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Dynamics between perceived social support and study engagement among primary school students: A three-year longitudinal survey

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Abstract
Perceived high study engagement relates to higher school achievement and has been found to promote social and emotional well-being as well. Social support for studying has typically been examined as a resource for study engagement. However, the interrelation between social support and study engagement is likely to be bidirectional: engaged students might be more willing to find and share social support in their studies. The students' emotions and attitudes toward studying (i.e., study engagement) may also influence the teachers' and guardians' tendency to provide support for that individual student's studies. This study explores the bidirectional interrelations between perceived social support for studying and perceived study engagement using three-wave longitudinal survey data in which students are followed from the fourth to sixth grade collected in 2017, 2018, and 2019 ($N=2401$). The data are analyzed using the random-intercept cross-lagged panel model (RI-CLPM). The results indicate that perceived study engagement is a stronger and more consistent predictor of later perceived social support from teachers and among peers than vice versa. Moreover, teacher support has a bidirectional interrelation with study engagement. Girls perceive more study engagement, teacher support, and peer support in the fourth and fifth grades when compared with boys.

Keywords Social support · Study engagement · RI-CLPM · Longitudinal data, Gender differences

1 Introduction

Seeing studying as meaningful and inspiring has been found to be essential for students' achievement in school, psychological and social well-being, and better adjustment to society later in life (Lewis et al., 2011; Reschly et al., 2008; You &

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Sharkey, 2009). Study engagement refers to such experiences of meaningfulness, competence, and vigor while studying (Salmela-Aro & Upadyaya, 2012). However, in Finland, study engagement has been found to decrease already in primary school, with 45% of sixth graders suffering from cynical attitudes toward studying (Salmela-Aro et al., 2016). In relation to this, social support from teachers, peers, and guardians has been found to promote study engagement (Quin, 2017; Weyns et al., 2018). However, there is also tentative evidence that the interrelation might be bidirectional (Currie, 2014; Pitzer & Skinner, 2017; Zee et al., 2021). Engaged students might be more keen to provide and ask for help for studying when compared with their less-engaged peers (Ouweneel et al., 2011; Yang et al., 2021). Teachers also tend to have better relations with students who enjoy, value, and succeed in their schoolwork (Furrer & Skinner, 2009; Košir & Tement, 2014; Nurmi & Kiuru, 2015; O'Connor, 2010). Accordingly, to construct equally supportive learning environments for all students, the dynamics and development of students' perceived social support received from teachers, peers and guardians and study engagement need to be better understood.

Hence, in the current study, we presume that (a) perceived study engagement and social support from teachers, peers, and guardians predict each other over time (Curby et al., 2014; Furrer & Skinner, 2009; Košir & Tement, 2014; Nurmi & Kiuru, 2015; Ouweneel et al., 2011; Pitzer & Skinner, 2017; Weyns et al., 2018; Zee et al., 2021) and b) perceived social support from teachers and guardians has bidirectional relations with social support for studying among peers (Hughes & Chen, 2011; Newton et al., 2014). More specifically, we provide a new understanding of how perceived study engagement and social support influence each other within a student's changing experiences over time by considering the trait-like differences between students (Hamaker et al., 2015). There is some evidence that social support and study engagement are affected by some consistent trait-like factors, such as extraversion (Tan et al., 2017; Von Dras & Siegler, 1997) and openness (Bakker et al., 2015). These trait-like differences between students have not been taken into account in previous research, which may partly explain the mixed results on bidirectionality (e.g., Curby et al., 2014; Engels et al., 2016, 2019; Koka, 2013; Pitzer & Skinner, 2017; Weyns et al., 2018; Zee et al., 2021). We do this by analyzing three-wave longitudinal survey data in which students are followed from the fourth to sixth grade. In addition, we explore gender differences over time in terms of social support for studying and study engagement.

1.1 Study engagement

Study engagement refers to a student's positive experiences in relation to studying (Schaufeli et al., 2002). Study engagement consists of three distinct and complementary aspects: energy, dedication, and absorption (Salmela-Aro & Upadyaya, 2012). Energy entails vigor and being mentally resilient while studying (e.g., Tuominen-Soini & Salmela-Aro, 2014). Dedication entails experiences of significance, inspiration, pride, and identification related to studying and perceiving studying as meaningful (e.g., Salmela-Aro & Upadyaya, 2012). Absorption, on the other hand, is

characterized by a sense of competence and concentration while studying so that time passes quickly (Csikszentmihalyi, 1990; Schaufeli et al., 2002). Compared with energy and absorption, dedication is characterized by a more persistent positive attitude toward learning that persists even when facing a learning task that does not feel enjoyable (Wang & Eccles, 2012).

Compared with the broader definition of school engagement, which includes behavioral, cognitive, and emotional aspects (Appleton et al., 2006; Fredricks et al., 2004), study engagement describes the emotional and cognitive aspects in detail, but it does not include behavioral engagement (Salmela-Aro & Upadyaya, 2012). Experiencing higher levels of study engagement has been found to predict later behavioral engagement in school because dedicated students invest effort in studying and stay resilient when faced with challenges (Tuominen-Soini & Salmela-Aro, 2014). This increases the odds of study success, further resulting in positive experiences related to studying (i.e., energy and absorption). In turn, this promotes dedication and further behavioral engagement (Engels et al., 2019; Ouweneel et al., 2011; Skinner et al., 2008; Yang et al., 2021).

Generally, study engagement has been found to decrease slightly over time (e.g., Wang & Eccles, 2012), though differing trajectories of study engagement development have been detected (Li & Lerner, 2011; Tuominen-Soini & Salmela-Aro, 2014). There is some evidence that students who are engaged tend to stay so, whereas lower levels of initial engagement may result in decreased engagement over time (Tuominen-Soini & Salmela-Aro, 2014). Although most longitudinal studies on study engagement have focused on adolescents, there is tentative evidence that study engagement may begin to decrease in primary school (Salmela-Aro et al., 2016). Thus, more longitudinal studies are needed on study engagement during the primary school years.

Moreover, besides age differences, study engagement is also related to other individual factors such as gender. It seems that girls are more engaged in studying at school than boys (Li & Lerner, 2011; Skinner et al., 2008). However, also contextual factors relate to the development of students' study engagement (Lam et al., 2012; Weyns et al., 2018). Previous studies suggest that functional social interactions within the school community, particularly the social support provided by teachers and that is perceived to be available by the students, play a key role in the maintenance and development of study engagement (Quin, 2017; Weyns et al., 2018; Zee et al., 2021). Moreover, the students within a class tend to become more alike in their experiences of study engagement over time because positive emotions may spread across the group and further facilitate positive attitudes toward learning (Havik & Westergård, 2019; Kindermann, 2007; Kiuru et al., 2009; Ouweneel et al., 2011).

1.2 The bidirectional relationship between study engagement and social support for studies

Social support has been found to be an essential resource for students' study engagement (Upadyaya & Salmela-Aro, 2013), and it refers to the social resources

perceived to be available and used by students (see the seminal work by Cohen et al., 2000). Previous studies have indicated that for primary school students, teachers, peers, and guardians are the essential sources of support for studying, with each source having a distinctive but complementary role (Chen, 2005; Estell & Perdue, 2013; Malecki & Demaray, 2002).

There is cumulative research evidence that perceived teacher support for studying is a vital resource for students' study engagement (Hughes et al., 2008; Quin, 2017; Weyns et al., 2018). Well-explicated expectations, guidance, and clear instructions, combined with emotional support entailing acceptance, care, and warmth, are essential forms of social support from teachers (Hamre et al., 2013; Havik & Westergård, 2019). Moreover, such informational and emotional support from teachers facilitates students' willingness and ability to engage in peer support for studying (Buyse et al., 2009; Hughes & Chen, 2011; Luckner & Pianta, 2011; Wentzel et al., 2018). However, an increasing amount of research evidence indicates that the relationships may be bidirectional: study engagement and peer support may also be resources for teacher support (Curby et al., 2014; Currie, 2014; Pitzer & Skinner, 2017; Zee et al., 2021).

There is also evidence that perceived study engagement influences perceived teacher support. The students' characteristics have been found to influence the social support teachers provide for them (Currie, 2014; Furrer & Skinner, 2009; Hughes et al., 2008; Jennings & Greenberg, 2009; Jussim & Harber, 2005; Pitzer & Skinner, 2017; Skinner & Belmont, 1993; Zee et al., 2021). Students who are engaged and succeed in their studies tend to have better relations with their teachers (Košir & Tement, 2014; Nurmi & Kiuru, 2015; O'Connor, 2010; Split et al., 2011; Yang et al., 2021). Moreover, a student's positive emotions and attitudes toward studying may promote their willingness to perceive and utilize the available support from teachers (Pitzer & Skinner, 2017; Skinner et al., 2008). Thus, besides teacher support promoting study engagement, study engagement may also influence the perceived teacher support. The current study examines the bidirectional relations between study engagement and emotional and informational support from teachers.

Furthermore, besides perceived teacher support facilitating peer support, students' positive relationships with teachers may be cultivated by their willingness and ability to help their peers in studying (Hughes & Chen, 2011; Nurmi & Kiuru, 2015; O'Connor, 2010; Skinner & Belmont, 1993; Split et al., 2011). When students provide support for each other in studying, such prosocial behavior in relation to studying may promote positive emotions and expectations in the teacher towards the students that further facilitate better teacher-student relationships. Accordingly, perceived social support for studying from teachers and peers are also likely to promote each other over time (Hughes & Chen, 2011).

However, the findings on the relationship between perceived peer support and study engagement are more controversial (Estell & Perdue, 2013; Kiefer et al., 2015; Kindermann, 2007; Liu et al., 2016; Wentzel et al., 2017). Peer support for studying has been found to be positively related to study engagement (Rautanen et al., 2021; Ulmanen et al., 2014, 2016b). When students are willing to provide and seek social support for studying among their peers, it entails sharing a positive attitude toward studying in their peer group. Perceiving social support within a peer group that

shares a positive attitude toward studying has been found to promote study engagement (Wang & Eccles, 2012). Moreover, among peers, students can give or receive support, or they may engage in reciprocal support (Rautanen et al., 2021; Ulmanen et al., 2014, 2016b). The roles of the receiver and giver are both beneficial for the student's study engagement, even though receiving or giving the support determine the support experience differently (Feeney & Collins, 2015).

In addition, also the interrelation between perceived study engagement and peer support may be bidirectional. Accordingly, when the student is willing to invest effort and time in studying, perceives studies as meaningful and inspiring, and feels competent in and concentrated on studying (i.e., perceives study engagement), this is likely to increase the student's willingness and ability to provide and ask for help among peers for studying (Ouweneel et al., 2011; Wang & Eccles, 2012). In sum, we presume that engaged students are more keen to provide and seek help in studying, which further promotes their engagement in studying.

Besides teacher support, there is increasing evidence that perceived social support from guardians is also associated with study engagement and peer support (Estell & Perdue, 2013; Wang & Eccles, 2012). Guardians' valuing of and interest toward studying has been shown to facilitate the student's positive attitudes toward studying (Cheung & Pomerantz, 2015; Friedel et al., 2007; Lukin, 2013) and further their willingness for reciprocal support for studying among peers (Rautanen et al., 2021). The guardian's tendency to provide social support for their children is also affected by the child's study engagement. There is tentative evidence that guardians might be more involved if the student experiences challenges in studying (Chen, 2008). Moreover, the guardian's involvement in their child's studying has been found to be positively related to the teacher–student relationship (O'Connor, 2010). A positive and close relationship between teachers and guardians facilitates shared goals and a sense of partnership in supporting the student's learning (Christenson & Sheridan, 2001; O'Connor, 2010). A positive relationship with guardians may also pave the way for more positively tuned teacher expectations for the teacher–student relationship (Pianta & Walsh, 1996). However, in general, teacher support and peer support have been found to have stronger relationships to primary school students' study engagement than social support from guardians (Rautanen et al., 2021).

However, the relative importance of perceived support for studying from different sources seems to vary over time. Generally, of the three support sources that have been presented, peer relations become more important and those with teachers and guardians less so for students as they grow older (Chen, 2008; Split et al., 2012). Younger students rely more on adults for emotional and informational support, but as they grow older, their socioemotional and cognitive abilities mature, enabling them to seek independence from adults and increasingly construct social support for studying among peers (Chen, 2008; Liu et al., 2016; Split et al., 2012). However, there is individual variation in the developmental trajectories of teacher–student relationships (Split et al., 2012). Moreover, there is some evidence of teacher–student relations becoming more important for older students' engagement (Liu et al., 2016; Roorda et al., 2011).

Besides the differences related to the student's age, gendered differences in perceived study engagement and social support for studying have also been

detected. Girls have been found to experience stronger study engagement than boys, especially in terms of energy and dedication to studying (Lam et al., 2012; Salmela-Aro & Upadyaya, 2012). Girls have also reported more teacher support and tend to engage more in peer support as well (Lam et al., 2012; Wentzel et al., 2017), particularly in lower grades (Liu et al., 2016). Boys tend to have stronger changes in their support trajectories over time (Li & Lerner, 2011). It has been suggested that the school social environment and behavioral expectations placed upon students suit girls better, which may promote better teacher–student relations (Ewing, 2009; Split et al., 2012; Zahn-Waxler et al., 2008). However, it appears that girls integrate more strongly into the social interactions at school (Rautanen et al., 2021). However, there is individual variations in both study engagement and perceived social support.

In sum, previous studies have mainly focused on percevied social support's influence on study engagement, of which there is substantial evidence (Estell & Perdue, 2013; Havik & Westergård, 2019; Quin, 2017). However, more research is needed concerning the bidirectional interrelations between a student's study engagement and their perceived social support for studying from teachers and guardians and among peers during the last years of primary school. In our previous study (Rautanen et al., 2021), we explored the interrelations between perceived social support for studying and study engagement using cross-sectional data collected from fourth graders. This was the first wave of the three-wave longitudinal data explored in the current study. In our previous study, we found that social support from teachers played a particularly important role, being positively related to study engagement and peer support for studying, which then facilitated study engagement further (Rautanen et al., 2021). However, with cross-sectional data, we could not explore the direction of the influence between study engagement and social support. In the present study, we have followed the same students to fifth and sixth grade. This longitudinal data provide the opportunity to explore the bidirectional relations over time, that is, whether perceived social support is a stronger predictor of perceived study engagement or vice versa.

2 Aim of the study

The current study aims to gain a better understanding of the dynamic interrelations between students' perceived study engagement and social support over the last three years of primary school, specifically in the context of Finland (Fig. 1). We explore the within-person dynamics of study engagement and social support by separating the between-person variance that describes the consistent trait-like differences between students. Thus, we can study the state-like within-person dynamics between study engagement and social support (Hamaker et al., 2015). The longitudinal dynamics between teacher, guardian, and peer support are also studied. The differences between boys and girls in their experiences of social support are examined as well.

Accordingly, the following hypotheses were tested:

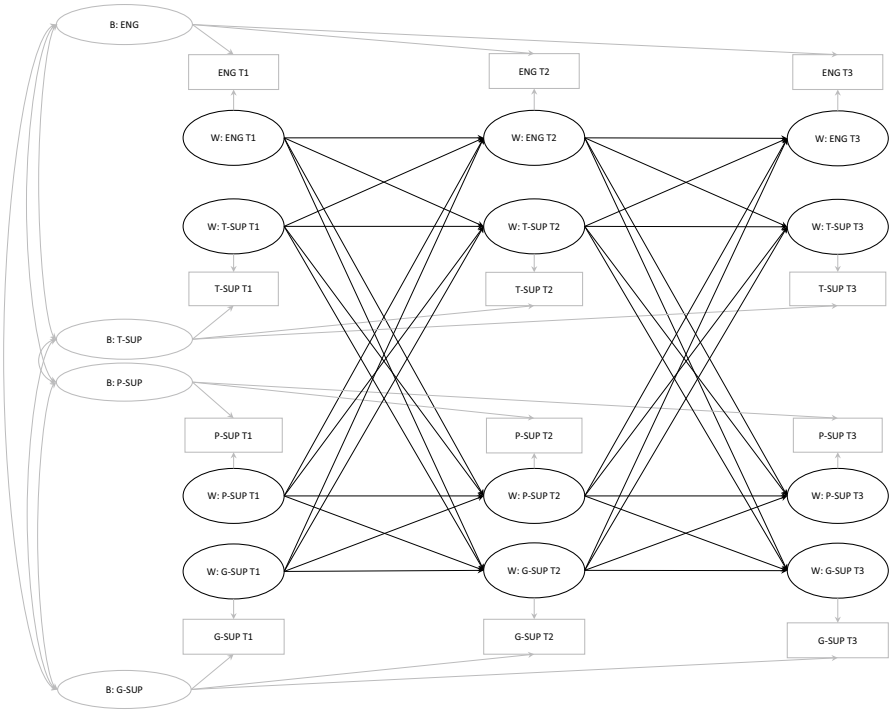

Fig. 1 Hypothesized random-intercept cross-lagged panel model (RI-CLPM). W = within person. B = between person, ENG = study engagement, T-SUP = teacher support, P-SUP = peer support, G-SUP = guardian support. Within-wave correlations among latent variables (T1) and residuals (T2–T3) are modeled in the analysis but not depicted in the figure for clarity

H1: The students' perceived study engagement and students' perceived social support for studying from teachers and guardians and among peers predict each other over time (i.e., they have bidirectional relations).
H2: The students' perceived social support for studying from teachers and guardians and among peers predict each other over time (i.e., they have bidirectional relations).
H3: Students' perceived study engagement and social support for studying from teachers and guardians and among peers positively correlate with each other at every time point (within T1, T2, and T3) and predict themselves over time. Study engagement and social support from teachers and among peers correlate more strongly with each other than with social support from guardians.

3 Materials and methods

3.1 Finnish primary school

The way schooling is organized in Finland at different levels of education influences the roles teachers, guardians, and peers have in relation to children's study engagement (Rautanen et al., 2021). In Finland, compulsory comprehensive school begins when the child is seven years old. Comprehensive school consists of six years of primary school and three years of lower secondary school. During primary school, most subjects are taught by a class teacher, who also teaches the same class group for several years. The national core curriculum provides only general guidelines and aims for teaching. Class teachers have a master's degree in educational science, and they are responsible for choosing the appropriate pedagogical practices, which they do by considering the unique characteristics of their students. Hence, the class teacher plays a central role in constructing the students' learning environment at school. In Finland, the school differences are typically small when it comes to the student's learning and well-being (Lindfors et al., 2018; Thuneberg et al., 2015; Vainikainen et al., 2014). However, more differences can be found between classes (Lindfors et al., 2018; Thuneberg et al., 2015; Vainikainen et al., 2014).

3.2 Participants and data collection

The data for the current study were collected using clustered hierarchical sampling (Snijders & Bosker, 2012). Altogether, $N^{T1} = 2{,}401$ fourth graders (49.1% girls) from 149 classes at 63 comprehensive schools around Finland participated in the study at time point 1. On average, they were 10 years of age at time point 1. The total response rate was 83% at time point 1. Only the students who participated in the first data collection were followed up on in the subsequent data collections [$N^{T2} = 2{,}067$ (86.08%); $N^{T3} = 2{,}003$ (83.42%)]. The students who dropped out of the study after T1 and did not return to the study in T3 ($n = 197$) experienced slightly lower levels of study engagement (mean level difference, Cohen's $d = -0.17$, $p < .02$), teacher support (Cohen's $d = -0.18$, $p < .02$), and peer support (Cohen's $d = -0.20$) compared with the respondents who answered in at least two measure points. However, the number of students dropping out was small ($n = 197$) in relation to the entire sample ($N = 2{,}401$); thus, the results were not skewed. The typical reasons for students dropping out of the study were that they were absent from school the day the data were collected or that they had moved to another school not included in the study.

The data were collected in the autumns of 2017, 2018, and 2019 in the classrooms during a lesson. The students were told about the study and provided instructions on how to complete the survey. The students were told that it was voluntary to participate in the study throughout the follow-up, that it was not a school assignment, and that individual student's answers would not be seen by anyone outside the research group. Guardians gave their informed consent for the students to participate. The school size varied from 50 students to over 1,000 students, and the schools

presented both high and low socioeconomical status (SES) areas (42% presenting low SES areas). The class size varied from five students to 33 students, and there were students who had learning difficulties and immigrant backgrounds who were also included.

3.3 Measurements

Social support for studying was assessed using three scales developed by the research group: support from teachers (11 items), support from guardians (7 items), and support among peers (10 items) for studying. From teachers, the scale assessed emotional and informational support (e.g., "My teachers give me encouragement and support"; "I often receive constructive feedback from teachers"). Among peers, the scale assessed providing and receiving social support for studying (e.g., "I support my friends in their studies", "My classmates' encouragement inspires me in my studies"). From guardians, the scale assessed expressed valuing of and involvement in the student's studies (e.g., "How often has an adult at home … asked if you need help with your homework or in preparing for an exam? How often has an adult at home … told you that school is important?") Teacher and peer support were measured using a 7-point Likert scale (1 = *I totally disagree*, 7 = *I totally agree*), and guardian support was measured using a 5-point scale assessing the students' perceptions of the frequency of their guardian's involvement (1 = *never*, 2 = *rarely*, 3 = *sometimes*, 4 = *quite often*, 5 = *very often*). The social support scales used in the current study were tested and further developed in a two-phase pilot study. In the pilot study, students from grades 4 to 8 were first interviewed to ensure that they understood the items in the survey. Then, the scales were statistically studied using principal axis factoring (PCA) and exploratory factor analysis (EFA) to identify the three scales. (Rautanen et al., 2021 for the full scales).

Study engagement was assessed using the Study Engagement Scale (9 items), which assesses energy, dedication, and absorption in studying (e.g., "I find my studies to be full on meaning and purpose. Time flies when I'm studying"; Salmela-Aro & Upadyaya, 2012; Schaufeli et al., 2002). Study engagement was measured using a 7-point Likert scale (1 = *I totally disagree*, 7 = *I totally agree*).

3.4 Data analysis

First, using confirmatory factor analysis (CFA), we examined the measurement models of study engagement, social support from teachers, social support from guardians, and social support among peers (Table 1). The residuals of the same items were allowed to correlate over time (Little et al., 2007). Consistent with previous research (Rautanen et al., 2021), the one-factor models of each scale fit the data well after three additional residual covariances were freed within each measurement point: one in social support from teachers and the other two in social support among peers.

Then, we tested the measurement invariance of the latent constructs over time for the same models (Appendix A). The configural model, metric invariance model, and scalar invariance model were tested, and a change above − 0.01 in the comparative

Table 1 The model fit of the scalar invariant measurement models

Scale	$\chi 2$	df	*n*	RMSEA	CFI	TLI	SRMR	NFI
Study engagement	1132.875*	326	2067	0.04 (90% CI 0.03–0.04)	0.97	0.97	0.03	0.96
Social support from teachers	2143.060*	496	2067	0.04 (90% CI 0.04–0.04)	0.95	0.95	0.04	0.94
Social support among peers	1502.695*	402	2067	0.04 (90% CI 0.03–0.04)	0.95	0.95	0.04	0.94
Social support from guardians	582.295 *	189	2066	0.03 (90% CI 0.03–0.04)	0.97	0.96	0.04	0.95

*$P < 0.001$

fit index (CFI), Tucker–Lewis index (TLI), or above 0.010 in root mean square error of approximation (RMSEA) was used as a cut-off value, hence showing a decreased fit that would reject the more constrained model (Chen, 2007; Cheung & Rensvold, 2002). Scalar invariance was supported for each scale.

Because of the clustered structure in the data of students within classes and class groups within schools, we calculated the intraclass correlation coefficients (*ICC*) to estimate the class- and school-level variance in the variables (Table 2). Because over 5% of the variance was at the class level for some variables, we utilized an approach for computing standard errors and a chi-square test that considered the nonindependence of observations in Mplus (Type complex). At this point, we excluded 133 students from the analysis, because they had changed classes over the follow-up period, which means they had varying values in the clustering variable used in our complex analyses. The students who had changed classes perceived slightly lower levels of peer support in fifth grade (Cohen's $d = -0.22$, $p < .02$) and sixth grade (Cohen's $d = -0.23$, $p < .01$), lower levels of study engagement in sixth grade (Cohen's $d = -0.20$, $p < .03$), and lower levels of guardian support in sixth grade (Cohen's $d = -0.25$, $p < .01$).

We used the full information maximum likelihood estimator (MLR) with robust standard errors and chi-square statistics (MLR estimator; Muthén & Muthén, 1998–2017) to account for the missing data (Schafer & Graham, 2002). Little's MCAR test indicated that the data were not missing completely at random: $\chi^2 98460.715$, $DF = 90{,}430$, $p = 0.00$. The data were assumed to be missing at random (MAR). We analyzed the descriptive statistics using SPSS.

We used structural equation modeling (SEM) to study the random-intercept cross-lagged panel model (Hamaker et al., 2015; Mund & Nestler, 2019), here by using Mplus 8.0 software (Muthén & Muthén, 1998–2017). The model separates within-person and between-person parts of the variance by means of the inclusion of a random-intercept factor. Consequently, the between-person variance that describes the trait-like and time-invariant differences between individuals (such as personality traits) are separated, and the lagged effects describe the within-person (i.e., individual-level) dynamics of the variables over time (Berry & Willoughby, 2017; Hamaker et al., 2015; Mund & Nestler, 2019). Therefore, the RI-CLPM was able to provide more robust answers to whether study engagement and social support

Table 2 Descriptive statistics of the scales

	1	2	3	4	5	6	7	8	9	10	11	12
1. Study engagement T1	–											
2. Social support from teachers T1	.59	–										
3. Social support among peers T1	.61	.67	-									
4. Social support from guardians T1	.39	.41	.44	–								
5. Study engagement T2	.60	.41	.38	.26	–							
6. Social support from teachers T2	.43	.59	.44	.25	.62	–						
7. Social support among peers T2	.44	.47	.59	.28	.61	.69	–					
8. Social support from guardians T2	.22	.28	.25	.52	.35	.39	.43	–				
9. Study engagement T3	.48	.29	.29	.24	.64	.38	.37	.23	–			
10. Social support from teachers T3	.36	.47	.33	.22	.48	.62	.46	.27	.57	–		
11. Social support among peers T3	.41	.41	.51	.26	.48	.50	.65	.30	.58	.62	–	
12. Social support from guardians T3	.22	.22	.21	.47	.29	.27	.28	.61	.36	.36	.38	–
M	4.51	5.37	5.60	4.02	4.25[a]	5.36	5.60	4.00	3.93[a]	5.13[a]	5.46[a]	3.92[a]
SD	1.41	1.22	1.12	0.77	1.46	1.28	1.13	0.77	1.45	1.34	1.12	0.79
Range	1–7	1–7	1–7	1–5	1–7	1–7	1–7	1–5	1–7	1–7	1–7	1–5
ICC Class	0.047	0.100	0.050	0.032	0.079	0.122	0.076	0.045	0.074	0.106	0.057	0.044
ICC School	0.039	0.065	0.031	0.017	0.043	0.078	0.035	0.021	0.049	0.058	0.033	0.028
Cohen's *d* (gender differences)	0.33***	0.28***	0.43***	0.17***	0.22***	0.16***	0.45***	0.02	0.08	0.04	0.39***	−0.05
Scale α	0.927	0.940	0.916	0.827	0.941	0.950	0.925	0.845	0.944	0.955	0.921	0.853

All correlations are significant at $p < 0.01$

[a] *t*-test previous measurement point ($p < 0.001$)

*** *t*-test gender differences ($p < 0.001$)

variables influence each other over time and which of the variables was causally dominant at the individual level compared with the traditional CLPM, in which the within- and between-person variances would be mixed in the lagged effects (Hamaker et al., 2015). The intraclass correlations indicated that approximately half of the variance was at the within-person level in study engagement ($ICC = 0.54$), teacher support ($ICC = 0.54$), guardian support ($ICC = 0.53$), and peer support ($ICC = 0.58$). Thus, there was enough within-person variance to use the RI-CLPM (Berry & Willoughby, 2017; Hamaker et al., 2015).

The measurement models of the latent variables could not be used in the panel model because there were more parameters in the model than the number of clusters in the data ($n = 149$). Thus, we analyzed the panel model using multiple imputations from five datasets of plausible values (Asparouhov & Muthén, 2010; Von Davier et al., 2009; Laukaityte & Wiberg, 2017; Muthén & Muthén, 1998–2017). The five datasets of plausible values for each scale were estimated of the measurement models with scalar invariance.

The model fit was evaluated using the following criteria for adequate or good fit: the CFI and TLI above 0.90, RMSEA below 0.07/0.05, and standardized root mean squared residual (SRMR) below 0.05 (Byrne, 2012; Hooper et al., 2008). In addition, the chi-square test statistic was used with caution because of its sensitivity to large sample sizes.

4 Results

The descriptive statistics showed that the mean scores of the perceived social support for studying from teachers, among peers, and from guardians were quite high and seemed to stay at the same level from fourth to fifth grade (Table 2; consider the differing scale of guardian support). In sixth grade, perceived social support from teachers and guardians and among peers slightly decreased. However, the students' perceived study engagement was not at the same high level and appeared to decrease from the fourth to fifth and sixth grades. Social support from guardians had the lowest correlations with the other scales, whereas study engagement, teacher support, and peer support correlated more with each other. The students within a class and school were most alike in terms of social support from teachers (Table 2). However, at the second and third time points, perceived study engagement and social support among peers also showed variance at the class level, although not as much as teacher support.

There were statistically significant differences between boys and girls in the mean scores (Table 2). The biggest difference was in the perceived social support for studies among peers. Girls reported higher levels of peer support, and the difference remained from fourth to sixth grade. Moreover, girls perceived higher levels of study engagement and social support from teachers in fourth grade compared with boys. However, over the years, girls' perceptions of their study engagement and teacher support decreased more than that of boys and ended up at the same level as

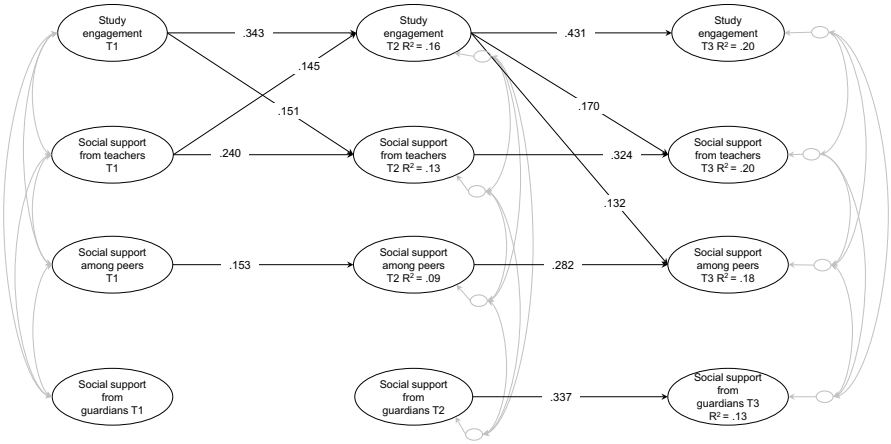

Fig. 2 Simplified random-intercept cross-lagged panel model with plausible values. The presented autoregressive and cross-lagged effects are statistically significant ($P < 0.05$) and standardized. The model fit is as follows: $\chi 2(6,\ N = 2067)\ M = 16.224\ SD = 4.10$, RMSEA $M = 0.03\ SD = 0.01$; CFI $M = 1.00\ SD = 0.00$; TLI $M = 0.99\ SD = 0.00$; SRMR $M = 0.01\ SD = 0.00$

for boys in the sixth grade. From guardians, girls perceived slightly more social support in the fourth grade, but the difference evened out in the fifth and sixth grades.

The tested random-intercept cross-lagged panel model with plausible values (Fig. 2) fit the data well and provided partial support for H1 by showing that a higher level of perceived study engagement in the fourth grade, here relative to the student's expected average levels, predicted perceived social support from teachers ($0.15^{T1–T2}$) to increase over the following year. The effect was repeated over the second follow-up year, from the fifth to sixth grade, from study engagement to teacher support ($0.17^{T2–T3}$). Additionally, a higher level of perceived study engagement in fifth grade also predicted increased levels of peer support in sixth grade ($0.13^{T2–T3}$). Accordingly, seeing studying as meaningful and inspiring predicted increased levels of perceived emotional and informational support from teachers one year later. Study engagement also predicted students' increased willingness and ability to share social support for studying among their peers one year later.

The model showed that a higher level of perceived social support from teachers in fourth grade, relative to the student's average levels, predicted perceived study engagement to increase over time ($0.15^{T1–T2}$). Perceiving more emotional and informational support from teachers predicted increased levels of energy, dedication, and absorption in studying one year later. However, the effect was not repeated from the fifth to sixth grade. In any case, the results suggest a bidirectional relationship between perceived teacher support and study engagement. A higher level of social support for studying among peers or from guardians in fourth grade did not predict increased study engagement a year later. Accordingly, the results indicate that with a one-year time interval, primary school students' perceived study engagement is a stronger and more consistent predictor for later perceived social support than vice versa.

The model did not support H2, which states that all forms of perceived social support for studies predict each other over time. When studying the within-person dynamics between the variables over a one-year period, it appears that a higher level of social support from one source does not directly predict an increase in the level of social support from the other sources.

The model supported H3 by showing that perceived study engagement and social support from teachers and guardians and among peers predicted themselves over time. However, perceived guardian support predicted itself only from fifth to sixth grade. In the RI-CLPM, the autoregressive parameters represent the amount of the within-person carry-over effect, not the stability of the rank order of individuals over time (Hamaker et al., 2015). Accordingly, students who perceived increased levels of study engagement compared with the student's average levels also reported increased levels of study engagement a year later. Similar effects were also found for perceived teacher support and peer support. Study engagement predicted itself the most ($0.34^{T1–T2}$; $0.43^{T2–T3}$) over a one-year time interval. Study engagement and social support from teachers and guardians and among peers correlated strongly and positively with each other at each time point. Social support from guardians had the lowest correlations with the other variables, as expected.

5 Discussion

The majority of previous studies have explored social support as a resource for study engagement, of which there is substantial evidence (Estell & Perdue, 2013; Quin, 2017; Wang & Eccles, 2012). Interestingly, according to our results, perceived study engagement appears to be a stronger and more consistent predictor of later perceived social support for studying than vice versa. Regarding peer support for studying, it appears that students need to first perceive their studying as meaningful and inspiring, which may then result in increased willingness and ability to provide and ask for social support from their peers for studying (Ouweneel et al., 2011). Regarding perceived teacher support, however, we found that emotional and informational support for studying from teachers has bidirectional relations with study engagement (cf. Curby et al., 2014; Engels et al., 2019; Pitzer & Skinner, 2017; Weyns et al., 2018; Zee et al., 2021).

Students who found studying meaningful and inspiring and who felt competent in studying perceived more emotional and informational support from their teachers a year later. It may be that engaged students are more eager to recognize and utilize the available support from teachers compared with those students whose study engagement has decreased (Pitzer & Skinner, 2017; Skinner et al., 2008; Yang et al., 2021). On the other hand, these results may imply that teachers tend to provide more care, empathy, trust, encouragement, acknowledgment, and constructive feedback to those students who are more engaged in studying. This is, if the student's perceptions of teacher support and engagement reflect actual received support and engagement in studies. Engaged students may evoke positive emotions and expectations in the teacher, which may cultivate a more positive teacher–student relationship (Jennings & Greenberg, 2009; Jussim & Harber, 2005; Nurmi, 2012; Nurmi & Kiuru, 2015;

O'Connor, 2010; Split et al., 2011; Yang et al., 2021 cf. Bronfenbrenner & Morris, 2006). Thus, providing social support for unengaged students, which may evoke more negative reactions in the teacher, can be considered an especially demanding task for the teacher. The relations may be influenced by the teacher's interpersonal skills in relating to different kinds of students and their opportunities for drawing on the collective resources of the professional community (Garner, 2010; Jennings & Greenberg, 2009; Pianta et al., 2012; Pyhältö et al., 2020). Our results imply that by considering the unique characteristics of each student and the group and by then cultivating the kinds of pedagogical practices that promote the student's experiences of meaningfulness, inspiration, dedication, identification, and competence related to studying (i.e., study engagement; Hamre et al., 2013; Lam et al., 2012; Lauermann & Berger, 2021; Skinner & Pitzer, 2012), teachers can facilitate positive, learning-oriented social interactions in the classroom.

In line with previous research, we also found that perceived emotional and informational support from teachers can enhance students' perceived study engagement (Havik & Westergård, 2019; Wang & Eccles, 2012). Social support from teachers also facilitates peer support because engaged students are more willing and able to support each other in schoolwork and learning (Ulmanen et al., 2014, 2016a, 2016b). Thus, by providing empathy, care, acknowledgment, and encouragement (i.e., emotional support), combined with clear instructions on how to efficiently achieve the proposed learning goals (i.e., informational support), teachers can help students engage in their schoolwork. This, in turn, promotes their willingness and ability to share social support with other students. Moreover, teachers play a key role in choosing pedagogical practices that build opportunities for peer support in the classroom (Ryan et al., 2001; Soini et al., 2016; Westling et al., 2017).

Interestingly, however, our results indicate that perceived study engagement is a stronger predictor for later perceived teacher support than the other way around. Previous studies have had mixed results of bidirectionality, typically indicating that teacher support is the stronger predictor (cf. Curby et al., 2014; Engels et al., 2019; Koka, 2013; Pitzer & Skinner, 2017; Weyns et al., 2018; Zee et al., 2021). Our results may be related to the form of teacher support and engagement assessed in the current study, as well as to using the student's self-assessments (Estell & Perdue, 2013; Koka, 2013; Roorda et al., 2011; Yang et al., 2021). Our results indicate that perceiving energy, dedication, and abortion in studies (i.e., study engagement) promotes the student's perceived emotional and informational support from their teacher more than the other way around (Yang et al., 2021).

The results show that the student's class group influenced the experiences of social support and study engagement (Havik & Westergård, 2019; Tuominen-Soini & Salmela-Aro, 2014). It has been found that emotions are contagious (Wild et al., 2001). Thus, the positive or negative emotions related to studying may spread across the group and further facilitate positive or negative attitudes. Peer group norms regarding expressing emotions when it comes to studying and the pedagogical practices implemented by the teacher may regulate the spread of these emotions within the class (Kindermann, 2007; Ryan et al., 2001). In accordance with the literature, we have found that girls experienced more study engagement and social support from teachers and were more willing and able to help each other than boys in the

fourth and fifth grades (Lam et al., 2012; Liu et al., 2016). Interestingly, however, girls' experienced study engagement and teacher support decreased over the three years more than for boys, ending up at the same level as boys in the sixth grade.

Consistent with previous studies, perceived study engagement strongly predicted itself over time. There is evidence that the inner dynamics of study engagement may promote future engagement (Skinner et al., 2008; Tuominen-Soini & Salmela-Aro, 2014). Our results further suggest that perceived social support from teachers may facilitate this development (Nouwen & Clycq, 2019). In addition, social support from teachers and among peers appears to have a carry-over effect over the years. During the last three years of primary school, the students typically stay with the same teacher and classmates, which may partly explain the stability of the perceived support experience and variation between classes (O'Connor, 2010).

In sum, our results have shown that when students find studying meaningful and inspiring, they are more willing to support their peers in studying and perceive more support from their teachers. This, in turn, further promotes the students' study engagement. Further studies are needed to explore whether these reciprocal interrelations constitute a gain cycle, in which students who enjoy and value studying tend to share more social support among their peers and perceive more support from their teachers as well, in turn promoting their study engagement further (Curby et al., 2014; Currie, 2014; Hamre et al., 2013; Jennings & Greenberg, 2009; O'Connor, 2010; Pianta et al., 2012; Pitzer & Skinner, 2017; Skinner & Pitzer, 2012; cf. Bronfenbrenner & Morris, 2006; Jang et al., 2016). Accordingly, a lack of study engagement may result in a negative developmental trajectory, in which engagement and support decrease over time (Pitzer & Skinner, 2017; Skinner & Pitzer, 2012; Skinner et al., 2008). To reveal the differing developmental trajectories, however, these dynamic interrelations should be studied with person-oriented approaches that focus on the developmental trajectories of these constructs.

5.1 Limitations

We have used a longitudinal design, which can be considered a major strength of the study. The RI-CLPM separates within-person and between-person variance by including latent factors that capture the between-person variance (Hamaker et al., 2015). Thus, compared with the traditional CLPM, the RI-CLPM provides more robust evidence for the finding that study engagement is a causally more dominant predictor of later social support than the other way around (Hamaker et al., 2015).[1] However, the RI-CLPM does not describe the developmental trajectories of a certain construct. Rather, it focuses on the interrelations between constructs over time, particularly at the individual level (Mund & Nestler, 2019). We utilized a one-year time interval; thus, the results indicate changes in the variables over that period. Further studies with varying time intervals are needed to see how these relations vary over

[1] Our additional analysis using the traditional CLPM also indicated that study engagement is a stronger and more consistent predictor of later social support for schoolwork than the other way around.

shorter or longer time intervals. Additionally, there was class-level variance in social support and study engagement, which calls for multilevel research designs.

The data were collected from primary school students in fourth grade (T1), and these students were followed through the fifth (T2) and sixth grades (T3). Because the majority of prior studies on study engagement have focused on a secondary school setting, although Finnish students' study engagement begins to decrease in primary school (Salmela-Aro et al., 2016), our study has provided new insights into the early development of study engagement. The data consisted of a nationally representative sample of Finnish primary schools, and the response rate was exceptionally high, including the follow-up. The reliability of the scales was supported by confirmatory factor analyses (Rautanen et al., 2021). The scalar measurement invariance for the factor structures was also supported over the three measurements.

The data consisted of self-reports that may have been influenced by the participants' abilities and willingness to identify the support available to them. It has been found that it is vital that the student recognizes the support for it to influence the student's perceived study engagement (Estell & Perdue, 2013; Havik & Westergård, 2019; Skinner et al., 2008). It has been found that students and teachers provide different perspectives on the social support available at school (Aldrup et al., 2018; Cipriano et al., 2019; Lauermann & Berger, 2021). Future research should utilize multiple informants (i.e., teachers, peers, and guardians) to provide different viewpoints regarding the available social support for studying. Moreover, the teachers' resources and how these influence their abilities to provide support for their students (i.e., professional support, educational level, teaching experience, occupational stress) should be further studied to support teachers in their work.

Future research on social support for studies should also consider the student's achievement in studies because it may influence their perceived social support. High-achieving students have been found to have better relations with their teachers, and they may be more eager to share support for studies among peers as well (Nurmi, 2012; Nurmi & Kiuru, 2015). Regarding guardian support, it may be that high-achieving students do not need their parents to intervene as much (Rautanen et al., 2021). Future research should also consider the guardians' educational level because this may influence the value they place on high school achievement, which may further influence the support guardians' provide for the child's studies. Moreover, in the current study, we explored gender differences only in terms of perceived level of social support and study engagement. The main analyses were not conducted separately for different genders. However, there is tentative evidence of gender differences in the interrelations between social support and study engagement, and these should be studied further (Rautanen et al., 2021). Finally, our results call for further studies that explore the bidirectional relationship between study engagement and social support practices in real life settings, i.e., within the authentic teaching–learning situations, utilizing observational and/or qualitative methods.

6 Conclusions and practical implications

Our results have provided new evidence of the ways in which social support for studying is constructed in the dynamic interactions within a class community. Students who perceive study engagement facilitate social support for studying among their peers and form positive relations with their teachers, which might benefit not only themselves, but also others in their class community. In line with the literature, the present study has highlighted that perceiving close and caring relationships with teachers and clear instructions for students are essential in facilitating students' perceived study engagement and, further, their willingness and ability to help each other in their schoolwork and learning. Perceveinig teacher support is especially important for unengaged students because a lack of engagement may result in perceived engagement and social support for studying to further decrease over time. Although important, forming positive relationships with unengaged students can be especially demanding for the teacher. In the present study, we did not include the teacher's viewpoint in the reciprocal process of social support. In any case, our results suggest that engaged students could provide the teacher with a resource for constructing a socially supportive learning environment at school.

Appendix A

See Tables 3, 4, 5, 6.

Table 3 Measurement invariance of the scale of study engagement

Model	CFI	TLI	RMSEA
Baseline model	0.979	0.974	0.033
Factor loadings constrained equal	0.977	0.974	0.033
Measurement intercepts constrained equal	0.974	0.972	0.035

Table 4 Measurement invariance of the scale of social support from peers

Model	CFI	TLI	RMSEA
Baseline model	0.955	0.946	0.037
Factor loadings constrained equal	0.955	0.949	0.036
Measurement intercepts constrained equal	0.953	0.949	0.036

Table 5 Measurement invariance of the scale of social support from teachers

Model	CFI	TLI	RMSEA
Baseline model	0.960	0.954	0.039
Factor loadings constrained equal	0.959	0.955	0.039
Measurement intercepts constrained equal	0.954	0.952	0.040

Table 6 Measurement invariance of the scale of social support from guardians

Model	CFI	TLI	RMSEA
Baseline model	0.973	0.966	0.031
Factor loadings constrained equal	0.972	0.967	0.030
Measurement intercepts constrained equal	0.967	0.964	0.032

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Declarations

Conflict of interest We have no known conflict of interest to disclose. This article is based on three wave longitudinal data. The first wave of this data were published on Rautanen et al., 2021. Some of the data from this paper were previously presented at the annual FERA conference on Education in Finland (December 2020) and in the biennial EARLI conference on Education online (August 2021).

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