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Teacher-student relationship quality from kindergarten to sixth grade and students' school adjustment: A person-centered approach



Rianne J. Bosman^{a,*}, Debora L. Roorda^a, Ineke van der Veen^b, Helma M.Y. Koomen^a

^a Research Institute of Child Development and Education, University of Amsterdam, P.O. Box 15776, 1001 NG Amsterdam, The Netherlands

^b Kohnstamm Institute, Roetersstraat 31, 1018 WB Amsterdam, The Netherlands

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ABSTRACT

The present study used a person-centered approach to identify teacher-student relationship trajectories from kindergarten to sixth grade in a Dutch sample ($N = 1300$). Teachers reported about relationships with individual students (closeness, conflict, and dependency) in kindergarten, grade 3, and grade 6, and about externalizing behaviors in kindergarten. Students were tested for verbal ability in kindergarten, and completed math and reading tests and questionnaires about task motivation and self-efficacy in sixth grade. Latent class growth analyses revealed three trajectories for closeness: high-stable (normative), very high-decreasing, and moderate-increasing. For conflict, low-stable (normative), low-increasing, and high-decreasing trajectories were found. For dependency, a low-decreasing (normative) and a low-increasing trajectory were found. Boys, students with lower levels of verbal ability, and students with more externalizing behavior were overrepresented in non-normative trajectories. Furthermore, students with low-increasing levels of teacher-student dependency scored lower on achievement tests and reported lower motivation in sixth grade compared to students with a normative trajectory.

1. Introduction

Research has shown that affective teacher-student relationships, characterized by high levels of closeness and low levels of conflict, contribute to students' social-emotional, behavioral, and academic adjustment (Hamre & Pianta, 2001; Ladd, Birch, & Buhs, 1999; Roorda, Koomen, Spilt, & Oort, 2011). Although most studies used cross-sectional designs (e.g., Baker, Grant, & Morlock, 2008; Ly, Zhou, Chu, & Chen, 2012), some longitudinal studies also provide insight in how teacher-student relationships influence students' outcomes over time. For example, Hamre and Pianta (2001) found that negativity in teacher-student relationships in kindergarten predicted lower academic achievement and poor behavioral outcomes until upper elementary school and for boys even until middle school. Other longitudinal studies also supported that low levels of closeness and high levels of conflict in teacher-student relationships resulted in poor academic, motivational, and behavioral outcomes of students both within (Ladd et al., 1999; McCormick, O'Connor, Cappella, & McClowry, 2013) and across school years (Engels et al., 2016; Hughes, Luo, Kwok, & Loyd, 2008; Jerome, Hamre, & Pianta, 2009). However, these longitudinal studies usually do not provide insight in how individual children's relationships with subsequent teachers change during the elementary school period. Attention for changes or stability in relationship quality over the school years seems to be warranted, as continued exposure to interpersonal adversity appears to be an important predictor of

* Corresponding author.

E-mail addresses: R.J.Bosman@uva.nl (R.J. Bosman), D.L.Roorda@uva.nl (D.L. Roorda), ivanderveen@kohnstamm.uva.nl (I. van der Veen), H.M.Y.Koomen@uva.nl (H.M.Y. Koomen).

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children's maladjustment (Ladd & Burgess, 2001; Ladd, Herald-Brown, & Reiser, 2008). Hence, cumulative experiences may have longer lasting effects on children's development than relationship quality measured at a specific moment in time.

Although some studies did investigate the development of teacher-student relationship quality in general (e.g., Hajovsky, Mason, & McCune, 2017; Jerome et al., 2009), little is known about certain subgroups of students that have a different development of teacher-student relationship quality over the entire elementary school period. Therefore, the present study examined the development of teacher-student relationship quality from kindergarten to sixth grade by modeling growth trajectories using a person-centered approach. Furthermore, as previous studies have found that relationship quality depends on certain child characteristics (McGrath & Van Bergen, 2015; Nurmi, 2012), it was also investigated whether children's personal and demographic characteristics (e.g., gender, ethnicity, socioeconomic status, externalizing behavior, and verbal ability) contributed to the occurrence of a specific teacher-student relationship trajectory. Finally, because both students' motivation and academic achievement are found to be influenced by teacher-student relationship quality (e.g., Roorda et al., 2011), we also examined whether relationship trajectories affected students' motivation and academic adjustment in sixth grade.

1.1. Theoretical framework

One of the leading theories in teacher-student relationship research has been an extended attachment perspective (Pianta, 1999; Verschueren & Koomen, 2012). According to this perspective, poor relationships with teachers will evoke feelings of insecurity and distress in children, resulting in less academic and social growth of children (Pianta, 1999). On the contrary, sensitive teachers can serve as a secure base and, hence, will make children more inclined to explore the school environment and become motivated for school work (Howes, 2000; Pianta, Hamre, & Stuhlman, 2003). Studies inspired by attachment theory often examine teacher-student relationship quality in terms of closeness, conflict, and dependency (Pianta, 2001). Closeness can be defined as the degree of warmth and open communication in the relationship, which helps to facilitate children's learning and school performance. Conflict refers to dysfunctional interactions and negativity, which is hypothesized to be related to poor motivation and impaired academic achievement. Dependency can be defined as the degree of possessive child behaviors that indicate an overreliance on the teacher as a source of support. High levels of dependency indicate a failure to use the teacher as a secure base (Verschueren & Koomen, 2012).

With regard to changes and stability in teacher-student relationship quality, theories of psychological risks and stress state that probabilities of maladjustment increase when children are exposed to interpersonal stressors for a longer time period (Ladd et al., 2008). According to these theories, it is mostly the continued exposure to interpersonal stressors that results in poor student outcomes (Ladd & Burgess, 2001). Especially a *sustained* or increasing exposure to interpersonal constraints is hypothesized to discourage productive forms of classroom engagement and to reduce children's motivation for learning activities (Buhs & Ladd, 2001; Ladd et al., 2008). The longer children are exposed, the greater the anticipated influence on children's maladjustment (Ladd & Troop-Gordon, 2003). Thus, in contrast to experiences of temporary difficulties on a certain moment in time, cumulative experiences of interpersonal stressors are expected to have a greater impact on children's development. Likewise, continuous experiences of teacher support across different school years would probably be more beneficial for students' adjustment than support at one moment in the school career (Spilt, Hughes, Wu, & Kwok, 2012).

1.2. Stability and change in teacher-student relationship trajectories

Some previous studies actually investigated stability and changes in teacher-student relationships over time. For instance, Jerome et al. (2009) found that the degree of closeness in teacher-student relationships decreased from kindergarten to sixth grade, whereas teacher-student conflict increased over time. Pianta and Stuhlman (2004) found a similar trend of teachers reporting decreasing levels of closeness from preschool to first grade. In contrast to Jerome et al. (2009), teachers also reported decreases in conflict over time. These contradicting findings may suggest that different groups of children experience different relationship trajectories with their teachers. Therefore, the present study focused on the identification of different trajectories in children's relationships with their teachers during the elementary school years.

Research on different trajectories of relationship quality across school years has been scarce. One of the exceptions is the study of O'Connor and McCartney (2007), who examined teacher-student relationship trajectories from preschool to third grade in a demographically diverse sample in the United States. The authors examined teacher-student relationship quality as one construct and did not distinguish between positive and negative dimensions (e.g., closeness and conflict). Three different trajectories of teacher-student relationship quality were identified. More than half of the included sample had increasing levels of relationship quality, whereas a quarter of the sample experienced moderate-stable levels. The smallest group consisted of students with low-decreasing levels of relationship quality. In a follow-up study, O'Connor, Dearing, and Collins (2011) found four different trajectories of teacher-student relationship quality from first to fifth grade. In contrast to the previous study, the largest group consisted of high-stable teacher-student relationships. A quarter of the sample had high-decreasing levels of relationship quality, whereas the smallest group consisted of students with moderate-decreasing trajectories. Finally, there was a small group which had moderate-increasing levels of teacher-student relationships over time, which was the largest group in the previous study (O'Connor & McCartney, 2007).

In a second follow-up study, O'Connor, Collins, and Supplee (2012) examined closeness and conflict as separate dimensions of the relationship in the same sample as the two previous studies. The relevance of distinguishing between different relationship dimensions was supported by previous research, as conflict appeared to have a stronger influence on primary school children's academic adjustment than closeness (Roorda et al., 2011). O'Connor et al. (2012) found four different trajectories of closeness from pre-kindergarten to fifth grade: More than half of the children had high-stable trajectories of closeness, one group had moderate-

increasing levels of closeness, one group had high-decreasing trajectories and the smallest group showed low-stable trajectories. For conflict, six different trajectories were revealed, with the large majority of children demonstrating low-stable levels of conflict over time, and five small groups of children showing non-linear trajectories of conflict with several trajectories showing either low-increasing and high decreasing levels of conflict over time (O'Connor et al., 2012). To conclude, different trajectories were found with regard to closeness and conflict, confirming the importance of investigating positive and negative dimensions of teacher-student relationships separately.

Spilt, Hughes, et al. (2012) also distinguished between the relationship dimensions closeness and conflict in their diverse sample of children with below-average literacy skills. Two distinct trajectories of teacher-student closeness were found from first grade to fifth grade: Approximately 85% of the children had high and (relatively) stable trajectories (i.e., there was a very small decrease), and a smaller group consisted of children with moderate-increasing trajectories (Spilt, Hughes, et al., 2012). High-stable trajectories of closeness were also most prevalent in the study of O'Connor et al. (2012). Additionally, four different trajectories were distinguished for conflict. Similar to O'Connor et al. (2012), half of the sample had low-stable trajectories, one small group showed low-increasing trajectories, and one small group had high-decreasing trajectories. In contrast to the findings of O'Connor et al. (2012), the smallest group consisted of children with high-stable trajectories of conflict (Spilt, Hughes, et al., 2012).

To conclude, O'Connor et al. (2012) and Spilt, Hughes, et al. (2012) found that half or more of the children followed high-stable trajectories for closeness and low-stable trajectories for conflict. However, these two studies do differ with regard to the smaller groups that were found. This may be due to differences in measuring teacher-student relationship quality (i.e., the Student Teacher Relationship Scale versus an adaptation of the Network of Relationships Inventory). In addition, Spilt, Hughes, et al. (2012) used a sample of students who were academically at-risk due to their low literacy skills, whereas O'Connor et al. (2012) investigated a more general sample of students. Furthermore, O'Connor et al. (2012) also examined non-linear trajectories, whereas Spilt, Hughes, et al. (2012) did not, which may also explain differences in the found trajectories. The goal of the present study was to examine whether the majority of students in a Dutch sample would also follow high-stable trajectories of closeness and low-stable trajectories of conflict and which other trajectories could be found (e.g., low-increasing, moderate-increasing, or low-stable trajectories for closeness; low-increasing, high-decreasing, or high-stable trajectories for conflict). Furthermore, we not only distinguished between closeness and conflict but also examined growth trajectories for the third relationship dimension belonging to the attachment perspective, dependency. Although dependency has been less often studied than closeness and conflict, some evidence has been found that dependency is an important relationship dimension to study in upper elementary school (Zee, Koomen, & Van der Veen, 2013).

1.3. Predictors of teacher-student relationship trajectories

According to developmental systems theory (Pianta et al., 2003), the development of teacher-student relationships is expected to be influenced by personal and demographic characteristics of both relationship partners. As previous research provided ample evidence that student characteristics such as gender, ethnicity, socioeconomic status (SES), externalizing behavior, and verbal ability influenced the quality of teacher-student relationships at specific moments in time (McGrath & Van Bergen, 2015; Nurmi, 2012), the present study examined the effect of these characteristics on teacher-student relationship trajectories. With respect to the impact of students' gender on relationship quality, relationships with boys are usually perceived by teachers as higher in conflict and lower in closeness than relationships with girls (Ewing & Taylor, 2009; Hamre & Pianta, 2001; Saft & Pianta, 2001). In a longitudinal study, Jerome et al. (2009) found that boys had higher and more stable levels of conflict and a stronger decrease in teacher-reported closeness than girls during elementary school. With regard to growth trajectories, Spilt, Hughes, et al. (2012) revealed highly similar trajectories of conflict and closeness for boys and girls. However, there were no girls with high-stable levels of conflict, whereas about 5% of the boys could be identified as such. Furthermore, slightly more boys showed high-declining levels of closeness than girls (Spilt, Hughes, et al., 2012).

With regard to ethnicity and SES, teachers tend to report less closeness and more conflict in their relationships with African American students in comparison with Hispanic and White students (Hughes & Kwok, 2007; Murray & Murray, 2004; Saft & Pianta, 2001), and with students from a lower socioeconomic background (Ladd et al., 1999; Rudasill, Reio, Stipanovic, & Taylor, 2010; Wyrick & Rudasill, 2009). Saft and Pianta (2001) found that ethnic minority students had high levels of teacher-student dependency when their teachers had a different ethnic background. In a longitudinal study, ethnic minority children appeared to have more conflict in the relationship with their teachers over time than ethnic majority children, whereas ethnicity of children was not related to teacher-student closeness (Jerome et al., 2009). In the same study, children's socioeconomic backgrounds did not affect the degree of conflict in the relationship. In contrast, children with lower SES did demonstrate lower levels of teacher-student closeness over time (Jerome et al., 2009). In a person-centered study, Spilt, Hughes, et al. (2012) showed that ethnic minority students had more often low-increasing and high-decreasing trajectories of conflict, and high-declining closeness trajectories. In a follow-up study, they concluded that African American children more often had atypical conflict trajectories, even after controlling for socio-behavioral predictors. In addition, children with a low socioeconomic background were overrepresented in low-increasing trajectories of conflict (Spilt, Hughes, et al., 2012). In a follow-up study, however, SES did not appear to be a significant predictor of conflict trajectories (Spilt & Hughes, 2015).

Ample evidence has been found that children's externalizing behaviors influence teacher-child relationship quality over time (e.g., Hamre & Pianta, 2001; Henricsson & Rydell, 2004). For example, externalizing behavior in kindergarten appeared to be associated with higher levels of teacher-reported conflict across the elementary school years (Jerome et al., 2009). Higher degrees of externalizing problem behavior also predicted more dependency in teacher-student relationships over time (Birch & Ladd, 1997; Henricsson & Rydell, 2004). There seems to be less evidence for an association between externalizing behavior and teacher-student

closeness across school years (Henricsson & Rydell, 2004; Jerome et al., 2009), although significant associations were found in cross-sectional studies (e.g., Buyse, Verschueren, Verachtert, & Van Damme, 2009; Thijs, Westhof, & Koomen, 2012). Two previous person-centered studies showed that children with high levels of externalizing behavior were overrepresented in unfavorable trajectories of conflict (e.g., high-stable, low-increasing, high-decreasing; O'Connor et al., 2012; Spilt, Hughes, et al., 2012). Furthermore, O'Connor et al. (2012) did not find associations between externalizing behavior and the different trajectories of teacher-student closeness, whereas Spilt, Hughes, et al. (2012) found that externalizing behaviors predicted high-declining trajectories of closeness.

Concerning language ability, it has recently been argued that children with better skills develop more close relationships with their teachers (Justice, Cottone, Mashburn, & Rimm-Kaufman, 2008; Moritz Rudasill, Rimm-Kaufman, Justice, & Pence, 2006), because they are more able to engage in elaborate conversations (Spilt, Koomen, & Harrison, 2015) and have less difficulties in understanding others compared to children with poor language abilities (Menting, van Lier, & Koot, 2011). One study also found an association between low language complexity and high levels of teacher-student conflict (Moritz Rudasill et al., 2006). However, others did not find evidence for a link between language ability and teacher-student relationship closeness or conflict (Howes et al., 2008; Pianta & Stuhlman, 2004). As far as we know, no prior research has focused on the effects of language ability on growth trajectories over time. It seems therefore important to further explore associations between verbal ability of children and trajectories of teacher-student relationship quality.

In the present study we examined whether child characteristics and behaviors predicted different teacher-student relationship trajectories over time. We expected that boys, students from low SES families, and students with higher levels of externalizing behavior would be overrepresented in more unfavorable trajectories, such as low-decreasing levels of closeness and high-stable or increasing levels of conflict (Spilt, Hughes, et al., 2012). Although previous studies also suggest that ethnic minority students would be overrepresented in more unfavorable trajectories, these results are based on African American and Hispanic students (Spilt, Hughes, et al., 2012). In the sample of the present study most ethnic minority students had a different background, namely Turkish or Moroccan. Previous research has shown that teachers reported more conflict and dependency in their relationship with Moroccan students compared to Dutch students (Thijs et al., 2012). Therefore, we may also expect to find ethnic differences in relationship trajectories in the present study. Finally, we hypothesized that students with less verbal ability would have less favorable relationship trajectories (Spilt et al., 2015).

1.4. Teacher-student relationship trajectories and motivation and achievement

A previous meta-analysis provided strong support for the association between teacher-student relationship quality and students' school engagement and achievement (see Roorda et al., 2011). Longitudinal studies also found evidence that low levels of closeness and high levels of conflict resulted in lower academic achievement (Buyse et al., 2009; Hamre & Pianta, 2001; Hughes et al., 2008). However, far less is known about the effect of different relationship trajectories on students' achievement. One study found that low-declining relationship trajectories predicted low achievement in third grade, whereas no differences existed between the effects of moderate-stable trajectories and high-increasing trajectories on achievement (O'Connor & McCartney, 2007). Furthermore, high-stable levels of conflict as well as low-increasing levels of conflict appeared to be most strongly associated with underachievement, whereas neither high-declining nor low-stable trajectories of conflict were predictive of underachievement (Spilt, Hughes, et al., 2012). In addition, low-increasing levels of closeness were related to underachievement in fifth grade for boys only (Spilt, Hughes, et al., 2012). Based on these studies, we expected that unfavorable trajectories, such as increasing or high-stable levels of conflict and dependency, would be predictive of lower achievement in sixth grade.

Based on social-motivational theories (Connell & Wellborn, 1991; Deci & Ryan, 2000), we not only focus on actual performance but also on students' motivation as an outcome variable. According to this theory, teachers' supportive behaviors influence students' achievement through their effect on students' motivation (Skinner, Wellborn, & Connell, 1990). Therefore, motivation is considered to be an important variable to take into account when studying academic adjustment. Although variable-centered studies have found that teacher-student relationships affect students' motivation (Wentzel, 1998; Zee & de Bree, 2017), motivation has not yet been examined as outcome variable of relationship trajectories. A distinction can be made between two main domains of motivation (Wigfield & Eccles, 2000): motivational values and motivational expectancies. Motivational values include many different aspects of motivation, of which task motivation (i.e., the positively valued experiences that students derive directly from the task; Thomas & Velthouse, 1990) was most often found to predict other motivational behaviors and achievement (Wigfield & Cambria, 2010). Motivational expectancies refer to students' perceived academic competence. The most common expectancy-related concept is academic self-efficacy (i.e., students' beliefs about how well they will do on tasks; Wigfield & Eccles, 2000). Students' self-efficacy was found to be more predictive of achievement than other motivational beliefs (Hascher, Van Der Veen & Roede, 2005). It thus seems that task motivation and self-efficacy are both important for aspects of students' academic adjustment. Hence, they were included as outcome variables in the present study. Based on variable-centered studies, we hypothesized that unfavorable trajectories (i.e., low-stable or decreasing levels of closeness and increasing or high-stable levels of conflict and dependency) would result in lower task motivation and lower self-efficacy in sixth grade.

Different from person-centered studies and inspired by the risk and stress hypothesis (Ladd et al., 2008; Ladd & Burgess, 2001), we additionally investigated whether students with a problematic relationship trajectory on two or more dimensions of the teacher-student relationship (e.g., problematic trajectories on both closeness and conflict and/or dependency) would achieve worse and be less motivated in sixth grade had worse outcomes in sixth grade compared to students with only one problematic relationship trajectory. As cumulative experiences of interpersonal adversity or stress appear to be worse for students' development than problems on a single domain at the interpersonal level (Ladd et al., 2008), we hypothesized that students with unfavorable trajectories on two,

or even three, dimensions would achieve worse and would be less motivated than students with only one (or none) problematic relationship trajectory.

1.5. Present study

The present study investigated growth trajectories of teacher-student relationship quality (i.e., closeness, conflict, and dependency) in a sample of Dutch elementary school students. First, we examined whether different trajectories of teacher-student closeness, conflict, and dependency could be identified from kindergarten to sixth grade. Second, we investigated if these trajectories could be predicted by specific child characteristics (i.e., gender, ethnicity, SES, externalizing behavior, and verbal ability). Third, we examined how specific trajectories of teacher-student relationships were related to students' motivation and academic achievement in sixth grade. Finally, we investigated whether students with problematic relationship trajectories on two or more dimensions (i.e., students' risk status) were most at risk of negative outcomes in sixth grade.

2. Method

2.1. Participants

The current study was conducted using data from three waves of the Dutch COOL-cohort study (i.e., COOL refers to *Cohortonderzoek onderwijsloopbanen*; Driessen, Mulder, Ledoux, Roeleveld, & Van der Veen, 2007). The COOL-cohort study started in the academic year 2007–2008 when students were in the second year of kindergarten (i.e., in the Dutch educational system, kindergarten consists of two years). Follow-up measures took place when children were in third grade (2010–2011) and sixth grade (2013–2014). At the start of the study, a total of 10,069 kindergartners participated (Driessen et al., 2007). For the present study, only students who had complete data on relationship quality and background characteristics at more than one measurement occasion were selected, in order to reach model convergence (Dong & Peng, 2013). The selected students did not differ significantly in mean scores from the original sample with regard to all study variables at each measurement occasion ($ps > 0.050$, Cohen's d ranged from 0 to 0.08). The final sample consisted of a total of 1300 children and their teachers from 109 schools in the Netherlands. At the first measurement occasion, a total of 207 classes were included. During the first COOL-measurement, 1300 students participated (49.3% girls), who were on average 5.6 years old ($SD = 0.43$). In the second wave, 1248 students participated (49.1% girls) and they were on average 9.6 years old ($SD = 0.43$). In the third wave, 1097 students participated (50.1% girls), with a mean age of 11.6 years ($SD = 0.43$). Information about family composition was available for 97.6% of the students: Most children were raised by both of their parents (92.7%), whereas a minority was raised only by their mother (4.3%) or father (0.4%). Furthermore, most children in the sample had fathers (88.4%) and mothers (87.8%) born in the Netherlands. Half of the mothers (52.2%) had completed senior secondary vocational education, and approximately a quarter (24.2%) had completed higher education. Other mothers completed only primary education (3.8%) or secondary prevocational education (16.9%). Demographic information about students' teachers was not available.

2.2. Procedure

All schools from a previous cohort study (PRIMA; Driessen, Langen, & Vierke, 2004) were asked to participate in the COOL study. To generate a large enough sample, other Dutch schools were invited to participate as well. Data collection occurred in three phases: First, schools received an invitation to participate in the COOL-cohort study (between April and September), and when they agreed, informed consent was obtained from students' parents. Second, when both schools and parents agreed to participate, school administrators provided data on students' background characteristics (September). Third, each year research assistants visited schools to obtain information from teachers and students. Teachers in kindergarten, third grade, and sixth grade reported about their relationship with individual students between January and April. The kindergarten teachers were at the same time also asked to rate children's externalizing behavior problems. On average, kindergarten teachers completed questionnaires about 6 students in their classrooms (ranging from 1 to 23 students for each teacher). Students completed a verbal ability test when they were in kindergarten. Furthermore, they filled out questionnaires about their own motivational beliefs and completed reading and math achievement tests when they were in sixth grade (Driessen et al., 2007).

2.3. Measurements

2.3.1. Teacher-student relationships

The Dutch version of the Student-Teacher Relationship Scale (STRS) was used to assess teachers' perceptions of their relationship with individual students (Koomen, Verschueren, & Pianta, 2007; Koomen, Verschueren, van Schooten, Jak, & Pianta, 2012). The STRS consists of three subscales: Closeness, which represents the degree of warmth, openness, and security in the relationship (e.g., "I share an affectionate and warm relationship with this child"), Conflict, which refers to discorded and coercive relationships (e.g., "This child and I always seem to be struggling with each other"), and Dependency, which measures the degree to which children show age-inappropriate demanding and claiming behavior (e.g., "This child reacts strongly to separation from me"). Items were rated on a 5-point scale ranging from 1 (*definitely does not apply*) to 5 (*definitely applies*). Mean scores of the scales were used in the analyses. The Dutch version of the STRS has demonstrated adequate psychometric properties, such as satisfactory internal consistencies, test-

retest reliability, and construct validity from preschool to upper elementary school (Doumen et al., 2009; Koomen et al., 2012).

In the present study, a shortened version of the STRS was used, which consists of 5 items per dimension that were selected based on the highest factor loadings in previous research (Koomen et al., 2012). The shortened version of the STRS showed high internal consistencies in previous research (Zee et al., 2013). We checked whether the models for Closeness, Conflict, and Dependency were measurement invariant over time. Only the item ‘If upset, this child will seek comfort from me’ of the Closeness-model appeared to cause problems for scalar invariance. This item also appeared to cause measurement invariance problems in the validation study of Koomen et al. (2012). Therefore, we decided to delete this item from our subscale, resulting in a four-item subscale for Closeness. Cronbach's alpha coefficients in the present study were 0.92, 0.92, 0.95 for Conflict, 0.83, 0.82, 0.84 for Closeness, and 0.90, 0.92, 0.92 for Dependency at time 1, 2, and 3, respectively.

2.3.2. Externalizing behaviors

Kindergarten teachers reported about students' Externalizing Behavior on four items that were selected from other questionnaires, such as the Teacher Report Form (TRF; Driessen et al., 2007; Ivanova, Achenbach, Rescorla, & Dumenci, 2007; Jungbluth, Roede, & Roeleveld, 2001): “This student is often rude”, “This student always complies to the rules”, “This student always tries to get what he/she wants”, and “This student never fights”. Items were rated on a scale from 1 (*completely untrue*) to 5 (*completely true*). After recoding items 2 and 4, higher scores represented more Externalizing Behavior. A mean score of the items was used for each student. Psychometric properties of this subscale were adequate (Jungbluth et al., 2001). In the present study, Cronbach's alpha for this scale was also acceptable ($\alpha = 0.77$).

2.3.3. Task motivation

Students filled out the Task Motivation Scale to assess the extent to which students are oriented towards increasing their competence and understanding (Seegers, Van Putten, & De Brabander, 2002). This questionnaire consisted of 5 items (e.g., “If I do not understand something at school immediately, I will put in more effort”), which were rated on a 5 point scale ranging from 1 (*definitely not true*) to 5 (*definitely true*). The mean score on all items was used as the level of Task Motivation. Previous research found support for the construct validity and predictive validity of the Task Motivation Scale (Hornstra, Van Der Veen, Peetsma, & Volman, 2013). Cronbach's alpha was 0.74 in the present study.

2.3.4. Academic self-efficacy

The Academic Efficacy subscale of the Patterns of Adaptive Learning Survey (PALS; Midgley et al., 2000) was used to assess students' expectancies about their own capability to perform academic tasks in the classroom. This questionnaire consisted of 6 items (e.g., “I can also learn difficult things at school”), which were answered on a 5-point scale ranging from 1 (*definitely not true*) to 5 (*definitely true*). Mean scores were used as the level of Academic Self-Efficacy. The Academic Efficacy subscale displayed sufficient reliability, construct validity, and predictive validity in previous research (Midgley et al., 2000). Cronbach's alpha was 0.79 in the present study.

2.3.5. Math achievement

Students' Math Achievement was measured with nationally normed tests that were developed by the Dutch assessment institute CITO (Hollenberg & Van Der Lubbe, 2011). CITO tests are widely used by Dutch schools to screen and determine students' current mathematics performance (Hollenberg & Van Der Lubbe, 2011). The math test consisted of 96 multiple-choice questions, which included exercises on geometry, multiplication, and addition. The total amount of correct answers provides a general score of students' math ability (Driessen et al., 2007). Raw scores of Math Achievement were transformed to ability scores to be able to longitudinally follow students' Math Achievement. These ability scores were standardized on a continuous scale ranging from 0 to 150. The scores on Math Achievement ranged in our sample from 53 to 150. The psychometric properties of this test could be considered as adequate ($\alpha = 0.92$; Janssen, Verhelst, Engelen, & Scheltens, 2010).

2.3.6. Reading achievement

Three CITO subtests were used to measure students' reading achievement: Reading Comprehension, Vocabulary, and Technical Reading (Driessen et al., 2007). The test for Reading Comprehension measured the proficiency in conceptual reasoning and practical reading ability, and consisted of 55 multiple-choice items about the content of short narratives. The Vocabulary test consisted of 70 items that aimed to measure children's receptive vocabulary, which refers to the extent to which children comprehend and use language. For the tests of Reading Comprehension and Vocabulary, the same age-appropriate and standardized ability scores were used as was described for the test of math achievement. Technical Reading was assessed by a test in which children were asked to read aloud as many words as possible in three minutes. The extent to which children were able to decode words accurately and quickly was measured. Again, these tests transformed raw scores into standardized ability scores ranging from 0 to 150. In this sample, the scores on Reading Comprehension ranged from 10 to 147, the scores of Vocabulary ranged from 52 to 147, and the scores of Technical Reading ranged from 35 to 139. Reliability and validity of the tests on Reading Comprehension ($\alpha = 0.88$; Weekers, Groenen, Kleintjes, & Feenstra, 2011), Vocabulary ($\alpha = 0.92$; Van Van Berkel et al., 2010), and Technical Reading ($\alpha = 0.94$; Krom, Jongen, Verhelst, Kamphuis, & Kleintjes, 2010) were good.

2.3.7. Verbal ability

In kindergarten, children completed a Verbal Ability test in which different aspects of language development and emerging

literacy were examined. This test was also nationally normed and developed by CITO (Lansink, 2009). The total score represented the extent to which children were capable of understanding and using language as assessed by their passive vocabulary, critical listening, rhyming, and auditory synthesis. In the present study, again age-appropriate standardized ability scores were used. Scores on Verbal Ability ranged from 46 to 111. Research showed good reliability, construct validity and predictive validity for Verbal Ability ($\alpha = 0.89$; Lansink & Hemker, 2010).

2.3.8. Demographics

School administrators provided background information of students and their families, such as gender, ethnicity, and SES. Gender was dummy coded, with 1 representing boys, and 2 representing girls. Ethnicity was based on both fathers' and mothers' country of origin. Given the small amount of ethnic groups other than Dutch, a dichotomy was created: Ethnic majority students were represented by 0, whereas students with at least one parent with a non-western birth country were represented by 1. Our sample consisted of 86.4% ethnic majority students and 11.1% ethnic minority students. No information regarding ethnicity was available for 2.5% of the students. Maternal education was used as a proxy for SES and varied from (1) no more than primary education to (4) higher education.

2.4. Statistical analyses

First, to identify relationship trajectories (question 1), latent class growth analysis (LCGA) was performed in Mplus (version 7; Muthén & Muthén, 1998–2012). LCGA is a special feature of growth mixture modeling (GMM), aiming to classify individuals into specific subgroups or classes based on their responses on multiple measurement occasions (Jung & Wickrama, 2008). Because the GMM-models did not converge, we decided to use LCGA in all models. First, we specified an unconditional model without predictors. Due to the nested structure of the data (i.e., students were nested in classes), the cluster option TYPE = COMPLEX in Mplus was used, with classes in kindergarten being the cluster variable. Preliminary analyses showed that linear growth models fitted the data better than quadratic growth models. Therefore, linear models were fitted for each of the three dimensions. Decisions about the number of trajectories that should be retained were based on several guidelines: the sample size adjusted BIC was used as an indication of model fit, because simulation studies suggested that this adjusted BIC is superior to other IC statistics (Yang, 2006). The model with the lowest sample size adjusted BIC value is regarded as the best fitting model. Furthermore, class selection was guided by high entropy, which should be near 1, and high posterior probabilities of class membership, which should also be near 1 (Jung & Wickrama, 2008). In addition, model parsimony and theoretical interpretability of the found classes were taken into account.

Second, to examine the effects of students' characteristics on the trajectories (question 2), we specified conditional LCGA models in which we included several variables of students' characteristics as predictor variables (i.e., gender, ethnicity, SES, externalizing behavior, and verbal ability). These students' characteristics were already included in the LCGA models when examining the trajectories (Jung & Wickrama, 2008). For this second research question, we used multinomial logistic regression analysis in Mplus to examine the effects of students' characteristics on the probability of having a specific teacher-student relationship trajectory.

Third, we wanted to test the differences in students' outcomes for specific relationship trajectories (question 3). As it is not possible to directly regress the outcome variables on the covariates within the same model in Mplus, we first regressed the outcome variables on the covariates (i.e., SES, ethnicity, gender, verbal ability and externalizing behavior, measured in kindergarten) in SPSS and saved their standardized residuals. These standardized residuals are thus the outcome variables corrected for the covariates at occasion 1. Subsequently, we used these standardized residual scores of the outcome variables (i.e., students' self-efficacy, task-motivation, reading achievement, and math achievement) in the final LCGA models using the BCH method in Mplus (Asparouhov & Muthén, 2014; Vermunt, 2010). This BCH method tests the equality of means for students' outcomes across different latent relationship trajectories using the measurement model. Missing data (10.5% across all models) was treated using full information maximum likelihood estimation in Mplus (Enders & Bandalos, 2001).

Finally, to examine the effect of students' risk status on the three relationship dimensions on the outcome variables (question 4), we divided our sample in three groups: That is, we saved the predicted class membership to SPSS. Consequently, we rated for each dimension whether students were in the normative trajectory (0) or in a problematic trajectory (1). Then, we combined the ratings on the three dimensions, which resulted in three groups of students with different risk status: (1) a no-risk group (i.e., students who followed the normative trajectories on all three dimensions), (2) a low-risk group (i.e., students who followed a problematic trajectory on only one dimension but not on the other two dimensions), and (3) a high-risk group (i.e., students who followed problematic trajectories on two or three relationship dimensions). Subsequently, we conducted a MANCOVA with students' risk status as independent variable, the motivation and achievement variables as outcome variables, and students' characteristics (i.e., SES, ethnicity, gender, verbal ability, and externalizing behavior) as covariates. In this analysis, we used multiple imputations in SPSS for the missing cases.

3. Results

Table 1 presents the correlations and descriptive statistics for all study variables. Cross-year correlations for Conflict were slightly larger than for Closeness and Dependency. Correlations between Dependency and Closeness were mostly not significant, whereas correlations between Conflict and Dependency and between Conflict and Closeness were significant at most occasions. The correlations between the three relationship dimensions and other study variables were mostly in the expected directions. With regard to predictors of relationship quality, SES was only significantly correlated with all relationship dimensions in Grade 6, and gender of the

Table 1
Descriptive statistics and correlations between study variables.

a											
	<i>N</i>	<i>M(SD)</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Closeness T1	1295	3.86 (0.58)	–								
2. Closeness T2	1244	3.72 (0.61)	0.23**	–							
3. Closeness T3	1097	3.74 (0.66)	0.12**	0.16**	–						
4. Conflict T1	1298	1.68 (0.71)	–0.38**	–0.12**	–0.05	–					
5. Conflict T2	1246	1.62 (0.75)	–0.08**	–0.30**	–0.06	0.35**	–				
6. Conflict T3	1100	1.51 (0.74)	–0.09**	–0.08**	–0.38**	0.23**	0.29**	–			
7. Dependency T1	1299	2.12 (0.74)	–0.20**	–0.06	0.01	0.43**	0.13**	0.05	–		
8. Dependency T2	1248	2.13 (0.86)	0.00	–0.02	–0.02	0.17**	0.40**	0.20**	0.20**	–	
9. Dependency T3	1100	1.79 (0.78)	–0.01	0.02	–0.10**	–0.16**	0.23**	0.45**	0.13**	0.32**	–
10. Task motivation	1086	3.97 (0.62)	0.04	0.07*	0.10*	–0.06*	–0.12*	–0.08*	–0.08*	–0.09*	–0.09*
11. Self-efficacy	1085	3.69 (0.64)	0.04	0.01	0.05	–0.06*	–0.10*	–0.01	–0.09*	–0.14**	–0.12**
12. Math achiev.	1216	111.44 (12.28)	0.01	0.03	0.06*	–0.08**	–0.12**	–0.09*	–0.17**	0.32**	–0.26**
13. Vocabulary	1016	98.43 (13.74)	0.06	0.02	0.06	–0.04	–0.05	–0.08*	–0.12**	–0.13**	–0.17**
14. Tech. reading	1117	101.69 (13.93)	0.02	0.01	0.10**	–0.06*	–0.08**	–0.02	–0.05	–0.14**	–0.14**
15. Reading compr.	1229	56.46 (18.91)	0.07*	0.08**	0.11**	–0.08**	–0.12**	–0.18**	–0.15**	–0.21**	–0.27**
16. Verbal ability	1257	75.41 (9.06)	0.15**	0.06*	0.03	–0.05	–0.04	–0.04	–0.15**	–0.13**	–0.07*
17. Ext. behavior	1295	3.71 (0.73)	–0.22**	–0.09**	–0.06	0.61**	0.36**	0.25**	0.25**	0.17**	0.12**
18. SES	1262	2.92 (0.89)	–0.02	0.01	0.08*	0.00	–0.02	–0.08**	–0.05*	–0.04	–0.09**
19. Gender	1294	1.49 (0.50)	0.18**	0.14**	0.14**	–0.14**	–0.20**	–0.16**	–0.02	0.03	0.01
20. Ethnicity	1262	0.11 (0.32)	–0.07*	–0.08**	–0.11**	0.06	0.05	0.11**	0.04	–0.01	0.05

b											
	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
11. Self-efficacy	0.53**	–									
12. Math achiev.	0.20**	0.34*	–								
13. Vocabulary	0.13**	0.24**	0.54**	–							
14. Tech. reading	0.16**	0.20**	0.29**	0.22**	–						
15. Reading compr.	0.17**	0.27**	0.65**	0.67**	0.34**	–					
16. Verbal ability	0.04	0.15**	0.25**	0.36**	0.08**	0.30**	–				
17. Ext. behavior	–0.12**	–0.08*	–0.12**	–0.06	–0.06	–0.13**	–0.04	–			
18. SES	0.05	0.08**	0.21**	0.25**	0.09**	0.23**	0.14**	0.08*	–		
19. Gender	0.01	–0.13**	–0.10**	0.04	0.11**	0.06*	0.08**	0.13**	–0.03	–	
20. Ethnicity	0.14**	0.07*	–0.05	–0.14**	0.05	–0.07*	–0.24**	–0.03	0.25**	–0.05	–

Note. T1 = academic year of 2007–2008, T2 = academic year of 2010–2011, T3 = academic year of 2013–2014. Math achiev = math achievement. Tech. reading = technical reading. Reading compr. = reading comprehension. Ext. behavior = externalizing behavior. All variables had a relatively normal distribution (skewness < 1.5, kurtosis < 3.1) and no outliers were detected.

* *p* < .05.
** *p* < .01.

students was not associated with Dependency at either of the time points. Most outcome measurements (e.g., academic achievement and motivation) only significantly correlated with Closeness in Grade 6, whereas they correlated significantly with Conflict and Dependency on nearly all time points.

3.1. Teacher-student relationship trajectories

3.1.1. Closeness

The model of Closeness with three trajectories fitted the data best compared to models with less or more trajectories (see Table 2). The majority of students (*n* = 947, 73%) showed high-stable levels of Closeness (*I* = 3.87, *SE* = 0.02, *p* < .001; *S* = –0.07, *SE* = 0.02, *p* < .001). Additionally, 175 students (13%) had moderate-increasing trajectories of Closeness (*I* = 2.91, *SE* = 0.36, *p* < .001; *S* = 0.36, *SE* = 0.04, *p* < .001), and 178 students (14%) showed a very high-decreasing trajectory (*I* = 4.79, *SE* = 0.03, *p* < .001; *S* = –0.59, *SE* = 0.03, *p* < .001). Mean scores of Closeness for each trajectory are represented in Table 3 (see also Fig. 1).

3.1.2. Conflict

The fit of the four-class model was comparable to the fit of the three-class model (see Table 2). However, the four-class model included a very small group of students which was not meaningfully different from other trajectories. With model parsimony and theoretical interpretability taken into account, the three-class model appeared to be most preferable. The largest group (*n* = 1139, 88%) consisted of students with low-stable levels of Conflict (*I* = 1.55, *SE* = 0.04, *p* < .001; *S* = –0.10, *SE* = 0.03, *p* = .002). The two other groups had either high decreasing (*n* = 65, 5%; *I* = 3.40, *SE* = 0.02, *p* < .001; *S* = –0.79, *SE* = 0.09, *p* < .001) or low-

Table 2
Model fit for the latent class growth curve analyses.

	BIC	Entropy	Posterior probabilities
Closeness			
1 trajectory	6828.10	–	–
2 trajectories	6720.26	0.76	0.76–0.95
3 trajectories	6636.10	0.87	0.90–0.95
4 trajectories	6617.73	0.83	0.72–0.92
Conflict			
1 trajectory	8101.95	–	–
2 trajectories	7542.72	0.91	0.89–0.98
3 trajectories	7368.99	0.92	0.85–0.98
4 trajectories ^a	6754.98	0.89	0.86–0.97
Dependency			
1 trajectory	8690.47	–	–
2 trajectories	8407.71	0.82	0.84–0.98
3 trajectories ^a	8271.50	0.81	0.83–0.92

Note. BIC = Sample Size Adjusted Bayesian Information Criterion. Dashes indicate that entropy and posterior probabilities were not relevant for a 1-trajectory model.

^a One of the trajectories consisted of a very small group of teacher-student dyads and had no meaningful distinction with the other trajectories. Model parsimony was therefore taken into account.

Table 3
Means and standard deviations per measurement occasion for each relationship trajectory.

	Kindergarten	Grade 3	Grade 6
Closeness			
High-stable trajectory	3.87 (0.27)	3.75 (0.57)	3.75 (0.66)
Moderate-increasing trajectory	2.90 (0.39)	3.36 (0.68)	3.58 (0.67)
Very high-decreasing trajectory	4.82 (0.22)	3.93 (0.62)	3.82 (0.66)
Conflict			
Low-stable trajectory	1.54 (0.56)	1.46 (0.56)	1.35 (0.50)
High-decreasing trajectory	3.35 (0.67)	2.76 (0.97)	1.77 (0.67)
Low-increasing trajectory	2.07 (0.65)	2.64 (0.95)	3.38 (0.71)
Dependency			
Low-decreasing trajectory	2.06 (0.69)	1.98 (0.75)	1.60 (0.58)
Low-increasing trajectory	2.58 (0.90)	3.18 (0.84)	3.13 (0.73)

Note. Standard deviations are reported between brackets.

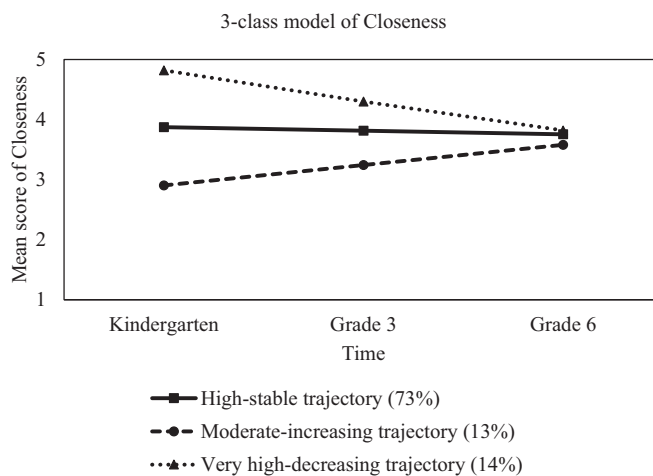


Fig. 1. Three-class model solution for teacher-student Closeness.

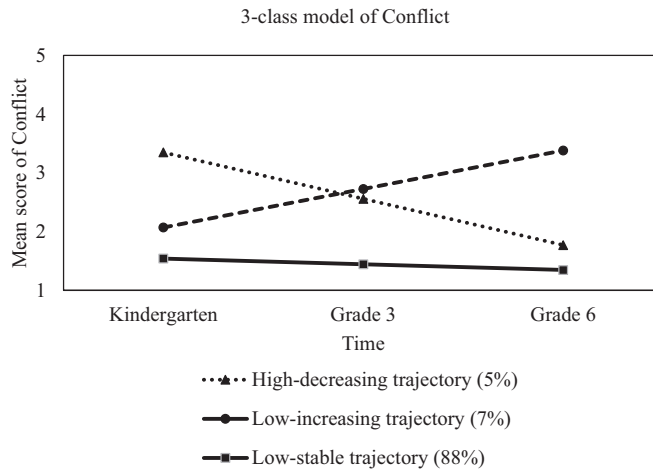


Fig. 2. Three-class model solution for teacher-student Conflict.

increasing ($n = 96, 7\%; I = 2.05, SE = 0.10, p < .001; S = 0.65, SE = 0.07, p < .001$) levels of Conflict. Mean scores of the found trajectories are presented in Table 3 (see also Fig. 2).

3.1.3. Dependency

Fit statistics of the two- and three trajectory models of Dependency were comparable (see Table 2). Please note that the three-class model included a very small group which was not meaningfully different from the other trajectories. Therefore, a two-class model seemed to be most favorable. The largest group ($n = 1155, 89\%$) consisted of students with low-decreasing levels of Dependency ($I = 2.11, SE = 0.04, p < .001; S = -0.23, SE = 0.03, p < .001$), whereas a smaller group of students ($n = 145, 11\%$) had low-increasing levels of Dependency ($I = 2.68, SE = 0.13, p < .001; S = 0.27, SE = 0.10, p = .007; Fig. 3$). Mean scores can be found in Table 3.

3.2. Predictors of relationship trajectories

3.2.1. Closeness

In search of predictors of relationship trajectories, the high-stable Closeness trajectory was used as reference category because it included the largest number of students. Gender, Externalizing Behavior, and Verbal Ability were significant predictors of relationship trajectories (Table 4). Boys had a 1.55 higher chance than girls to have moderate-increasing Closeness trajectories instead of high-stable trajectories ($b = 0.44, p = .023, Odds\ ratio = 1.55$). Students with higher levels of Externalizing Behavior more often had moderate-increasing Closeness trajectories instead of high-stable trajectories ($b = 0.66, p < .001, Odds\ ratio = 1.93$), whereas they were less often found in the very high-decreasing trajectory ($b = -0.61, p < .001, Odds\ ratio = 0.55$). Furthermore, students with higher scores on Verbal Ability had a higher chance of having a very high-decreasing trajectory of Closeness whereas students with lower Verbal Ability more often showed high-stable trajectories ($b = 0.03, p = .001, Odds\ ratio = 1.03$).

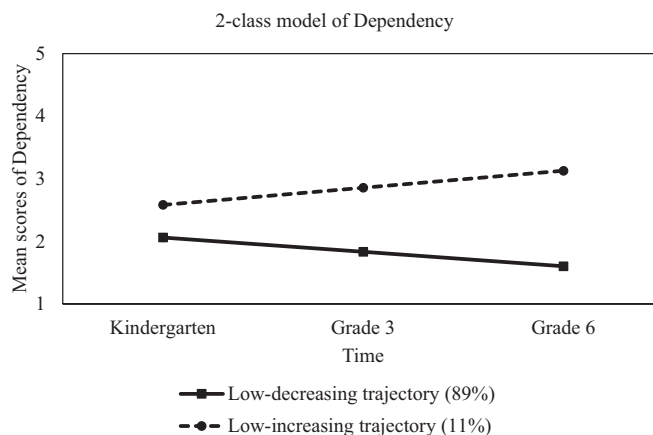


Fig. 3. Two-class model solution for teacher-student Dependency.

Table 4
Effects of student and family characteristics on relationship trajectories.

	Closeness			
	Moderate-increasing (vs. high-stable)		Very high-decreasing (vs. high-stable)	
	<i>b</i> (SE)	Odds ratio	<i>b</i> (SE)	Odds ratio
Gender	0.44 (0.20)*	1.55	−0.35 (0.20)	0.70
SES	0.14 (0.13)	1.15	0.20 (0.14)	1.22
Ethnicity	0.28 (0.30)	1.32	0.04 (0.37)	1.04
Verbal ability	−0.02 (0.01)	0.98	0.03 (0.01)**	1.03
Ext. behavior	0.66 (0.13)**	1.93	−0.61 (0.16)**	0.54

	Conflict			
	High-decreasing (vs. low-stable)		Low-increasing (vs. low-stable)	
	<i>b</i> (SE)	Odds ratio	<i>b</i> (SE)	Odds ratio
Gender	0.80 (0.40)*	2.22	1.02 (0.30)**	2.77
SES	−0.02 (0.24)	0.98	−0.11 (0.18)	0.90
Ethnicity	0.22 (0.57)	1.25	0.44 (0.41)	1.55
Verbal ability	−0.01 (0.02)	0.99	−0.01 (0.02)	0.99
Ext. behavior	2.83 (0.31)**	16.93	1.23 (0.20)**	3.43

	Dependency	
	Low-increasing (vs. low-decreasing)	
	<i>b</i> (SE)	Odds ratio
Gender	−0.13 (0.22)	0.88
SES	−0.17 (0.14)	0.84
Ethnicity	−0.18 (0.36)	0.84
Verbal ability	−0.03 (0.01)*	0.97
Ext. behavior	0.59 (0.14)**	1.81

Note. Ext. behavior = externalizing problem behavior.

* $p < .05$.

** $p < .01$.

3.2.2. Conflict

For Conflict, the low-stable trajectory was used as a reference category. Gender and Externalizing Behavior were significant predictors of relationship trajectories (Table 4). Boys appeared to have a higher chance than girls of either high-decreasing Conflict trajectories ($b = 0.80$, $p = .001$, Odds ratio = 2.22) or low-increasing trajectories ($b = 1.02$, $p = .001$, Odds ratio = 2.77) compared to low-stable trajectories. Furthermore, students with higher levels of Externalizing Behavior were more often found to have either high-decreasing trajectories ($b = 2.83$, $p < .001$, Odds ratio = 16.93) or low-increasing trajectories whereas students with lower levels of Externalizing Behavior were more often found in the low-stable trajectories ($b = 1.23$, $p < .001$, Odds ratio = 3.43).

3.2.3. Dependency

With regard to Dependency, the low-decreasing trajectory was used as reference category. Both Verbal Ability and Externalizing Behavior significantly predicted trajectories of teacher-student Dependency (Table 4). Students with lower levels of Verbal Ability appeared to have higher chances of showing a low-increasing trajectory of Dependency ($b = -0.03$, $p = .014$, Odds ratio = 0.97) whereas students with higher levels of Verbal Ability more often showed a low-decreasing trajectory. In addition, the analyses revealed that students with higher levels of Externalizing Behavior more often showed a low-increasing trajectory of Dependency ($b = 0.59$, $p < .001$, Odds ratio = 1.81), whereas students with lower levels of Externalizing Behavior had more often low-decreasing trajectories.

3.3. Associations between relationship trajectories and school outcomes

3.3.1. Closeness

With regard to associations between Closeness trajectories and students' outcomes in sixth grade, significant effects were found for Task Motivation only: Students with high stable trajectories showed higher levels of Task Motivation in sixth grade than students with moderate-increasing levels of Closeness, $\chi^2(1) = 3.98$, $p = .046$, Cohen's $d = 0.17$ (Table 5).

Table 5
Differences between relationship trajectories in standardized residuals of students' outcomes in sixth grade.

	Closeness			Conflict			Dependency	
	High-stable	Moderate-increasing	Very high-decreasing	High-decreasing	Low-increasing	Low-stable	Low-decreasing	Low-increasing
Self-efficacy	-0.01(0.05) _a	-0.08(0.05) _a	0.16(0.10) _a	-0.02(0.14) _a	-0.16(0.21) _a	0.01(0.04) _a	0.03(0.05) _a	-0.22(0.11) _b
Task motivation	0.04(0.05) _a	-0.19(0.10) _b	0.01(0.08) _{a, b}	-0.05(0.17) _a	-0.35(0.19) _a	0.03(0.04) _a	0.06(0.04) _a	-0.39(0.12) _b
Vocabulary	0.01(0.05) _a	-0.01(0.06) _a	-0.04(0.11) _a	0.05(0.15) _a	-0.18(0.17) _a	0.01(0.05) _a	0.05(0.05) _a	-0.39(0.12) _b
Technical Reading	-0.02(0.05) _a	0.11(0.11) _a	-0.03(0.08) _a	0.09(0.16) _a	-0.12(0.18) _a	0.001(0.04) _a	0.05(0.05) _a	-0.38(0.13) _b
Reading Compreh.	-0.01(0.05) _a	0.08(0.08) _a	-0.02(0.10) _a	0.15(0.14) _a	-0.21(0.19) _a	0.005(0.04) _a	0.08(0.04) _a	-0.59(0.12) _b
Math Achievem.	0.002(0.05) _a	-0.06(0.11) _a	-0.08(0.08) _a	-0.05(0.21) _a	-0.07(0.14) _a	0.008(0.04) _a	0.12(0.04) _a	-0.87(0.14) _b

Note. Standard errors are between brackets. Reading compreh. = reading comprehension. Math Achievem. = Math Achievement. Mean scores in the same row that do not share subscripts differ significantly from each other at $p < .05$.

3.3.2. Conflict

No significant differences were found between the Conflict trajectories regarding students' outcomes (Table 5).

3.3.3. Dependency

Significant differences between the two trajectories of teacher-student Dependency were found for all students' outcomes in Grade 6. With regard to achievement, students with low-increasing levels of Dependency reported significantly lower levels of Vocabulary, $\chi^2(1) = 11.243, p = .001$, Cohen's $d = 0.27$, Technical Reading, $\chi^2(1) = 10.315, p = .001$, Cohen's $d = 0.29$, Reading Comprehension, $\chi^2(1) = 26.753, p < .001$, Cohen's $d = 0.47$, and Math Achievement, $\chi^2(1) = 43.613, p < .001$, Cohen's $d = 0.63$, compared to students with low-decreasing trajectories (Table 5). On top of that, students with low-increasing Dependency had lower levels of Self-Efficacy, $\chi^2(1) = 4.372, p = .037$, Cohen's $d = 0.18$, and Task Motivation, $\chi^2(1) = 12.314, p < .001$, compared to students with low-decreasing trajectories (Table 5).

3.4. Associations between risk status and school outcomes

With regard to students' risk status on the relationship trajectories, the no-risk groups consisted of 919 students (70.7%). The low risk group included 293 students (22.5%), and the high-risk group consisted of 88 students (6.8%). Overall, the results of the MANCOVA showed that there was a statistically significant difference between the risk-groups in school outcomes, $F(12, 2574) = 3.80, p < .001$, Wilks' $\Lambda = 0.965, \eta^2 = 0.02$. When inspecting the separate outcomes, it appeared that Self-Efficacy was significantly predicted by differences in risk status, $F(2, 1292) = 4.50, p = .014$. Pairwise comparisons between the three risk groups showed that students in the low-risk group had lower levels of Self-Efficacy than students in the no-risk group (Cohen's $d = 0.22$; Table 6), whereas students in the high-risk group did not differ significantly from the no-risk group (Cohen's $d = 0.26$) or the low-risk group (Cohen's $d = 0.04$). With regard to Reading Comprehension, significant differences between risk groups were also found, $F(2, 1292) = 6.87, p = .001$. Again, students in the low-risk group had lower levels of Reading Comprehension than students in the no-risk group (Cohen's $d = 0.36$; Table 6), whereas students in the high-risk group did not differ significantly from the no-risk group (Cohen's $d = 0.47$) or the low-risk group (Cohen's $d = 0.10$). Task Motivation was also significantly predicted by differences in risk groups, $F(2, 1292) = 6.60, p = .001$. Students in the high-risk group appeared to have lower levels of Task Motivation compared to students in the no-risk group (Cohen's $d = 0.48$; Table 6), whereas students in the low-risk group did not differ significantly from students in the high-risk group (Cohen's $d = 0.31$) and the no-risk group (Cohen's $d = 0.16$). With regard to Math Achievement, significant differences between risk groups were also found, $F(2, 1292) = 11.82, p < .001$. Pairwise comparisons revealed that students in the high-risk group had lower scores on Math Achievement than students in both the low-risk group (Cohen's $d = 0.33$) and the no-risk group (Cohen's $d = 0.61$; Table 6). Students' scores in Vocabulary and Technical Reading, however, did not differ

Table 6
Differences between the risk groups in mean scores of students' outcomes in sixth grade.

	No-risk group (n = 919)	Low-risk group (n = 293)	High-risk group (n = 88)
Self-Efficacy	3.75 (0.02) _a	3.63 (0.04) _b	3.60 (0.07) _{a, b}
Task Motivation	4.00 (0.02) _a	3.92 (0.04) _{a, b}	3.74 (0.07) _b
Vocabulary	98.47 (0.42) _a	96.98 (0.73) _a	96.04 (1.41) _a
Technical Reading	102.01 (1.59) _a	99.76 (0.82) _a	102.29 (1.59) _a
Reading Comprehension	57.47 (0.59) _a	53.32 (1.04) _b	53.00 (2.00) _{a, b}
Math Achievement	112.25 (0.38) _a	109.96 (0.67) _b	106.14 (1.30) _c

Note. Standard errors are between brackets. Mean scores in the same row that do not share subscripts differ significantly from each other at $p < .05$. A Bonferroni adjustment was made for multiple comparisons.

based on their risk status.

4. Discussion

The present study aimed to identify teacher-student relationship trajectories from kindergarten to sixth grade. Furthermore, we examined whether relationship trajectories could be predicted by students' personal and demographic characteristics and whether teacher-student relationship trajectories were associated with students' achievement and motivation in sixth grade. Different from previous studies, we additionally analysed trajectories of teacher-student dependency.

4.1. Teacher-student closeness

With regard to closeness, the majority of students appeared to follow high-stable trajectories, which is in line with the findings of Spilt, Hughes, et al. (2012) and O'Connor et al. (2012). As such, these findings stress the importance of using a person-centered approach, since variable-centered studies tend to find decreases in teacher-student closeness over time (Jerome et al., 2009; Pianta & Stuhlman, 2004), whereas person-centered studies provide a more positive view of the development of closeness during the primary school years. That is, the majority of students seemed to start with relatively high levels of closeness in the relationship with their kindergarten teacher and continued to have relationships high in closeness with their subsequent teachers, whereas only 15–37% of the students appeared to have less favorable trajectories with their successive teacher (O'Connor et al., 2012; Spilt, Hughes, et al., 2012).

When looking at these less favorable trajectories, > 10% of the sample appeared to have moderate-increasing levels of closeness, which is also comparable to the studies of O'Connor et al. (2012) and Spilt, Hughes, et al. (2012). Different from Spilt, Hughes, et al. (2012) but comparable to O'Connor et al. (2012), we also found that > 10% of the students experienced very high-decreasing levels of closeness in their relationship with their teachers. In the present study, the high-decreasing students still ended up with similar levels of closeness compared to the other two groups, whereas the decreasing group in the study of O'Connor et al. (2012) ended up with lower closeness compared to the level of closeness in other groups. Interestingly, we did not find a trajectory that was consistently negative throughout elementary school. That is, in contrast to O'Connor et al. (2012), we did not identify a subgroup with low-stable levels of closeness. A possible explanation might be that the sample of O'Connor et al. consisted of somewhat more at-risk students than the present sample. That is, the sample of O'Connor consisted of more students from ethnic minority families, a larger percentage of single mothers, and about 10% more mothers who did not complete high school. Still, it should be noted that the low-stable group in the study of O'Connor et al. (2012) only included 3% of the students. Another explanation for the differences in findings may be that O'Connor et al. (2012) used somewhat less restrictive methods of model selection (i.e., they did not have a restriction in group size).

With regard to the effect of students' characteristics on closeness trajectories, boys and students with externalizing behavior appeared to be overrepresented in the moderate-increasing trajectory. Although it may seem unexpected that these at-risk students would experience increasing levels of closeness, the smaller standard deviations in kindergarten seemed to suggest that each group was more homogenous in kindergarten than in later school years. Furthermore, the mean levels of closeness seemed to be somewhat further apart in kindergarten than in later years. Therefore, it may be mainly the begin level of closeness that was affected by students' higher levels of externalizing behavior or gender. It is promising that these students who were initially at risk for lower-quality teacher-student relationships were able to recover during elementary school. Additionally, students with higher levels of externalizing behavior were *less* often found to have very high-decreasing trajectories of closeness than students with lower levels of externalizing behavior, indicating that it was, again, mostly the level of closeness in kindergarten that was affected by their lower externalizing behavior.

No prior person-centered study examined the influence of verbal ability on relationship trajectories. We found that students with better verbal ability more often had a very high-decreasing trajectory of closeness. This implicates that verbal ability might be an important prerequisite of developing a supportive teacher-student relationship at the start of the school career. The ability to have more elaborated conversations may lead to better understanding and more warmth in the relationship of teachers and students (cf., Moritz Rudasill et al., 2006; Spilt et al., 2015). However, as this result refers to the high-decreasing trajectory, the advantage of having better verbal abilities does not seem to hold over time. It should be noted, however, that this effect of verbal ability on the high-decreasing closeness trajectory was rather small ($b = 0.03$). More research is needed to find out the practical implications of these findings. Finally, in contrast to Spilt, Hughes, et al. (2012), we did not find that ethnic minority students were overrepresented in certain trajectories of teacher-student closeness. These differences in findings may be due to differences between the samples. The ethnic minority students in the study of Spilt, Hughes, et al. (2012) had mostly an African American or Hispanic background, whereas the present study had ethnic minority students with mostly a Turkish or Moroccan background. Furthermore, Spilt, Hughes, et al. (2012) used a sample in which students had poor literacy skills, which may result in a more at risk sample of students. This could confound some of the results with regard to ethnicity, which may explain the differences in findings between the present study and the study of Spilt, Hughes, et al. (2012).

With regard to students' outcomes, we found that students with moderate-increasing trajectories had lower levels of task motivation in sixth grade than students with high-stable trajectories. Apparently, the increase in closeness during the elementary school years was not enough to compensate for the lower level of teacher-student closeness in kindergarten with regard to students' task motivation. Therefore, it seems important to promote warm teacher-student relationships as early as in kindergarten (cf., Hamre & Pianta, 2001). In contrast to Spilt, Hughes, et al. (2012), the closeness trajectories did not seem to affect students' achievement. As

Spilt, Hughes, et al. (2012) found that the closeness trajectories only had a significant impact on the achievement of boys, it might be that these effects cease to exist when no distinction is made between boys and girls in the analyses. Another explanation could be that the present study focused on achievement in different subjects, whereas Spilt, Hughes, et al. (2012) used a composite score of achievement. Furthermore, the study of Spilt, Hughes, et al. (2012) was conducted in the United States, whereas the present sample took place in the Netherlands. Finally, the difference in risk status between the present study and the study of Spilt, Hughes, et al. (2012) should be taken into consideration. Spilt, Hughes, et al. (2012) used an at-risk sample with children who were selected due to their low literacy levels at the start of the study, whereas the present study used a community sample. Perhaps, the closeness-trajectories were more relevant for the academic achievement of the at-risk sample of Spilt, Hughes, et al. (2012) because at-risk students tend to be more strongly affected by relationships with their teachers than students who are not at risk for academic failure (cf., Hamre & Pianta, 2001; Roorda et al., 2011). More research is necessary to explore the conditions under which closeness trajectories would affect students' achievement.

4.2. Teacher-student conflict

With regard to teacher-student conflict, the majority of students had low-stable trajectories of conflict, which is in agreement with Spilt, Hughes, et al. (2012) and O'Connor et al. (2012). Similar to the findings regarding closeness, most students have a favorable development of conflict during elementary school. In contrast to some variable-centered studies (Jerome et al., 2009), person-centered studies thus seem to indicate that the majority of students follow a relatively positive trajectory with low-stable levels of conflict throughout elementary school, whereas 15 to 43% of the students seem to follow more unfavorable trajectories (cf., O'Connor et al., 2012; Spilt, Hughes, et al., 2012). Interestingly, the amount of unfavorable trajectories differs substantially between the three studies. O'Connor et al. (2012) and Spilt, Hughes, et al. (2012) identified more different trajectories of teacher-student conflict than the present study (i.e., high stable levels of conflict), which may be explained by differences in sample selection or analyzing the models for boys and girls separately. For instance, O'Connor et al. (2012) used a more diverse sample, and Spilt, Hughes, et al. (2012) used a sample of more at-risk students.

In contrast with Spilt, Hughes, et al. (2012) and findings from variable-centered studies (e.g., Jerome et al., 2009), we did find that boys and students with more externalizing behavior would have decreasing levels of conflict over time. A possible explanation might be that these students are less prepared for the learning environment in kindergarten and the early years of elementary school, but become more able to regulate their behavior after spending more years in school or simply because they grow older. The decrease of teacher-student conflict may also be caused by an increased awareness of school personnel for these at-risk students. In contrast, students with externalizing behavior and boys were also overrepresented in the low-increasing trajectory, which was in line with our expectations (e.g., Spilt, Hughes, et al., 2012). This may indicate that children's externalizing behavior and teacher-student conflict influence each other over time. Likewise, Doumen et al. (2008) found evidence for a vicious circle in which children's high externalizing behavior led to more conflict in the relationship, which in turn, led to even more externalizing behavior of the child. Thus, part of the children with high externalizing behavior and boys followed very-high decreasing or low-increasing trajectories. More research is needed to understand why some children start with a high level of teacher-student conflict and have a decrease over time, whereas others start with low levels of conflict which increase significantly during elementary school. For instance, future research could investigate to what extent students use self-regulation strategies or how school personnel deals with externalizing behavior of students. We were not able to confirm the results of Spilt, Hughes, et al. (2012) and Spilt and Hughes (2015) referring to the overrepresentation of ethnic minority students in unfavorable conflict trajectories. Similar as results of teacher-student closeness, this may be due to differences in cultural backgrounds of ethnic minority students. It must be noted that the correlations between teacher-student conflict and ethnicity were only significant in sixth grade. It is possible that ethnicity of student is mainly important in upper elementary school, which was also found in a variable-centered study of Thijs et al. (2012). Consistent with Spilt and Hughes (2015), we did not find that students' SES influenced the development of teacher-student relationship trajectories. When inspecting correlations between SES and relationship dimensions, we found that SES was significantly associated with relationship dimensions in sixth grade. It may therefore be possible that SES only influences relationship quality in upper elementary school.

In contrast to Spilt, Hughes, et al. (2012), students' from different conflict trajectories did not differ in their motivation and achievement outcomes in sixth grade. In Spilt, Hughes, et al. (2012), only students from the high-stable and low-increasing conflict trajectories had a lower achievement score. As the low-increasing trajectory in the present study consisted of less students than in Spilt, Hughes, et al. (2012) and the high-stable trajectory was not found in the present study at all, this may (partly) explain why we did not find effects of the conflict trajectories on students' motivation and achievement. Furthermore, as teacher-student relationships are expected to have more impact on the school functioning of students at risk for academic maladjustment (Hamre & Pianta, 2001), such as academically at-risk students in Spilt, Hughes, et al. (2012), this may also explain why the conflict trajectories were more influential in the study of Spilt, Hughes, et al. (2012) than in the present sample. More research is needed to examine which groups of students appear in problematic trajectories and if this interpersonal adversity leads to poor academic adjustment.

4.3. Teacher-student dependency

The present study was the first person-centered study that included teacher-student dependency. In contrast to findings from closeness and conflict, only two trajectories for dependency were found. The majority of students had low-decreasing levels of dependency. This can be considered a favorable trajectory, because variable-centered research indicated that high levels of dependency are associated with more internalizing problems of students (Murray & Murray, 2004) and lower school adjustment (Birch

& Ladd, 1997; Hamre & Pianta, 2001). Additionally, we found a group of students (i.e., 11%) with low-increasing levels of teacher-student dependency, reflecting an increase in overreliance on the teacher as a source of support (Verschuieren & Koomen, 2012). This can thus be regarded as a more unfavorable trajectory of dependency (cf., Birch & Ladd, 1997; Murray & Murray, 2004). Interestingly, the two groups started with relatively similar levels of dependency in kindergarten, which may indicate that differences in dependency become more visible as children grow older.

Several child characteristics predicted trajectories of teacher-student dependency: Students with higher levels of externalizing problem behavior and lower levels of verbal ability in kindergarten were more often in the low-increasing trajectories. It could be that externalizing children become more reliant on their teachers over time because teachers tend to use more behavior regulation for these students (Thijs, Koomen, & van der Leij, 2008). In this way, externalizing behavior and dependency may reinforce each other over time (cf., Birch & Ladd, 1998). With regard to the findings for verbal ability, students may need more support from their teacher if they grow older because the academic and social demands increase in the higher grades and, hence, students become more hampered by their low verbal abilities. It should be noted, however, that verbal ability was only measured in kindergarten. Therefore, future research should use repeated measures of verbal ability and externalizing behavior to further disentangle the association between these predictors and teacher-student dependency.

With regard to students' outcomes, we found that students with increasing levels of dependency were less motivated and had lower achievement in sixth grade. Different from closeness and conflict, the unfavorable dependency trajectory was associated with all four outcomes, which seemed to indicate that dependency is an important relationship dimension during the elementary school years. Likewise, Zee et al. (2013) found that dependency was more strongly associated with students' outcomes in upper elementary school than teacher-student conflict. Thus, although dependency has been understudied in previous research (Roorda et al., 2011), our results suggest that it is important for future research to focus on this relationship dimension more often.

4.4. Risk status and school outcomes

With regard to students' risk status at the three relationship dimensions, it is encouraging that only 6.8% of the students had problematic trajectories on two or three relationship dimensions. This implies that only a small part of the students experienced unfavorable relationships with their teachers on multiple dimensions. Based on the risk and stress hypothesis (Ladd et al., 2008; Ladd & Burgess, 2001), we expected that students with problematic trajectories on two or more dimensions (i.e., the high-risk group) would be less motivated and achieve worse than students with only one problematic relationship trajectory. This hypothesis was only supported with respect to students' math achievement, and not for the other outcome variables. In combination with variable-centered studies that found that the three relationship dimensions uniquely predict students' outcomes (e.g., Roorda et al., 2011), our findings with regard to the different risk groups raise questions about the added value of investigating students' risk status based on the combination of the three relationship dimensions. Although more research is needed, it seems that we would profit more and get a more nuanced view on the effect of teacher-student relationships on students' motivation and achievement if we examine the relationship dimensions separately.

However, the lack of significant differences between the high-risk group and the other two risk groups might also be explained by a lack of statistical power. That is, the high-risk group was much smaller than the other two risk groups (i.e., $N = 88$ in the high-risk group versus $N = 919$ and $N = 293$ in the no-risk and low-risk group, respectively) in combination with relatively large standard errors in the high-risk group for part of the outcome variables (e.g., vocabulary and reading comprehension). Studies with even larger samples than the present study might be needed to create enough power to find significant differences between the high-risk group and the other two risk-groups.

4.5. Limitations and directions for research

Some limitations should be taken into account when interpreting the results of the present study. First, we only used teacher reports to measure the quality of the relationship. Previous research has found that the agreement in teacher and child reports of the relationship is generally not very high (Murray, Murray, & Waas, 2008; Wu, Hughes, & Kwok, 2010). As none of the person-centered studies used child reports before (O'Connor et al., 2011; O'Connor et al., 2012; O'Connor & McCartney, 2007; Spilt, Hughes, et al., 2012), it is advisable for future research to include child reports of the relationships when studying relationship trajectories.

Second, children's externalizing behavior and verbal ability were only measured in kindergarten. For future research, it might be interesting to measure these child characteristics at more occasions to be able to examine how they influence further development of relationship trajectories (cf., Birch & Ladd, 1998; Doumen et al., 2008). In our study, some of the results can also be somewhat confounded because the predictors (e.g., child characteristics) and outcomes (e.g., academic achievement and motivation) were measured simultaneously with the first and last measurement of relationship quality, respectively.

Third, information about the number of teachers and teachers' characteristics was not available. As teacher characteristics also seem to contribute to the quality of teacher-student relationships (Mashburn & Henry, 2004; Saft & Pianta, 2001), future research should collect information about teachers' characteristics to be able to explore the influence of these characteristics on teacher-student relationship trajectories as well.

Fourth, we recommend to include a more elaborated measurement of externalizing behavior in future research, to capture the full construct more thoroughly. As we used only four items to measure this concept, we probably did not cover the whole range of externalizing behaviors. For instance, items about students' hyperactive behaviors seem to be lacking in the current measure. Future research could expand our measure for externalizing problems with, for example, items from the Strength and Difficulties

Questionnaire (SDQ; Goodman & Scott, 1999).

Fifth, we did not have measurements of students' achievement and motivation in kindergarten and therefore we were not able to control for these effects when investigating the outcomes. Combined with the fact that we did not use an experimental design, the present study prevents strong conclusions about causality.

4.6. Conclusions and implications for practice

The current study provides evidence for the existence of different trajectories of teacher-student relationship quality from kindergarten to sixth grade. For each relationship dimension, the majority of students appeared to follow favorable relationship trajectories during elementary school. That is, they shared relationships high in closeness and low in conflict and dependency with their subsequent teachers. In this way, our findings and that of other person-centered studies (e.g., Spilt, Hughes, et al., 2012) provide a more positive view of the development of teacher-student relationship quality during elementary school than variable-centered studies (e.g., Jerome et al., 2009; Pianta & Stuhlman, 2004). Still, there also seem to be students who share less favorable relationships with their teachers (e.g., low-increasing levels of conflict or dependency). Boys, students with externalizing behavior, and students with lower verbal ability appeared to be overrepresented in these less favorable trajectories. With regard to students' outcomes, it seems mainly the dependency trajectories that affect students' motivation and achievement. More specifically, students who were increasingly exposed to more dependency in the relationship with their subsequent teachers were less motivated and achieved worse in sixth grade.

For school practitioners, it will be reassuring to know that the majority of students seem to share positive relationships with their teacher during their elementary school career. Still, there also appear to be substantial numbers of students who will need help in developing more favorable relationships with their teachers to prevent academic maladjustment later on (cf., Roorda et al., 2011). Our results suggest that especially students who experience high levels of dependency in their relationships with subsequent teachers are at risk for academic maladjustment at the end of elementary school. Therefore, teachers should help these students to become more independent and autonomous, for example by using instructional practices directed at stimulating self-regulated learning (see Dignath, Buettner, & Langfeldt, 2008). Finally, teachers can be made aware that boys, students with high levels of externalizing behavior, and students with lower verbal abilities are at risk for developing less favorable relationships with their teachers and that these negative relationships will have deteriorating consequences for their motivation and academic achievement. Existing interventions might help teachers to improve their relationship with these students (Driscoll & Pianta, 2010; Spilt, Koomen, et al., 2012; Vancraeyveldt et al., 2015).

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