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Title: The role of mothers' beliefs in students' self-concept of ability development

Year: 2018

Version: Accepted version (Final draft)

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Please cite the original version:

Pesu, L., Aunola, K., Viljaranta, J., Hirvonen, R., & Kiuru, N. (2018). The role of mothers' beliefs in students' self-concept of ability development. *Learning and Individual Differences*, 65(2018), 230-240. <https://doi.org/10.1016/j.lindif.2018.05.013>

Abstract

The aim of this study was to investigate whether the child-related competence beliefs of mothers are associated with the development of Finnish adolescents' self-concept of mathematics and literacy ability during their transition from primary to lower secondary school and whether these associations depend on adolescents' level of performance. The results showed that, first, adolescents' self-concept of mathematics and literacy ability decreased over time. The impact of maternal beliefs on the linear trend of the self-concept of mathematics and literacy ability was dependent on the level of students' performance. Mothers' high beliefs buffered against the decrease in adolescents' self-concept of ability in mathematics, but only among high-performing adolescents. In turn, mothers' high beliefs in adolescents' literacy ability were detrimental to the development of low-performing adolescents' self-concept of ability in literacy, whereas mothers' beliefs had no effect on the change in the self-concept of students with average or high literacy performance.

Keywords: self-concept of ability, mothers' beliefs, transition to lower secondary school, mathematics, literacy

The Role of Mothers' Beliefs in Students' Self-Concept of Ability Development

Previous studies have revealed that students' self-concept of ability is an important predictor of their behavior (Durik, Vida, & Eccles, 2006). The self-concept of students' ability has been defined as students' perception of their current competence in a particular subject area (Eccles, 2005), and it has been found to be associated with, for example, their academic performance (Valentine, DuBois, & Cooper, 2004) and choice of college major (Musu-Gillette, Wigfield, Harring, & Eccles, 2015). One of the most important factors affecting the development of self-concept of ability is parental beliefs about their children's abilities (Frome & Eccles, 1998; Gniewosz, Eccles, & Noack, 2012), and this effect has been found among primary (Frome & Eccles, 1998; Spinath & Spinath, 2005; Simpkins, Fredricks, & Eccles, 2012) and secondary school children (Fredricks & Eccles, 2002; Simpkins et al., 2012), as well as during the transition to lower secondary school (Gniewosz et al., 2012). Recent evidence, however, suggests that the impact of parental beliefs may vary depending on students' level of performance. There is some indication that high-performing students may be more prone to being affected by mothers' beliefs than low-performing students (Pesu, Viljaranta, & Aunola, 2016a; Pesu, Aunola, Viljaranta, & Nurmi, 2016b). However, more evidence is needed on the differential impact of parental support on low- and high-performing students.

As far as we know, only two prior studies have investigated the moderating role of students' performance level in the associations between mothers' beliefs and students' self-concepts of ability. The first of these studies focused on first grade children (Pesu et al., 2016a), while the second focused on lower secondary school students (Pesu et al., 2016b). Besides the obvious need to replicate these studies' findings with other samples, neither of them focused on critical educational transitions. It has been argued that during school transitions, students are

particularly sensitive to external feedback, such as parental beliefs regarding their competencies (Ruble, 1994). Consequently, there is a need for a novel understanding of students' self-concept of ability development and the role of mothers' beliefs on this development during the different transition phases. The present study aims to examine the extent to which mothers' beliefs about their children's abilities predict their children's self-concept of ability development in mathematics and literature during the critical transition from primary to lower secondary school and the possible moderating role of students' level of performance in these associations.

1.1. Self-concept of Ability among Adolescents

The self-concept of one's ability refers to an individual's perception of his or her competence in a certain domain (Eccles, 2005; Wigfield & Eccles, 2000). Previous research has shown that it is highly domain-specific and that children have distinct mathematics and verbal domains in the academic self-concept of abilities (Arens et al., 2011). Self-concept of ability has been shown to impact school achievement and skill development in both the domains of mathematics and literacy: the higher the self-concept of ability in a certain domain (e.g., in mathematics), the higher the subsequent performance in this domain (Marsh & Martin, 2011; Marsh, Trautwein, Lüdtke, Köller, & Baumert, 2005; Valentine et al., 2004). Children tend to have overly positive perceptions of their abilities when they enter school and during the first school year (Aunola, Leskinen, Onatsu-Arviolommi, & Nurmi, 2002; Wigfield & Eccles, 2000), but these perceptions tend to become more realistic and more negative during later school years (Dweck, 2002; Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002).

The stage–environment fit model (see Eccles et al., 1993) focuses on the impact of school transitions on adolescent development and states that a poor fit between changes in individual (e.g., an intensified need for autonomy) and contextual (e.g., stricter grading practices)

levels may lead to a decrease in ability beliefs during a school transition. Accordingly, previous research has documented that students' self-concepts of abilities decrease, on average, during the transition to lower secondary school (Gniewosz et al., 2012). It has been suggested that this declining trend is due to the fact that the transition to lower secondary school comes with changes in adolescents' social relationships as well as in the ways in which adolescents are given feedback in school (see Wigfield, Eccles, Schiefele, Roeser, & Davis-Kean, 2006). During school transitions, adolescents are also faced with many other changes, including new academic challenges: courses become increasingly difficult, students move from a classroom teacher system to a subject teacher system, and there is a change in the reference group to which a student compares his/her skills. Moreover, it has been argued that during school transitions, students are especially susceptible to external feedback, such as parental beliefs concerning their competencies (Ruble, 1994). From this point of view, the transition from primary to lower secondary school can be assumed to be a particularly important period in the development of the self-concept of one's ability and the factors associated with this development.

1.2. Associations between Parental Beliefs and Students' Self-concept of Abilities

Parental beliefs have been suggested to play an important role in the formation of students' ability beliefs (Eccles, 1993). Eccles et al.'s expectancy-value model proposes some mechanisms through which parental beliefs are associated with students' self-concepts of abilities (Eccles, 1993; Eccles et al., 1983; Simpkins et al., 2012). Parents may directly communicate their beliefs to their offspring by encouraging their children to do better in school or by giving them positive feedback (Eccles, 1993). Parents may also indirectly convey their beliefs to their children through the ways in which they behave with their children (Eccles, 1993). There is also empirical evidence showing that parents' beliefs about their children's abilities have an impact on these

children's ability perceptions (Eccles, 1993). For example, in studies by Gniewosz et al. (2012, 2014), parents' perceptions of their children's abilities were found to have a positive impact on the domain-specific self-concept of ability among sixth and seventh grade students (Gniewosz et al., 2012) and among fifth to seventh graders (Gniewosz et al., 2014). Although not yet widely examined, it has recently been suggested that the impact of adults' beliefs on students' self-concept of ability development may be dependent on students' level of performance. Pesu et al. (2016a) found that the role of teachers' beliefs in the development of first grade students' self-concept of ability was particularly evident among high-performing students in both the domains of mathematics and literacy. Similarly, mothers' beliefs were positively related to the development of their children's self-concept of mathematics ability among high-performing students in grades seven to nine, but less so among low-performing students (Pesu et al., 2016b).

One theoretical proposal that lends support to the assumption that low- and high-performing students may be differently impacted by adults' beliefs is self-verification theory (Kwang & Swann, 2010). This theory proposes that people prefer others to see them in the same way in which they see themselves, even when a person's self-perception is negative. People seek self-verification because it makes the world seem more coherent and predictable (Kwang & Swann, 2010). Thus, according to self-verification theory, people who see their abilities as low, for example, in mathematics, have a preference for others to see their abilities in mathematics as low. By contrast, people who consider their abilities in mathematics as high prefer others to perceive these abilities as high. It is thus possible that high-performing students are more likely to benefit from positive teacher and parental beliefs than low-performing students because positive beliefs fit better with their perceptions of themselves. Low-performing students might have strong negative self-perceptions, which would contradict positive beliefs expressed by

teachers and parents; this lack of fit between self-perceptions and external evaluations may explain why teachers' and parents' positive beliefs have a less positive impact on low-performing students' self-concept of ability (see Pesu et al., 2016b). Moreover, it is possible that for low-performing students whose self-concepts of abilities are low, the negative beliefs of adults would be in line with these students' self-concepts and, thus, may have less detrimental impacts on their self-concepts than they might have on those of high-performing students.

Another relevant theory is self-enhancement theory, which proposes that people have a need to see themselves positively (for a review, see Leary, 2007). It has been argued that the self-enhancement motive is a "cornerstone" of psychological activity (Sedikides & Gregg, 2008). According to self-enhancement theory, people tend to engage in self-serving biases that presumably enable them to maintain positive conceptions of themselves. An example of this kind of bias is the tendency to attribute positive outcomes to the self and negative outcomes to external factors (e.g., Blaine & Crocker, 1993). In light of self-enhancement theory, students might have a need to obtain a positive view of themselves and, in this case, would use the positive feedback from adults to serve this need. Based on this theory, mothers' beliefs should be positively connected to students' self-concept of ability, regardless of students' performance level.

Previous research has shown that, at the mean level, parental beliefs have a positive effect on students' self-concept of ability (e.g., Eccles, 1993; Gniewosz et al., 2012). Thus, an important next step in the research on self-concept of ability would be to study whether the predictive effects of parental beliefs are actually similar for students at all ability levels. The present study focuses on mothers' beliefs as a predictor. It has previously been argued that the role of teachers' and parents' beliefs in students' self-concept of ability may be particularly

evident among high-performing students (Pesu et al., 2016a, 2016b). However, this issue represents an under-studied area, and there is a need for further investigation.

1.3. The Finnish School System

The present study was conducted in Finland. In the Finnish educational system, children start school by attending pre-school in the year they turn six. In the year children turn seven, they go to compulsory comprehensive school, which is divided into primary school (grades 1–6) and lower secondary school (grades 7–9). Thus, the transition from primary school to lower secondary school takes place between grades six and seven. In the Finnish school system, the transition from primary to lower secondary school is the first remarkable transition for students. It includes some important changes in the school environment, such as changing school and moving from a classroom teacher system to a subject teacher system. In lower secondary school, students also start to study new school subjects. Moreover, a change of school also means changes in peer relations. In Finnish primary and lower secondary school, students do not need to decide whether to take higher- or lower-level courses. Instead, they all follow the same curriculum and are taught at the same academic level. This characteristic of the Finnish school system is different from, for example, the system in Germany, where students must decide which achievement-based secondary school track they will take as early as 10 years of age (Gniewosz & Noack, 2012). In Finland, as compulsory courses in lower secondary school are at the same level for everyone, both high- and low-performing students study in the same classrooms. Moreover, students need to decide whether to go to vocational school or upper secondary school after grade 9, when they are 15.

1.4. Research Questions and Hypotheses

As described above, there has been a dearth of research on the connections between mothers' beliefs and children's self-concept of ability development in mathematics and literacy during the critical transition from primary to lower secondary school and the possible role of students' level of performance in these associations. Consequently, the present study focuses on the following research questions:

1) How do students' self-concepts of their mathematics and literacy abilities change during the transition to lower secondary school? We hypothesized that students' self-concept of ability declines during grades six and seven in both mathematics and literacy (Cole et al., 2001).

2) To what extent are mothers' beliefs about their children's abilities associated with the levels of students' self-concept in mathematics and literacy ability, on one hand, and the development of their self-concept of ability during the transition from primary to lower secondary school, on the other? Based on earlier literature, we hypothesized a positive association between mothers' beliefs and students' level and developmental trend regarding self-their concept of ability in both mathematics and literacy (e.g., Frome & Eccles, 1998; Jacobs et al., 2002; Pesu et al., 2016b).

3) Does the association between mothers' beliefs and students' self-concept of ability development differ on the basis of students' level of performance? We hypothesized that the positive association between mothers' beliefs about their children's abilities and students' self-concept of ability development would be stronger among high-performing adolescents than among low-performing adolescents. This hypothesis was based on self-verification theory, which lends support to the assumption that high-performing students would be more likely to benefit from positive maternal beliefs than low-performing students, as these positive beliefs fit better with their self-perceptions (Kwang & Swann, 2010). Following the same line of reasoning, we

expected that low-performing students would not be harmed by negative maternal beliefs to the same extent as high-performing students, since low maternal beliefs fit the self-perceptions of low-performing students. However, an alternative hypothesis was developed, which suggested that mothers' positive beliefs increase students' self-concept of ability, whereas negative maternal beliefs decrease students' self-concept of ability, regardless of students' level of performance. This hypothesis was based on self-enhancement theory, according to which students have a need to see themselves positively (Leary, 2007). Thus, based on this assumption, all students would use positive feedback from their mothers to serve this need.

2. Method

2.1. Participants and Procedure

The participants were part of a larger longitudinal study focusing on individual and environment-related factors that promote students' learning and school well-being during the transition from primary to lower secondary school (Authors, 2014). The original sample consisted of 879 primary school students (473 girls and 406 boys) from 56 school classes, ranging in size between 7 and 30 pupils ($M = 21.1$, $SD = 4.66$). The students were recruited from one larger town and one mid-sized town in Central Finland. Both towns were also composed of semi-rural areas with smaller schools. The recruitment of the students was done in cooperation with the school authorities and school principals so as to optimize the participation of entire schools and entire school classes. The average student participation rate was 74%. New students were also recruited to the study at later time points when they moved to the schools participating in the study. In Finland, students from specific primary schools usually transition to certain lower secondary schools. In other words, the primary schools that took part in this study directed students to certain lower secondary schools, which were then recruited for the study with the support of the

local school authorities. The adolescents' parents were also asked to participate in the study. The invitation to participate was targeted primarily at mothers, but fathers were also given an opportunity to participate. In total, 94 fathers completed the parents' questionnaire at Time 1. However, 66 were from families from which the mother also participated. The remaining 28 fathers were the only respondents from their families. As the main focus in the data collections was on the mothers' data, and the mother's sample was thereby more representative, the present study focuses only on mothers. Previous research has shown that mothers are typically more involved than fathers in their offsprings' schooling (Paulson & Sputa, 1996). Moreover, the sample of fathers was too small and under-representative to enable advanced analyses. We did, however, test the correlations between the study variables on the fathers' data and found them to be very similar to those of mothers.

The inclusion criteria for the study were: (a) the student needed to be in grade six at the beginning of the study (fifth graders from combined classes of fifth and sixth graders were excluded); (b) the students' native language had to be Finnish; (c) only mothers and their children were chosen as the target group. These inclusion criteria yielded 814 students (441 girls, 373 boys; mean age = 12.3, $SD = 0.3$ at Time 1 as the study participants. Of them, maternal responses were available for 631 students (77.5% of the students; mothers' mean age = 42, $SD = 5.5$). A total of 809 students (99.4%) participated at the first time point, 806 (99.0%) at the second time point, 772 (94.8%) at the third time point, and 774 (95.1%) at the fourth time point. When the students who participated at all four time points ($n = 745$) were compared with those who had missing data for at least one time point ($n = 69$), the t -test results showed that students with missing data were not as good in literacy ($t(1, 808) = -2.53, p < .05$) and that their mothers'

beliefs in their literacy skills were lower ($t(1, 629) = -2.68, p < .01$) than those of students who participated at all four time points.

The mothers in the sample were somewhat more educated than the average 30- to 54-year-old women in Finland (Official Statistics of Finland, 2016a). A total of 3% of the mothers were not educated beyond comprehensive school (i.e., nine years of basic education); 30% had completed upper secondary education; 40% had a bachelor's degree or vocational college degree; and 27% had a master's degree or higher. The majority of the families (76%) were nuclear families; 13% were single-parent families; 9% were blended families; and 2% comprised other family forms. Compared to Finnish families with underage children (see Official Statistics of Finland, 2016b), nuclear families were overrepresented in the study sample, while single-parent households were underrepresented.

Parents' written consent was requested for their children's and their own participation. Parents were advised to discuss the study with their offspring to ensure the children's own willingness to participate. The teachers of the participating classes gave their written consent for the data to be collected during school days. This longitudinal study was evaluated and approved by the Ethics Committee of the research team's university. American Psychological Association (APA) ethical guidelines have been followed as well as ethical rules on how to handle participants and data, as stated in Finnish universities under Finnish law.

2.2. Procedure

Data from the adolescents were collected in four waves. All data collections were conducted on normal school days by trained testers in the classrooms. The four waves took place in the autumn (Time 1, T1) and spring (Time 2, T2) semesters for Grade 6 and the autumn (Time 3, T3) and

spring (Time 4, T4) semesters for Grade 7. The mothers' data were collected by questionnaires sent to them either on paper by regular mail or electronically, depending on the mothers' preferences. The paper and electronic questionnaires were identical in content. A total of 49% of the mothers filled in the paper questionnaire, and 51% used the electronic form. The mothers completed the questionnaires at approximately the same time as the data on the adolescents were being collected at Time 1. For a more detailed description of the data collection procedures, see Authors (2016a) and Authors (2016b).

2.3. Measures

2.3.1. Self-concept of ability. The students' self-concept of their abilities in mathematics and literacy were assessed at all four time points (T1, T2, T3, and T4) using questions adapted from Eccles and Wigfield (1995) and Spinath and Steinmayr (2008). The students' self-concept of ability in mathematics was assessed with three questions ("How good are you at mathematics calculation problems? How good are you at mathematics story problems? Have you noticed that you have difficulties in mathematics?" [reversed]). The students' self-concept of ability in literacy were examined with four questions ("How good are you at reading precisely and fast? How good are you at reading comprehension? How good are you at spelling? Have you noticed that you have difficulties in reading?" [reversed]). The response scale for all items ranged from 1 (very poor/very big difficulties) to 5 (very good/no difficulties). Cronbach's alpha reliabilities were as follows: for self-concept of ability in mathematics, they were .85 (T1), .86 (T2), .85 (T3), and .86 (T4), and for self-concept of ability in literacy, they were .75 (T1), .73 (T2), .76 (T3), and .77 (T4).

2.3.2. Mothers' beliefs. Mothers' beliefs about their children's school success at T1 were assessed with two items (questions modified from previous studies; Aunola, Nurmi, Niemi,

Lerkkanen, & Rasku-Puttonen, 2002; Eccles Parsons, Adler, & Kaczala, 1982; Frome & Eccles, 1998) using a 5-point Likert scale (1 = poorly, 5 = very well) (“How well is your child doing at the moment in mathematics/literacy? How well do you think your child will do in mathematics/literacy later on in lower secondary school?”). Cronbach’s alpha reliabilities for mothers’ beliefs about their children’s success were .91 in mathematics and .92 in literacy.

2.3.3. Mathematics performance. Mathematics performance at T1 was measured with a basic arithmetic test (Aunola & Räsänen, 2007; Räsänen, Salminen, Wilson, Aunio, & Dehaene, 2009) to assess fluency in arithmetic skills. In this speeded, group-administered test, the participant is required to complete as many arithmetic operations as possible within three minutes. The test consists of 11 additions, 11 subtractions, and 6 tasks that require addition and subtraction or multiplication and division. The test–retest reliability of this task was reported as 0.86 (Räsänen et al., 2009). The score was the total number of correct answers (maximum 28).

2.3.4. Literacy performance. Literacy performance was assessed at T1 with three group-administered subtests, two of which were drawn from the *Dyslexia Screening Test for Youth and Adults* by Holopainen, Kairaluoma, Nevala, Ahonen, and Aro (2004; also see Kiuru et al., 2011; Savolainen, Ahonen, Aro, Tolvanen, & Holopainen, 2008). The spelling error-finding test comprised 100 words typed on a sheet of paper, and the students’ task was to find as many spelling errors as possible within 3.5 minutes. According to the test manual (Holopainen et al., 2004), the test–retest reliability has been found to be satisfactory, as tested in two consecutive assessments in two different cities (.83 and .85). The word chain test comprised 100 words that had been written together in four-word clusters, without spaces between them, and the task was to separate as many words as possible within 1.5 minutes. The test manual (Holopainen et al., 2004) states that the test–retest correlation measured in two Finnish cities turned out to be

satisfactory (.70 and .84). The third reading test was a short version of Salzburg's Sentence Reading Test (Landerl, Wimmer, & Moser, 1997), in which students were asked to read silently and evaluate the truth or falsity of as many of 36 sentences as possible within 1.5 minutes. Two different versions of the Salzburg's Sentence Reading Test were distributed to the students to minimize the possibility of copying the correct answers from classmates. According to the test manual (Pichler & Wimmer, 2006), the reliability of the original Salzburg Sentence Reading Test has been found to be satisfactory: .95 for second grade students and .87 for eighth grade students. A sum score of these three reading tests was calculated by computing the mean of the standardized test scores in each test. Cronbach's alpha reliability for the sum score was .87.

All tests were time-administered to avoid possible ceiling effects. None of the students reached the maximum scores of 100 in the finding spelling errors test and the word chain test, neither did they achieve the maximum score of 28 in the arithmetic test. Two students reached the maximum score of 36 in the Salzburg Reading Test.

2.4. Analyses Strategy

The analyses were carried out for the self-concepts in literacy and mathematics separately and employed latent growth curve modeling (LGM). First, unconditional LGMs were conducted to examine whether self-concepts of literacy and mathematics abilities changed during the transition from primary to lower secondary school and, if so, whether there was individual variation in the initial level and rate of change in students' self-concepts of abilities. In these analyses, two latent growth factors were estimated for latent literacy and mathematics self-concepts: an intercept factor (level) to estimate the initial level of self-concept and a slope factor to estimate the linear growth from T1 to T4. The factor loadings were set to 1 on the intercept factor at each of the four time points. For the linear growth component, the factor loadings were

set to 0, 1, 2, and 3, respectively. Second, the adolescents' initial level of performance in literacy and mathematics and their mothers' beliefs concerning their literacy and mathematics abilities, along with the interaction term Performance \times Mother's belief (the interaction term was calculated as the multiplication of the standardized performance and belief variables), were added to the model to examine whether individual variation in the initial level and changes in the literacy/mathematics self-concept of ability would be predicted by these variables. At this stage, the impacts of the adolescents' gender and their mothers' level of education on the level and change in self-concept were controlled for.

To interpret the nature of the interactions between performance and mothers' beliefs on children's self-concepts in greater detail, we used the Johnson-Neyman Technique (Preacher, Curran, & Bauer, 2006). This technique provides the regions of significance for the range of the moderator variable z (i.e., student performance), within which the simple slope of the dependent variable y (i.e., self-concept) on the independent variable x (i.e., mothers' beliefs) is significantly different from zero at the chosen α -level. As a result, two values describing the upper and lower boundaries of the region of significance were calculated and plotted. The effect of mothers' beliefs on the initial levels/changes in students' self-concept was significant at the values of the students' performance, which were less than the lower boundary and greater than the upper boundary, while the effect of the mothers' beliefs was non-significant at the values of the students' performance falling within the region. The analyses were carried out using the Mplus statistical package version 8.0 (Muthén & Muthén, 1998–2017). The model parameters were estimated using robust maximum likelihood (MLR estimator). Based on the missing at random (MAR) assumption, the full information maximum likelihood estimation was used, which enables the use of all the information in the data without imputation (Muthén & Muthén, 1998–

2015). Missingness at random (MAR) is a weaker condition for missing data than missingness completely at random (MCAR). In the MAR situation, missingness does not depend on the unmeasured variables, although it can depend on the values of the observed variables included in the analyses (Little, 1988). The goodness-of-fit of the estimated models was evaluated with five indicators: χ^2 -test, Bentler's (1990) comparative fit index (CFI), the Tucker–Lewis Index (TLI), the root mean square error of approximation (RMSEA), and the standardized root mean square residual (SRMR). According to Hu and Bentler (1999), values above .95 for TLI and CFI, values below .06 for RMSEA, and values below .08 for SRMR can be considered as indicating a good fit between the hypothesized model and the observed data.

3. Results

The means (*M*s), standard deviations (*SD*s), and Pearson product-moment correlations of the study variables are shown in Table 1.

-----Insert Table 1 about here-----

3.1. Self-Concept of Mathematics Ability

First, the unconditional linear growth model comprising two growth components, i.e., the intercept growth factor (level) and the linear growth rate (linear trend), of the self-concept of mathematics ability was estimated. The intercept was defined as the initial status of the self-concept of mathematics ability. The residual variances of the observed self-concept variables were allowed to be freely estimated. Moreover, the residuals of one of the self-concept items (i.e., difficulty of math) at different time points were allowed to correlate with each other. The model fitted the data well: $\chi^2(59, N = 814) = 253.66, p < .001$; CFI = 0.96; TLI = 0.96; RMSEA = 0.06; SRMR = 0.03.

The results showed that, at the mean level, the self-concept of mathematics ability decreased during the transition from primary school to lower secondary school (mean of the linear trend = -0.04, *s.e.* = 0.01, $p < .001$). The results further showed that there was statistically significant individual variation in both the level ($Var = 0.54$, *s.e.* = 0.03, $p < .001$) and the linear trend ($Var = 0.03$, *s.e.* = 0.00, $p < .001$) of the self-concept of mathematics ability.

Second, the predictor variables (i.e., mathematics performance at T1, maternal beliefs at T1) and the interaction term between them were added to the previous model as predictors of the level and linear trend. To control for the impact of the initial level of the self-concept of mathematics ability on its trend, the path from the level component to the trend component was also estimated. Moreover, to control for the impact of gender and mothers' level of education, paths from these variables to the level and trend components were estimated. The fit of the model was good: $\chi^2(109, N = 814) = 362.91$, $p < .001$; CFI = 0.96; TLI = 0.96; RMSEA = 0.05; SRMR = 0.03. The results are shown in Figure 1.

-----Insert Figure 1 about here-----

The results (Figure 1) showed that both the adolescents' performance in mathematics and their mothers' beliefs were associated with the level of the adolescents' self-concept of mathematics ability: the higher the adolescents' level of mathematics performance and the higher the mothers' beliefs about their children's mathematics performance, the higher the self-concept of mathematics ability the adolescents reported at the beginning of the sixth grade. However, the results further showed that the interaction term performance \times maternal belief was also associated with the adolescents' level of self-concept of mathematics ability. To interpret this interaction further, the Johnson-Neyman Technique was used. The results are shown in Figure 2.

-----Figure 2 about here-----

The results (see Figure 2) demonstrate that mothers' beliefs predicted statistically significantly both low- and high-performing students' level of self-concept of mathematics ability: the higher the mothers' beliefs, the higher the students' initial level of self-concept of mathematics ability. However, mothers' beliefs had a stronger effect on high- than low-performing students' level of self-concept of mathematics ability in Grade 6 (i.e., among high-performing students, both confidence intervals of the regression coefficient of mothers' beliefs on students' self-concept of ability in mathematics were further above zero than those of low-achieving students).

The results further showed that the linear trend of self-concept of mathematics ability was predicted not only by the level of mathematics performance, but also by the interaction term performance \times maternal belief. To interpret this interaction further, the Johnson-Neyman Technique was used. The results are shown in Figure 3.

----- Insert Figure 3 -----

As shown in Figure 3, the effect of mothers' beliefs on the linear change in students' self-concept of ability in mathematics was statistically significant and positive only when student performance was above average (values above +0.2 SD): the higher the mothers' beliefs, the less the decrease in self-concept of ability during the transition from primary to lower secondary school among adolescents whose math performance was above average or high. However, when the students' mathematics performance was average or poor, their mothers' beliefs showed no effect on the linear change in their self-concept of ability in mathematics.

3.2. Self-Concept of Literacy Ability

Next, an unconditional linear growth model comprising the two growth components (i.e., the intercept growth factor (level) and the linear growth rate (linear trend)) of the self-concept of literacy ability was estimated. The intercept was defined as the initial status of the self-concept of literacy ability. The residual variances of the observed self-concept variables were allowed to be freely estimated. Moreover, the residuals of one of the self-concept items (i.e., difficulty of literacy) at different time points were allowed to correlate with each other. The fit of the model was satisfactory: $\chi^2(115, N = 814) = 1013.62, p < .001$; CFI = 0.82; TLI = 0.81; RMSEA = 0.10; SRMR = 0.06. The inspection of the modification indices suggested that estimating the residual correlations of the identical items of the self-concept between different time points would improve the fit of the model. Following these specifications, the fit of the model was good: $\chi^2(105, N = 814) = 385.65, p < .001$; CFI = 0.94; TLI = 0.94; RMSEA = 0.06; SRMR = 0.05.

The results showed that, at the mean level, students' self-concept of literacy ability decreased during the transition from primary to lower secondary school (the mean of the trend = $-0.04, s.e. = 0.01, p < .001$). The results further showed that there was statistically significant individual variation in the level ($Var = 0.32, s.e. = 0.02, p < .001$), but not in the trend, of students' self-concept of literacy ability ($Var = 0.01, s.e. < 0.001, p = .15$).

Finally, predictors were added to the model to explain the level and trend of students' self-concept of literacy ability. After fixing the non-significant path from the interaction term performance \times maternal belief to the level of reading self-concept to zero, the fit of the model was: $\chi^2(178, N = 814) = 611.87, p < .001$; CFI = 0.93; TLI = 0.92; RMSEA = 0.05; SRMR = 0.06. The results are shown in Figure 4.

-----Insert Figure 4 about here-----

The results showed that both maternal beliefs and the level of literacy performance predicted the initial level of students' self-concept of literacy ability: the higher the adolescents' literacy performance and the higher the mothers' beliefs concerning their children's literacy ability, the higher the adolescents' self-concept of literacy ability at the beginning of the sixth grade. The small variation in the linear trend of students' self-concept of literacy ability, in turn, was only predicted by the interaction term performance \times maternal belief. To interpret this interaction further, the Johnson-Neyman Technique was used. The results are shown in Figure 5.

-----Insert Figure 5 about here-----

As shown in Figure 5, the effect of mothers' beliefs on the linear change in students' self-concept of ability in literacy was statistically significant and negative when student performance was below average (values below -1.4 SD): the higher the mothers' beliefs, the more the self-concept of ability in literacy decreased during the transition to lower secondary school among students whose literacy performance was poor. However, when the students' literacy performance was average or high, their mothers' beliefs showed no effect on the linear change in their self-concept of ability in literacy.

4. Discussion

This study examined the development of self-concepts of mathematics and literacy abilities during the transition to lower secondary school in Finland—that is, from the beginning of grade six to the end of grade seven—and the role of mothers' beliefs about their children's abilities in this development. Our main interest was whether the associations between mothers' beliefs and students' self-concept of ability development differ on the basis of students' level of performance. The results showed that, overall, students' self-concepts of mathematics and literacy abilities declined during the transition to lower secondary school. As an important

contribution to the previous literature, the findings of the present study further revealed that the effect of mothers' beliefs on changes in adolescents' self-concepts varied with the level of student performance. Thus, although the adolescents' self-concept of mathematics ability decreased from grades 6 to 7, their mothers' high beliefs buffered against this decrease among above-average and high-performing adolescents. This kind of buffering effect was not evident among low-performing adolescents. In literacy, the results were somewhat different. Mothers' beliefs had no significant effect on the change in the self-concept of literacy ability among adolescents with average or high literacy performance. Instead, mothers' high beliefs in lower-performing adolescents' abilities were related, although weakly, to a steeper decrease in the self-concept of literacy ability.

4.1. The Developmental Trend of Adolescents' Self-concept of Ability during the Transition from Primary to Lower Secondary School

The first aim of the study was to examine whether adolescents' self-concepts of abilities in literacy and mathematics change, on average, during the transition from primary to lower secondary school. The results lend support to Hypothesis 1 by showing that the adolescents' self-concepts, both of their mathematics and literacy abilities, declined during the transition from primary to lower secondary school. In the Finnish context, our results are also in line with earlier findings reported in other educational systems and cultural settings, for example, in the U.S. (Fredricks & Eccles, 2002; Gniewosz et al., 2012; Jacobs et al., 2002). As suggested by the stage–environment fit model (Eccles et al., 1993), the multiple changes that adolescents face during school transitions may lead to a poor fit between changes in the individual (e.g., an intensified need for autonomy) and contextual (e.g., stricter grading practices) levels. This poor fit may explain the decrease in students' ability beliefs during school transitions.

4.2. The Role of Mothers' Beliefs in the Development of Adolescents' Self-concepts of Ability

The results concerning the relationship between mothers' beliefs and adolescents' self-concepts of ability showed that, first, both in mathematics and literacy, mothers' beliefs were positively related to the initial level of their children's self-concepts. Thus, the more positive beliefs the mother had, the higher were the adolescent's self-concepts of ability in the sixth grade, and vice versa. This result is consistent with the expectancy-value theory of Eccles et al. (Eccles Parsons et al., 1982; Wigfield & Cambria, 2010) and with previous empirical research on this topic (Frome & Eccles, 1998; Gniewosz et al., 2014; Lau & Pun, 1999; McGrath & Repetti, 2000) that maternal beliefs have a significant positive effect on students' self-concept of ability. Mothers' beliefs may affect students' self-concept of ability through different kinds of mechanisms. First, it has been suggested that mothers may communicate their beliefs to their children by encouraging them to do better in school or by giving them positive feedback on their effort (Eccles, 1993). Second, mothers may also indirectly convey their beliefs to their children through the ways they behave with their children (Eccles, 1993). Overall, the result that the mothers' beliefs were positively associated with the initial level of the adolescents' self-concepts in mathematics and literacy, regardless of the level of the students' performance, is in line with self-enhancement theory, which suggests that people have a tendency and a need to see themselves positively (Leary, 2007). Another explanation for the result is, however, that a third factor—adolescents' actual ability level—might explain both positive maternal beliefs and adolescents' own self-concepts. It has been previously found that both students and parents use the information from grades in forming their competence beliefs (Gniewosz et al., 2014).

Second, the results showed that mothers' beliefs of their adolescent children's ability were related to the changes in these adolescents' self-concepts of ability. However, this effect was found to vary according to the adolescents' performance level and the subject domain. In the domain of mathematics, mothers' high beliefs were found to buffer against the decrease in adolescents' self-concept of mathematics ability, but only among high-performing adolescents. Thus, the more positive beliefs the mothers had about high-performing adolescents' abilities, the less these students' self-concept in mathematics decreased during the transition to lower secondary school. In turn, the less positive the mothers' beliefs, the steeper was the decrease in high-performing students' self-concept of ability development. Among low-performing students, mothers' beliefs were not related to the changes in self-concept of mathematics ability. Overall, this pattern of findings is in line with our first hypothesis for research question 3, which suggested that the positive association between mothers' beliefs about their children's abilities and students' self-concept of ability development is stronger among high-performing adolescents than among low-performing adolescents.

One explanation for this result draws on self-verification theory (Kwang & Swann, 2010), according to which people prefer others to see them in the same way that they see themselves, even when their self-perception is negative. Consequently, it may be that high-performing students benefit more from their mothers' positive beliefs than low-performing students, and as such, positive beliefs fit better with these students' perceptions of themselves. Similarly, negative maternal beliefs may be less detrimental to low-performing students than to high-performing students, as low maternal beliefs fit with low-performing students' self-perceptions. Besides self-verification theory, there are also alternative explanations for the results. For example, one possible explanation is that students' cognitive abilities affect the way

they perceive and interpret the beliefs of their mothers (Bohlmann & Weinstein, 2013). High-performing students may have better cognitive ability to more accurately perceive and interpret their mothers' beliefs and, consequently, benefit more from positive maternal beliefs (see also Pesu et al., 2016b). It may also be that above-average and high-performing students feel encouraged by their mothers' positive beliefs, whereas low-performing students may feel discouraged or pressured by positive maternal beliefs. Further investigation is needed to examine the suggested differences in the thinking patterns and interpretation mechanisms between low- and high-performing students.

Mothers' high beliefs in adolescents' literacy abilities, as opposed to mathematics abilities, were related to a steeper decrease in low-performing adolescents' self-concept of ability. In other words, decreases in low-performing students' self-concept were less dramatic if their mothers had less positive beliefs about their abilities. Among students with average or high literacy performance, mothers' beliefs had no effect on the change in the self-concept of literacy ability. This result was somewhat unexpected and, in contrast to our hypothesis, suggests that high-performing students are more prone to being impacted by maternal beliefs than low-performing students. One explanation for this result might be that, as suggested by self-verification theory, mothers' positive beliefs concerning low-performing students are incongruent with the students' perceptions of their own abilities and that this disparity then has negative consequences for the development of these students' self-concept of literacy ability. However, when interpreting this particular finding, it should be noted that since the variance in the trend of the self-concept of literacy ability was not statistically significant, the impact of maternal beliefs on that trend should be interpreted with caution and as tentative only.

Interestingly, the results concerning the effects of mothers' beliefs on the development of low- and high-performing students' self-concepts of ability were somewhat different in mathematics and literacy. In mathematics, mothers' positive beliefs buffered against the decrease in the self-concept of ability of above-average and high-performing adolescents, but not among low-performing adolescents. In literacy, in contrast, mothers' beliefs had no effect on the change in the self-concept of literacy ability among average or high-performing adolescents, whereas among low-performing adolescents, mothers' high beliefs were related, although weakly, to a steeper decrease in the self-concept of literacy ability. In previous studies on Finland, the role of mothers' beliefs in students' self-concept of ability has been demonstrated to be different in the domains of mathematics and literacy. For example, Pesu et al. (2016b) found that mothers' beliefs about their children's abilities had a positive effect on self-concept of ability in mathematics, though not in literacy, among seventh and ninth grade students.

The fact that the effect of mothers' beliefs on low- and high-performing students' self-concepts of ability varied between mathematics and literacy may be due to the differences in mathematics and literacy as school subjects. Mathematics is a subject in which students may more easily see their success and progress. For example, mathematical problems can be solved either correctly or incorrectly; there are usually no in-between options. In literacy, it may be less straightforward for students to see their success, and it is more difficult to indicate whether they have succeeded or failed, for example, in writing a short story. This difference between school subjects might also make it easier for mothers to see their children's success or failure in mathematics, whereas success or failure in literacy may not be so clear to them. Consequently, it might be easier for mothers to form a conception of their children's success in mathematics compared to literacy and to convey these conceptions to their child. This could further explain

why mothers' beliefs had a buffering effect against the decrease in students' self-concept in mathematics but not in literacy. This explanation is speculative, however, and needs further investigation, although some support for similar kinds of effects have been found in other motivational constructs. For example, it has been found among seventh through ninth graders that parents' beliefs play a more significant role in students' interest and importance values in mathematics than in literacy (Viljaranta, Lazarides, Aunola, Rääkkönen, & Nurmi, 2015).

The results of the present study – which show that in mathematics, mothers' beliefs buffered against the decrease in the self-concept of ability of high-performing students, but not among low-performing students, and that in literacy, mothers' high beliefs in adolescents' abilities were related to a steeper decrease in low-performing adolescents' self-concept of ability – are important in many ways. These results lend some support to the assumption that mothers' beliefs play varying roles among high- and low-performing students. Future studies should take this result into consideration and investigate whether low- and high-performing students benefit differently, on average, from parental support. Moreover, this information is important for planning interventions to improve students' self-concepts and school motivation. It is important to note that because mothers' beliefs were shown to have an impact on their children's self-concepts of ability and because self-concept of ability has been shown to be related to academic success (Valentine et al., 2004) and academic choices (Musu-Gillette et al., 2015), these beliefs likely have an effect on their children's academic success and choices via their impact on adolescents' self-concept of ability development. This link should be further investigated.

4.3. Limitations

This study has several limitations. First, although the study design was longitudinal, it is possible that a third factor that was not controlled for could have explained the predictions found.

Therefore, any judgement on the possible causality of the results should be made with caution. Second, this study was conducted in a single educational setting in Finland. The role of mothers' beliefs in students' self-concept of ability may vary in different educational settings and cultures, and thus, further cross-cultural research on the topic is required. Third, the study focused on maternal beliefs because the sample of fathers was too small and under-representative to enable advanced analyses. It is possible that mothers and fathers play a different role in adolescents' self-concept of ability development, and thus, future studies should also include fathers. Fourth, mechanisms that might explain why mothers' beliefs are conveyed to students were not studied. These possible mechanisms should be investigated in future studies.

4.4. Conclusions

The findings of the present study expand on the previous results of Pesu et al. (2016b) by showing that mothers' positive beliefs predict self-concepts of mathematics ability more strongly among high-performing adolescents than among low-performing adolescents, not only during lower secondary school (Pesu et al., 2016b), but also during the critical transition from primary to lower secondary school. The transition to lower secondary school is the first remarkable school transition for Finnish students. It includes changes in school environment, such as changing school and moving to a subject teacher system. The results of this study suggest that maternal beliefs continue to play an important role in the development of early adolescents' self-concepts of abilities during the transition to lower secondary school. Because self-concept of ability is crucial for many academic behaviors and choices (Bouchey & Harter, 2005; Eccles Parsons et al., 1983; Marsh & Martin, 2011), it is important to find ways that best support students' developing self-concepts during critical school transitions. Furthermore, it is crucial to consider individual differences in how forms of support are received, as the present study

showed that low- and high-performing students might benefit from their mothers' beliefs in different ways. Finally, it is important for schools and teachers to inform parents about the important role they can have in the development of their children's self-concept in different academic domains.

References

- Arens, A. K., Yeung, A. S., Craven, R. G., & Hasselhorn, M. (2011). The twofold multidimensionality of academic self-concept: Domain specificity and separation between competence affect components. *Journal of Educational Psychology, 103*, 970–981. doi: 10.1037/a0025047.
- Aunola, K., Leskinen, E., Onatsu-Arvilommi, T., & Nurmi, J.-E. (2002). Three methods for studying developmental change: A case of reading skills and self-concept. *British Journal of Educational Psychology, 72*, 343–364. doi: 10.1348/000709902320634447
- Aunola, K., Nurmi, J.-E., Niemi, P., Lerkkanen, M.-K., & Rasku-Puttonen, H. (2002). Developmental dynamics of achievement strategies, reading performance, and parental beliefs. *Reading Research Quarterly, 37*, 310–327. doi: 10.1598/RRQ.37.3.3
- Aunola, K., & Räsänen, P. (2007). The 3-minutes Basic Arithmetic Test. Unpublished test material. Jyväskylä, Finland.
- Blaine, B., & Crocker, J. (1993). Self-esteem and self-serving biases in reactions to positive and negative events: An integrative review. In R. F. Baumeister (Ed.), *Self-esteem: The puzzle of low self-regard* (pp. 55-85). Hillsdale, NJ: Erlbaum.
- Bohlmann, N., & Weinstein, R. (2013). Classroom context, teacher expectations, and cognitive level: Predicting children's math ability judgments. *Journal of Applied Developmental Psychology, 34*, 288–298. doi: 10.1016/j.appdev.2013.06.003
- Bouchey, H. A., & Harter, S. (2005). Reflected appraisals, academic self-perceptions, and math/science performance during early adolescence. *Journal of Educational Psychology, 97*, 673–686. doi: 10.1037/0022-0663.97.4.673

- Cole, D. A., Maxwell, S. E., Martin, J. M., Peeke, L. G., Seroczynski, A. D., Tram, J. M., & Maschman, T. (2001). The development of multiple domains of child and adolescent self-concept: A cohort sequential longitudinal design. *Child Development, 72*, 1723–1746. doi:10.1111/1467-8624.00375
- Durik, A. M., Vida, M., & Eccles, J. S. (2006). Task values and ability beliefs as predictors of high school literacy choices: A developmental analysis. *Journal of Educational Psychology, 98*, 382–393. doi: 10.1037/0022-0663.98.2.382
- Dweck, C. S. (2002). The development of ability conceptions. In A. Wigfield & J. S. Eccles (Eds.), *Development of achievement motivation* (pp. 57–88). San Diego, CA: Academic Press.
- Eccles, J. S. (1993). School and family effects on the ontogeny of children's interests, self-perceptions, and activity choices. In J. E. Jacobs & R. Dienstbier (Eds.), *Developmental perspectives on motivation* (pp. 145–208). University of Nebraska Press.
- Eccles, J. S. (2005). Subjective task value and the Eccles et al. model of achievement-related choices. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 105–121). New York, NY: Guilford Press.
- Eccles, J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motivation* (pp. 75–146). San Francisco: W. H. Freeman.
- Eccles, J. S., Midgley, C., Wigfield, A., Buchanan, C. M., Reuman, D., Flanagan, C., & MacIver, D. (1993). Development during adolescence: The impact of stage-environment fit

- on young adolescents' experiences in schools and in families. *American Psychologist*, 48, 90–101. doi: 10.1037/0003-066X.48.2.90
- Eccles Parsons, J., Adler, T. F., & Kaczala, C. M. (1982). Socialization of achievement attitudes and beliefs: Parental influences. *Child Development*, 53, 310–321. doi: 10.2307/1128973
- Eccles, J. S., & Wigfield, A. (1995). In the mind of the actor: The structure of adolescents' achievement task values and expectancy-related beliefs. *Personality and Social Psychology Bulletin*, 21, 215–225. doi: 10.1177/0146167295213003
- Fredricks, J. A., & Eccles, J. S. (2002). Children's competence and value beliefs from childhood through adolescence: Growth trajectories in two male-sex-typed domains. *Developmental Psychology*, 38, 519–533. doi: 10.1037/0012-1649.38.4.519
- Frome, P. M., & Eccles, J. S. (1998). Parents' influence on children's achievement-related perceptions. *Journal of Personality and Social Psychology*, 74, 435–452. doi: 10.1037/0022-3514.74.2.435
- Gniewosz, B., Eccles, J. S., & Noack, P. (2012). Secondary school transition and the use of different sources of information for the construction of the academic self-concept. *Social Development*, 21, 537–557. doi: 10.1111/j.1467-9507.2011.00635.x
- Gniewosz, B., Eccles, J. S., & Noack, P. (2014). Early adolescents' development of academic self-concept and intrinsic task value: The role of contextual feedback. *Journal of Research on Adolescence*, 25, 1–15. doi: 10.1111/jora.12140.
- Holopainen, L., Kairaluoma, L., Nevala, J., Ahonen, T., & Aro, M. (2004). *Lukivaikeuksien seulontamenetelmä nuorille ja aikuisille* [Dyslexia Screening Test for Youth and Adults]. Jyväskylä: University of Jyväskylä.

- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, 6, 1-55. doi: 10.1080/10705519909540118
- Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one through twelve. *Child Development*, 73, 509–527. doi: 10.1111/1467-8624.00421
- Kiuru, N., Haverinen, K., Salmela-Aro, K., Nurmi, J-E., Savolainen, H. & Holopainen, L. (2011). Students with reading and spelling disabilities: Peer groups and educational attainment in secondary education. *Journal of Learning Disabilities*, 44, 556–569. doi: 10.1177/0022219410392043
- Kwang, T., & Swann, W. B. (2010). Do people embrace praise even when they feel unworthy? A review of critical tests of self-enhancement versus self-verification. *Personality and Social Psychology Review*, 14, 263–280. doi: 10.1177/1088868310365876
- Landerl, K., Wimmer, H., & Moser, E. (1997). *Salzburger Lese- und rechtschreibtest* [Salzburg Reading and Spelling Test]. Bern: Huber.
- Lau, S., & Pun, K-T. (1999). Parental evaluations and their agreement: Relationship with children's self-concepts. *Social Behavior and Personality*, 27, 639–650. doi: 10.2224/sbp.1999.27.6.639
- Leary, M. R. (2007). Motivational and emotional aspects of the self. *Annual Review of Psychology*, 58, 317-344. doi: 10.1146/annurev.psych.58.110405.085658
- Little, R. J. A. (1988). A test of missing completely at random for multivariate data with missing values. *Journal of the American Statistical Association*, 83, 1198–1202. doi: 10.1080/01621459.1988.10478722

- Marsh, H. W., & Martin, A. J. (2011). Academic self-concept and academic achievement: Relations and causal ordering. *British Journal of Educational Psychology, 81*, 59–77. doi: 10.1348/000709910X503501
- Marsh, H. W., Trautwein, U., Lüdtke, O., Köller, O., & Baumert, J. (2005). Academic self-concept, interest, grades, and standardized test scores: Reciprocal effects models of causal ordering. *Child Development, 76*, 397–416. doi: 10.1111/j.1467-8624.2005.00853.x
- McGrath, E. P., & Repetti, R. L. (2000). Mothers' and fathers' attitudes toward their children's academic performance and children's perceptions of their academic competence. *Journal of Youth and Adolescence, 29*, 713–723. doi: 10.1023/A:1026460007421
- Midgley, C., & Edelin, K. C. (1998). Middle school reform and early adolescent well-being: The good news and the bad. *Educational Psychologist, 33*, 195–106. doi: 10.1207/s15326985ep3304_4
- Musu-Gillette, L. E., Wigfield, A., Harring, J. R., & Eccles, J. S. (2015). Trajectories of change in students' self-concepts of ability and values in math and college major choice. *Educational Research and Evaluation, 21*, 343–370. doi: 10.1080/13803611.2015.1057161
- Official Statistics of Finland (2016a). *Educational structure of population* (e-publication). Helsinki, Finland: Statistics Finland. Retrieved from www.stat.fi/til/vkour/2014/vkour_2014_2015-11-05_tie_001_en.html
- Official Statistics of Finland (2016b). *Families. Appendix Table 3: Families with underage children by type in 1950–2014* (e-publication). Helsinki, Finland: Statistics Finland. Retrieved from www.stat.fi/til/perh/2014/perh_2014_2015-05-28_tau_003_en.html

- Paulson, S. E., & Sputa, C. L. (1996). Patterns of parenting during adolescence: Perceptions of adolescents and parents. *Adolescence, 31*, 369-382.
- Pesu, L., Viljaranta, J., & Aunola, K. (2016a). The role of parents' and teachers' beliefs in children's self-concept development. *Journal of Applied Developmental Psychology, 44*, 63–71. doi: 10.1016/j.appdev.2016.03.001
- Pesu, L., Aunola, K., Viljaranta, J., & Nurmi, J.-E. (2016b). The Development of Adolescents' Self-concept of Ability through Grades 7-9 and the Role of Parental Beliefs. *Frontline Learning Research, 4*, 92–109. doi: 10.14786/flr.v4i3.249
- Pichler, C., & Wimmer, L. (2006). Das salzburger Lesescreening 2-9. Handreichung für Lehrerinnen und Lehrer. Based on Mayringer, H., & Wimmer, H. (2003). *Salzburger Lesescreening für die Klassenstufen 1-4* and Auer, M., Gruber, G., Mayringer, H., & Wimmer, H. (2005). *Salzburger Lesescreening für die Klassenstufen 5-8*.
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437-448. doi:10.3102/10769986031004437
- Ruble, D. N. (1994). A phase model of transitions: Cognitive and motivational consequences. *Advances in Experimental Social Psychology, 26*, 163–214. doi: 10.1016/S0065-2601(08)60154-9
- Räsänen, P., Salminen, J., Wilson, A. J., Aunio, P., & Dehaene, S. (2009). Computer-assisted intervention for children with low numeracy skills. *Cognitive Development, 24*, 450–472. doi: 10.1016/j.cogdev.2009.09.003
- Savolainen, H., Ahonen, T., Aro, M., Tolvanen, A., & Holopainen, L. (2008). Reading comprehension, word reading and spelling as predictors of school achievement and

- choice of secondary education. *Learning and Instruction, 16*, 201–210. doi: 10.1016/j.learninstruc.2007.09.017
- Sedikides, C., & Gregg, A. P. (2008). Self-enhancement: Food for thought. *Perspectives on Social Psychology, 3*, 102-116. doi: 10.1111/j.1745-6916.2008.00068.x
- Simpkins, S. D., Fredricks, J. A., & Eccles, J. S. (2012). Charting the Eccles' expectancy-value model from mothers' beliefs in childhood to youths' activities in adolescence. *Developmental Psychology, 48*, 1019–1032. doi: 10.1037/a0027468
- 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. doi: 10.1016/j.learninstruc.2005.04.008
- Spinath, B., & Steinmayr, R. (2008). Longitudinal analysis of intrinsic motivation and competence beliefs: Is there a relation over time? *Child Development, 79*, 1555–1569. doi: 10.1111/j.1467-8624.2008.01205.x
- Starkey, P., & Klein, A. (2000). Fostering parental support for children's mathematical development: An intervention with Head Start families. *Early Education and Development, 11*, 659-81. doi: 10.1207/s15566935eed1105_7
- Valentine, J. C., DuBois, D. L., & Cooper, H. (2004). The relation between self-beliefs and academic achievement: A meta-analytic review. *Educational Psychologist, 39*, 111–133. doi: 10.1207/s15326985ep3902_3
- Viljaranta, J., Lazarides, R., Aunola, K., Räikkönen, E., & Nurmi, J. E. (2015). The different role of mothers' and fathers' beliefs in the development of adolescents' mathematics and literacy task values. *International Journal of Gender, Science and Technology, 7*. 297–317.

- Wigfield, A., & Cambria, J. (2010). *Expectancy-value theory: Retrospective and prospective*. In *The decade ahead: Theoretical perspectives on motivation and achievement* (pp. 35-70). Emerald Group Publishing Limited.
- Wigfield, A., & Eccles, J. S. (2000). Expectancy-value theory of achievement motivation. *Contemporary Educational Psychology, 25*, 68–81. doi: 10.1006/ceps.1999.1015
- Wigfield, A., Eccles, J. S., Schiefele, U., Roeser, R. W., & Davis-Kean, P. (2006). Development of achievement motivation. In N. Eisenberg, W. Damon, & R. M. Lerner (Eds.), *Handbook of child psychology: Vol. 3, Social, emotional, and personality development* (6th ed., pp. 933–1002). Hoboken, NJ: John Wiley.

Figure captions.

Figure 1. Latent Growth Curve Model with Predictors for Children's Self-concept of Mathematics Ability (Standardized Estimates). *Note.* *** $p < .001$, ** $p < .01$, * $p < .05$.

Figure 2. The effect of mothers' beliefs on the level of children's self-concept of mathematics as a function of students' level of math performance. The X-axis depicts a continuous range of student performance (moderator variable) values. The Y-axis depicts a continuous range of values for the adjusted effect of mothers' beliefs on the initial level of students' self-concept. The straight plot line represents values of the adjusted effect that correspond to the full range of all continuous values of student performance requested (i.e., -2 to +2). The curved lines above and below the plot line represent 95% confidence bands around the adjusted effect of mothers' beliefs on the initial level of self-concept in mathematics.

Figure 3. The effect of mothers' beliefs on the linear change of children's self-concept of mathematics as a function of students' level of math performance. The X-axis depicts a continuous range of student performance (moderator variable) values. The Y-axis depicts a continuous range of values for the adjusted effect of mothers' beliefs on the linear change of student self-concept. The straight plot line represents values of the adjusted effect that correspond to the full range of all continuous values of student performance requested (i.e., -2 to +2). The curved lines above and below the plot line represent 95% confidence bands around the adjusted effect of mothers' beliefs on the linear change of self-concept in mathematics. When the standardized score of students' level of math performance is over the value 0.2 (dashed line), the effect of mothers' beliefs on the linear change of self-concept is positive and statistically significant, whereas when the value of math performance is lower than 0.2, mothers' beliefs have no effects on the change of students' self-concept.

Figure 4. Latent Growth Curve Model with Predictors for Children's Self-concept of Literacy Ability (Standardized Estimates). *Note.* *** $p < .001$, ** $p < .01$, * $p < .05$.

Figure 5. The effect of mothers' beliefs on the linear change of children's self-concept of literacy as a function of students' reading performance. The X-axis depicts a continuous range of students' reading performance (moderator variable) values. The Y-axis depicts a continuous range of values for the adjusted effect of mothers' beliefs on the linear change of students' self-concept. The straight plot line represents values of the adjusted effect that correspond to the full range of all continuous values of student performance requested (i.e., -2 to +2). The curved lines above and below the plot line represent 95% confidence bands around the adjusted effect of mothers' beliefs on the linear change of self-concept in literacy. When the standardized score of students' level of reading performance is below the value -1.4 (dashed line), the effect of mothers' beliefs on the linear change of self-concept is negative and statistically significant, whereas when the value of reading performance is higher than -1.4, mothers' beliefs have no effects on the change of students' self-concept.

Table 1

Intercorrelations, Means, and Standard Deviations for the Study Variables

Variables	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Self-concept literacy T1													
2. Self-concept literacy T2	.71***												
3. Self-concept literacy T3	.68***	.74***											
4. Self-concept literacy T4	.65***	.66***	.72***										
5. Self-concept math T1	.35***	.25***	.20***	.21***									
6. Self-concept math T2	.29***	.31***	.23***	.23***	.78***								
7. Self-concept math T3	.32***	.28***	.33***	.29***	.72***	.76***							
8. Self-concept math T4	.26***	.23***	.25***	.32***	.63***	.71***	.76***						
9. Performance literacy T1	.49***	.48***	.45***	.50***	.20***	.20***	.22***	.19***					
10. Performance math T1	.21***	.21***	.15***	.20***	.47***	.49***	.47***	.42***	.47***				
11. Mother belief literacy T1	.47***	.44***	.41***	.43***	.16***	.19***	.21***	.23***	.52***	.30***			
12. Mother belief math T1	.27***	.22***	.17***	.22***	.59***	.58***	.56***	.50***	.36***	.55***	.55***		

13. Gender	-.12**	-.17***	-.16***	-.13***	.23***	.20***	.16***	.11**	-.22***	.10**	-.33***	.07
<i>M</i>	3.89	3.88	3.89	3.78	3.84	3.79	3.82	3.74	.00	.00	.00	.00
<i>SD</i>	0.52	0.52	0.54	0.56	0.73	0.72	0.73	0.79	1.00	1.00	1.00	1.00

Note. *** $p < .001$. ** $p < .01$. * $p < .05$. T1 = time 1, T2= time 2, T3 = time 3, T4 = time 4. Literacy and mathematics performance and mothers' beliefs are standardized variables.

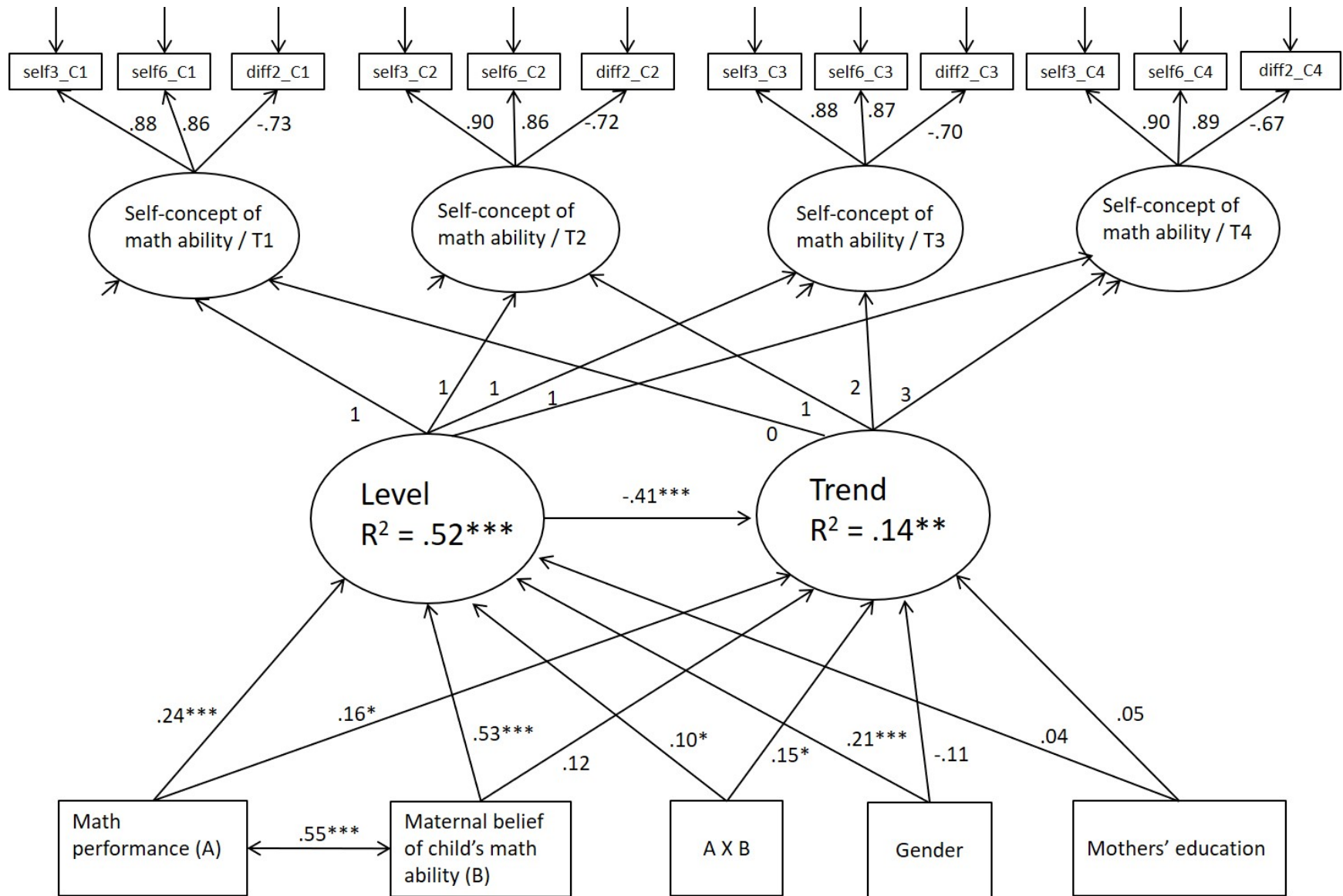


Figure 1.

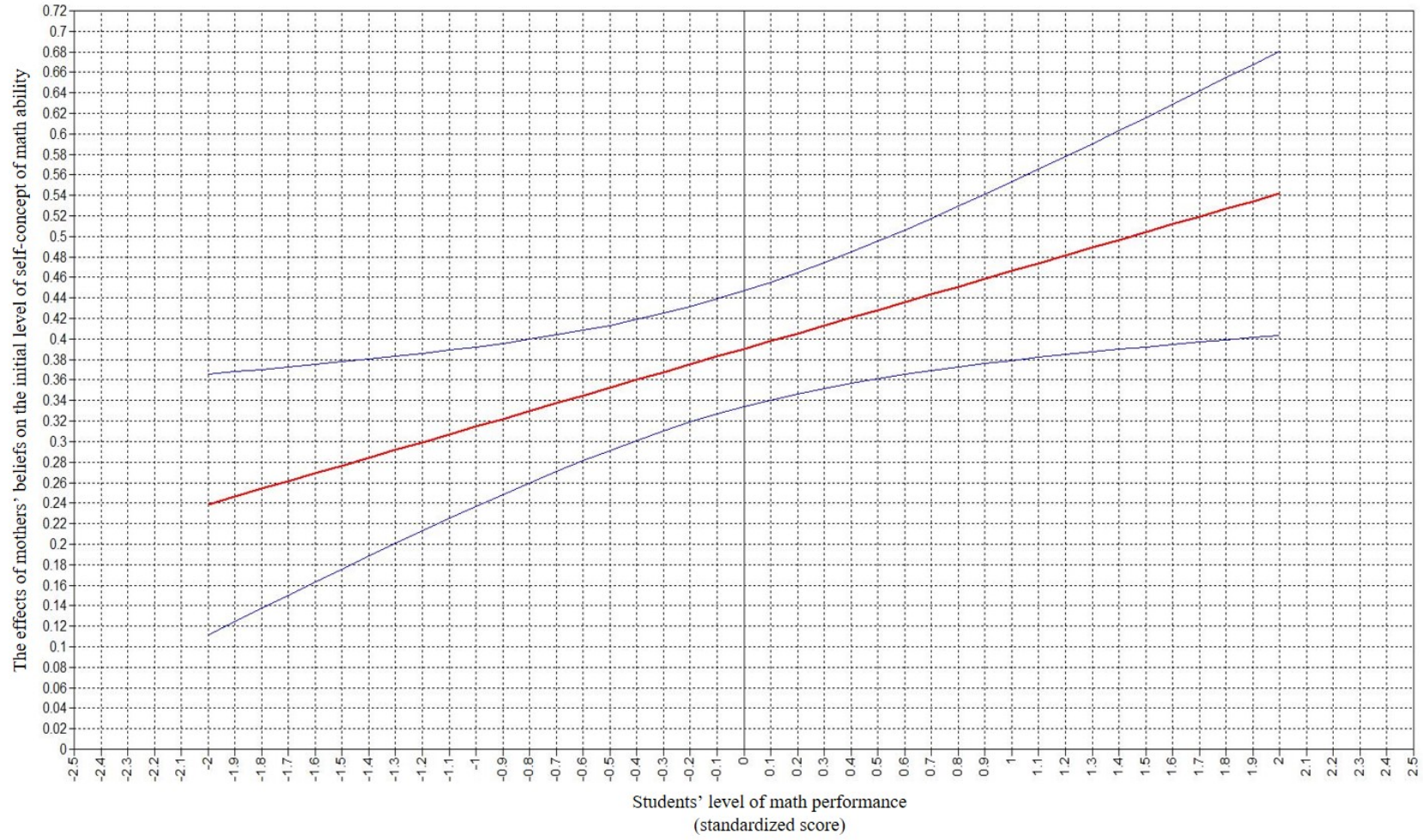


Figure 2.

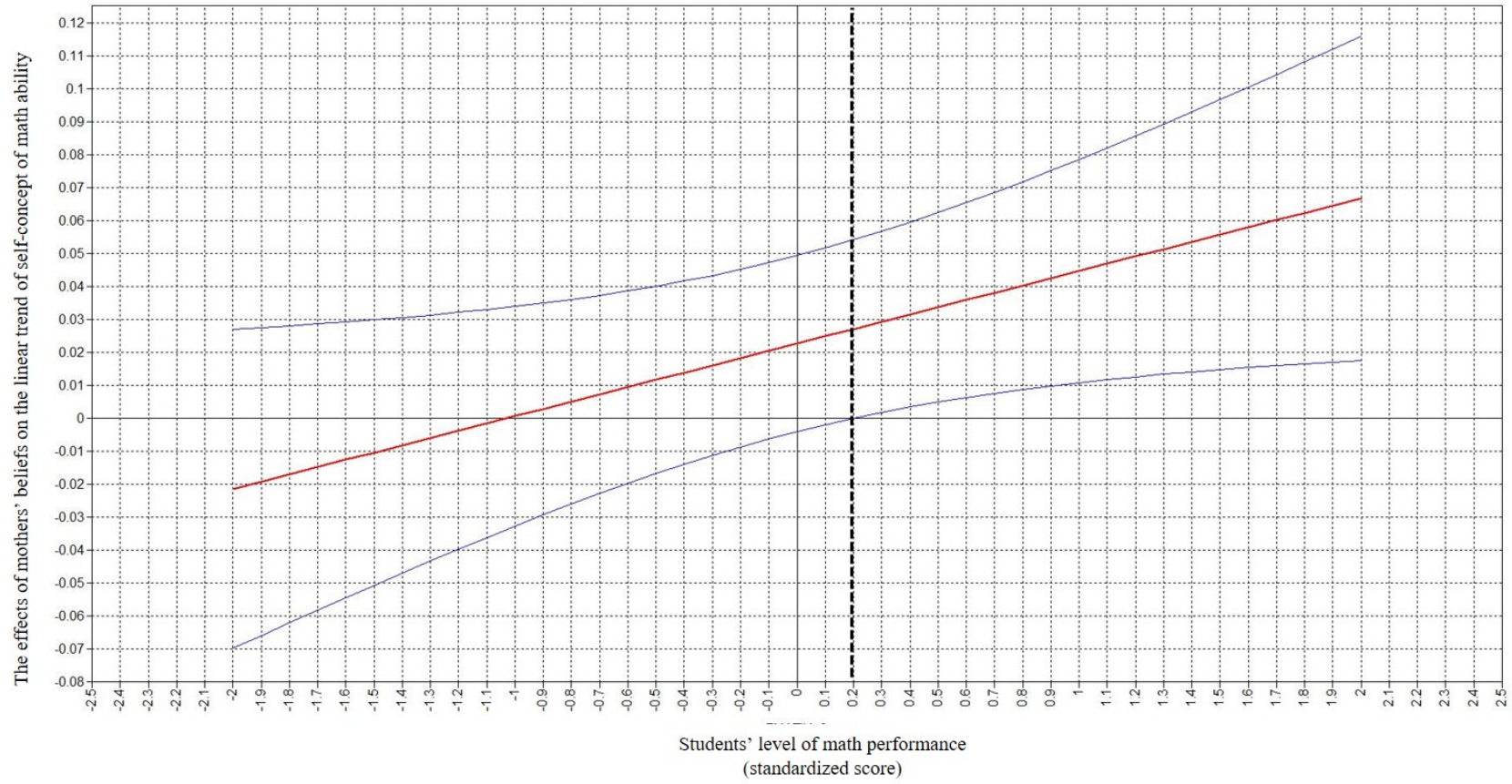


Figure 3.

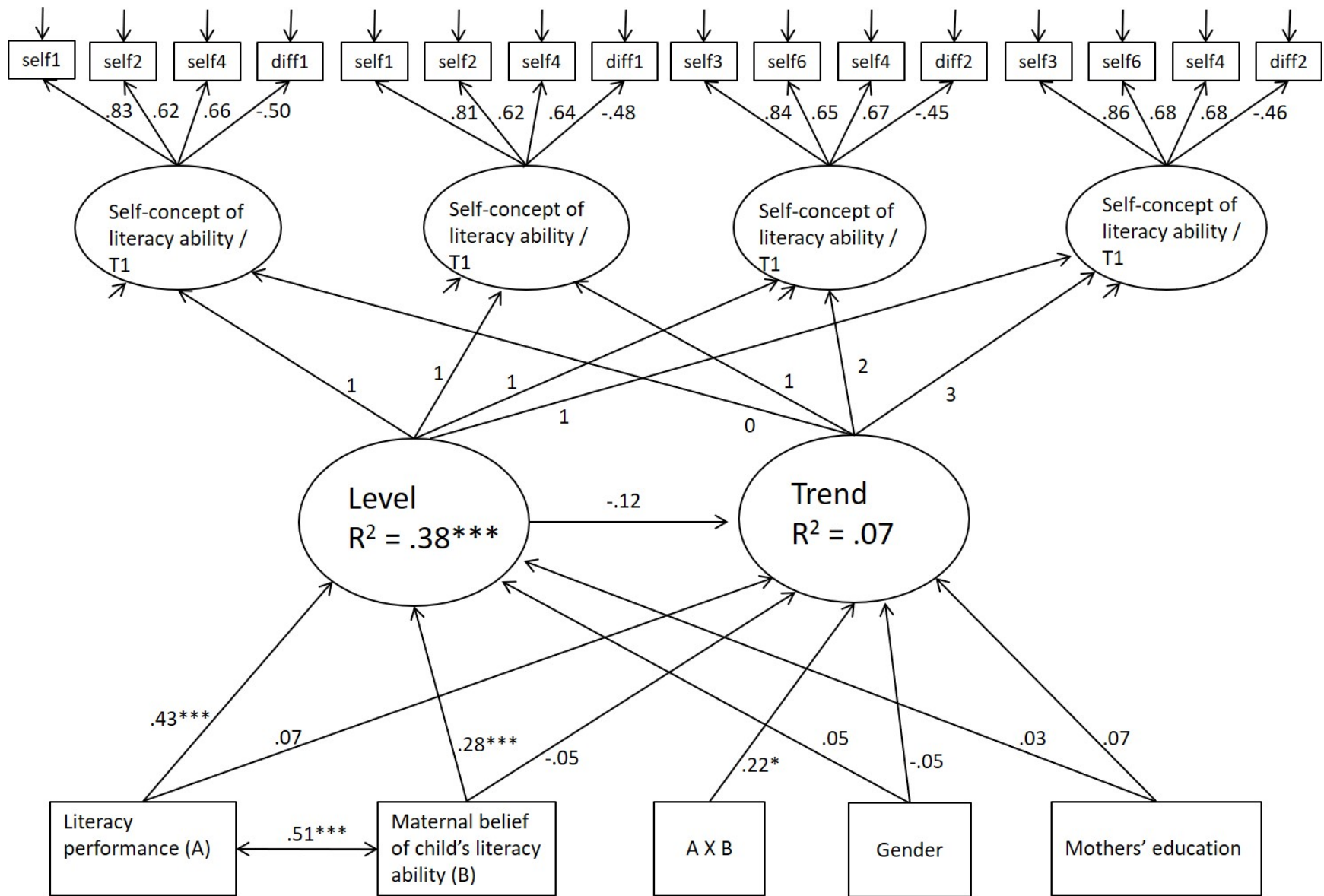


Figure 4.

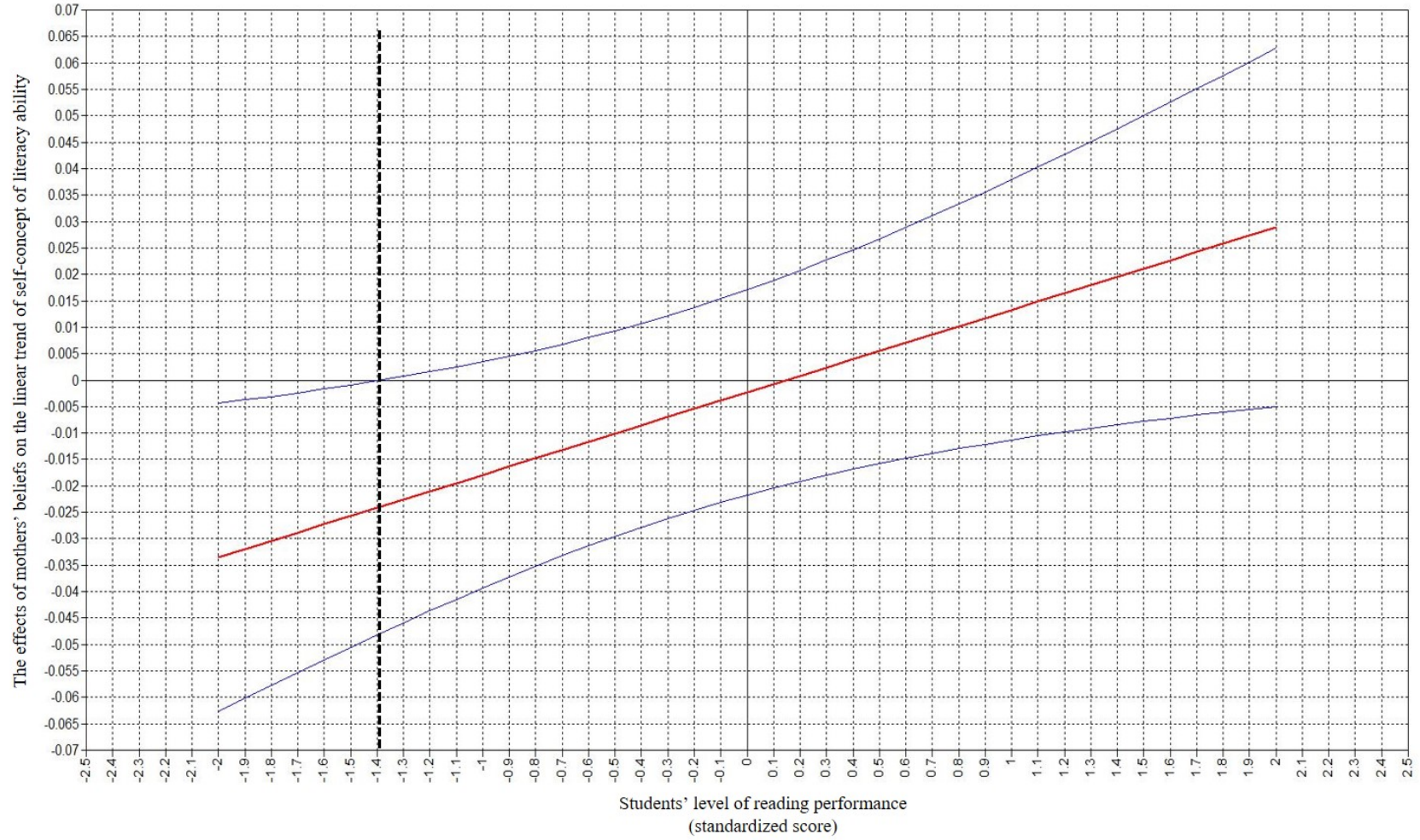


Figure 5.