-BI children paternal affection had no effect on the development of reading skills ($B = .01, p = 0.84$).

DISCUSSION

The aim of this study was to investigate the role of child's behavioral inhibition and parents parenting styles, and their joint effects, on the development of children's reading and math skills in the first grade. Also the role of child's gender in these associations was examined. It was found that

the impact of mother's and father's parenting styles on child's skill development was different depending on the level of child's BI and the child's gender. Few unique effects of parenting styles were also found, but these effects too were different depending on child's gender. Overall, children showing low BI were, unexpectedly, found to be more vulnerable to parental influences than those showing high BI.

The results showed that BI and parenting styles had no main effects on children's math and reading skill development at the level of the whole data but rather showed joint effects which most were further dependent on gender. Previous literature has shown that behaviorally inhibited or shy children are more prone to difficulties in socioemotional development and school adjustment than others (Arbeau et al., 2010; Biederman et al., 2001; Clauss & Blackford, 2012; Coplan et al., 2008; Coplan et al., 2001; Fox et al., 2005; Hanish & Guerra, 2000; Hymel et al., 1993; Nelson et al., 2005; Nigg, 2006; Sanson et al., 1996). For example, in their review of the topic, Fox et al. (2005) showcased that previous research has linked BI with peer rejection and victimization, loneliness, low self-esteem and anxiety. Previous research has also shown that inhibited and shy children may be more sensitive to parental impacts when it comes to socioemotional development (Coplan et al., 2008; Williams et al., 2009). In contrast to these earlier findings the results of the present study showed that the impacts of parenting on children's academic skill development were more evident among children showing *low* BI than high BI. The results for children showing low BI showed, first, that mothers' affection was linked positively with reading and math skill development, but only among boys. This result was found to be in accordance with the differential susceptibility model, suggesting that regarding reading and math skill development, boys with low BI would benefit from high levels of mothers' affection, and suffer from low levels of maternal affection, more than their peers showing higher level of BI. These results found among boys showing low BI are in line with previous research which has suggested that parental supportiveness and sensitivity are positively linked with academic skill development (Fraleley et al., 2013; Gray & Steinberg, 1999; Martin et al., 2007; Roisman & Fraley, 2012). According to Gray and Steinberg (1999) parental support increases the child's global well-being. All in all, it could be argued that mother's affection helps to develop a safe home environment and good developmental qualities and traits which would make children easier to develop their academic skills too. However, the results of the present study add to previous literature by suggesting that during the first grade this is true particularly among boys showing low BI. In other words, inhibited children and girls did not seem to benefit from maternal affection in terms of their academic skill development. It is unclear why this result is evident only among boys with low BI, and therefore further studies on the topic are needed.

Secondly, the results showed that among the children who had low BI, paternal affection had a diathesis-stress like effect to the development of children's reading skills. This means that children whose fathers were more affectionate towards them developed less in their reading skills during the first grade than others. This result is inconsistent with previous research, because parental affection has been found to have a positive effect (Martin et al., 2007; Roisman & Fraley, 2012) and high level of shyness negative effect (Hughes & Coplan 2010) on children's academic skills. The result may be due to the fact that the amount of parental affection or support may be proportional to the time fathers spend with their children. For example, Yeung, Sandberg, Davis-Kean and Hofferth (2001) found that when fathers spend time with their children they usually engage less in achievement-related activities and more in play/companionship-like activities than mothers. It is possible that fathers showing high affection spend more time with their children in other than achievement-related activities. This decreased time spent with achievement-related activities could hinder the development of academic skills. Another explanation for the result is that children whose fathers show high level of affection have good reading skills already before school entry and, thus, they show less development in their skills during the first grade than their peers. Previous research has shown that in Finland individual differences in reading skills rather decrease than increase during grade 1 (Leppänen et al., 2004), whereas in math an opposite is true (Aunola, Leskinen, Lerkkanen, & Nurmi, 2004). This may explain why the surprising result was found only in reading and not in math. However, why the result was found only among children showing low BI would need further studying.

The results for children with high BI showed only one effect regarding parenting styles: maternal psychological control was linked positively with boys' math skill development. The result was a bit mixed, since part of the results suggested that the found association represented a vantage sensitivity model, meaning that in terms of math skill development boys with high BI would be particularly sensitive to the *advantages* of mother's high psychological control. However, other part of the results supported differential susceptibility model, suggesting that besides of beneficial effects of high maternal psychological control boys with high BI would be also more prone than other boys to the *negative* effects of low levels of maternal psychological control. Overall, this result is inconsistent with previous research, which has suggested that parental psychological control has a negative effect on math skill development and academic achievement in general (Aunola & Nurmi, 2004; Bean et al., 2003). However, it could be argued that children high with BI would want to please their mothers and therefore could be more susceptible to the influence of mothers' psychological pressure than other children. This could, in turn, lead them to investigate more into studying. However, the result does not consider the influence of psychological control to

socioemotional development. For example, Zarra-Nezhad et al. (in press) found in their study that maternal psychological control predicted better prosocial skills and fewer externalizing problems, but greater amount of internalizing problems among children with high level of social withdrawal. Therefore it could be argued that although maternal psychological control may benefit some external variables (e.g., math skill development), it could still result into children suffering internally. Furthermore, Miller (2012) has found that shyness together with parental psychological control predicted lower involvement in sports, music and other activities among boys, but not so much among girls in grade five. This could lead to shy boys having more time to invest into studying and therefore better math skill development.

There were some main effects of parenting styles on children's academic skills, independent of BI, but dependent on child's gender. The results showed that maternal psychological control was marginally negatively associated to boys' reading skills at time 2. This is supported by earlier research, according to which psychological control is negatively associated with academic achievement (Bean et al., 2003) and its opposite (autonomy support) is associated with higher academic achievement (Gray & Steinberg, 1999; Joussement et al., 2005; Mattanah et al., 2005). Gray and Steinberg have hypothesized that parental autonomy granting promotes the feelings of self-competence and self-confidence, which could in turn give students desire to achieve and faith that they could succeed. However, if the parent does not give the child the proper amount of autonomy but in turn uses psychological control, it could be detrimental to child's feelings of self-competence and confidence, and therefore hinder reading skill development. One reason why psychological control affected only boys' skills might be found in the differences of skill levels of boys and girls: in the present study girls had better results from reading skill tests than boys at both time points, though the difference was not statistically significant. Still, it could be argued that the better skill level at the start of school would benefit girls to be not as susceptible to psychological pressure from mothers.

Results considering parental behavioral control were partly in line with previous research, showing that maternal behavioral control had a marginally positive effect on the development of girls' reading skills. This is similar to the results of Bean et al. (2003) and Gray and Steinberg (1999), who both found that parental behavioral control was associated with higher academic competence. Gray and Steinberg hypothesize that high level of parental behavioral control may help child to develop stronger self-control and discipline. This could, in turn, help them in their studies. However, contrary to earlier research, results also suggest that maternal behavioral control has a negative effect on the development of boys' math skills. The interpretation of this result is not clear, but it might be hypothesized that boys tend to exercise math in more creative and daily setting,

which could mean that parental behavioral control might be restrictive and therefore detrimental to boys' math skill development. For example, in their study Arnold, Fisher, Doctoroff and Dobbs (2002) used an innovative program, in which preschool teachers aimed to incorporate math-relevant activities into the daily routines of preschool students. This program benefited boys a lot more than girls, which could indicate that it is more natural to boys than girls to apply math in more daily settings. However, this result is in need for further studies.

To summarize, the results showed that there were interaction effects between parenting styles and BI. Contrary to the initial study idea most found effects of parenting styles considered the group with low BI rather than high BI, and these effects were further related to parent's affection, in particular. This would suggest that children with low BI are more susceptible to the positive and negative aspects of parental affection than those with high BI. The one significant interaction effect that was connected to high level of BI but not to low was that maternal psychological control benefited boys' math skill development.

It should also be noted that parental affection had no significant main effects, but the significant effects were moderated by child's BI. Psychological control had a positive interaction effect with high BI among boys but also a negative effect unrelated to the level of children's BI. Behavioral control, on the other hand, had only main effects towards academic skill development, which would indicate that the effects of parental behavioral control are unrelated to the level of children's BI. Furthermore, most of the found parental effects considered maternal parenting styles. This may be due to the fact that mothers are usually the main caretakers in the family. In fact, the only significant effect of fathers' parenting styles was diathesis-stress -like connection, indicating that the high level of paternal affection had negative rather than positive impact on skill development. Whether this result is due to the fact that fathers showing high affection spend more time with their children in non-academic activities than those showing low affection needs further studying.

There were no significant effects of children's BI to academic skill development unrelated to parenting styles. Previous studies have found that indicators closely related to BI are negatively associated with academic skills (Coplan et al., 2001; Hughes, & Coplan 2010; Valiente et al., 2010). However, none of these studies have studied the interaction between BI and parenting styles. The present study, in turn, strongly suggests that the effects of children's' BI on academic skill development may be related to parents' parenting styles.

One of the research questions was whether the effects of BI, parenting styles and their interaction were different between boys and girls. The results showed that almost all found effects

were conditioned by child's gender, which would indicate that parenting styles and children's BI have different effects for boys and girls. Only the effect of father's affection towards reading skills was on the level of the whole data. In addition to that, for girls there was just one significant effect, which also considered reading skills. This would suggest that girls' math skill development is unrelated to their level of BI or parenting styles. For boys, more significant effects were found and they were related to both reading and math skill development. This would suggest that boys are more susceptible to the effects of parenting styles, and the joint effects of BI and parenting, than girls are, at least in relation to math skill development. Previous research has not been able to create a clear picture of the gender effects and therefore more research is necessary to evaluate the differences between boys and girls in aforementioned themes.

There were some limitations in this study. Firstly, it focuses only on the first school year of the children. To gain a more comprehensive picture of the transition to school period, it could be beneficial to broaden the study to include preschool period and also possibly the second school year. Longer time span for study would also help to investigate the long-term effects of parenting styles and BI. Secondly, since the amount of fathers who participated in the study was lower than the amount of mothers, the statistical power of the results in the case of fathers was not as good as in the case of mothers. Thirdly, since parents assessed their parenting styles themselves, it could be that they might give answers that are considered more socially desirable. One could also argue, whether the children themselves or their peers should have assessed their BI, although the children in the present study might be quite young for that. Fourthly, this study was conducted in Finland so there is a need for further studies in different cultural settings. For example, in Finland learning to read is a very rapid process because of the almost perfect letter-sound correspondence (Leppänen et al., 2004) and, partly due to this, individual differences in reading skills decrease during the first grade (Leppänen et al., 2004). This feature of Finnish language may have had an impact on the results of the present study. Fifthly, due to the small sample size this study did not investigate the joint effects of several parenting style variables at the same time, which could need further studying. For example, previous research suggests that it is particularly the combination of parenting variables that is important for skill development rather than unique impacts of parenting variables (e.g., Aunola & Nurmi, 2004).

Overall these results indicate that the level of child's behavioral inhibition, particularly among boys, moderates the effects of parenting styles on academic skill development in many ways, while there are also some effects unrelated to it. It was also found that the results differ in relation to the sex of both parent and child. These results would point the need to focus on

developing a suitable rearing environment for each child, responding to their specific needs at the difficult and vital period of school transition.

REFERENCES

- Arbeau, K. A., Coplan, R. J., & Weeks, M. (2010). Shyness, teacher-child relationships, and socio-emotional adjustment in grade I. *International Journal of Behavioral Development, 34*, 259-269.
- Arnold, D. H., Fisher, P. H., Doctoroff, G. L., & Dobbs, J. (2002). Accelerating math development in head start classrooms. *Journal of Educational Psychology, 94*, 762-770.
- Aunola, K., & Nurmi, J.-E. (2004). Maternal affection moderates the impact of psychological control on a child's mathematical performance. *Developmental Psychology, 40*, 965-978.
- Aunola, K., Leskinen, E., Lerkkanen, M.-K., & Nurmi, J.-E. (2004). Developmental dynamics of math performance from preschool to Grade 2. *Journal of Educational Psychology, 96*, 699-713.
- Aunola, K., Nurmi, J.-E., & Viljaranta, J. (2006-2009). The LIGHT study. [Data set] University of Jyväskylä, Finland.
- Barber, B. K. (1996). Parental psychological control: Revisiting a neglected construct. *Child Development, 67*, 3296-3319.
- Barber, B. K., Olsen, J. E., & Shagle, S. C. (1994). Associations between parental psychological and behavioral control and youth internalized and externalized behaviors. *Child Development, 65*, 1120-1136.
- Bean, R. A., Bush, K. R., McKenry, P. C., & Wilson, S. M. (2003). The impact of parental support, behavioral control, and psychological control on the academic achievement and self-esteem of African American and European American adolescents. *Journal of Adolescent Research, 18*, 523-541.
- Belsky, J. (1997). Theory testing, effect-size evaluation, and differential susceptibility to rearing influence: The case of mothering and attachment. *Child Development, 64*, 598-600.
- Belsky, J., Bakermans-Kranenburg, M. J., & van IJzendoorn, M. H. (2007). For better *and* for worse: Differential susceptibility to environmental influences. *Current Directions in Psychological Science, 16*, 300-304.
- Belsky, J., & Pluess, M. (2009). Beyond diathesis stress: Differential susceptibility to environmental influences. *Psychological Bulletin, 135*, 885-908.

- Biederman, J., Hirshfeld-Becker, D. R., Rosenbaum, J. F., Hérot, C., Friedman, D., Snidman, N., ... Faraone, S. V. (2001). Further evidence of association between behavioral inhibition and social anxiety in children. *The American Journal of Psychiatry*, *158*, 1673-1679.
- Bouffard, T., Marcoux, M-F., Vezeau, C., & Bordeleau, L. (2003). Changes in self-perceptions of competence and intrinsic motivation among elementary schoolchildren. *British Journal of Educational Psychology*, *73*, 171-186.
- Boyce, W. T., & Ellis, B. J. (2005). Biological sensitivity to context: I. An evolutionary–developmental theory of the origins and functions of stress reactivity. *Development and Psychopathology*, *17*, 271-301.
- Bradley, R. H., & Corwyn, R. F. (2008). Infant temperament, parenting, and externalizing behavior in first grade: A test of the differential susceptibility hypothesis. *Journal of Child Psychology and Psychiatry*, *49*, 124-131.
- Clauss, J. A., & Blackford, J. U. (2012). Behavioral inhibition and risk for developing social anxiety disorder: A meta-analytic study. *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*, 1066-1075.
- Coplan, R. J., Arbeau, K. A., & Armer, M. (2008). Don't fret, be supportive! Maternal characteristics linking child shyness to psychosocial and school adjustment in kindergarten. *Journal of Abnormal Child Psychology*, *36*, 359-371.
- Coplan, R. J., & Armer, M. (2007). A “multitude” of solitude: A closer look at social withdrawal and nonsocial play in early childhood. *Child Development Perspectives*, *1*, 26-32.
- Coplan, R. J., & Evans, M. A. (2009). At a loss of words? Introduction to the special issue on shyness and language in childhood. *Infant and Child Development*, *18*, 211-215.
- Coplan, R. J., Gavinski-Molina, M-H., Lagacé-Séguin, D. G., & Wichmann, C. (2001). When girls versus boys play alone: Nonsocial play and adjustment in kindergarten. *Developmental Psychology*, *37*, 464-474.
- Darling, N., & Steinberg, L. (1993). Parenting style as context: An integrative model. *Psychological Bulletin*, *113*, 487-496.
- Entwisle, D. R., & Alexander, K. L. (1998). Facilitating the transition to first grade: The nature of transition and research on factors affecting it. *The Elementary School Journal*, *98*, 351-364.
- Entwisle, D. R., Alexander, K. L., Pallas, A. M., & Cadigan, D. (1988). A social psychological model of the schooling process over first grade. *Social Psychology Quarterly*, *51*, 173-189.
- Fox, N. A., Henderson, H. A., Marshall, P. J., Nichols, K. E., & Ghera, M. M. (2005). Behavioral inhibition: Linking biology and behavior within a developmental framework. *Annual Review of Psychology*, *56*, 235–262.

- Fraley, R. C., Roisman, G. I., & Haltigan, J. D. (2013). The legacy of early experiences in development: Formalizing alternative models of how early experiences are carried forward over time. *Developmental Psychology, 49*, 109-126.
- Galambos, N. L., Barker E. T., & Almeida, D. M. (2003). Parents *do* matter: Trajectories of change in externalizing and internalizing problems in early adolescence. *Child Development, 74*, 578-594.
- Gray, M. R., & Steinberg, L. (1999). Unpacking authoritative parenting: Reassessing a Multidimensional construct. *Journal of Marriage and the Family, 61*, 574-587.
- Hanish, L. D., & Guerra, N. G. (2000). Predictors of peer victimization among urban youth. *Social Development, 9*, 521-543.
- Hirshfeld-Becker, D. R., Micco, J., Henin, A., Bloomfield, A., Biederman, J., & Rosenbaum, J. (2008). Behavioral inhibition. *Depression and Anxiety, 25*, 357-367.
- Hughes, K., & Coplan, R. J. (2010). Exploring processes linking shyness and academic achievement in childhood. *School Psychology Quarterly, 25*, 213-222.
- Hymel, S., Bowker, A., & Woody, E. (1993). Aggressive versus withdrawn unpopular children: Variations in peer and self-perceptions in multiple domains. *Child Development, 64*, 879-896.
- Ikäheimo, H. (1996). *Matematiikan keskeisten käsitteiden diagnoosi*. Helsinki: Oy Oopperi Ab.
- Joussement, M., Koestner, R., Lekes, N., & Landry, R. (2005). A longitudinal study of the relationship of maternal autonomy support to children's adjustment and achievement in school. *Journal of Personality, 73*, 1215-1236.
- Kagan, J., Reznick, J. S., & Snidman, N. (1988). Biological bases of childhood shyness. *Science, 240*, 167-171.
- Kiuru, N., Aunola, K., Torppa, M., Lerkkanen, M-K., Poikkeus, A-M., Niemi, P., ... Nurmi, J-E. (2012). The role of parenting styles and teacher interactional styles in children's reading and spelling development. *Journal of School Psychology, 50*, 799-823.
- Lengua, L. J. (2008). Anxiousness, frustration, and effortful control as moderators of the relation between parenting and adjustment in middle-childhood. *Social Development, 17*, 554-577.
- Leppänen, U., Niemi, P., Aunola, K., & Nurmi, J-E. (2004). Development of reading skills among preschool and primary school pupils. *Reading Research Quarterly, 39*, 72-93.
- Martin, R. P., & Bridger, R. C. (1999). *The temperament assessment battery for children - Revised*. University of Georgia, Athens, GA.
- Martin, A., Ryan, R. M., & Brooks-Gunn, J. (2007). The joint influence of mother and father parenting on child cognitive outcomes at age 5. *Early Childhood Research Quarterly, 22*, 423-439.

- Mattanah, J. F., Pratt, M. W., Cowan, P. A., & Cowan, C. P. (2005). Authoritative parenting, parental scaffolding of long-division mathematics, and children's academic competence in fourth grade. *Applied Developmental Psychology, 26*, 85-106.
- Mesman, J., Stoel, R., Bakermans-Kranenburg, M. J., van Ijzendoorn, M. H., Juffer, F., Koot, H. M., & Alink, L. R. A. (2009). Predicting growth curves of early childhood externalizing problems: Differential susceptibility of children with difficult temperament. *Journal of Abnormal Child Psychology, 37*, 625-636.
- Miller, S. R. (2012). I don't want to get involved: Shyness, psychological control, and youth activities. *Journal of Social and Personal Relationships, 29*, 908-929.
- Morris, A. S., Silk, J. S., Steinberg, L., Sessa, F. M., Avenevoli, S., & Essex, M. J., (2002). Temperamental vulnerability and negative parenting as interacting predictors of child adjustment. *Journal of Marriage and Family, 64*, 461-471.
- Nelson, L. J., Rubin, K. H., & Fox, N. A. (2005). Social withdrawal, observed peer acceptance, and the development of self-perceptions in children ages 4 to 7 years. *Early Childhood Research Quarterly, 20*, 185-200.
- Nigg, J. T. (2006). Temperament and developmental psychopathology. *Journal of Child Psychology and Psychiatry, 47*, 395-422.
- Pitzer, M., Jennen-Steinmetz, C., Esser, G., Schmidt, M. H., & Laucht, M. (2011). Differential susceptibility to environmental influences: The role of early temperament and parenting in the development of externalizing problems. *Comprehensive Psychiatry, 52*, 650-658.
- Pluess, M., & Belsky, J. (2013). Vantage sensitivity: Individual differences in response to positive experiences. *Psychological Bulletin, 139*, 901-916.
- Presley, R., & Martin, R. P. (1994). Toward a structure of preschool temperament: factor structure of the temperament assessment battery for children. *Journal of Personality, 62*, 415-448.
- Roberts, G. C., Block, J. H., & Block, J. (1984). Continuity and change in parents' child-rearing practices. *Child Development, 55*, 586-597.
- Roisman, G. I., & Fraley, R. C. (2012). A Behavior-genetic study of the legacy of early caregiving experiences: Academic skills, social competence, and externalizing behavior in kindergarten. *Child Development, 83*, 728-742.
- Roisman, G. I., Newman, D. A., Fraley, R. C., Haltigan, J. D., Groh, A. M., & Haydon, K. C. (2012). Distinguishing differential susceptibility from diathesis-stress: Recommendations for evaluating interaction effects. *Development and Psychopathology, 24*, 389-409.
- Sanson, A., Pedlow, R., Cann, W., Prior, M., & Oberklaid, F. (1996). Shyness ratings: Stability and correlates in early childhood. *International Journal of Behavioral Development, 19*, 705-724.

- Spinath, B., & Spinath, F. M. (2005). Longitudinal analysis of the link between learning motivation and competence beliefs among elementary school children. *Learning and Instruction, 15*, 87-102.
- Stright, A. D., Gallagher, K. C., & Kelley, K. (2008). Infant temperament moderates relations between maternal parenting in early childhood and children's adjustment in first grade. *Child Development, 79*, 186-200.
- Thomas, A., & Chess, S. (1977). *Temperament and development*. New York, NY: Brunner/Mazel.
- Valiente, C., Lemery-Chalfant, K., & Swanson, J. (2010). Prediction of kindergarteners' academic achievement from their effortful control and emotionality: Evidence for direct and moderate relations. *Journal of Educational Psychology, 102*, 550-560.
- Williams, L. R., Degnan, K. A., Perez-Edgar, K. E., Henderson, H. A., Rubin, K. H., Pine, D. S., ... Fox, N. A. (2009). Impact of behavioral inhibition and parenting style on internalizing and externalizing problems from early childhood through adolescence. *Journal of Abnormal Child Psychology, 37*, 1063-1075.
- Windle, M., & Lerner, R. M. (1986). Reassessing the dimensions of temperamental individuality across the life span: the revised dimensions of temperament survey (DOTS-R). *Journal of Adolescent Research, 1*, 213-230.
- Yeung, W. J., Sandberg, J. F., Davis-Kean, P. E., & Hofferth, S. L. (2001). Children's time with fathers in intact families. *Journal of Marriage and Family, 63*, 136-154.
- Zarra-Nezhad, M., Kiuru, N., Aunola, K., Zarra-Nezhad, M., Ahonen, T., Poikkeus, A-M., ... Nurmi, J-E. (in press). Social withdrawal in children moderates the association between parenting styles and the children's own socioemotional development. *Journal of Child Psychology and Psychiatry*.