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## EMPIRICAL ARTICLE

# Socioemotional functioning across the transition to lower secondary school: The role of temperament and relationships with mothers and teachers

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**Abstract**

This Finnish longitudinal study investigated the role of relationships with mothers ( $n=631$ ) and teachers ( $n=56$ ), and adolescents' ( $n=848$ ; 53.9% girls, 46.1% boys) temperament in the development of the adolescents' socioemotional functioning during the transition to lower secondary school (Grade 6 to Grade 7; age in Grade 6:  $M=12.32$ ,  $SD=0.36$ ). The results showed that mother–adolescent closeness predicted a higher level and teacher–adolescent closeness predicted a smaller decrease in prosocial behavior. Teacher–adolescent conflict predicted a higher level, and mother–adolescent conflict predicted an increase in externalizing problems. Only temperament predicted internalizing problems. In addition, relationship quality both mediated and moderated some of the associations between temperament and socioemotional functioning.

**KEYWORDS**

externalizing problems, internalizing problems, mother–adolescent relationship, prosocial behavior, teacher–adolescent relationship, temperament

**INTRODUCTION**

During the transition to lower secondary school, adolescents face increased academic demands and changes in social relationships, which can be reflected in their adjustment to a new educational environment (Symonds, 2015). The personal characteristics of adolescents together with supportive home and school environments interact in shaping the successful socioemotional functioning of adolescents (Bronfenbrenner, 1979; see also Carlo et al., 2010; Roorda & Koomen, 2021). For instance, adolescents' temperament can predict their socioemotional functioning (e.g., Hirvonen et al., 2018; Wang et al., 2016), which may become especially important when adolescents switch from primary to lower secondary school. However, there is a lack of research on the mechanisms of how adolescents' temperament and relationships with parents and teachers intertwine to predict their socioemotional functioning. Relationship quality with both parents and teachers might mediate (e.g., Ezpeleta et al., 2019; Rudasill et al., 2010) or moderate the

links between temperament and socioemotional functioning (Leve et al., 2005). Consequently, this study aimed to investigate the role of temperament and relationship quality with mothers and teachers in the socioemotional functioning of adolescents during the transition from primary school to lower secondary school. The current study contributes to previous research by investigating multiple mechanisms that contribute to the development of socioemotional functioning across the transition.

## Socioemotional functioning across the transition to lower secondary school

The transition from primary school to lower secondary school brings even more responsibilities and independence for adolescents than the previous academic transitions, which may become challenging to adjust to (Palmu et al., 2017; Symonds, 2015). Adolescents must adjust to new teaching styles, new academic subjects, increasing academic

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demands, a busier schedule, new peers, and multiple classrooms. In addition, when adolescents move from primary school to lower secondary school, their teachers change from one classroom teacher to multiple subject teachers. On top of the academic changes, adolescents face pubertal changes. These multiple changes during the transition are stressful for some adolescents (Symonds, 2015) and may be linked to their socioemotional functioning (i.e., prosocial behavior, externalizing problems, and internalizing problems). Socioemotional functioning is substantially connected to environmental factors and the ability to interact with others (Denham et al., 2009; Hirvonen et al., 2018). One factor of socioemotional functioning is the prosociality of adolescents. Prosocial behavior refers to intentionally positive behavior towards others, such as helping, sharing, comforting, or empathizing (Eisenberg, 1982; Rushton, 1982). Prosocial behavior is shown to be related to lower aggression, involvement in risky behaviors, and deviant peer affiliation (Carlo et al., 2014). In contrast, externalizing and internalizing problems represent maladaptive socioemotional functioning (see also Hirvonen et al., 2018). Externalizing problems refer to a broad category of disruptive behaviors, such as aggressiveness, oppositional behavior, conduct problems, hyperactivity, and attention deficit problems (McMahon, 1994; Metsäpelto et al., 2017). Internalizing problems refer to self-directed negative emotional experiences, such as anxiety, depression, or social avoidance (McMahon, 1994; Roeser et al., 1998). Early adolescents with higher externalizing problems are at risk of having increased risky behaviors (Thompson et al., 2011), whereas early adolescents with internalizing problems are more at risk of having difficulties socializing with their peers (Fanti & Henrich, 2010), which can also add to the decrease in adolescents' achievement and motivation (Metsäpelto et al., 2017; Palmu et al., 2017; Weidman et al., 2015). Changes brought about by the critical transition to lower secondary school can reinforce the poor socioemotional functioning of adolescents; therefore, it is crucial to focus on mitigating externalizing and internalizing problems and encourage prosocial behaviors of adolescents throughout the transition.

Previous studies have shown different patterns in changes in socioemotional functioning across adolescence. Some studies have found a decline (Carlo et al., 2007) and others an increase in prosocial behavior (Padilla-Walker et al., 2017). In addition, declines in externalizing (Leve et al., 2005) and internalizing problems (Martin-Storey et al., 2018) and increases in externalizing (Bos et al., 2018) and internalizing problems (Leve et al., 2005) were found across adolescence as well. However, these studies concentrated on a wider range of ages, but not specifically on the transition to lower secondary school. Even though studies have shown an increase in self-reported school problems (Martínez et al., 2011), and declines in achievement, well-being, and self-efficacy (Eccles & Roeser, 2011; Marušić et al., 2020) during the transition to lower secondary school, only a handful of studies have investigated changes in adolescents' socioemotional functioning across this transition.

## Adolescents' temperament and socioemotional functioning

Personal characteristics, such as temperament, may play a role in the socioemotional functioning of early adolescents across the transition to lower secondary school (e.g., Hirvonen et al., 2018; Muris et al., 2007; Wang et al., 2016). Temperament refers to relatively stable individual differences in activity, affectivity, attention, and self-regulation, which are determined by complex interactions between biological and environmental factors (Goldsmith et al., 1987; Shiner et al., 2012). In the present study, we focus on three major dimensions of adolescent temperament: surgency (extraversion), negative affectivity, and effortful control (Rothbart et al., 2001). Each of the temperamental dimensions plays a significant role in shaping adolescents' socioemotional functioning across the transition to lower secondary school.

*Surgency* includes positive emotionality, activeness, sensation-seeking, and low shyness (Rothbart, 2007; Rothbart et al., 2001). Higher surgency has been associated with lower prosocial behaviors and internalizing problems, and higher externalizing problems (Wang et al., 2016; Zentner, 2020; Zentner & Shiner, 2012). Adolescents with higher surgency or extraversion are more outgoing and have more positive affectivity, which could be seen as a favorable quality for prosocial behaviors. In addition, adolescents, who have higher positive emotionality, can create a broader social circle while gaining more social support that can prevent adolescents from developing internalizing problems (Zentner & Shiner, 2012). However, higher sensation-seeking tendencies and seeking rewards associated with higher surgency might also predict more risky behaviors and even externalizing problems for some individuals (Zentner & Shiner, 2012). Hence, high surgency might hamper successful adaptation to the new school context after the transition to lower secondary school when more disciplined behavior is expected and irresponsible behavior can be viewed as unfavorable in the classroom (Rothbart et al., 2001; Symonds, 2015).

*Negative affectivity* encompasses discomfort, negative emotionality, and difficulty in dealing with negative emotions and experiences (Rothbart, 2007; Rothbart et al., 2001). Previous studies have shown that negative affectivity is related to higher externalizing and internalizing problems and lower prosocial behavior (Hirvonen et al., 2018; Lengua, 2006; Lunetti et al., 2022; Martin-Storey et al., 2018; Muris et al., 2007; Zentner, 2020). Adolescents with high negative affectivity can have challenges adjusting to changes brought on by educational transition due to their higher sensitivity to negative environmental cues and their higher vulnerability to experience and dwell on intense negative feelings when, for example, confronted with disappointments (Rothbart et al., 2001; Scrimin et al., 2019; Zentner, 2020).

*Effortful control* is a self-regulatory dimension of temperament that includes the ability to focus one's attention and control and regulate behavior and emotions (Rothbart, 2007; Rothbart et al., 2001). Effortful control has been associated with higher prosocial behaviors toward others (Luengo

Kanacri et al., 2013; Zentner, 2020) and negatively associated with externalizing and internalizing problems in early adolescence (Lengua, 2006; Lunetti et al., 2022; Muris et al., 2007; Wang et al., 2016). Due to their ability to regulate their emotions and behavior, adolescents with high effortful control can better adapt to new school demands, such as busier schedules and more effort-requiring academic demands, and they can effectively socialize with their peers. Therefore, adolescents with higher effortful control may avoid difficulties during the transition (Rothbart et al., 2001; Symonds, 2015).

However, as far as we know no previous studies have investigated the role of temperament in externalizing and internalizing problems, and prosocial behavior specifically during the transition to lower secondary school. Poor socioemotional functioning during this critical transition can have detrimental consequences on adolescents' achievement and motivation (Caprara et al., 2014; Metsäpelto et al., 2017; Palmu et al., 2017). Therefore, it is important to investigate personal characteristics that may contribute to successful adjustment during the transition to lower secondary school.

### Relationship quality with parents and teachers and socioemotional functioning

Close relationships with parents and teachers are crucial for the well-being of adolescents who are facing educational transitions (Symonds, 2015). According to the ecological approach (Bronfenbrenner, 1979), the successful development of humans depends on interactions with the environments they are surrounded by, such as home and school. Even though early adolescents become increasingly independent from adults and enjoy spending time with their peers, support from parents and teachers remains important, especially during critical educational transitions (Symonds, 2015). However, the roles of parents and teachers across the transition to lower secondary school differ in terms of the continuity of these relationships (Virtanen et al., 2020). The relationships with parents are typically not interrupted across the transition, whereas relationships with teachers are renegotiated when adolescents switch from one primary school teacher to multiple secondary school subject teachers. In the present study, the relationship quality with mothers and teachers in primary school was measured by two dimensions: closeness and conflict (Pianta, 1992a, 1992b, 2001). Closeness refers to the degree of support, warmth, and trustworthiness between adolescents and their parents and teachers, whereas conflict defines a degree of tense and conflictual interactions, and disagreements between adolescents and their parents and teachers (Pianta, 2001; Verschueren, 2015; see also Kiuru et al., 2020).

Research has shown that warmth and close relationships with parents and teachers predict higher prosocial behavior (Carlo et al., 2010; Luengo Kanacri et al., 2020; Obsuth et al., 2017; Padilla-Walker et al., 2017). The closer relationships adolescents have with parents and teachers before the

transition, the more belongingness and connection they feel with them and in turn the more they develop positive behavioral outcomes across the transition (Ryan & Deci, 2000). On the other hand, low parental warmth and conflicts with parents and teachers can predict externalizing and internalizing problems (Allison, 2000; Klahr et al., 2011; Martin-Storey et al., 2018; Pakarinen et al., 2018; Piquart, 2017; Roorda & Koomen, 2021). During early adolescence, conflicts with adults might increase, which can be seen as part of the normal development of autonomy. When they are handled well, conflicts can even contribute to solving issues and help adolescents learn to look through different perspectives (Branje, 2018; Branje et al., 2009). However, intense, or poorly handled conflicts with parents and teachers before the transition can be negatively linked to the socioemotional functioning of adolescents across the transition (Allison, 2000; Branje, 2018). Therefore, we have investigated the role of pretransitional relationship closeness and conflict with both mothers and teachers in socioemotional functioning (i.e., prosocial, externalizing, and internalizing) among early adolescents during the critical transition to lower secondary school.

### Associations between temperament and socioemotional functioning: Relationship quality as a mediator or a moderator

The development of adolescents' behavior should be interpreted in its interaction with the closest environmental systems (Bronfenbrenner, 1979). Therefore, both personal characteristics and environments should be considered when examining the socioemotional functioning of adolescents across critical educational transitions. In the current study, we investigated two possible mechanisms via which adolescents' temperament and relationships with mothers and teachers predict socioemotional functioning across the transition.

First, temperament may predict the socioemotional functioning of adolescents across the transition via the reactions of parents and teachers toward their temperamental characteristics (Rutter, 1997; Scarr & McCartney, 1983). For example, higher approach tendencies of adolescents with higher surgency might provoke more impulsive behavior and conflicting situations with parents and teachers, which might, in turn, develop into more externalizing problems (Zentner & Shiner, 2012). In addition, if adolescents have higher negative affectivity, their higher anger and frustration might encourage parents and teachers to use harsher discipline, which can relate to more conflicts and higher externalizing and internalizing problems (Zentner & Shiner, 2012). Finally, if adolescents have higher effortful control, they are more capable to manage their emotions and frustration during the transition, which helps to promote closer relationships with parents and teachers and in turn prosocial behavior (Zentner & Shiner, 2012). However, to our knowledge, only a few studies have investigated the indirect effects

of temperament on socioemotional functioning via relationship quality (e.g., Ezpeleta et al., 2019; Rudasill et al., 2010). Karreman et al. (2010) did not find a significant mediation of parenting between temperament and the problem behavior of preschool children. In contrast, another study showed that lower levels of positive parenting practices mediated the relationship between low temperamental effortful control and the affective problems of 3- to 7-year-old children (Ezpeleta et al., 2019). In addition, Rudasill et al. (2010) found that conflicts with teachers mediated the relationship between difficult temperament and the risky behavior of early adolescents. However, previous studies that investigated the indirect effects of temperament on socioemotional functioning via relationship quality have overlooked parent-adolescent relationships, internalizing problems, and prosocial behaviors in these associations across the transition to lower secondary school.

Second, temperament may interact with the relationship quality with parents and teachers to shape adolescents' socioemotional functioning across the transition. Differential susceptibility theory (Belsky & Pluess, 2009; Jolicoeur-Martineau et al., 2020) suggests that some people are more sensitive to different environmental effects, such as critical educational transitions, than are others. Temperament might, therefore, predict adolescents' socioemotional functioning differently depending on the support they receive from their teachers and parents during the transition from primary to lower secondary school. For example, conflicting relationships with parents and teachers may encourage adolescents who are less shy and have higher tendencies to approach risks, to engage in more externalizing problems (Acar et al., 2020; Zentner & Shiner, 2012). In addition, conflicting relationships may strengthen the discomfort of adolescents who have difficulties in dealing with their negative emotions brought on by educational transition, which may predict internalizing problems (Harvey et al., 2022; Zentner & Shiner, 2012). On the other hand, when adolescents have high effortful control together with close relationships with parents and teachers, they have a stronger base to engage in effective social interactions with others, which can promote the prosocial behavior of adolescents (Zentner & Shiner, 2012). Ramos et al. (2005) found that family conflict predicted externalizing problems in elementary school only for children with negative affectivity and slow adaptability. In addition, Acar et al. (2020) showed that shy children had a higher social competence when they had a close relationship with teachers, whereas less shy children engaged in more antisocial behaviors when they had more conflicts with their teachers (Acar et al., 2020). Harvey et al. (2022) found that high levels of closeness with teachers acted as a protective factor in the relationship between low surgency and internalizing problems, whereas high levels of conflict acted as a risk factor in the relationship between high negative affectivity and internalizing problems of elementary school children. Finally, Karreman et al. (2010) found that fathers' positive control acted as a moderator

between impulsivity and externalizing problems. Despite some previous evidence on interactions between relationship quality and temperament predicting child socioemotional functioning, little is known about the interaction of temperament with parent and teacher relationship quality to predict changes in the socioemotional functioning of early adolescents (Leve et al., 2005).

## The present study

To investigate the role of relationship quality with mothers and teachers and adolescent temperament in socioemotional functioning across the transition to lower secondary school (i.e., from Grade 6 to Grade 7), three research questions were examined:

1. To what extent does adolescent temperament (i.e., surgency, negative affectivity, and effortful control) predict the levels of and changes in their socioemotional functioning (prosocial, externalizing, and internalizing)? It was expected that higher surgency would predict more externalizing problems and less prosocial behavior and fewer internalizing problems in adolescents (Hypothesis 1a). In addition, it was expected that higher negative affectivity would predict more externalizing and internalizing problems and less prosocial behavior (Hypothesis 1b). Finally, it was hypothesized that higher effortful control would predict more prosocial behavior and fewer externalizing and internalizing problems (Hypothesis 1c; e.g., Muris et al., 2007; Wang et al., 2016; Zentner & Shiner, 2012).
2. To what extent does relationship quality in terms of closeness and conflict in the relationships with mothers and teachers at the end of primary school predict the level of and change in adolescents' socioemotional functioning during the transition? It was expected that close relationships with mothers and teachers would positively predict the prosocial behavior of early adolescents (Hypothesis 2a) and that conflicts with mothers and teachers would positively predict adolescents' externalizing and internalizing problems (Hypothesis 2b; e.g., Carlo et al., 2010; Roorda & Koomen, 2021).
3. To what extent are the effects of adolescent temperament on subsequent socioemotional functioning (a) mediated through relationship quality with mothers and teachers or (b) moderated by the relationship quality with mothers and teachers? We investigated which hypotheses, mediation or moderation based, received the most support.
  - a. First, regarding mediation, it was expected that higher surgency and negative affectivity, and lower effortful control would predict a higher initial level of and an increase in externalizing problems via the higher relationship conflict (Hypothesis 3a-1). In addition, it was expected that lower surgency and effortful control and higher negative affectivity would predict a higher initial level of and an increase in internalizing problems



via relationship conflict (Hypothesis 3a-2). Finally, it was expected that lower surgency and negative affectivity and higher effortful control would predict a higher initial level of and a lower decrease in prosocial behavior via closer relationships (Hypothesis 3a-3; e.g., Ezpeleta et al., 2019; Rudasill et al., 2010; Zentner & Shiner, 2012).

- b. Second, regarding the moderation hypothesis, relationships with mothers and teachers were expected to moderate the association between adolescent temperament and their socioemotional functioning. More specifically, we expected to find that high surgency, high negative affectivity, and low effortful control combined with high relationship conflicts would contribute to a higher initial level of and an increase in externalizing problems (Hypothesis 3b-1). In addition, we expected to find that low surgency and effortful control, and high negative affectivity, combined with high relationship conflicts would contribute to a higher initial level of and increase in internalizing problems (Hypothesis 3b-2). Finally, we expected to find that low surgency, low negative affectivity, and high effortful control combined with high relationship closeness would contribute to a higher initial level of and a lower decrease in prosocial behavior (Hypothesis 3b-3; e.g., Acar et al., 2020; Karreman et al., 2010; Zentner & Shiner, 2012).

Due to the associations of relationship quality and socioemotional functioning with achievement and parents' education, the control variables of GPA, as well as the mother's and father's education, were included in the final analyses (Hinshaw, 1992; Martin-Storey et al., 2018; Pakarinen et al., 2018). In addition, boys tend to get involved in more conflicts and externalizing problems than girls do (Baker, 2006; Hamre & Pianta, 2001), thus we also added adolescent gender as a control variable.

## METHODS

### Participants

The research data were collected during a broader longitudinal study following a community sample of Finnish adolescents across the transition from primary school to lower secondary school. The data were collected at four time points (Grade 6 fall, Grade 6 spring, Grade 7 fall, and Grade 7 spring). In total, 848 adolescents (835 at T1, 826 at T2, 800 at T3, and 772 at T4; 53.9% girls and 46.1% boys) answered questions about their socioemotional functioning and their temperament, while 631 mothers and 56 teachers answered about the mother-adolescent and teacher-adolescent relationship quality, respectively. The mean age of adolescents at the beginning of Grade 6 was 12.32 years ( $SD = 0.36$ ). The vast majority of the adolescents were living with both parents (74.4%) or alternately with their mother and their father (11.7%), 7.3% lived with

only their mother, 4.2% lived with their mother and stepfather, 0.8% lived with only their father, and 0.8% lived with their father and stepmother. The remaining 0.7% lived with foster parents or somebody else. The procedures followed the principles of the Helsinki Declaration on research with human subjects. Written consent to participate was collected from participants, and the research plan of the project was approved by the Human Sciences Ethics Committee of the local university.

In the Finnish educational system, primary school lasts from Grade 1 to Grade 6 and lower secondary school begins in Grade 7 and continues up to Grade 9. Therefore, the transition from primary to lower secondary school takes place between Grades 6 and 7. The transition to lower secondary school brings changes in increased academic demands, and an increased number of classmates and teachers, which often requires shifting between school buildings. Primary school students have the same classroom teacher throughout primary school including the whole of Grade 6. However, when they enter lower secondary school in Grade 7, their teachers change from classroom teachers to subject teachers (Finnish National Agency for Education, 2014).

## Measures

### Temperament (Grade 6 fall)

Early adolescents answered questions about their temperament using the Finnish version of the Early Adolescent Temperament Questionnaire—Revised EATQ-R (Capaldi & Rothbart, 1992; Ellis, 2002; Ellis & Rothbart, 2001). The questionnaire includes 65 statements, which adolescents rated on a five-point Likert scale (1 = almost never true; 5 = almost always true). After a pilot study, six statements (e.g., “I get irritated if I am criticized”; “I finish what I start”) drawn from similar subscales of the EATQ-R parent-report form were added to improve the reliability of some of the scales. The resulting 71 statements measured temperamental surgency/extraversion, negative affectivity, effortful control, and affiliativeness. The affiliativeness scale was not used in the present study. The mean scores for effortful control ( $\alpha = .79$ ), negative affectivity ( $\alpha = .86$ ), and surgency/extraversion ( $\alpha = .73$ ) were calculated. For the validity of the measure in the Finnish sample, see Kiuru et al. (2019).

### Mother-adolescent relationship (Grade 6 fall)

The mothers were asked to rate their experienced closeness (5 items; e.g., “If upset, my child will seek comfort from me”) and conflict (5 items; e.g., “My child easily becomes angry at me”) with their adolescent using the 10 items of the short form of the Child-Parent Relationship Scale (CPRS; Driscoll & Pianta, 2011; Pianta, 1992b; see

also Kiuru et al., 2020; Mauno et al., 2018). The mothers answered the questions on a five-point Likert scale (1 = not true at all; 5 = completely true). Cronbach's  $\alpha$  for closeness was .77 and for conflict, it was .84.

### Teacher–adolescent relationship (Grade 6 spring)

The teachers reported the perceived quality of their relationship with 312 adolescents individually in Grade 6 spring (T2) using the short form of the Student–Teacher Relationship Scale (STRS; Pianta, 1992a; Pianta, 2001). The scale consists of 10 items rated on a five-point Likert scale (1 = Completely disagree; 5 = Completely agree) and includes two subscales: closeness (5 items; e.g., “I have a warm and close relationship with this student”) and conflict (5 items; e.g., “This student gets mad at me easily”). Cronbach's  $\alpha$  for closeness was .83, and for conflict, it was .89.

In addition to the teacher-reported quality of their relationships with adolescents, we included youth-report for the additional analyses. Adolescents ( $n = 837$ ) reported on their relationships with class teachers in Grade 6 fall (T1), using the same Student–Teacher Relationship Scale (STRS; Pianta, 1992a; Pianta, 2001). The scale consists of 11 items rated on a five-point Likert scale (1 = Completely disagree; 5 = Completely agree) and includes 5 closeness items (e.g., “I have a warm and close relationship with my teacher”) and 6 conflict items (e.g., “I am often angry at my teacher”). Cronbach's  $\alpha$  for closeness was .82, and for conflict, it was .76.

### Socioemotional functioning (Grade 6 fall, Grade 6 spring, Grade 7 fall, Grade 7 spring)

The early adolescents reported their socioemotional functioning using the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) on a scale from 0 to 2 (0 = Not true; 2 = Certainly true), two times in Grade 6 and two times in Grade 7. Adolescents' prosocial behavior was measured with five items (e.g., “I am kind to younger children”), externalizing problems were measured using the scales for hyperactivity/inattention (five items, e.g., “I am restless, I cannot sit still for long”) and conduct problems (five items; e.g., “I fight a lot. I can make other people do what I want”), and to measure internalizing problems we used the emotional symptoms scale (e.g., “I have many fears, I get scared easily”; see also Goodman et al., 2010; Metsäpelto et al., 2017). Mean scores of prosocial behavior and internalizing problems were calculated separately for all four time points. The composite score for externalizing problems was formed as a mean score of the hyperactivity/inattention and conduct problems scales separately for all four time points. The Cronbach's alpha reliability was .65 in Grade 6 fall, .68 in Grade 6 spring, .70 in Grade 7 fall, and .71 in Grade 7 spring for prosocial behavior; .73 in Grade 6

fall, .73 in Grade 6 spring, .75 in Grade 7 fall, .81 in Grade 7 spring for externalizing problems; and .73 in Grade 6 fall, .73 in Grade 6 spring, .79 in Grade 7 fall, and .80 in Grade 7 spring for internalizing problems.

### Control variables

The adolescents' gender was coded as 1 (for girls) or 2 (for boys). The grade point average was acquired from the school registers in the Grade 6 fall. In Finnish schools, grades range from 4 to 10, with 5 being the lowest passing grade and 10 the highest passing grade. Both fathers and mothers reported their education level from 1 to 7 (1 = No vocational training; 2 = Employment or vocational training courses; 3 = Vocational training, 4 = General upper secondary education, 5 = University of Applied Sciences, 6 = University or college, 7 = University postgraduate degree). The education levels of mothers and fathers were added separately as control variables.

### Data analysis strategy

Data analysis was performed using Mplus Version 8.4 statistical package (Muthén & Muthén, 1998–2017). All the available data were included in the analyses. The missing data of the main study variables ranged from 1.1% to 63.2% ( $M = 12.5\%$ ,  $SD = 18.8\%$ ). Full information maximum likelihood estimation (FIML) with robust standard errors (MLR) was applied. Teachers rated more than one adolescent from their classrooms ( $M = 14.77$ ,  $SD = 5.51$ , ranging from 2 to 25); thus, nestedness of the data within the classrooms was considered. The intra-class correlations (ICCs) were estimated for the main study variables. The range of ICCs varied from 0.000 to 0.201 ( $.05 < p < .01$ ). Some significant ICCs have shown that adolescents were nested within classrooms, thus the COMPLEX approach was applied.

The models were built in a few steps. First, the latent growth models (LGM) with four measurement points were built separately for prosocial behavior, externalizing problems, and internalizing problems. To answer the first and the second research questions, three temperamental dimensions (i.e., surgency or extraversion, negative affectivity, effortful control) were added as predictors of level and slope to all three LGM models. Furthermore, mother and teacher relationship closeness was added together with temperamental dimensions to predict the level of and change in prosocial behavior (Model for prosocial behavior), and mother and teacher relationship conflict was added together with temperamental dimensions to predict the level of and change in externalizing problems (Model for externalizing problems), and internalizing problems (Model for internalizing problems). To answer the third research question, (a) indirect paths were calculated from temperament on socioemotional functioning via the relationship quality, and (b) interaction terms were added

to all three models to investigate the moderating effect of the relationship quality (with both mothers and teachers) on the associations between each temperamental dimension and socioemotional functioning. One-tailed significance testing was used for hypothesized associations. For the indirect effects, a bootstrapping procedure was used with 95% confidence intervals (MacKinnon et al., 2004). Gender, GPA, and parental education were included as control variables in the models. They were specified to predict the intercepts and slopes of the socioemotional functioning and to covary with the dimensions of relationship quality and temperament.

As additional analyses, we used adolescent report of teacher–adolescent relationship (T1) instead of teacher report (T2) in all three models for prosocial behavior, externalizing problems, and internalizing problems. The additional analyses were computed because teachers filled in the questionnaires only for a subsample at the end of Grade 6. For consistency and to avoid common method bias we used mother and teacher reports on their perceived relationships with adolescents in the main analyses. However, to rationalize the validity of the results we report an adolescent report of teacher–adolescent relationships in the additional analyses with much fewer missing data (1.3% instead of 63.2%).

Five model-fit statistics were considered: chi-square test of model fit, root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker-Lewis index (TLI), and standardized root mean square residual (SRMR). For a good model fit, the  $p$ -value for the chi-square test was expected to be higher than .05, RMSEA smaller than .06, CFI and TLI higher than .95, and SRMR lower than .08 (Hu & Bentler, 1999).

## RESULTS

Descriptive statistics are presented in Table 1. Results from zero-order correlations (Table 2) showed that prosocial behavior was positively associated with effortful control and negatively associated with negative affectivity at all time points. In addition, at all time points, prosocial behavior was positively associated with mother–adolescent closeness, and prosocial behavior after the transition was positively associated with teacher–adolescent closeness. Externalizing problems at all time points were negatively associated with effortful control and positively associated with negative affectivity, and externalizing problems after the transition were positively associated with surgency. In addition, externalizing problems across the transition were positively associated with mother– and teacher–adolescent conflict. Internalizing problems were negatively associated with effortful control and surgency, and positively associated with negative affectivity at all time points. Finally, internalizing problems were positively associated with mother–adolescent conflict at times 2, 3, and 4, and with teacher–adolescent conflict at Time 2.

## Latent growth models for prosocial behavior, externalizing problems, and internalizing problems

First, latent growth models (LGM) were built for prosocial behavior, externalizing problems, and internalizing problems separately. The loadings for socioemotional functioning at all four time points were set to 1 for the level factor and were set to 0, 1, 2, and 3 for the slope factor. The linear growth models fitted well for prosocial behavior ( $\chi^2[5]=5.792$ ,  $p=.327$ , CFI=0.999, TLI=0.999, RMSEA=0.014, SRMR=0.023), externalizing problems ( $\chi^2[5]=30.337$ ,  $p<.001$ , CFI=0.970, TLI=0.964, RMSEA=0.078, SRMR=0.032), and internalizing problems ( $\chi^2[5]=71.908$ ,  $p<.001$ , CFI=0.950, TLI=0.940, RMSEA=0.126, SRMR=0.059). The estimation of the results of latent growth models is shown in Table 3. The mean level results showed that adolescents' prosocial behavior decreased (linear mean trend =  $-0.019$ ,  $p<.001$ ) and externalizing problems (linear mean trend =  $0.008$ ,  $p=.047$ ) and internalizing problems (linear mean trend =  $0.024$ ,  $p<.001$ ) increased during the transition to lower secondary school. There was also statistically significant variation in both the initial level and the growth component of prosocial behavior, externalizing problems, and internalizing problems (see Table 3).

## The direct effects of temperament and relationship quality on socioemotional functioning

To investigate the first two research questions about the direct effects of adolescent temperament and relationship quality with parents and teachers on socioemotional functioning, the predictors were added to the latent growth models described above. In the model for prosocial behavior, relationship closeness with mothers and teachers and temperament in terms of surgency, negative affectivity, and effortful control were included as predictors of level and slope in the LGM of prosocial behavior (Figure 1, Model fit:  $\chi^2[23]=34.945$ ,  $p=.053$ , CFI=0.992, TLI=0.986, RMSEA=0.025, SRMR=0.017). Similarly, in the models for externalizing problems and internalizing problems, variables of relationship conflict and temperament were included as predictors of level and slope in the LGM of externalizing problems (Figure 2, Model fit:  $\chi^2[23]=75.384$ ,  $p<.001$ , CFI=0.972, TLI=0.948, RMSEA=0.052, SRMR=0.018) and internalizing problems (Figure 3, Model fit:  $\chi^2[23]=102.562$ ,  $p<.001$ , CFI=0.955, TLI=0.917, RMSEA=0.064, SRMR=0.023).

### Model for prosocial behavior

The results of the model for prosocial behavior (Figure 1) showed that effortful control positively predicted the level



TABLE 1 Descriptive statistics.

Variables	<i>n</i>	<i>M</i>	<i>SD</i>	Potential range	Actual range	Skewness
Mother–adolescent closeness T1	631	4.27	0.56	1–5	2–5	–0.85
Teacher–adolescent closeness T2	312	3.44	0.78	1–5	1–5	–0.48
Mother–adolescent conflict T1	631	2.14	0.83	1–5	1–4.8	0.75
Teacher–adolescent conflict T2	312	1.62	0.85	1–5	1–4.8	1.53
Prosocial behavior T1	835	1.48	0.36	0–2	0–2	–0.53
Prosocial behavior T2	826	1.45	0.37	0–2	0–2	–0.41
Prosocial behavior T3	800	1.45	0.38	0–2	0.2–2	–0.40
Prosocial behavior T4	772	1.43	0.39	0–2	0–2	–0.36
Externalizing problems T1	835	0.42	0.29	0–2	0–1.8	0.95
Externalizing problems T2	826	0.41	0.29	0–2	0–1.8	0.91
Externalizing problems T3	800	0.40	0.29	0–2	0–1.67	0.93
Externalizing problems T4	772	0.45	0.34	0–2	0–1.6	0.76
Internalizing problems T1	835	0.46	0.42	0–2	0–2	1.06
Internalizing problems T2	826	0.44	0.42	0–2	0–2	1.18
Internalizing problems T3	800	0.44	0.44	0–2	0–2	1.11
Internalizing problems T4	772	0.55	0.49	0–2	0–2	0.79
Effortful control T1	839	3.55	0.53	1–5	2.02–5	0.01
Surgency T1	839	3.23	0.56	1–5	1.17–4.62	–0.25
Negative affectivity T1	839	2.39	0.53	1–5	1.06–4.06	0.17
Gender (1 = Girl; 2 = Boy)	848	1.46	0.50	1–2	1–2	0.16
Grade point average (GPA)	694	8.25	0.66	1–10	5.75–9.83	–0.50
Mother's education	686	4.34	1.37	1–7	1–7	–0.02
Father's education	671	3.96	1.45	1–7	1–7	0.32

Note: T1 = Grade 6 fall; T2 = Grade 6 spring; T3 = Grade 7 fall; T4 = Grade 7 spring.

(but not the slope) of prosocial behavior, while surgency positively predicted the level of prosocial behavior and negatively predicted the change in it. The higher effortful control and surgency manifested in adolescents, the more prosocial behavior they exhibited. Moreover, the higher the surgency adolescents perceived, the more decrease in prosocial behavior was reported to take place from Time 1 to Time 4. There were no significant effects found between negative affectivity and socioemotional functioning (both level and slope).

Regarding relationship quality, mother–adolescent closeness at Grade 6 positively predicted the level (but not the slope) of prosocial behavior: The higher closeness with their children mothers reported, the more prosocial behavior manifested in adolescents. In addition, teacher–adolescent closeness in Grade 6 positively predicted the rate of change in (but not the level of) prosocial behavior across the transition to lower secondary school: The closer relationships with adolescents' teachers reported, the less decrease in prosocial behavior was reported.

## Model for externalizing problems

The results of the model (Figure 2) for externalizing problems showed that effortful control negatively predicted the level (but not the slope) of externalizing problems, which

indicated that the more effortful control adolescents reported, the fewer externalizing problems they expressed. Moreover, surgency positively predicted the rate of change (but not the level) in externalizing problems: The more temperamental surgency manifested in adolescents, the more externalizing problems increased from Time 1 to Time 4. Finally, negative affectivity positively predicted the level of and negatively predicted the change in externalizing problems. The higher the negative affectivity adolescents reported the more externalizing problems they perceived. Moreover, the higher negative affectivity they manifested, the less externalizing problems increased across the transition to lower secondary school.

Regarding relationship quality, mother–adolescent conflict positively predicted the range of change in (but not the level of) externalizing problems across the transition to lower secondary school, which indicates that the more conflict with their children mothers reported, the more adolescents' externalizing problems increased. In addition, teacher–adolescent conflict positively predicted the level of externalizing problems. The more conflicts teachers reported the higher externalizing problems adolescents demonstrated. One significant path from teacher–adolescent conflict to the change in externalizing problems was not interpreted due to the suppression or multicollinearity effect.

TABLE 2 Correlations between observed variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
1. Mother-adolescent relationship closeness T1	—																						
2. Teacher-adolescent relationship closeness T2	.15*	—																					
3. Mother-adolescent relationship conflict T1	-.21**	.05	—																				
4. Teacher-adolescent relationship conflict T2	-.05	.06	.29**	—																			
5. Prosocial behavior T1	.16**	.06	-.08*	-.13*	—																		
6. Prosocial behavior T2	.12**	.10	-.09*	-.16**	.57**	—																	
7. Prosocial behavior T3	.21**	.18**	-.08	-.25**	.54**	.58**	—																
8. Prosocial behavior T4	.15**	.15*	-.04	-.18**	.50**	.51**	.60**	—															
9. Externalizing problems T1	-.12**	-.01	.19**	.40**	-.36**	-.31**	-.35**	-.27**	—														
10. Externalizing problems T2	-.07	-.02	.18**	.35**	-.30**	-.35**	-.33**	-.27**	.66**	—													
11. Externalizing problems T3	-.12**	-.08	.23**	.29**	-.30**	-.31**	-.42**	-.33**	.60**	.67**	—												
12. Externalizing problems T4	-.12**	-.08	.19**	.24**	-.27**	-.27**	-.32**	-.45**	.50**	.54**	.66**	—											
13. Internalizing problems T1	.05	-.02	.07	.08	-.04	-.09*	-.04	-.02	.45**	.34**	.27**	.19**	—										
14. Internalizing problems T2	.03	-.04	.10*	.16**	-.07*	-.09*	-.04	-.01	.34**	.43**	.34**	.22**	.64**	—									
15. Internalizing problems T3	.03	-.07	.12**	.07	-.08*	-.09*	-.06	-.04	.31**	.31**	.44**	.29**	.58**	.71**	—								
16. Internalizing problems T4	.00	-.07	.09*	.04	-.14**	-.13**	-.08*	-.10**	.27**	.28**	.35**	.49**	.49**	.56**	.67**	—							
17. Effortful control T1	.14**	.05	-.21**	-.28**	.38**	.35**	.35**	.30**	-.54**	-.53**	-.48**	-.42**	-.25**	-.25**	-.21**	-.22**	—						
18. Surgency T1	-.05	.03	.12**	.12*	.05	.04	-.04	-.07	-.01	.01	.11**	.10**	-.37**	-.32**	-.26**	-.23**	.00	—					
19. Negative affectivity T1	-.06	.03	.13**	.09	-.16**	-.15**	-.16**	-.09*	.44**	.34**	.29**	.22**	.50**	.44**	.41**	.28**	-.37**	-.31**	—				
20. Gender (1 = Girl; 2 = Boy)	-.14**	-.04	-.02	.25**	-.25**	-.21**	-.33**	-.38**	.16**	.14**	.20**	.25**	-.20**	-.20**	-.20**	-.16**	-.07	.31**	-.09*	—			
21. Grade point average (GPA)	.07	.07	-.21**	-.46**	.20**	.17**	.24**	.20**	-.37**	-.34**	-.34**	-.39**	-.11**	-.06	-.05	-.10**	.31**	-.09*	-.04	-.27**	—		
22. Mother's education	.09*	.13*	-.05	-.07	.09*	.02	.13**	.13**	-.11**	-.07	-.11**	-.13**	-.04	-.08	-.09*	-.10**	.10**	.07	-.04	-.02	.36**	—	
23. Father's education	.08*	.03	.06	-.09	.07	.03	.10*	.10*	-.08*	-.09*	-.07	-.12**	-.00	-.04	-.02	-.04	.09*	.03	.01	-.01	.29**	.45**	

\* $p < .05$ ; \*\* $p < .01$ .

**TABLE 3** Parameter estimates of latent growth models for prosocial behavior, externalizing problems, and internalizing problems.

Growth parameters	Prosocial behavior	Externalizing problems	Internalizing problems
	Estimate (SE)	Estimate (SE)	Estimate (SE)
<b>Means</b>			
Intercept	1.48*** (0.02)	0.41*** (0.01)	0.43*** (0.02)
Slope	-0.02*** (0.01)	0.01* (0.00)	0.02*** (0.01)
<b>Variances</b>			
Intercept	0.08*** (0.01)	0.06*** (0.01)	0.12*** (0.01)
Slope	0.00** (0.00)	0.00*** (0.00)	0.01*** (0.00)
Covariance (intercept, slope)	-0.00, $p = .13$ (0.00)	-0.00, $p = .20$ (0.00)	-0.00, $p = .27$ (0.00)
<b>Residual variance</b>			
Time 1	0.05*** (0.01)	0.03*** (0.01)	0.07*** (0.01)
Time 2	0.06*** (0.01)	0.03*** (0.00)	0.06*** (0.01)
Time 3	0.06*** (0.00)	0.03*** (0.00)	0.05*** (0.00)
Time 4	0.06*** (0.01)	0.05*** (0.01)	0.09*** (0.01)

Note: Unstandardized estimates are presented in the table. Standard errors are presented in parentheses.

\* $p < .05$ ; \*\* $p < .01$ ; \*\*\* $p < .001$ .

## Model for internalizing problems

The results of the model (Figure 3) for internalizing problems showed that effortful control negatively predicted the level (but not the slope) of internalizing problems, which indicated that the more effortful control adolescents reported, the fewer internalizing problems they had. In addition, surgency negatively predicted the initial level and positively predicted the rate of change in internalizing problems. The results indicate that the more temperamental surgency manifested in adolescents, the less internalizing problems they had before the transition, however, they had a higher increase in their internalizing problems from Time 1 to Time 4. Finally, negative affectivity positively predicted the level of and negatively predicted the change in internalizing problems. The higher the negative affectivity adolescents reported, the more internalizing problems they had. On the other hand, the higher negative affectivity adolescents had, the less internalizing problems increased across the transition to lower secondary school. Regarding relationship quality, we did not find significant associations between relationship quality and the level or slope of internalizing problems across the transition.

## Relationship quality with mothers and teachers as mediators

To answer the third research question about the possible indirect effects of temperament on socioemotional functioning via relationship quality, the following indirect effects were included in the above-mentioned models. The indirect effects included paths from each temperamental dimension separately on a level of prosocial behavior via the relationships with mothers and teachers, and the indirect

effect of temperamental dimensions separately on change in prosocial behavior via the relationships with mothers and teachers. Similar model specifications were made in the externalizing and internalizing models. Thirty-six (12 for each model) indirect effects were estimated. The relationship closeness and prosocial behavior model fit was  $\chi^2[23] = 34.945$ ,  $p = .0527$ , CFI = 0.992, TLI = 0.981, RMSEA = 0.025, SRMR = 0.017, the relationship conflict and externalizing problems model fit was  $\chi^2[23] = 75.384$ ,  $p = .001$ , CFI = 0.974, TLI = 0.937, RMSEA = 0.052, SRMR = 0.018, and the relationship conflict and internalizing problems model fit was  $\chi^2[23] = 102.562$ ,  $p < .001$ , CFI = 0.959, TLI = 0.898, RMSEA = 0.064, SRMR = 0.023.

## Model for prosocial behavior

We found only one indirect effect from effortful control on the level of prosocial behavior (but not the slope) via mother-adolescent closeness (Table 4). The higher effortful control adolescents manifested, the closer relationships with their mothers, and in turn, the more prosocial behaviors they showed. No significant indirect effects were found from surgency and negative affectivity on the level and change of prosocial behavior.

## Model for externalizing problems

We found five significant indirect effects (see Table 4). First, the effortful control negatively predicted the level (but not the slope) of externalizing problems via teacher-adolescent conflict and the change in (but not the level of) externalizing problems via mother-adolescent conflict. The higher effortful control adolescents reported,

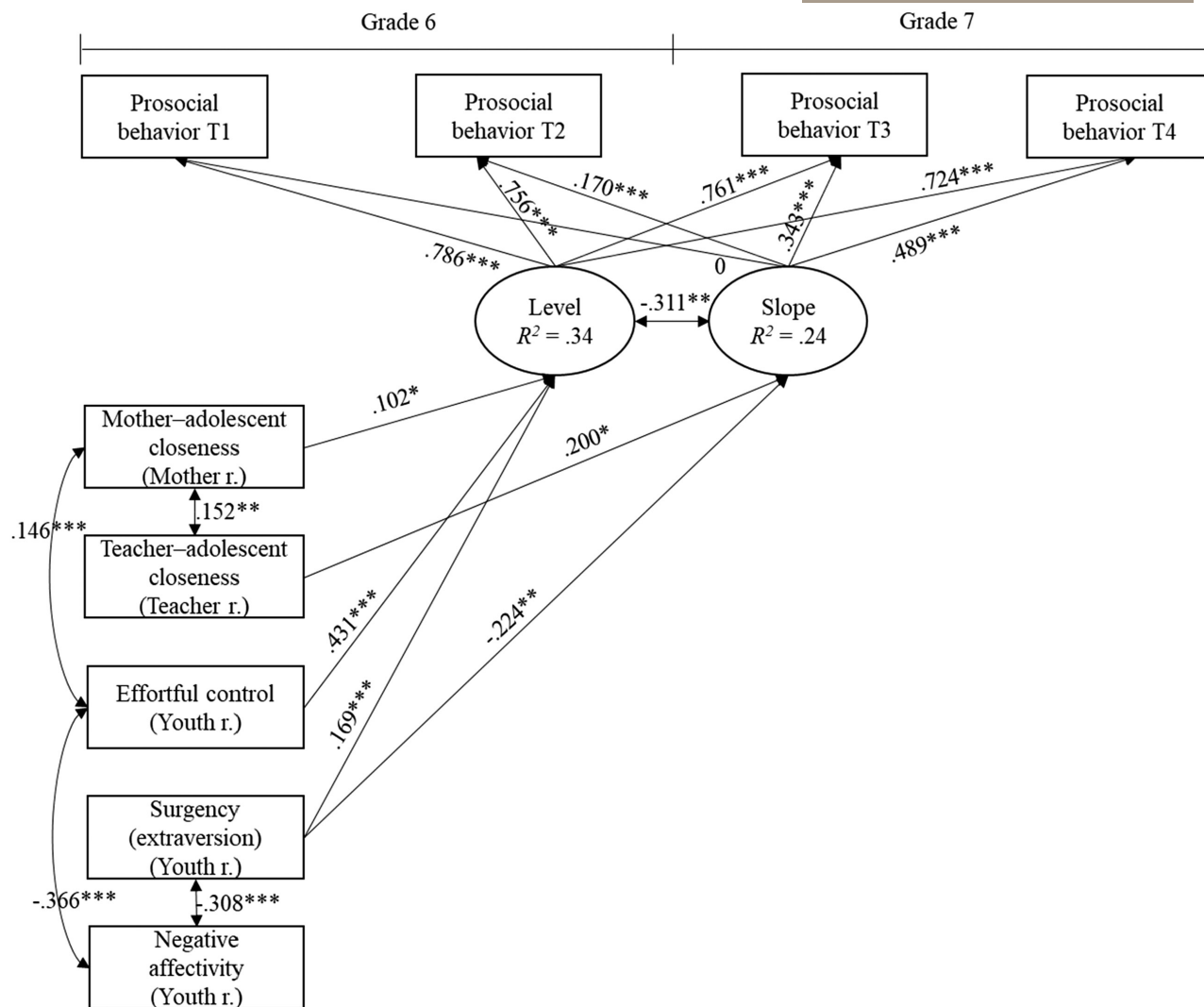


FIGURE 1 The effects of relationship closeness and temperament on the level of and change in early adolescents' prosocial behavior. The effects of covariates were included in the analysis. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

the fewer conflicts with teachers they had, and the fewer externalizing problems manifested. Moreover, the higher effortful control adolescents had, the fewer conflicts mothers perceived with them, and the less externalizing problems increased. In addition, results have shown that temperamental surgency positively predicted the level (but not the slope) of externalizing problems via teacher-adolescent conflict and positively predicted the change in (but not the level of) externalizing problems via mother-adolescent conflict. The results indicate that the higher temperamental surgency adolescents had, the more conflicts teachers perceived, and the more externalizing problems adolescents had. Moreover, the higher level of surgency manifested, the more conflicting relationships adolescents had with their mothers and the more externalizing problems increased. Regarding negative affectivity, only one indirect effect was found on the change in (but not the level of) externalizing problems via the mother-adolescent conflict. The higher temperamental negative affectivity adolescents had, the more conflicts

mothers reported, and the higher increase in externalizing problems adolescents showed across the transition.

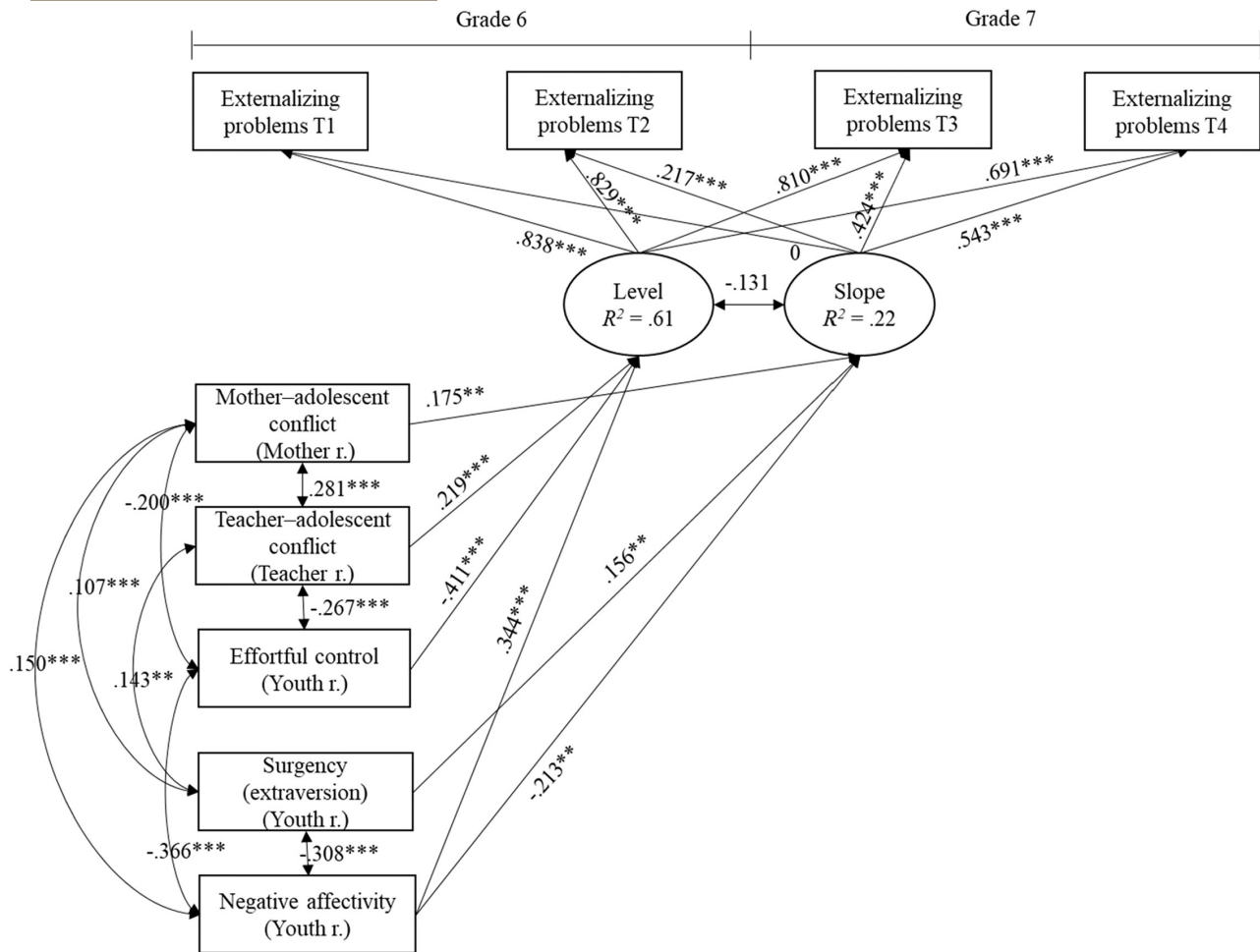
### Model for internalizing problems

We did not find significant indirect effects of adolescents' temperament on internalizing problems (level and slope) via the relationship quality.

### Relationship quality as a moderator

To answer the third research question about relationship quality with parents and teachers as possible moderators in the association between adolescent temperament and subsequent socioemotional functioning, six interaction terms were included in the prosocial model, six interaction terms in the model of externalizing problems, and six interaction terms in the model of internalizing problems. That





**FIGURE 2** The effects of relationship conflict and temperament on the level of and change in adolescents' externalizing problems. The effects of covariates were included in the analysis. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

is, mother and teacher relationship conflicts with each temperamental dimension separately were included in the models of the externalizing and internalizing problems, and mother and teacher relationship closeness with each temperamental dimension separately was included in the prosocial behavior model. All the respective main effects were also included in the models. The relationship closeness and prosocial behavior model fit was  $\chi^2[35] = 64.153$ ,  $p = .002$ , CFI = 0.982, TLI = 0.967, RMSEA = 0.031, SRMR = 0.016, relationship conflict and externalizing problems model fit was  $\chi^2[35] = 86.640$ ,  $p = .001$ , CFI = 0.974, TLI = 0.951, RMSEA = 0.042, SRMR = 0.014, and relationship conflict and internalizing problems model fit was  $\chi^2[35] = 111.367$ ,  $p < .001$ , CFI = 0.955, TLI = 0.915, RMSEA = 0.051, SRMR = 0.018.

### Model for prosocial behavior

The results showed that the interaction term mother-adolescent closeness  $\times$  surgency predicted the level (but not the slope) of prosocial behavior (see Figure 4;  $\beta = -.114$ ,  $p = .003$ ). When mother-adolescent closeness was low,

high adolescent surgency predicted higher prosocial behavior, whereas when maternal closeness was high adolescent surgency was unrelated to prosocial behavior (see Figure 4). Neither effortful control nor negative affectivity together with relationship quality predicted prosocial behavior.

### Model for externalizing problems

The results showed that teacher-adolescent conflict  $\times$  negative affectivity interaction predicted both the level of and change in externalizing problems ( $\beta = .145$ ,  $p = .002$ ;  $\beta = -.234$ ,  $p = .009$ ; see Figures 5 and 6). When teacher-adolescent conflict was high, high negative affectivity predicted higher initial levels but a lower slope (increase) in externalizing problems. In turn, when teacher-adolescent conflict was low, the association between negative affectivity and the initial externalizing problems was weaker and there was no association between negative affectivity and change of externalizing problems. Finally, the mother-adolescent conflict  $\times$  negative affectivity interaction predicted the level of and change in externalizing problems

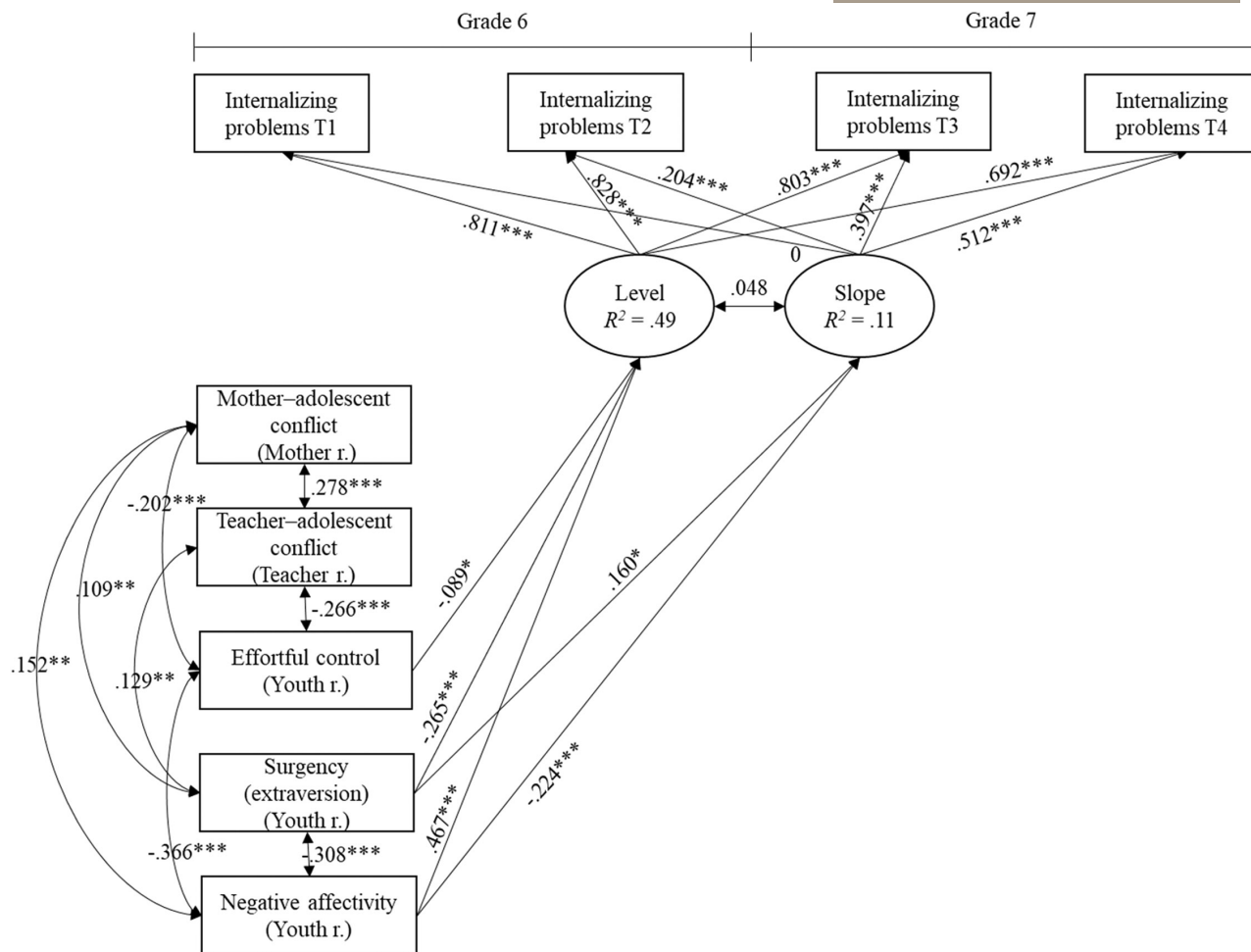


FIGURE 3 The effects of relationship conflict and temperament on the level of and change in adolescents' internalizing problems. The effects of covariates were included in the analysis. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

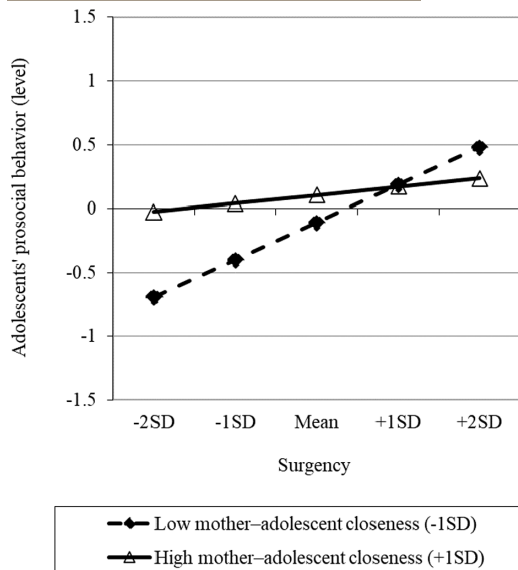
TABLE 4 The indirect effects of temperament on level of and change in socioemotional functioning.

Effect	Estimate of total effect	Estimate of indirect effect	SE	95% CI	
				LL	UL
Prosocial behavior					
Effortful control → Mother-adolescent closeness → Level	0.445	0.014	.009	.002	.036
Externalizing problems					
Effortful control → Teacher-adolescent conflict → Level	-0.466	-0.055	.024	-.111	-.018
Effortful control → Mother-adolescent conflict → Slope	-.027	-0.026	.014	-.062	-.006
Surgency → Teacher-adolescent conflict → Level	0.057	0.035	.017	.010	.077
Surgency → Mother-adolescent conflict → Slope	0.183	0.027	.014	.006	.061
Negative affectivity → Mother-adolescent conflict → Slope	-0.188	0.025	.016	.005	.072

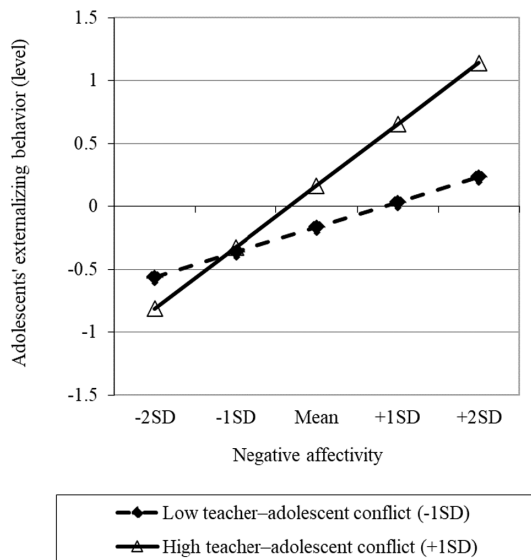
Note: The effects of covariates were included in the analysis. Standardized estimates are reported in the table.

( $\beta = -.109$ ,  $p = .015$ ;  $\beta = .243$ ,  $p = .007$ ; see Figures 7 and 8). When mother-adolescent conflict was high, higher negative affectivity predicted a higher initial level of externalizing problems. When mother-adolescent conflict was

low, the same prediction was true but to a slightly higher degree. Moreover, when the mother-adolescent conflict was low, high negative affectivity predicted a lower increase in externalizing problems.



**FIGURE 4** Mother-adolescent closeness as a moderator between surgency and the level of adolescents' prosocial behavior.



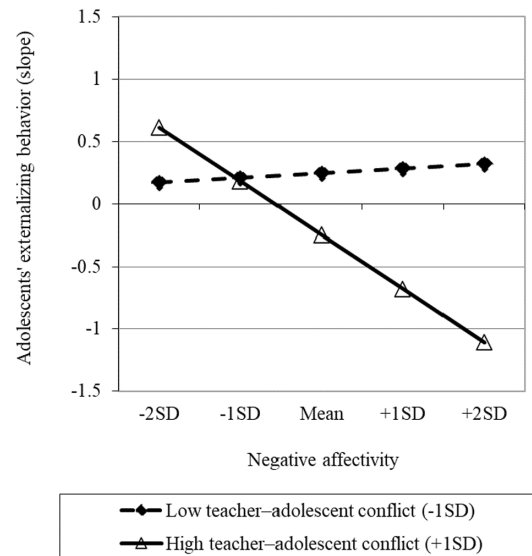
**FIGURE 5** Teacher-adolescent conflict as a moderator between negative affectivity and the level of adolescents' externalizing problems.

### Model for internalizing problems

We did not find significant effects of interactions between temperament and relationship quality on internalizing problems (level and slope).

### Additional analyses

For the additional analyses, we investigated the adolescent report of teacher-adolescent relationship in all three models. The results closely resembled the results of the models with teacher-reported teacher-adolescent relationship with few exceptions.



**FIGURE 6** Teacher-adolescent conflict as a moderator between negative affectivity and the change in adolescents' externalizing problems.

### Model for prosocial behavior

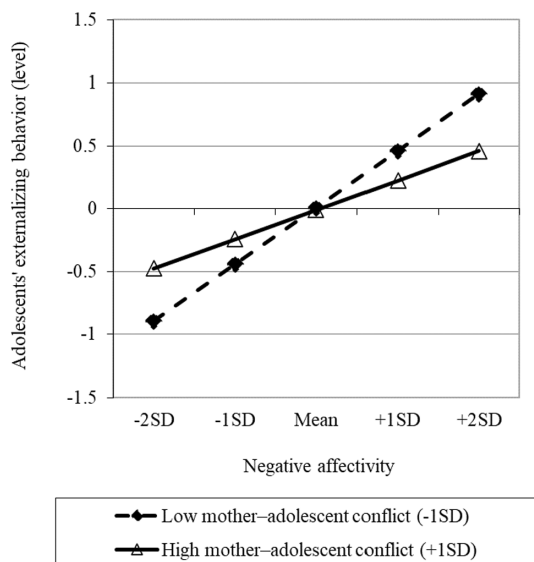
Same as in the main model (with teacher-reported closeness), mother-adolescent closeness predicted the level of prosocial behavior ( $\beta = .093$ ,  $p = .030$ ), effortful control predicted the level ( $\beta = .396$ ,  $p < .001$ ), and surgency predicted the level ( $\beta = .177$ ,  $p < .001$ ) and slope ( $\beta = -.208$ ,  $p = .002$ ) of prosocial behavior. The only difference was that teacher-reported closeness with adolescents (in the main model) predicted the slope, whereas adolescent-reported closeness with teachers (in the additional model) predicted the level of prosocial behavior ( $\beta = .146$ ,  $p < .001$ ).

### Model for externalizing problems

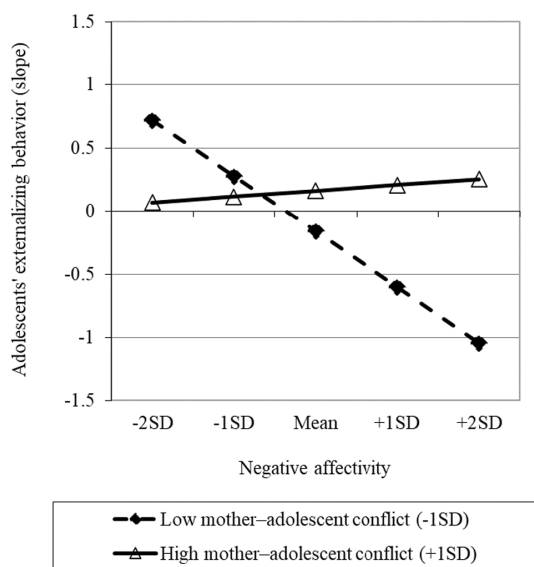
All the significant paths from the main model (teacher-reported conflict) remained significant in the additional model (adolescent-reported conflict). Mother-adolescent conflict predicted the slope of externalizing problems ( $\beta = .116$ ,  $p = .046$ ), teacher-adolescent conflict predicted the level of externalizing problems ( $\beta = .122$ ,  $p = .001$ ), effortful control predicted the level ( $\beta = -.414$ ,  $p < .001$ ), surgency predicted slope ( $\beta = .135$ ,  $p = .010$ ), and negative affectivity predicted both the level ( $\beta = .318$ ,  $p < .001$ ) and slope ( $\beta = -.238$ ,  $p < .001$ ) of externalizing problems.

### Model for internalizing problems

All the significant paths remained significant after adding adolescent-reported teacher-adolescent conflict instead of teacher-reported teacher-adolescent conflict. Effortful control negatively predicted the level of internalizing problems ( $\beta = -.084$ ,  $p = .029$ ), surgency negatively predicted the level ( $\beta = -.273$ ,  $p < .001$ ), and positively predicted the slope



**FIGURE 7** Mother-adolescent conflict as a moderator between negative affectivity and the level of adolescents' externalizing problems.



**FIGURE 8** Mother-adolescent conflict as a moderator between negative affectivity and the slope of adolescents' externalizing problems.

( $\beta = .144$ ,  $p = .024$ ), and negative affectivity positively predicted the level ( $\beta = .447$ ,  $p < .001$ ) and negatively predicted the slope ( $\beta = -.254$ ,  $p < .001$ ) in internalizing problems.

## DISCUSSION

This longitudinal study expands our knowledge on the role of adolescents' temperament and their relationship quality with mothers and teachers on their socioemotional functioning across the transition to lower secondary school. In addition, this is one of the few studies that investigated the mediation and moderation of the relationship quality in the association

between adolescents' temperament and socioemotional functioning across the transition. First, results showed that each temperamental dimension (i.e., surgency, negative affectivity, and effortful control) had an individual contribution to the socioemotional functioning of adolescents. Second, close relationships with mothers and low conflicts with teachers predicted more successful socioemotional functioning in adolescents before the transition (i.e., higher prosocial behavior and lower externalizing problems), whereas close relationships with teachers and low conflicts with mothers predicted more successful socioemotional functioning across the transition. In addition to the direct effects, we also found indirect effects of temperament and interaction effects of temperament and relationship quality on socioemotional functioning.

## Temperament and socioemotional functioning of adolescents

The first research question was set to investigate the role of three temperamental dimensions on the level of and change in prosocial behavior, externalizing, and internalizing problems of adolescents. The descriptive findings for latent growth models were in line with many previous studies regarding educational transition (Eccles & Roeser, 2011; Martínez et al., 2011; Marušić et al., 2020), indicating that adolescents' prosocial behavior decreased, and externalizing and internalizing problems increased across the critical educational transition to lower secondary school. Furthermore, the results revealed that adolescent temperament played a role in their socioemotional functioning during this transition.

First, as expected, higher surgency predicted a higher decrease in prosocial behavior, an increase in externalizing problems, and a lower initial level in internalizing problems (Hypothesis 1a). However, adolescents with higher temperamental surgency were more prosocial before the transition and had a higher increase in internalizing problems across the transition. Albeit previous studies associated higher surgency with fewer prosocial behaviors and internalizing problems, and more externalizing problems (Wang et al., 2016; Zentner, 2020; Zentner & Shiner, 2012), there are indications that higher surgency can have both positive and negative outcomes (Anttila et al., 2022). For example, before the transition, extrovert students might be more outgoing, less shy, and more confident in social interactions, which can encourage them to actively engage in prosocial behaviors. In addition, higher positive emotionality before the transition, which is one of the characteristics of high surgency (Rothbart, 2007; Rothbart et al., 2001), may lessen internalizing problems. However, when adolescents with higher surgency are facing stressful life events, such as the educational transition to lower secondary school, their enthusiasm, and higher sensation-seeking, might manifest and be perceived differently, for example, as impulsivity or disruptive behavior. If adolescents are perceived as disruptive, they may also have difficulties socializing, which may relate to higher



internalizing and externalizing problems. This change in manifestation and perception of surgency after the transition can explain a further decrease in prosocial behaviors and an increase in externalizing and internalizing problems.

Second, the results for negative affectivity partly supported our hypotheses. As expected, higher temperamental negative affectivity predicted a higher initial level of externalizing and internalizing problems (Hypothesis 1b). The results comply with the previous studies which showed that adolescents with higher negative affectivity experience more negative emotions and frustration, which is linked to externalizing and internalizing problems (Lunetti et al., 2022; Rothbart et al., 2001, 2011; Scrimin et al., 2019; Zentner, 2020). For example, when adolescents with high negative affectivity face educational transition, their negative emotionality may rise, which can make them more susceptible to internalizing problems (Lunetti et al., 2022). In addition, to our surprise, we have found that higher negative affectivity also predicted a lower increase in externalizing and internalizing problems. This finding contradicts the previous studies which have shown positive associations between negative affectivity and externalizing and internalizing problems (Martin-Storey et al., 2018; Muris et al., 2007; Wang et al., 2016). This finding might indicate that some adolescents, with higher negative affectivity, already had high levels of externalizing and internalizing problems before the transition, leaving no space for these problems to increase. Hence, these findings should be carefully interpreted, because even though results showed a lower increase in externalizing and internalizing, it can still imply that adolescents with temperamental negative affectivity might have difficulties in their socioemotional functioning across the transition. Contrary to our expectations and previous studies (Hirvonen et al., 2018; Zentner, 2020), negative affectivity neither predicted the initial level nor the change in prosocial behaviors (Hypothesis 1b). In the current study, adolescents' intense negative feelings and difficulty in dealing with negative emotions were related only to the indicators of poor socioemotional functioning (i.e., externalizing, and internalizing problems).

Finally, as expected (Hypothesis 1c), and in line with the previous studies, adolescents who were able to better focus attention and control their behavior and emotions, engaged in more prosocial behaviors and fewer externalizing and internalizing problems (Luengo Kanacri et al., 2013; Lunetti et al., 2022; Muris et al., 2007; Wang et al., 2016). For example, adolescents who have higher effortful control can inhibit their inappropriate behavior, which minimizes the appearance of externalizing problems. In addition, the ability to maintain attention and regulate emotions may foster empathy in adolescents, which can be beneficial for higher prosocial behaviors. Finally, adolescents with higher effortful control can ruminate less on their negative emotions, which may relate to lower internalizing problems.

To conclude, the results indicate that surgency is a stronger predictor of prosocial behavior, whereas negative affectivity

is more detrimental in terms of disruptive behaviors, such as externalizing problems or internalizing problems. However, surgency also predicted lower internalizing problems before the transition and a higher increase in internalizing problems across the transition. In this specific sample, temperamental effortful control was not as determinant across the transition as surgency or negative affectivity. Nevertheless, adolescents who had higher effortful control had the best socioemotional functioning before the transition due to higher levels of prosocial behavior and lower levels of externalizing and internalizing problems.

## Relationship quality and socioemotional functioning of adolescents

The second research question was set to investigate the role of relationship quality with mothers and teachers on the level of and change in socioemotional functioning of adolescents across the transition to lower secondary school. In line with Hypothesis 2a, the results indicated that adolescents benefited from close relationships with mothers (in Grade 6) before the transition. However, close relationships with teachers were more beneficial during the transition to higher prosocial behaviors. One of the possible explanations is that experiences in primary school are brought to lower secondary school (Bronfenbrenner, 1979). Before the transition, parents are important figures in shaping adolescents' prosociality towards others. However, school experiences of close relationships with primary school teachers are brought to the secondary school, which becomes a crucial part of adolescents' prosocial behaviors across the transition.

In contrast, conflicts with mothers in Grade 6 were detrimental to the increase in adolescents' externalizing problems during the transition, while conflicts with teachers were detrimental to higher externalizing problems only before the transition. These findings coincide with the ecological approach (Bronfenbrenner, 1979), which concerns the social connections between both the home and school environments. Before the transition, in primary school, the tension between teachers and adolescents can provoke disruptive behaviors of adolescents. After the transition, adolescents renegotiate their relationships with other subject teachers and in times of changes brought by transition, the only constant relationship remains with parents (Virtanen et al., 2020). Thus, conflicts with mothers might add to the perceived lack of support, which becomes especially detrimental to adolescents' externalizing problems.

Contrary to our expectations (Hypothesis 2b) and previous studies (e.g., Martin-Storey et al., 2018; Pakarinen et al., 2018), the results showed no significant associations between relationship conflict and internalizing problems. The study indicates that in this specific sample only personal characteristics, but not conflicts with parents and teachers played a role in shaping internalizing problems across the transition to lower secondary school. One possible explanation could be that adolescents who are more socially

withdrawn also engage in fewer interactions with others and may also seem to be less disruptive than students who exhibit externalizing problems. Therefore, there are also fewer possibilities for students with internalizing problems to engage in conflicts with parents and teachers.

Results have shown that both mothers and teachers play an individual role in shaping the socioemotional functioning of adolescents across the transition. In previous studies, parental warmth and closeness with teachers were shown to predict the prosocial behavior of adolescents (Carlo et al., 2010; Luengo Kanacri et al., 2020; Padilla-Walker et al., 2017), yet both conflicts with parents and teachers predicted the externalizing problems of adolescents (Allison, 2000; Klahr et al., 2011; Roorda & Koomen, 2021). When adolescents feel warmth and support from parents and teachers, they engage in more prosocial behaviors, while tension and disagreements between adolescents and their parents and teachers provoke disruptive behavioral patterns. The findings of the current study revealed that conflicts with mothers already before the transition can prevent adolescents from successful adjustment at school. In contrast, close relationships with teachers before the transition can help adolescents to better adjust when they face critical educational transitions.

### Relationship quality as a mediating and moderating mechanism between temperament and socioemotional functioning

The first part of the third research question (3a) was set to investigate the indirect effects of temperament on the initial level and change in socioemotional functioning via the relationship quality with mothers and teachers. Hypothesis 3a was partially supported as only a part of the expected indirect effects were significant. First, as expected (Hypothesis 3a-1), the results indicated that when adolescents had higher temperamental surgency, their lower ability to control behavior was related to poorly handled conflicts with teachers and mothers that respectively related to more disruptive behaviors before the transition and strengthened the increase in externalizing problems during the transition. Similar to the current study's results, Rudasill et al. (2010) found a significant indirect effect of difficult temperament on the risky behavior of adolescents via conflicts with teachers.

Second, in line with Hypothesis 3a-1, the higher negative affectivity manifested through anger and frustration, the more adolescents engaged in conflicts with their mothers, which, in turn, related to a higher increase in their externalizing problems across the transition. The current study implies that adolescents with higher temperamental surgency and negative affectivity were more sensitive to conflicts with mothers and were more prone to develop higher externalizing problems across the transition. These results are in line with the previous study by Ezpeleta et al. (2019) but contradict the results of Karreman et al. (2010), who found no significant indirect effects of temperament on the problem behavior of children via parenting. It is important for

parents to note that negative reactions towards adolescents with higher negative affectivity might predict their socioemotional functioning in the long run, which includes the period of critical educational transition.

Third, as expected (Hypothesis 3a-3), the results showed that when adolescents had higher effortful control and were able to better control their behavior, they were able to engage in closer relationships with their mothers, which related to more positive behavior towards others (i.e., prosocial behaviors) before the transition. On the other hand, adolescents with lower effortful control were more involved in conflicts with teachers and mothers, due to their lower ability to control their behavior, which respectively related to higher initial levels and even higher increase in externalizing problems (Hypothesis 3a-1). The current study implies that both mothers and teachers react to the manifestation of adolescents' temperament, which relates to their socioemotional functioning across the transition. These results are in line with the ecological approach (Bronfenbrenner, 1979), which recommends investigating personal characteristics and environmental support together to explain the socioemotional functioning of adolescents across the critical educational transition.

The second part of the third research question (3b) was set to investigate relationship quality as a moderator in the association of temperament and the level of and change in socioemotional functioning during the transition to lower secondary school. First, to our surprise (Hypothesis 3b-3), the results showed that when the mother-adolescent closeness was low, the higher temperamental surgency predicted a higher level of prosocial behavior. One possible explanation for these findings is that extrovert adolescents try to gain more autonomy from their mothers and are more interested in maintaining a wider social circle outside the family. For this reason, even though mothers rated their relationship with their extrovert children as less close, adolescents with higher surgency still perceived their prosocial behaviors as high. The findings of the current study support the indication that higher surgency does not necessarily bring either poor or successful socioemotional functioning outcomes (Anttila et al., 2022).

Second, as expected (Hypothesis 3b-1), the results showed that when adolescents had low conflicts with teachers, their higher negative affectivity was more detrimental to their externalizing problems before the transition. In addition, if adolescents had high conflicts with their teachers, their negative affectivity predicted even more externalizing problems before the transition. The results are similar to those of Ramos et al. (2005), which showed that when children had a temperament that manifested via negative mood, high intensity, distractibility, low persistence, and high activity, their higher conflicts with family predicted externalizing problems in elementary school. Moreover, as expected, the results showed that when adolescents had a small number of conflicts with their mothers, their higher negative affectivity predicted more externalizing problems before the transition. In addition, when adolescents had a lot of conflicts with

their mothers, their higher negative affectivity was slightly weaker in predicting more externalizing problems before the transition. Conflicts with mothers strengthened the susceptibility of adolescents with higher negative affectivity to externalizing problems.

In addition to expected moderations, the results also showed some surprising findings. When teacher–adolescent conflict was high and mother–adolescent conflict was low, higher negative affectivity predicted a lower increase in externalizing problems across the transition. These unexpected associations might have occurred due to the already high rates of externalizing problems of adolescents who had not only higher negative affectivity but also high conflicts with teachers. In line with differential susceptibility theory (Belsky & Pluess, 2009), the results of the current study indicate that adolescents with higher negative affectivity were more susceptible to conflicts with mothers and teachers across the transitions than those who had higher surgency or lower effortful control.

To conclude, we generally found more significant indirect effects (6) than interaction effects (5). However, the results of the current study have revealed that both indirect and interaction effects covered different underlying mechanisms in predicting socioemotional functioning across the transition. For example, regarding negative affectivity, more support was found for the interaction effects between negative affectivity and conflicts with mothers and teachers in predicting externalizing problems. Regarding surgency, when predicting positive adjustment outcomes, surgency interacted with mother–adolescent closeness in predicting prosocial behavior. However, when predicting negative adjustment outcomes, surgency predicted externalizing problems via the relationship conflict between mothers and teachers. Finally, results for the effortful control provide more support for the mediation hypotheses, due to only indirect effects on socioemotional functioning. The results of the current study provided support for both a moderating and mediating role of relationship quality in the association between adolescents' temperament and socioemotional functioning. These findings are an important step in the current state of research in the field and should encourage further studies to have a closer look into these mechanisms.

## Limitations

The current study has several limitations. First, even though we used longitudinal data, the direction of associations should be interpreted carefully, especially when predicting the initial levels of socioemotional functioning. Second, mothers and teachers can well identify their relationship quality with adolescents, and we aimed to use their reports to avoid common method bias when investigating associations between relationship quality and adolescent-reported socioemotional functioning. We also conducted additional analyses that included an adolescent report on their

relationships with teachers. However, the current study could also benefit from adolescents' reports on their perceived relationship quality with parents. Third, in our main analyses, teacher reports on teacher–adolescent relationship were collected from a rather small sample of teachers at T2; thus, we had a large amount of missing data. In addition, we predicted the socioemotional functioning at T1 by teacher–adolescent relationship at T2. To mitigate this limitation, we conducted additional analyses that included the adolescent reports on teacher–adolescent relationship at T1 with much fewer missing data. This way, we also investigated the role of teacher–adolescent relationship at T1 on the socioemotional functioning of adolescents starting from T1, but there were no substantial differences in the results. Fourth, when interpreting the associations between relationship conflict and externalizing problems, it is important to keep in mind a possible overlap. Externalizing problems include such qualities as anger, aggressiveness, and temper, which can also manifest in conflicting situations. Fifth, due to the adolescent reports on both temperament and socioemotional functioning, common-method bias could have affected the associations between temperamental types and initial level and changes in prosocial behavior, externalizing, and internalizing problems. Finally, we used four subscales of SDQ in our study, therefore future studies could benefit from also investigating the role of adolescents' temperament and relationship quality on peer problems across the transition from primary to lower secondary school.

## Practical applications

The current study has several practical applications. First, the results imply that avoiding conflicts with adolescents and providing them with a supportive environment can help promote their socioemotional functioning at school. Especially important is closeness with teachers and avoiding conflicts with parents before the transition. Adolescents face stressful life changes at school during the transition. Stressful situations at home, caused by conflicts with parents, can prevent adolescents from having a safe space, which might increase adolescents' externalizing problems during the transition. In addition, close relationships with teachers before the transition can help adolescents successfully face the transition and develop successful socioemotional functioning.

Second, results have shown that adolescents with higher surgency or negative affectivity can be more susceptible to externalizing problems than are those with higher effortful control, especially when facing the transition to lower secondary school. Parents and teachers should note that their negative reactions towards adolescents can even strengthen the possibility of adolescents with higher surgency and negative affectivity developing externalizing problems. Therefore, stronger education or even intervention programs for parents and teachers about the differences between temperament types and its role in their reactions towards adolescents and later socioemotional functioning



could be beneficial. Negative reactions toward adolescents' temperamental expressions can be detrimental to their socioemotional functioning across the transition. Therefore, a collaboration between parents and teachers should be encouraged to provide a positive environment across the transition to lower secondary school, especially for adolescents that are more temperamentally susceptible to conflicts during the critical educational transition to lower secondary school. Observing adolescents' temperament can be especially important in identifying those adolescents who have the risk to develop internalizing problems before or during the transition.

Policymakers can be encouraged to put more emphasis in the curriculum on strengthening the relationships between teachers and adolescents, especially after the transition when one classroom teacher is exchanged for multiple subject teachers. Adolescents could benefit from more informal gatherings with not only class but also subject teachers. This could help to provide a stronger sense of continuity in closeness not only with parents but also with teachers across the transition to lower secondary school and might promote prosocial behaviors and lessen the risk of externalizing problems.

## CONCLUSIONS

The current study showed that adolescents' personal characteristics, such as temperament, and support from mothers and teachers, predict their socioemotional functioning across the transition to lower secondary school. It is especially important to note that when adolescents have close relationships with teachers and avoid conflicts with their mothers, they maintain more successful socioemotional functioning across the transition. Some adolescents with higher surgency and negative affectivity can be more susceptible to changes across the transition. Therefore, it is important to raise the awareness of parents and teachers that the personal characteristics of adolescents and the way parents and teachers react to these characteristics can be detrimental to adolescents' socioemotional functioning at school.

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## CONFLICT OF INTEREST STATEMENT

We have no conflicts of interest to disclose.

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