



# Reciprocal Associations Between Social Competence and Language and Pre-Literacy Skills in Preschool

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**ABSTRACT:** The present study examined reciprocal associations between children's social competence and language and pre-literacy skills across the preschool year. Participants were 441 children (six-year-olds; 212 boys, 229 girls) and their teachers. Teachers rated children's social competence in the autumn and again in the spring, using the Multisource Assessment of Social Competence Scale (MASCS), which produced sum scores for cooperating skills, empathy, impulsivity and disruptiveness. Children were tested by trained investigators on their pre-literacy skills in both the autumn and the spring, and, only in the spring, also on their receptive vocabulary. Parental education, each child's age and time elapsed between the measurement points were used as control variables. The gender differences in the reciprocal associations were also investigated. The results showed that cooperating skills predicted a higher vocabulary. Associations between social competence and pre-literacy skills varied between boys and girls. For girls, empathy and cooperating skills predicted higher pre-literacy skills, whereas, for boys, pre-literacy skills predicted subsequent empathy. For boys, higher pre-literacy skills were related to lower disruptiveness and impulsivity, whereas, for girls, higher disruptiveness predicted lower pre-literacy skills. The findings highlight the reciprocal association between social-emotional and pre-literacy skills and emphasise the importance of promoting children's overall development during the preschool year.

**Keywords:** *social competence, pre-literacy skills, gender, preschool*

## Introduction

A conceptual model of school readiness identifies both academic and social competence as important determinants of children's functioning at school entry (Blair, 2002). As early as their preschool days, children face, not only heightened pressure to acquire sufficient pre-academic skills, but also increased expectations of adaptive social behaviours. A growing body of empirical research documents that children's social-emotional skills play an important role in their academic performance and psychosocial functioning at school (e.g., Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000; Vitiello & Williford, 2016). Caprara et al. (2000), for example, demonstrate that early prosocial behaviours have stronger effects on children's later academic achievements than do their previous academic achievements in terms of grades. Consequently, it has been proposed that social competence is an important indicator of school readiness, which is directly related to children's ability to engage in peer interactions and learning activities and, thereby, facilitates learning later at school (Blair, 2002; Curby, Brown, Bassetta, & Denham, 2015).

At the same time, a substantial body of research indicates a relationship between children's development of social skills and their language and pre-literacy skills (e.g., Aro, Eklund, Nurmi, & Poikkeus, 2012; Doctoroff, Greer, & Arnold, 2006; Girard & Girolametto, 2013; Welsh, Parke, Widaman, & O'Neil, 2001). Yet, the direction of effect between these two important developmental domains is not clear. While some empirical studies suggest that social-emotional skills influence language and literacy development (e.g., Curby et al., 2015; Doctoroff et al., 2006; Girard & Girolametto, 2013; Ren, Knoche, & Edwards, 2016), there is also evidence to support the opposite hypothesis—i.e., that language and literacy skills predict social competence (e.g., Aro et al., 2012; Bouchard, Cloutier, Gravel, & Sutton, 2008; Rose, Lehrl, Ebert, & Weinert, 2018).

To date, however, only a few longitudinal studies have investigated bidirectional relations to discover how social-emotional and language and literacy skills influence, and are influenced by, one another (e.g., Sparapani et al., 2018; Trzesniewski, Moffitt, Caspi, Taylor, & Maughan, 2006; Welsh et al., 2001). The present study aims to add to previous literature by investigating bidirectional relations between social competence and language and pre-literacy skills during the preschool year, an important developmental period. In addition, research has documented that girls typically have better social competence (e.g., Dunsmore, Noguchi, Garner, Casey, & Bhullar, 2008; Junttila, Voeten, Kaukiainen, & Vauras, 2006; Ren et al., 2016) and higher language and literacy skills (Galsworthy, Dionne, Philip, & Plomin, 2000; Nancollis, Lawrie, & Dodd) than boys by the time of school entry. However, it remains unclear whether patterns of

reciprocal associations between social competence and language and pre-literacy skills differ by gender. Thus, the extent to which bidirectional relations vary by child gender was also examined.

## **Social competence**

Social competence is a multidimensional construct that refers to children's positive peer interactions (Rubin, Bukowski, & Parker, 2006), emotional understanding and emotional self-regulation (Denham, 2006; Rhoades et al., 2011) and adaptive behaviours in different social settings (Brophy-Herb, Lee, Nievar, & Stollak, 2007; Yates et al., 2008). Social competence has been divided into two key aspects: prosocial behaviour and antisocial behaviour (Junttila et al., 2006). Prosocial behaviour refers to socially desirable behaviours, such as cooperating, helping others, sharing, solving social problems and participating in group activities (Denham, 2006; Junttila et al., 2006; Miles & Stipek, 2006). These behaviours typically promote peer acceptance (see Coie, Dodge, & Kupersmith, 1990), facilitate positive relationships with teachers (Garner & Waajid, 2008; Ladd, Birch, & Buhs, 1999) and enhance learning (Arnold, Kupersmidt, Voegler-Lee, & Marshall, 2012; Caprara et al., 2000). In contrast, antisocial behaviours—such as physical and verbal aggressiveness, low emotional regulation and poor emotion expression skills (Denham, 2006)—are typically related to lower academic skills (Arnold et al., 2012) and negative social outcomes, including peer problems (Bulotsky-Shearer et al., 2010; Ladd et al., 1999) and coercive interactions with teachers (Ladd et al., 1999). Regarding social competence, the absence of antisocial behaviour—i.e., the inhibition of impulsive and disruptive behaviour—is desirable (Junttila et al., 2006). Consequently, to be considered socially competent, a child should display high levels of prosocial behaviour and low levels of antisocial behaviour (Junttila et al., 2006).

A high level of social competence leads to successful school adjustment through positive relationships with peers and teachers (Cummings, Kaminski, & Merrell, 2008; Ladd et al., 1999). In the case of pre-schoolers, social competence is manifested in selecting and using behavioural strategies that are effective in achieving interactional goals (Odom, McConnell & Brown, 2008), such as peer group entry, turn-taking, conflict resolution, maintenance of play (Guralnick, 2010) and prosocial behaviours (e.g., Gresham, Sugai, & Horner, 2001). A child, who is able to adaptively relate to others, is motivated to learn and can regulate his or her emotions, will be ready to learn and experience success in school (Yates et al., 2008). Gaining a better understanding of children's social skills over time can assist in predicting which young children may be at risk for impaired peer relations and lower academic achievement.

## Language and literacy skills

Language is viewed as an important psychological tool needed to regulate behaviour and cognition (Vygotsky, 1962), as well as emotions, and to navigate in social situations (Campos, Frankel, & Camras, 2004). It has been argued that language plays a primary role in regulating children's behaviour in the preschool years (e.g., Bernier, Carlson, & Whipple, 2010). Children's language skills facilitate their appropriate reactions to others, improve their emotional expression and knowledge, help them establish positive reciprocal relationships with others and, thus, may enable them to learn socially competent behaviour (e.g., Durkin & Conti-Ramsden, 2007). As such, several researchers argue that language skills are central to developing social competence (e.g., Bouchard et al., 2008; Rose et al., 2018).

Strong predictors of literacy skill development are phonological awareness (Ehri et al., 2001), letter knowledge (Lerkkanen, Rasku-Puttonen, Aunola, & Nurmi, 2004; Torppa et al., 2016) and vocabulary (Ouellette, 2006; Ouellette & Beers, 2010). These are also the focus of instruction and activities in preschool. Thus, it can be suggested that children who struggle to learn those emerging literacy skills may have a lower self-concept of ability and feel frustrated and less connected to their teachers and peers, making them prone to deploy less adaptive and less socially desirable behaviours in learning situations in the preschool classroom. This might be the beginning of a negative cycle of social and academic withdrawal (Trzesniewski et al., 2006).

## Links between social competence and language and literacy skills

Although the interrelatedness between early language and literacy skills and social competence is acknowledged in the literature (e.g., Sparapani et al., 2018), the pattern of associations is debated (Trzesniewski et al., 2006). The present study is grounded in theoretical propositions that underscore the dynamic and interactive nature of children's skills development—that is, dynamic system theories (Fischer & Bidell, 2006). Theoretical underpinnings and empirical studies have suggested that causal relations between the skill sets can be social competence-driven (i.e., social competence predicting the language and literacy skills), language and literacy skills-driven (language and literacy-skills predicting social-emotional skills) or reciprocal (see Trzesniewski et al., 2006). In empirical research, three different models have been investigated, in addition to a stability model, which includes only the links across measurement occasions among the same variables. First, relative advantages in social competence may lead to enhanced language and literacy skills, suggesting a social competence-driven model. Social-emotional skills may be instrumental in children's learning because they

facilitate children's successful navigation in the classroom social environment (Ladd et al., 1999). It has been argued that children with age-appropriate levels of social competence tend to benefit more from classroom learning opportunities (Blair, 2002; Miles & Stipek, 2006). Vitiello and Williford (2016) suggest that stronger social skills help children engage in classroom activities, which in turn promote their language and literacy development. In contrast, children with low social abilities become easily distracted from the learning situations, as they may not have the skills that would allow them to pay attention to instruction and the tasks at hand (Miles & Stipek, 2006)—tasks related to emergent literacy such as phonological awareness and letter knowledge.

In addition, several researchers have argued that social interactions provide a mechanism for practising language and literacy skills. Children who function well in social situations and interactions are more likely to grow in their pre-academic skills compared to children with impaired social competence (Denham et al., 2012; Denham & Brown, 2010). Furthermore, teachers are more likely to be responsive to socially competent children and, as a result, these children receive more instruction and more positive feedback (Denham, 2006; Raver & Knitzer, 2002), for example, on phonological awareness, letter knowledge and vocabulary. Moreover, children with social-developmental delays may not have the skills to effectively deal with social situations, which may lead to problems with both teachers (Garner & Waajid, 2008) and peers (Cummings et al., 2008). Such interpersonal problems may, in turn, undermine the learning process. The importance of social competence for early language and literacy skills is substantiated by interventions targeting children's social skills. For example, Bierman et al. (2009) found that pre-schoolers who received additional social-emotional training outperformed the control group in vocabulary, emerging literacy and learning engagement.

Second, theoretical (e.g., Fischer & Bidell, 2006; Vygotsky, 1962) and empirical evidence (Bouchard et al., 2008; Snowling et al., 2006) suggest that more advanced language and literacy skills may benefit the development of social competence, while difficulties in language and literacy skills may harm social-emotional development. For example, Aro et al. (2012) found that early receptive and expressive language skills in preschool predicted social skills at age eight. Children with more proficient language and literacy skills can use their verbal skills to navigate social scenarios (Fisher, Happé, & Dunn, 2005). In contrast, children with deficits in their language and pre-literacy skills may struggle with academic demands in preschool, which may result in frustration, reduced interest in learning and engagement in inappropriate or disruptive behaviours (Arnold & Doctoroff, 2003). Such behaviours may, in turn, lead to problems in relationships with teachers and rejection by their peers (Coie et al., 1990; Cummings et al., 2008). For example, phonological awareness, letter knowledge and vocabulary are central skills

that are the focus of preschool instruction and activities. Thus, it might be that problems in acquiring those key pre-reading skills may increase children's frustration and the likelihood of less adaptive and socially desirable behaviours in learning situations, suggesting a language and literacy skills-driven model.

Third, it is possible that social competence-driven and language and literacy-driven pathways may build off each other in a reciprocal pattern (Sparapani et al., 2018; Welsh et al., 2001), suggesting a reciprocal model. For example, as children struggling with language and literacy skills become increasingly frustrated, their less adaptive social behaviour increases, which interferes with their subsequent learning and creates more antisocial problems, and so on. Theoretically, it is argued that there is a dynamic interaction between developing skills and, as such, it is important to consider whether, and how, one domain of functioning may modify development in another domain (Fischer & Bidell, 2006). Consequently, in the present study, social competence and language and literacy skills are examined as dynamic skills simultaneously developing across the preschool period.

### **Gender differences in social competence and language skills**

In studying children's early development, it is important to consider child-level characteristics that may modify possible bidirectional developmental processes. Previous literature documents differences in the social-emotional and language development of boys and girls, particularly during the preschool period. Girls typically have higher language and literacy skills (Galsworthy et al., 2000; Nancollis et al., 2005) and show higher levels of prosocial behaviours and lower levels of antisocial behaviours (Junttila et al., 2006).

The literature suggests that associations between social-emotional competence and language and literacy skills may be stronger for boys than for girls (Doctoroff et al., 2006; Trzesniewski et al., 2006). These proposed differences have been linked to an 'invisible girl' phenomenon suggesting that girls' academic problems are likely to be unnoticed and unaddressed by teachers (Stowe et al., 1999) because of girls' less disruptive behaviours. Doctoroff et al. (2006), for example, have found that difficulties with emergent literacy skills are associated with aggressive behaviour and fewer prosocial interactions, but only among boys, while neither of these relations is observed for girls. Similarly, Stowe, Arnold and Ortiz (2000) have found that disruptive classroom behaviour and teacher-reported peer difficulties are more strongly associated with language problems for boys than for girls. Bouchard and colleagues (2008) demonstrate that language explains perceived prosocial skills in boys, but not in girls. On the other



hand, some studies have failed to find gender effects (e.g., Arnold et al., 2012; Duncan et al., 2007). The present study aims to contribute to the existing literature by investigating gender-related differences in the links between social competence and language and pre-literature skills.

## **The present study**

To contribute to the existing literature, the present study investigated reciprocal associations between various components of social competence and language and pre-literacy skills over the preschool period and sought to determine whether, and how, patterns of bidirectional relations differ by gender. First, we used a cross-lagged design to test whether a bidirectional model would best represent the associations between social and language and pre-literacy skills, assuming that social competence would contribute to improvements in later language and pre-literacy skills, and vice versa (Welsh et al., 2001). Second, we examined differences between genders in the levels of social competence and language and literacy skills that have been reported in prior research (e.g., Doctoroff et al., 2006; Eriksson et al., 2012; Junttila et al., 2006). Finally, we investigated the extent to which there were gender-related differences in reciprocal links between social competence variables (cooperating skills, empathy, disruptiveness and impulsivity) and language and pre-literacy skills across the preschool year (Doctoroff et al., 2006; Stowe et al., 2000; Trzesniewski et al., 2006).

## **Method**

### **Participants and procedures**

The participants were 441 preschool children (212 boys, 229 girls;  $M_{\text{age}} = 73.51$  months,  $SD = 3.56$  months) enrolled in 45 classrooms from 30 centres situated in Central Finland. Of these, 19 were municipal day care centres; six were private day care centres; and five were primary schools. The reported study is part of a larger project focusing on the role of teacher-child interactions and teacher stress in children's learning (Lerkkanen & Pakarinen, 2016–2017). All parents of six-year-old children from each classroom in which the teacher participated in the larger study were sent a letter home describing the study and inviting the child's, and their own, participation. Children whose parents provided written consent prior to data collection were included in the present analyses. Preschool classrooms in this study typically included 12.26 children ( $SD = 3.62$ ; range = 3–20 children). All classrooms were Finnish-speaking. Preschool teachers provided written consent for their own participation in the larger study.

Participation was voluntary, and participants were able to discontinue their participation at any point. For example, trained investigators were instructed to stop the assessments if children did not want to continue with the tasks.

Preschool teachers were asked to rate children's social competence twice during the preschool year (autumn [T1] and spring [T2]). The time between the two waves of data collection was, on average, 4.39 months (SD = .72), ranging between three and six months. At both measurement points [T1 and T2], children were tested on their pre-literacy skills (letter knowledge and phonological awareness) by trained investigators in individual test sessions. In addition, children's receptive vocabulary was assessed in the spring data collection [T2]. Parents were asked to complete a demographic questionnaire (response rate = 77% of those who agreed to participate) to indicate their levels of vocational education, as well as the child's age and gender.

In Finland, preschool education is provided free of charge for all six-year-old children during the year before they enter school at the age of seven. Preschool classrooms are situated either in day care centres (83%) or in primary schools (17%) (Statistics Finland, 2017). Regardless of location, preschool education follows the same national curriculum, which emphasises play-like activities, with the aim of supporting a child's capacity to grow and learn at his/her own pace and to promote the transversal skills needed for constructive participation in the society and for a smooth transition to school (National Board of Education, 2014). Moreover, the curriculum strongly emphasises support for multifaceted language use and social skills in varying social situations. Children are not formally taught to read, but they are provided with activities related to letters and phonemes. Preschool teachers are required to have at least a bachelor's degree in early childhood education.

## Measures

### *Social competence*

Preschool teachers rated children's social competence using the Multisource Assessment of Social Competence Scale (MASCS; Junttila et al., 2006). The MASCS questionnaire was formatted as a table, with items as rows and names of children in the classroom as columns. Items (15 in total) were rated on a four-point scale (1 = *never*, 4 = *very frequently*). The following four subscales were used as measures of social and antisocial aspects of social competence: Cooperating Skills (five items, e.g., 'effectively participates in group activities';  $\alpha = .85$  [T1] and  $.84$  [T2]), Empathy (three items, e.g., 'is sensitive to the feelings of others';  $\alpha = .84$  [T1 and T2]), Disruptiveness (four items, e.g., 'argues and



quarrels with peers';  $\alpha = .88$  [T1] and  $.91$  [T2]), and Impulsivity (three items, e.g., 'has a short fuse';  $\alpha = .88$  [T1] and  $.89$  [T2]). Higher scores on each scale indicated higher levels of prosocial and antisocial behaviours.

### ***Language and pre-literacy skills***

In the present study, pre-literacy skills were measured by phonological awareness and letter knowledge. Language skills were measured by receptive vocabulary.

*Initial phoneme identification* was assessed using a ten-item test (ARMI test material: A tool for assessing reading and writing skills in Grade 1; Lerkkanen, Poikkeus & Ketonen, 2006). For each item, the child was presented with four pictures of objects. Each object was named. The child was asked to select the correct picture based on the oral presentation of the target item's initial phoneme (e.g., 'Which word starts with the sound "o": omena, sukka, reppu, lintu?' [apple, sock, bag, bird]). The total score corresponded to the number of items correctly named (maximum value = 10;  $\alpha = .78$  [T1] and  $.73$  [T2]).

*Letter knowledge* was assessed using a naming test of all 29 letters in the Finnish alphabet. The letters were presented as uppercase letters in three rows and were shown to the child one row at a time (ARMI test material; Lerkkanen et al., 2006). The total score corresponded to the number of correctly named items (maximum value = 29;  $\alpha = .96$  [T1] and  $.93$  [T2]). In the further analyses, a mean of the standardised scores derived from the initial phoneme identification and letter knowledge tasks was used as an indicator of pre-literacy skills.

*Receptive vocabulary* was measured with a 30-item, shortened version of the Peabody Picture Vocabulary Test-Revised (PPVT-R, Form L; Dunn & Dunn 1981; Finnish version by Lerkkanen et al., 2010). The PPVT-R consisted of a series of cards with four pictures that were shown to each child as the examiner read a word that matched one of the pictures. The child was asked to identify which picture corresponded to the word. Words became increasingly challenging. The mean score representing the number of correctly named words was used in the analyses ( $\alpha = .61$ ).

### ***Parental education***

In the present study, parents were asked to indicate their own and their spouse's levels of vocational education. The highest education in the family was used as an indicator of parental education. A total of 27.7% of parents had a university degree, 16.6% a polytechnic degree, 4.3% a vocational college degree, 15.9% a vocational school degree and 0.5% had no education beyond a comprehensive school degree. This information was missing for 35.1% of the children. Sensitivity analyses indicated that children who

did not have information on their parents' levels of education had lower levels of letter knowledge and phonological awareness at both time points and lower vocabulary in the spring, compared to children whose parents returned the questionnaire. There was no difference between the two groups in any of the social competence variables.

### **Analytical strategy**

First, intercorrelations between the study variables were calculated with IBM SPSS statistics, separately for boys and girls. In the interests of interpretability and comparability to previous studies, these correlations were standard Pearson correlations that did not account for the nesting of children within classrooms. Though not presented, when these bivariate relationships were estimated using COMPLEX to account for nesting, coefficients tended to be slightly stronger, but not substantially different.

Next, longitudinal path analyses were conducted using the Mplus statistical package (Version 8; Muthén & Muthén, 1998–2015). The Full Information Maximum Likelihood (FIML) estimation was used to account for missing data (Enders, 2001), and the Maximum Likelihood Robust (MLR) estimator was used to adjust for any non-normality in the data. MLR adjusts both model  $\chi^2$  and model standard errors. As preschool teachers rated several children in one group, the COMPLEX option was applied to take into account the nested structure of the data (i.e., children in preschool groups; intra-class correlations ranging from .01 to .21). The COMPLEX method estimated the models at the level of the whole sample, correcting distortions of standard errors and chi-squared values in the estimation caused by clustering of the observations (i.e., children belonging to the same preschool group) (Muthén & Muthén, 1998-2015). Because the components of social competence correlated highly with each other ( $r = .61$  to  $.76$ ), path models were conducted separately for each of the social competence scales to avoid problems related to multi-collinearity. Each child's age in months at the beginning of the preschool year, parental levels of education and the time elapsed between the two measurement points were used as control variables in all the models presented.

In the first step of the path analyses, four nested models (see Figure 1) based on theory and empirical research were compared with the Satorra-Bentler (Satorra & Bentler, 2001) scaled chi-squared difference test to identify the model that best fit the data for each of the social competence scales: 1) a model controlling for the previous levels of social competence and pre-literacy skills (i.e., stability model [M1]); 2) a model including stability paths and paths from previous levels of social competence to language and pre-literacy skills (i.e., social competence-driven model [M2]); 3) a model including

stability paths and a path from previous pre-literacy skills to social competence (i.e., language and literacy-driven model [M3]); and 4) a fully reciprocal model including stability paths and all the cross-lagged paths (i.e., bidirectional model [M4]). In the second step, multiple-group models were specified to investigate whether the final models fit for both boys and girls. This was done by creating a non-restricted (freely estimated) model and then comparing the fit of this model to another model in which all regression and correlation coefficients were restricted to be equal across gender. These models were compared with the Satorra-Bentler scaled chi-squared difference test (Satorra & Bentler, 2001). As the last step of the analysis, the models were compared between children who had information on their parents' levels of education and those who did not have that information.

Goodness of fit of the models was evaluated using four indicators: chi-squared, Bentler's comparative fit index (CFI), the Tucker-Lewis fit index (TLI), the root mean square error of approximation (RMSEA) and the standardised root-mean-square residual (SRMR). The cut-off values for good-fitting models were as follows:  $\chi^2 = ns$  ( $p > .05$ ), SRMR  $< .05$ , RMSEA  $< .05$ , CFI and TLI  $> .95$  (Byrne, 2012). The cut-off values for acceptable model fit were CFI and TLI being above the value .90 and SRMR and RMSEA values being between .06 and .08 (Hu & Bentler, 1999). Standardised regression coefficients were used as measures of effect size, with  $\beta < 0.10$  indicating a small effect, a  $\beta$  of around 0.30 indicating a medium-sized effect and  $\beta > 0.50$  indicating a large effect (Kline, 2005).

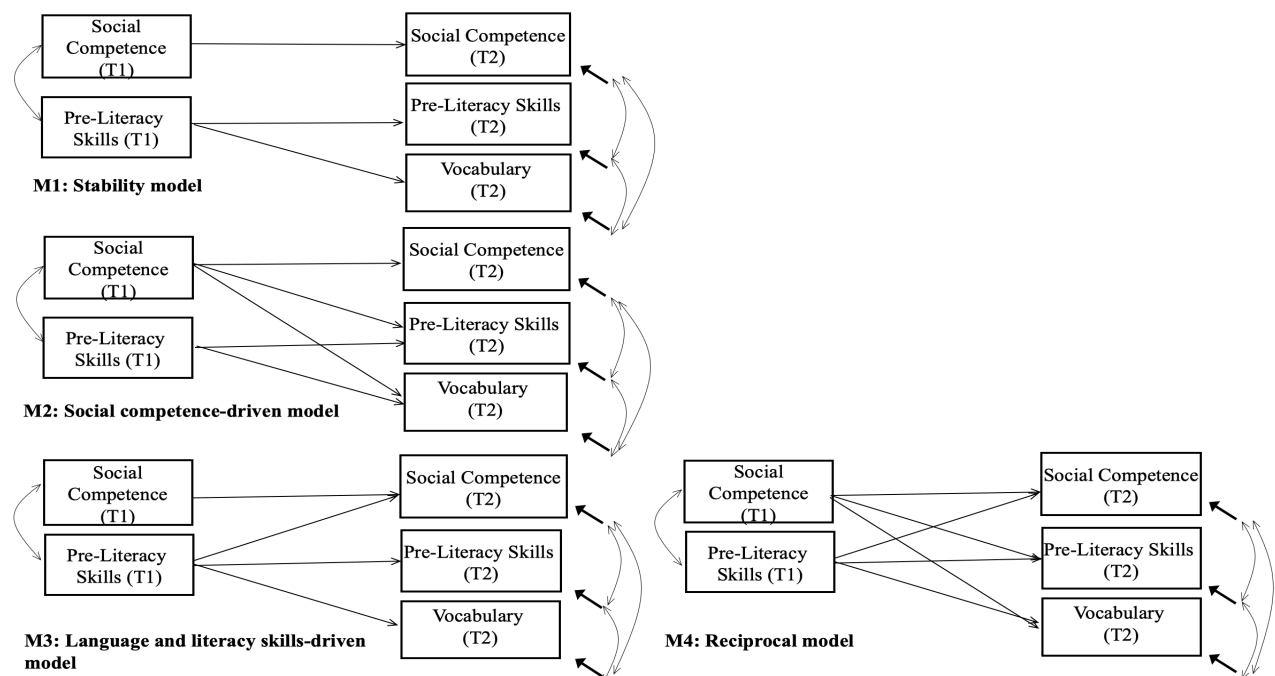


FIGURE 1 The investigated models

## Results

Descriptive statistics are shown in the Appendix Table 1. Correlations between the study variables are shown in the Appendix Table 2, separately for boys and girls (i.e., boys above the diagonal). The results indicated, for example, that cooperating skills were positively related to subsequent language and pre-literacy skills in both boys and girls. The strength of correlations was small (.10) to moderate (.37).

At preschool entry, the difference in letter knowledge ( $t[434] = 1.866, p = .063$ ) and phonological awareness ( $t[434] = 1.271, p = .205$ ) between genders was not significant. In the spring, however, girls had higher scores in letter knowledge ( $t[437] = 2.210, p = .028$ ), phonological awareness ( $t[437] = 2.753, p = .006$ ) and vocabulary ( $t[437] = 3.352, p = .001$ ) than boys. At both time points, teachers rated girls' cooperating skills (T1:  $t[434] = 4.631, p = .000$  and T2:  $t[438] = 4.387, p = .000$ ) and empathy (T1:  $t[438] = 5.470, p = .000$  and T2:  $t[434] = 4.749, p = .000$ ) higher than those of boys. In contrast, teacher ratings of disruptiveness (T1:  $t[438] = -8.402, p = .000$  and T2:  $t[437] = -9.445, p = .000$ ) and impulsivity (T1:  $t[437] = -5.397, p = .000$  and T2:  $t[438] = -6.084, p = .000$ ) were lower for girls than for boys.

### Associations between social competence and language and literacy skills

#### *Prosocial aspects: Cooperating skills and language and literacy skills*

The model comparison indicated that the social competence-driven model, which included stability paths and a predictive path from cooperating skills to language and literacy skills (i.e., model [M2]), best described the data (see Table 3, in the Appendix). The results (Figure 2) showed stability across time in cooperating skills and pre-literacy skills. In addition, cooperating skills and pre-literacy skills at preschool entry predicted a higher vocabulary at the second time point.

Next, a multiple-group model compared the pattern of associations between boys and girls. The restricted model, in which all paths and coefficients were set as equal for boys and girls, provided a better fit to the data than the freely estimated model:  $\Delta\chi^2(26) = 37.304, p = 0.07$ . The modification indices indicated that the model fit would increase when the stability path of pre-literacy skills (Mod = 19.127) and the predictive path from previous cooperative skills to subsequent pre-literacy skills (Mod = 4.601) were permitted to be freely estimated for boys and girls. After these modifications, the fit of the final multiple-group model for cooperating skills was excellent:  $\chi^2(26) = 15.652, p = 0.944$ ; CFI = 1.000; TLI = 1.020; RMSEA = 0.000; SRMR = 0.031. Gender-specific relations

were found. Among girls only, cooperative skills at preschool entry also predicted later pre-literacy skills.

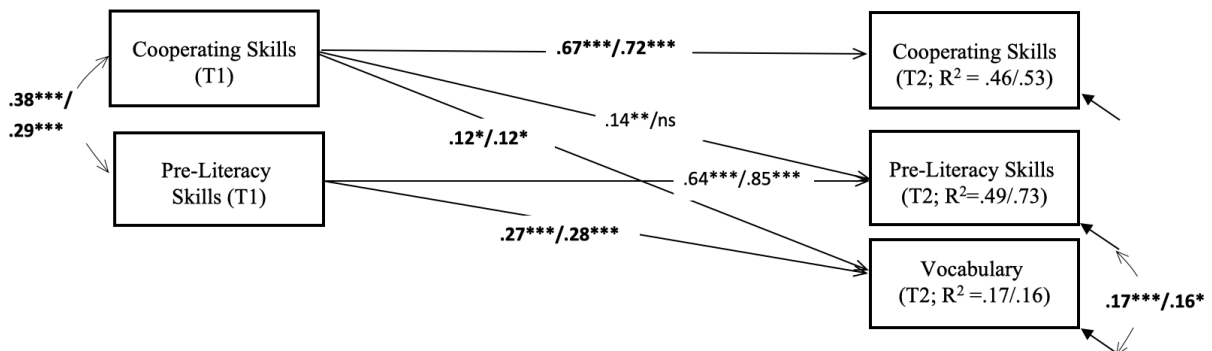


FIGURE 2 The associations between cooperating skills and language and literacy skills. Standardized estimates. The first estimates are for girls. The estimates in bold were set as equal.

**Prosocial aspects: Empathy and language and literacy skills**

The bidirectional model (M4), which included stability paths and all cross-lagged associations between empathy and language and pre-literacy skills, best described the data, as indicated by the model comparison (see Table 3 in the Appendix). The results (Figure 3) indicated stability across time in empathy and pre-literacy skills. In addition, the results showed that pre-literacy skills at preschool entry predicted vocabulary at the end of the preschool year.

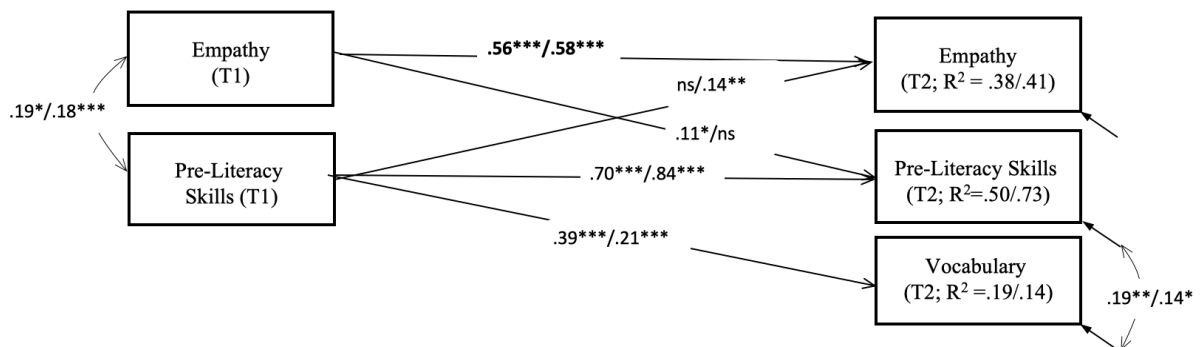


FIGURE 3 The associations between empathy and language and literacy skills. Standardized estimates. The first estimates are for girls. The estimates in bold were set as equal.

A multiple-group model compared the pattern of associations between boys and girls. The model comparison indicated that a model in which all paths and coefficients were freely estimated between boys and girls provided a better fit to the data than the restricted model:  $\Delta\chi^2(27) = 43.375, p = 0.024$ . The Satorra-Bentler scaled chi-squared difference test showed that the model fit would not decrease if the stability path of empathy were set as equal between genders. The fit of the final multiple-group model for empathy was excellent:  $\chi^2(1) = 0.257, p = 0.612$ ; CFI = 1.000; TLI = 1.043; RMSEA = 0.000; SRMR = 0.004. Gender-specific associations emerged. For girls, empathy predicted subsequent pre-literacy skills. For boys, pre-literacy skills at preschool entry predicted higher teacher ratings of empathy at the end of preschool.

### ***Antisocial aspects: Disruptiveness and language and literacy skills***

The model comparison (Table 3, in the Appendix) indicated that the bidirectional model (M4), which included stability paths and all cross-lagged associations between disruptiveness and language and literacy skills, best described the data (Table 3). The results (Figure 4) demonstrated that disruptiveness and pre-literacy skills were stable across time. In addition, pre-literacy skills at preschool entry predicted vocabulary at the end of preschool.

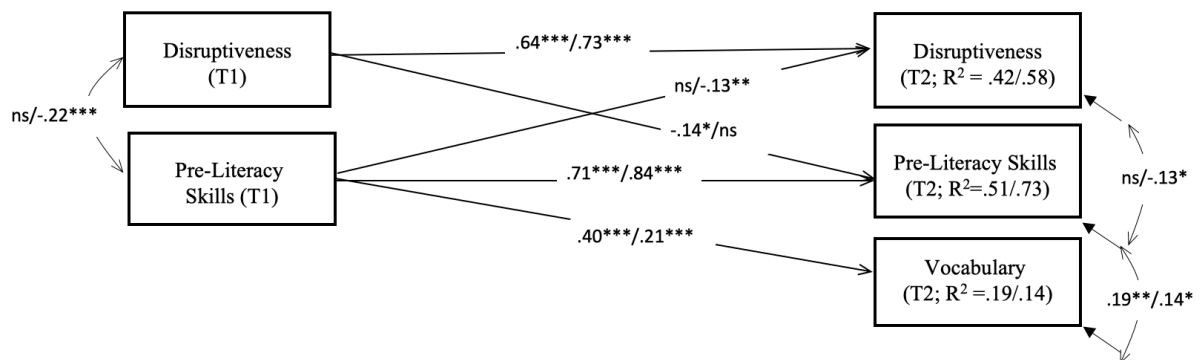


FIGURE 4 The associations between disruptiveness and language and literacy skills. Standardized estimates. The first estimates are for girls. The estimates in bold were set as equal.

Another multiple-group model compared the pattern of associations between boys and girls. The model comparison indicated that a non-restricted model, in which all paths and coefficients were freely estimated between boys and girls, provided a better fit to the data than the restricted model:  $\Delta\chi^2(27) = 57.222, p = 0.006$ . The Satorra-Bentler scaled chi-squared difference test showed that the model fit would not decrease if the predictive path from disruptiveness to vocabulary were set as equal between boys and



girls. The fit of the final multiple-group model for disruptiveness was excellent:  $\chi^2(1) = 0.074$ ,  $p = 0.785$ ; CFI = 1.000; TLI = 1.049; RMSEA = 0.000; SRMR = 0.002. For girls, previous disruptiveness negatively predicted pre-literacy skills, whereas for boys, pre-literacy skills at preschool entry were negatively related to subsequent disruptiveness.

### ***Antisocial aspects: Impulsivity and language and literacy skills***

The model comparison indicated that the bidirectional model (M4), which included stability paths and all cross-lagged associations between impulsivity and language and literacy skills, best described the data (Table 3 in the Appendix). The results (Figure 5) demonstrated that impulsivity and pre-literacy skills were stable across time. In addition, pre-literacy skills at preschool entry predicted later vocabulary.

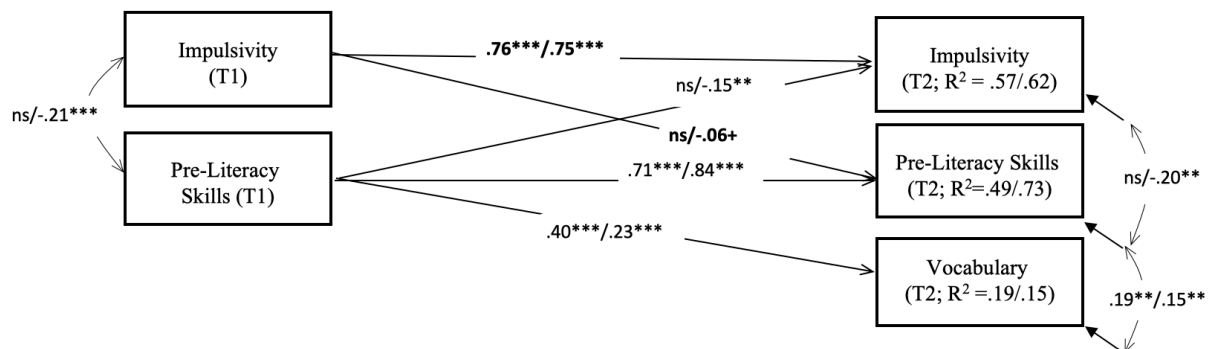


FIGURE 5 The associations between impulsivity and language and literacy skills. Standardized estimates. The first estimates are for girls. The estimates in bold were set as equal.

A multiple-group model compared the pattern of associations between boys and girls. The model comparison showed that a non-restricted model, in which all paths and coefficients were freely estimated between boys and girls, provided a better fit to the data:  $\Delta\chi^2(27) = 47.051$ ,  $p = 0.008$ . The Satorra-Bentler scaled chi-squared difference test showed that the model fit would not decrease if the stability path of impulsivity and the predictive path from impulsivity to pre-literacy skills were set as equal between groups. The fit of the final multiple-group model for cooperating skills was excellent:  $\chi^2(2) = 1.035$ ,  $p = 0.596$ ; CFI = 1.000; TLI = 1.023; RMSEA = 0.000; SRMR = 0.008. Boys who entered preschool with higher literacy skills were rated lower in impulsivity by their teachers at the end of preschool.

## Conclusions

The present study investigated reciprocal associations between social competence and language and pre-literacy skills in a sample of preschool children. The findings extend previous research by providing evidence that social competence and academic skills influence, and are influenced by, one another before school entry. Social competence and pre-literacy skills were stable across time. In addition, the associations between social competence and language and pre-literacy skills were gender-specific, with different patterns for girls and boys. Compared to boys, girls showed more cooperating skills and empathy and less disruptiveness and impulsivity at both time points. Children's pre-literacy skills did not vary by gender at the beginning of the preschool year but, by the end of the year, girls had gained higher skills in phonological awareness and letter knowledge.

### Associations between social competence and language and pre-literacy skills

Children's social competence and language and pre-literacy skills at the beginning of preschool predicted later competence in the same domains. Despite considerable growth in both skill sets over the preschool period, individual differences seemed to be relatively stable across time (Vaszonyi & Huang, 2010).

Two major findings emerged regarding the associations between social competence and language and pre-literacy skills. First, model comparisons revealed that the pattern of associations differed, depending on the component of social competence. Whereas, for empathy, disruptiveness and impulsivity, the bidirectional model was supported by the data, the social competence-driven model was a better indicator of cooperating skills. Second, evidence was found for gender-specific patterns in the association between social competence and language and pre-literacy skills. These two findings are discussed in more detail below.

Support was also found for the social competence-driven model. The results indicated that cooperating skills predicted vocabulary in both boys and girls. In addition, empathy and cooperating skills predicted higher pre-literacy skills, but only among girls. These results agreed with previous findings that adaptive social behaviours have beneficial effects on the development of language and pre-literacy skills (Caprara et al., 2000; Curby et al., 2015; Ren et al., 2016). It may be suggested that appropriate social skills enhance children's positive interactions with their teachers and peers and may, thereby,

also promote vocabulary development. Recent literature has implicated social-emotional competence as a potential component in supporting the development of emergent, pre-literacy skills (e.g., Denham et al., 2012; Denham & Brown, 2010). For example, Bierman et al. (2009) has found that pre-schoolers who receive additional social-emotional training outperform the control group in vocabulary and emerging literacy skills.

### **Gender-related patterns of associations**

In line with previous research (Bouchard et al., 2008; Junttila et al., 2006), the results of the present study indicated gender differences in the two key aspects of social competence. Teachers rated girls' prosocial behaviours higher than boys'. The opposite was found for antisocial behaviours, in which boys were rated higher than girls. It could be that the results reflect gender-specific behavioural expectations that differ for boys and girls (Beaman, Wheldall, & Kemp, 2006). A bias towards gender disparities may lead teachers to recognise behaviours that are considered gender-appropriate more readily than behaviours that do not confirm gender schemes. In addition, girls' more regulated style of play may incline teachers to perceive their behaviours as more prosocial, whereas boys' more rowdy play styles may result in teachers perceiving their behaviours as more antisocial (Fabes, Martin, Hanish, Anders, & Madden-Derdich, 2003; Smith & Inder, 1993).

The results further showed that children's pre-literacy skills did not vary by gender at the beginning of the preschool year. Interestingly, at the end of the year, girls outperformed boys in phonological awareness and letter knowledge. It may be surmised that girls are better able to take advantage of the learning opportunities and instruction during preschool, which in turn benefits their pre-literacy skills. This may be because girls' higher social competence and language skills help them to focus on the pre-literacy tasks at hand or that girls have higher learning motivation in literacy tasks (Fredricks & Eccles, 2002). There are some possible explanations for the gender differences. It seems that social skills enhance girls' pre-literacy skills, in particular. It may be, as mentioned previously, that girls' higher social competence helps them focus on the instruction and tasks at hand, but that competence may also help them to develop supportive and verbally rich relationships and interactions with peers and the teacher.

Some support was also found for the predictive effect of pre-literacy skills on social competence. The results demonstrated that, in boys, high pre-literacy skills predicted higher teacher ratings of empathy and lower ratings of disruptiveness and impulsivity. These results resemble the previous studies showing that language and literacy skills

are predictors of social-emotional skills (e.g., Aro et al., 2012; Rose et al., 2018). However, it should be noted that these results, in the present study, were true only for boys. In a similar vein, Bouchard and colleagues (2008) demonstrate that language explains perceived prosocial skills in boys, but not in girls. It seems that the developmental mechanisms between social competence and language and literacy skills differ somewhat by gender. It is possible that high pre-literacy skills enhance boys' positive attitudes towards learning and engagement and help them to better master their behaviours and emotions in learning situations. The results of the current study seem to suggest that boys' language and pre-literacy skills enhance their adaptive social behaviours. This could reflect the reciprocal causation model suggested by Trzesniewski et al. (2006), according to which poor literacy skills lead to antisocial behaviour, and vice versa. The result of the current study may also – at least to some extent – be related to the fact that social competence was measured by teacher ratings. It is possible that teachers see boys with high emergent literacy skills as having more adaptive social behaviours. Relatedly, Bouchard and colleagues (2008) have suggested that, for girls, prosocial skills, as perceived by teachers, appear to be independent of linguistic skills.

In general, children's social and academic development can be promoted by creating emotionally supportive classrooms that foster mutual respect and caring, as well as socially engaging the children in academic activities (Hamre & Pianta, 2001; Mashburn et al., 2008). Similarly, high-quality instruction, in which behaviour is modelled with rich language, is shown to be linked with higher levels of empathy and lower levels of disruptiveness in preschool children (Siekkinen et al., 2013). There is still work to be done, however, to sort out the components of social competence that underlie enhanced language and literacy skills and to identify the mediating mechanisms that link the sources and diverse effects of social-emotional skills. In addition, the role of language and literacy skills in social competence needs further attention. Although there is a clear need to investigate the gender-specific developmental pathways in more detail to best support children in their school readiness, it should be noted that there may be more variance within groups of boys and within groups of girls than there are differences between genders.

## Limitations

The study has some limitations. First, it involved only two measurement points, which does not allow for strong causal inferences. Although it utilised a cross-lagged design (following children's development from fall to spring during the preschool year), including more measurement points over multiple years—spanning from preschool to early elementary school—would have enabled more stringent testing of the variables. In

addition, it was not possible to include all variables of interest at both time points, as receptive vocabulary was only assessed at the end of the preschool year. Therefore, the analyses could not control for the initial level of vocabulary. Second, although the study controlled for parental levels of vocational education, this is a rather limited measure of the home environment. Future studies must include broader measures of the home learning environment, such as sensitive parenting (Dunsmore et al., 2008). Relatedly, more information on the home and preschool environment could have enhanced understanding of the processes that may influence the patterns of reciprocal associations between social competence and language and pre-literacy skills. Third, because more than one third of the parents did not indicate their level of education, caution is warranted in generalising the findings. Even though there were no significant differences in social competence between children who had the information on parental education and those who did not, differences were found for language and pre-literacy skills. Fourth, although teacher ratings have been shown to be reliable indicators of social-emotional skills, future studies might include peer, observer and parental ratings of social competence to yield stronger results. Finally, the study was not able to investigate the possible mechanisms explaining the associations. For instance, there is some evidence to show that self-regulation and task engagement may mediate the link between social competence and language and literacy skills (Vitiello & Williford, 2016).

### **Practical implications and future directions**

Some practical implications may be drawn from the study. The findings highlight the importance of raising awareness among teachers about possible gender-related differences in the developmental trajectories of social competence and language and pre-literacy skills. It is important to remember that the association between social and language skills can differ also within gender, and, therefore, the main focus of effective pedagogy must be on the needs of each individual child, not merely on gender. Further research is also needed regarding the role of different social competence components, as well as different components of language—within both the receptive and expressive domains—on the development of academic and psychosocial functioning. A comprehensive assessment of social competence and language and literacy skills may help identify those children who are most at risk for problems in later psychosocial functioning and academic development. Training may help preschool teachers understand the construct and importance of social-emotional development in relation to children's language and pre-literacy skills. In addition, teaching pre-academic skills can promote children's development of social-emotional competence, among boys in particular. Professional development to promote a comprehensive approach targeting a broad range of skills may accelerate children's development and have stronger effects than a narrower approach focusing, for example, just on pre-literacy skills. Pre- and

in-service training should be focused on determining specific classroom practices that may facilitate the development of language and pre-literacy skills by drawing on children's social competence—for example integrating pre-literacy activities in social interactions.

## Acknowledgements

This study was funded by a grant from Ella and Georg Ehrnrooth Foundation, personal funding for the first author from Academy of Finland (grant #277299) and other grants from the same funding agency for the second (#308070) and third author (#292466)

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## Appendix

TABLE 1 Descriptive statistics of the study variables

Variable	Total sample							Boys							Girls						
	N	M (SD)	Min.	Max.	Skew.	Kurt.	N	M(SD)	Min.	Max.	Skew.	Kurt.	N	M (SD)	Min.	Max.	N	M (SD)	Min.	Max.	
Cooperating Skills T1	437	12.26 (2.25)	5.56	16.00	-.24	-.49	208	11.75(2.30)	6.32	16.00	-.24	-.49	228	12.73(2.11)	5.56	16.00	228	12.73(2.11)	5.56	16.00	
Empathy T1	441	7.93 (1.38)	4.14	9.76	-.25	-.76	212	7.57(1.38)	4.14	9.76	-.25	-.76	228	8.27(1.29)	4.69	9.76	228	8.27(1.29)	4.69	9.76	
Disruptiveness T1	441	4.58 (1.82)	2.82	10.95	.97	.21	212	5.27(2.03)	2.82	10.95	.97	.21	228	3.92(1.28)	2.82	10.95	228	3.92(1.28)	2.82	10.95	
Impulsivity T1	440	4.18 (1.88)	2.57	10.28	1.20	.61	211	4.66(2.05)	2.57	10.28	1.20	.61	228	3.27(1.59)	2.57	10.28	228	3.27(1.59)	2.57	10.28	
Letter Knowledge T1	437	19.42 (8.52)	0	29	-.56	-.97	209	18.67(8.98)	0	29	-.56	-.97	227	20.18(7.97)	0	29	227	20.18(7.97)	0	29	
Phonological Awareness T1	437	8.25 (2.19)	0	10	-1.30	1.04	210	8.11(2.33)	0	10	-1.30	1.04	226	8.38(2.05)	0	10	226	8.38(2.05)	0	10	
Cooperating Skills T2	441	12.18 (2.27)	4.00	16.00	-.35	-.18	212	11.68(2.22)	6.34	16.00	-.35	-.18	228	12.63(2.23)	4	16.00	228	12.63(2.23)	4	16.00	
Empathy T2	441	7.88 (1.40)	4.04	9.76	-.28	-.55	212	7.56(1.37)	4.04	9.76	-.28	-.55	228	8.18(1.36)	4.13	9.76	228	8.18(1.36)	4.13	9.76	
Disruptiveness T2	440	4.67 (1.90)	2.82	11.28	1.20	1.05	211	5.48(2.06)	2.82	11.28	1.20	1.05	228	3.91(1.37)	2.82	11.28	228	3.91(1.37)	2.82	11.28	
Impulsivity T2	441	4.16 (1.91)	2.57	10.28	1.29	1.05	212	4.71(2.12)	2.57	10.28	1.29	1.05	228	3.64(1.54)	2.57	10.28	228	3.64(1.54)	2.57	10.28	
Letter Knowledge T2	440	23.50 (6.66)	0	29	-1.37	.99	212	22.81(7.16)	2	29	-1.37	.99	227	24.21(6.05)	0	29	227	24.21(6.05)	0	29	
Phonological Awareness T2	440	9.06 (1.77)	1	10	-2.35	5.68	212	8.83(1.95)	1	10	-2.35	5.68	227	9.29(1.54)	1	10	227	9.29(1.54)	1	10	
Vocabulary T2	440	18.76 (3.61)	0	27	-.44	1.32	212	18.19(3.70)	0	26	-.44	1.32	227	19.33(3.41)	7	27	227	19.33(3.41)	7	27	
Child's Age T1	434	73.51 (3.56)	68	80	.04	-1.26	208	73.43(3.75)	68	80	.04	-1.26	225	73.61(3.38)	68	80	225	73.61(3.38)	68	80	
Parental Education T2 <sup>1</sup>	286	3.85 (1.23)	1	5	-.60	-1.20	138	3.83(1.25)	2	5	-.60	-1.20	148	3.86(1.22)	1	5	148	3.86(1.22)	1	5	

Note. T1 = preschool fall, T2 = preschool spring; <sup>1</sup>1 = no vocational education; 5 = university degree; Skew = skewness; Kurt. = kurtosis



TABLE 2 Correlations between the study variables (boys above the diagonal)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Cooperating Skills T1	1.00	.65 <sup>a</sup>	-.21 <sup>b</sup>	-.22 <sup>b</sup>	.25 <sup>a</sup>	.26 <sup>a</sup>	.70 <sup>a</sup>	.47 <sup>a</sup>	-.21 <sup>b</sup>	-.25 <sup>a</sup>	.18 <sup>b</sup>	.26 <sup>a</sup>	.24 <sup>a</sup>	.16 <sup>c</sup>	.07
2. Empathy T1	.54 <sup>a</sup>	1.00	-.54 <sup>a</sup>	-.49 <sup>a</sup>	.18 <sup>c</sup>	.16 <sup>c</sup>	.54 <sup>a</sup>	.60 <sup>a</sup>	-.43 <sup>a</sup>	-.41 <sup>a</sup>	.17 <sup>c</sup>	.16 <sup>c</sup>	.09	.06	.06
3. Disruptiveness T1	-.07	-.40 <sup>a</sup>	1.00	.70 <sup>a</sup>	-.21 <sup>b</sup>	-.20 <sup>b</sup>	-.21 <sup>b</sup>	-.50 <sup>a</sup>	.75 <sup>a</sup>	-.62 <sup>a</sup>	-.18 <sup>b</sup>	-.19 <sup>b</sup>	-.09	-.02	-.16 <sup>+</sup>
4. Impulsivity T1	-.11 <sup>+</sup>	-.41 <sup>a</sup>	.75 <sup>a</sup>	1.00	-.25 <sup>a</sup>	-.15 <sup>c</sup>	-.20 <sup>b</sup>	-.40 <sup>a</sup>	.60 <sup>a</sup>	.77 <sup>a</sup>	-.27 <sup>a</sup>	-.19 <sup>b</sup>	-.03	-.08	-.22 <sup>b</sup>
5. Letter Knowledge T1	.38 <sup>a</sup>	.19 <sup>a</sup>	-.01	.03	1.00	.69 <sup>a</sup>	.24 <sup>b</sup>	.22 <sup>b</sup>	-.27 <sup>a</sup>	-.29 <sup>a</sup>	.85 <sup>a</sup>	.64 <sup>a</sup>	.25 <sup>a</sup>	.12 <sup>+</sup>	.18 <sup>c</sup>
6. Phonological Awareness T1	.32 <sup>a</sup>	.12 <sup>+</sup>	-.01	.03	.62 <sup>a</sup>	1.00	.26 <sup>a</sup>	.20 <sup>b</sup>	-.28 <sup>a</sup>	-.26 <sup>b</sup>	.67 <sup>a</sup>	.72 <sup>a</sup>	.23 <sup>b</sup>	.07	.15 <sup>+</sup>
7. Cooperating Skills T2	.70 <sup>a</sup>	.44 <sup>a</sup>	-.00	-.04	.28 <sup>a</sup>	.23 <sup>b</sup>	1.00	.66 <sup>a</sup>	-.31 <sup>a</sup>	-.33 <sup>a</sup>	.19 <sup>b</sup>	.23 <sup>a</sup>	.16 <sup>c</sup>	.11	.06
8. Empathy T2	.47 <sup>a</sup>	.61 <sup>a</sup>	-.28 <sup>a</sup>	-.26 <sup>a</sup>	.20 <sup>b</sup>	.10	.65 <sup>a</sup>	1.00	-.55 <sup>a</sup>	-.55 <sup>a</sup>	.23 <sup>b</sup>	.17 <sup>c</sup>	.10	.09	-.03
9. Disruptiveness T2	-.09	-.37 <sup>a</sup>	.64 <sup>a</sup>	.62 <sup>a</sup>	-.04	-.02	-.11 <sup>+</sup>	-.41 <sup>a</sup>	1.00	.75 <sup>a</sup>	-.27 <sup>a</sup>	-.29 <sup>a</sup>	-.14 <sup>c</sup>	-.07	-.12
10. Impulsivity T2	-.07	-.35 <sup>a</sup>	.61 <sup>a</sup>	.74 <sup>a</sup>	-.02	-.03	-.07	-.38 <sup>a</sup>	.79 <sup>a</sup>	1.00	-.37 <sup>a</sup>	-.31 <sup>a</sup>	-.08	-.15 <sup>c</sup>	-.11
11. Letter Knowledge T2	.37 <sup>a</sup>	.25 <sup>a</sup>	-.10	-.01	.76 <sup>a</sup>	.62 <sup>a</sup>	.27 <sup>a</sup>	.24 <sup>a</sup>	-.05	-.04	1.00	.71 <sup>a</sup>	.24 <sup>a</sup>	.15 <sup>c</sup>	.14
12. Phonological Awareness T2	.27 <sup>a</sup>	.10	-.14 <sup>c</sup>	-.07	.43 <sup>a</sup>	.45 <sup>a</sup>	.27 <sup>a</sup>	.12 <sup>+</sup>	-.11 <sup>+</sup>	-.14 <sup>c</sup>	.49 <sup>a</sup>	1.00	.32 <sup>a</sup>	.11	.10
13. Vocabulary T2	.24 <sup>a</sup>	.13 <sup>c</sup>	-.07	-.06	.41 <sup>a</sup>	.31 <sup>a</sup>	.14 <sup>c</sup>	.20 <sup>b</sup>	-.06	-.11 <sup>+</sup>	.44 <sup>a</sup>	.26 <sup>a</sup>	1.00	.24 <sup>a</sup>	.17 <sup>+</sup>
14. Child's Age T1	.08	.09	-.08	-.09	.09	.07	.07	.09	-.03	-.08	.10	.06	.10	1.00	-.05
15. Parental Education T2 <sup>1</sup>	.16 <sup>+</sup>	.20 <sup>c</sup>	-.21 <sup>b</sup>	-.16 <sup>+</sup>	.15 <sup>+</sup>	.17 <sup>c</sup>	.14 <sup>+</sup>	.22 <sup>b</sup>	-.09	-.12	.08	.06	.05	.00	1.00

Note. <sup>a</sup>  $p > 0.001$ , <sup>b</sup>  $p < 0.01$ , <sup>c</sup>  $p < 0.05$ , +  $p < 0.10$ . Two-tailed testing of significance. T1 = preschool fall, T2 = preschool spring; <sup>1</sup> 1 = no education; 5 = university degree

TABLE 3 Model fit indices of the nested models

	$\chi^2$	df	p-value	CFI	RMSEA	SRMR	AIC	BIC	Comparison	$\Delta S-B$	$\chi^2$	$\Delta df$	p-value	$\Delta CFI$
<b>Cooperating skills</b>														
M1: Stability model	13.529	3	.004	.984	.089	.050	5219.055	5288.569	-	-	-	-	-	-
M2: Social $\rightarrow$ lit+lang	1.788	1	.181	.999	.042	.013	5207.613	5285.305	M1 vs. M2	11.147	2	.002	.002	.015
M3: Literacy $\rightarrow$ social	11.077	2	.004	.986	.101	.045	5219.170	5292.772	M1 vs. M3	1.785	1	.182	.002	.002
M4: Fully reciprocal	.00	0	.000	1.00	.000	.000	5207.676	5289.457	M2 vs. M4	1.788	1	.181	.001	.001
	-	-	-	-	-	-	-	-	M3 vs. M4	11.077	2	.004	.004	.014
	-	-	-	-	-	-	-	-	M1 vs. M4	13.529	3	.004	.004	.016
<b>Empathy</b>														
M1: Stability model	13.393	3	.004	.981	.089	.045	5320.442	5389.956	-	-	-	-	-	-
M2: Social $\rightarrow$ lit+lang	4.750	1	.029	.993	.092	.027	5316.473	5394.165	M1 vs. M2	8.511	2	.014	.014	.012
M3: Literacy $\rightarrow$ social	8.221	2	.016	.988	.084	.028	5315.706	5389.309	M1 vs. M3	4.954	1	.026	.007	.007
M4: Fully reciprocal	.00	0	.000	1.00	.000	.000	5311.977	5393.758	M2 vs. M4	4.750	1	.029	.006	.006
	-	-	-	-	-	-	-	-	M3 vs. M4	8.221	2	.016	.012	.012
	-	-	-	-	-	-	-	-	M1 vs. M4	13.393	3	.004	.004	.019
<b>Disruptiveness</b>														
M1: Stability model	16.857	3	.001	.979	.102	.048	5207.494	5277.008	-	-	-	-	-	-
M2: Social $\rightarrow$ lit+lang	8.896	1	.003	.988	.134	.025	5201.177	5278.869	M1 vs. M2	8.757	2	.013	.009	.009
M3: Literacy $\rightarrow$ social	8.623	2	.013	.990	.087	.032	5201.427	5275.030	M1 vs. M3	9.105	1	.003	.011	.011
M4: Fully reciprocal	.00	0	.000	1.00	.000	.000	5195.241	5277.022	M2 vs. M4	8.896	1	.003	.012	.012
	-	-	-	-	-	-	-	-	M3 vs. M4	8.623	2	.013	.010	.010
	-	-	-	-	-	-	-	-	M1 vs. M4	16.857	3	.001	.001	.021
<b>Impulsivity</b>														
M1: Stability model	17.976	3	.000	.976	.106	.048	5162.578	5232.091	-	-	-	-	-	-
M2: Social $\rightarrow$ lit+lang	9.002	1	.003	.987	.135	.030	5156.833	5234.525	M1 vs. M2	8.431	2	.014	.011	.011
M3: Literacy $\rightarrow$ social	8.170	2	.017	.990	.084	.027	5151.858	5225.461	M1 vs. M3	9.107	1	.003	.014	.014
M4: Fully reciprocal	.00	0	.000	1.00	.000	.000	5146.538	5228.319	M2 vs. M4	9.002	1	.003	.013	.013
	-	-	-	-	-	-	-	-	M3 vs. M4	6.299	2	.043	.010	.010
	-	-	-	-	-	-	-	-	M1 vs. M4	17.976	3	.000	.000	.024