Perceived Parental Monitoring and School Motivation During Adolescence: A Bidirectional Model

June 28th, 2022

Abstract

School motivation is key to promoting optimal educational pathways. Some studies suggest that parental monitoring behaviors foster school motivation among adolescents; however, they did not examine the potential role of adolescents' motivation in shaping parental monitoring behaviors. This longitudinal study aimed to examine the bidirectional associations between three types of school motivation (autonomous, controlled, and amotivation) and two types of perceived parental monitoring behaviors (solicitation and control). The sample consisted of 328 adolescents (212 girls, 116 boys; $M = 15.78$ years), assessed at the end of their third or fourth year of secondary school, and again, one year later. Path analyses revealed that over a one-year period, bidirectional associations were found between autonomous motivation and perceived parental solicitation. Moreover, parental solicitation as perceived by the adolescents was associated with a decrease in amotivation during the following year. Findings provide support for the dynamic nature of the parent–child relationships and highlight the need to consider child-to-parent effects to promote positive school-related outcomes.

*Keyword*s: parental monitoring, school motivation, parent–child relationships, bidirectional model, adolescence

Perceived Parental Monitoring and School Motivation During Adolescence: A Bidirectional Model

School motivation is crucial to maintaining a successful educational path throughout adolescence and beyond (Gottfried et al., 2017; Renaud-Dubé et al., 2015). Academic motivation globally declines from childhood to adolescence (Gnambs & Hanfstingl, 2016; Gottfried et al., 2001), yet it increases at the end of adolescence (Symonds et al., 2019). Studying school motivation during high school is a worthwhile pursuit as it relates to academic achievement (Taylor et al., 2014). Moreover, school motivation is important to foster school persistence among adolescents (Lavigne et al., 2007). The strategies parents use to monitor their adolescents' activities appear to play a role in school motivation (Affuso et al., 2022; Lowe & Dotterer, 2013). However, previous studies did not consider the potential bidirectional associations between youth perceptions of parental monitoring and school motivation, which constitutes the focus of the current study.

School Motivation

School motivation is a multidimensional construct. According to the Self-Determination Theory, it includes three main dimensions: autonomous motivation, controlled motivation, and amotivation (Ryan & Deci, 2017, 2020). Adolescents experience autonomous motivation when they engage in their studies because they find them inherently interesting and enjoyable; this is called intrinsic motivation. Also included in the construct of autonomous motivation is identified motivation. This refers to a highly internalized form of extrinsic motivation, wherein the individual may not find inherent pleasure in schoolwork, but personally finds it important and identifies with the reasons underlying their involvement in school. In contrast, controlled motivation in adolescents occurs when they perform their schoolwork to avoid feelings of shame and guilt—this is called introjected motivation. Students may also experience controlled motivation when they do their schoolwork for instrumental reasons, such as seeking rewards or avoiding punishments; this is known as external regulation. Thus, students with controlled motivation might go to school to please their parents or because they need their high school diploma to get a job.

As a useful heuristic, some scholars also refer to autonomous motivation as *want-to* motivation, whereas controlled motivation is referred to as *have-to* motivation (Milyavskaya et al., 2015). Although they are different, autonomous and controlled school motivation coexist and over time, extrinsic motivation can become increasingly internalized and thus, autonomous (Núñez & León, 2015). The last form of motivation, called amotivation, is defined as a lack of motivation and purpose. Students who experience high levels of amotivation do not understand the purpose and relevance of performing school-related tasks. Because of its numerous positive consequences on

mental health and school persistence, autonomous motivation is considered to be preferable as compared to controlled motivation or amotivation (Ryan & Deci, 2017, 2020). Contextual factors can be useful targets to help understand and ultimately improve adolescents' school motivation (Ricard & Pelletier, 2016). Given that parental monitoring has been associated with school motivation among high school students (e.g., Affuso et al., 2022; Lowe & Dotterer, 2013), such parental behaviors constitute promising contextual factors to investigate.

Parental Monitoring During Adolescence

Parental monitoring behaviors aim at keeping track of adolescents' activities, friendships, and whereabouts. These behaviors are crucial as children mature and become adolescents who spend an increasing amount of time outside of their parents' direct supervision (Lionetti et al., 2019). Parental monitoring behaviors decrease the risks of numerous negative outcomes (e.g., delinquent behavior, substance use) but few studies have examined its relation to school outcomes (see review by Omer et al., 2016). Furthermore, many studies have used a measure of parental knowledge to operationalize the concept of parental monitoring — that is, participants (either parents or youth) were asked how much parents knew about the adolescent's life outside of parents' direct supervision (Lionetti et al., 2019). Yet, researchers have called attention to the need to examine the ways through which parents gather such information about their adolescent instead of only asking about parental knowledge regarding their adolescent's life (Kerr et al., 2012; Stattin & Kerr, 2000). They have proposed two categories of parent behavior to that effect: parental solicitation and parental control through rules.

Parental solicitation refers to parents' asking their adolescent to tell them about their life and activities outside of the home, as a mean to open up a conversation that will help parents learn how, where and with whom their youth spend their free time (e.g., asking how was their day at school or what they did in their free time). *Parental control through rules* refers to a set of behaviors that contribute to setting and maintaining clear limits and rules regarding adolescents' behaviors outside the home, for instance by imposing clear curfews or demanding that their adolescent asks for permission before going out on weeknights. Parental control does not imply that parents refuse that their adolescents spend time outside their supervision, but rather that they expect their adolescents to do so while respecting certain rules, such as informing their parents of whereabouts and coming back home before curfew (Stattin & Kerr, 2000). It is noteworthy that parental control through rules is also called parental behavioral control, which is different from the construct of psychological control, as defined by SDT (Omer et al., 2016). In SDT, psychological control occurs when parents use either rewards, punishments, guilt or shame to pressure their

adolescents to behave in a certain way. Psychological control, as defined by SDT, has been shown to be detrimental to adolescents' development (Ryan & Deci, 2017; 2020). In contrast, parental control through rules as defined in the parental monitoring literature is a strategy used by parents to remain informed their adolescents' behavior whenever they are out-of-home and is associated with various positive outcomes (Kerr et al., 2012; Stattin & Kerr, 2000). Parental rules are not necessarily enforced in a controlling manner, parents can be highly autonomy-supportive while implementing rules, which is optimal (Rodríguez-Meirinhos et al., 2020).

Associations Between Parental Monitoring and School Motivation

Only a handful of empirical studies have examined the links between parental monitoring and school motivation. In fact, most research on parental monitoring focused on how it can prevent delinquent and risky behaviors, which may indirectly harm school performance or persistence. By preventing such behaviors, parents may help their adolescents engage in other behaviors that are beneficial for their studies. Among middle and high school students, both youth and parent reports of parental monitoring have been positively related to concurrent school motivation (Henry et al., 2011; Lowe & Dotterer, 2013; Plunkett & Bámaca-Gómez, 2003). However, these studies assessed school motivation using an intrinsic motivation subscale or a general motivation score (e.g., the importance of grades and education, the extent to which students like school), rather than a multidimensional measure that would include autonomous and controlled motivation in addition to amotivation. Moreover, parental monitoring was assessed by measuring parental knowledge, not parental behaviors per se, and their cross-sectional designs did not allow to test for the direction of effects. To our knowledge, only one study used a longitudinal design. Affuso and colleagues (2022) used a single self-determined motivation score, which reflected a combination of the three types of motivation defined by SDT (i.e., autonomous motivation, controlled motivation and amotivation), and found that parent-reported school-related monitoring was positively related to self-determined motivation in school two years later. In sum, previous studies suggest that parental monitoring during adolescence contributes to the development of self-determined school motivation. Yet, they did not explore the specific and potentially different roles of parental solicitation and control, and they did not study the different types of motivation separately (autonomous, controlled, and amotivation).

The current study aims to fill these gaps. This is an important endeavor as the processes leading to increased autonomous motivation may differ from those leading to decreases in controlled motivation or amotivation. For example, conversations initiated through parental solicitation may convey to the youth that their

interests, experiences, and ideas are valuable and important in their own right, regardless of parents' own thoughts and preferences, thus satisfying their child's need for autonomy. Solicitation can also satisfy youth's need for relatedness as it is a way for parents to show that they care about them (Rodríguez-Meirinhos et al., 2020). In turn, need supportive behaviors are associated with autonomous motivation among youth (Ricard & Pelletier, 2016; Ryan & Deci, 2020). In contrast, parental control through rules may promote controlled school motivation, which takes place when youth feel external pressure to do their schoolwork (Núñez & León, 2015). By establishing rules and limits around their adolescent's behavior (e.g., imposing curfews), parents may emphasize their expectations for prioritizing schoolwork over other activities. According to SDT, if adolescents internalize their parents' expectations without internalizing their values, this may lead to controlled motivation (*have-to* motivation). Both parental solicitation and parental control through rules could help decrease amotivation by providing reasons to execute schoolwork—whether the student has internalized them or not. In turn, amotivation may elicit more monitoring as parents may want to prevent their youth from further disengaging from school and engaging in delinquent activities, a process referred to as vigilant care (Omer et al., 2016).

Bidirectional Processes

It is important to highlight that extant studies on parental monitoring and adolescent school motivation have so far only conceptualized school motivation as an "outcome" of parental monitoring behaviors (e.g., Affuso et al., 2022; Henry et al., 2011; Plunkett & Bámaca-Gómez, 2003). Yet, several scholars have insisted on the importance of acknowledging parental monitoring behaviors as part of a bidirectional and dynamic process involving parents and their youth (Kerr et al., 2012; Laird et al., 2003; Pardini, 2008). This perspective is coherent with the bioecological model of human development, which states that parent–child bidirectional exchanges are central to the development of youth, as they constitute proximal processes (Bronfenbrenner & Morris, 2006). Proximal processes are defined as regular interactions between individuals and their environment, which become increasingly complex over time. They are considered to be primary mechanisms leading to human growth. The bioecological model posits that although adolescents are influenced by several aspects of their environment, they are active agents and can generate changes in their environment as well—including changes in their parents' behaviors. The bioecological model also suggests that examining parent-to-child effects while excluding child-to-parent effects might lead to an incomplete understanding of parent–child relationships.

Additional support for such proximal processes was provided in studies suggesting that parents might change their monitoring behaviors as a response to emergent problematic behaviors in their youth (Kerr et al., 2012; Laird et al., 2003). To provide strong, empirical tests of hypothetical bidirectional processes, several researchers have called for an increased reliance on modern statistical methods allowing for a valid test of putative reciprocal effects in parent–child relationships (Davidov et al., 2015; see Paschall & Mastergeorge, 2016, for a review). We argue that it is necessary to follow these recommendations and adopt a truly bidirectional statistical model to simultaneously consider school motivation as a consequence, but also as a potential antecedent, of youth perceptions of parental monitoring behaviors.

Other Antecedents of Parental Monitoring and School Motivation

Several additional contextual factors are known to be related to school motivation and parental monitoring, such as gender. Some studies suggest that girls have higher levels of autonomous motivation and lower levels of amotivation than boys (Affuso et al., 2022; Guay et al., 2015); others, however, have yielded mixed results (Lowe & Dotterer, 2013; Ratelle et al., 2007). Girls also report more perceived parental solicitation and control than boys (Lionetti et al., 2019). In addition, autonomous school motivation is associated with higher school grades (Affuso et al., 2022; Taylor et al., 2014), and higher maternal and paternal education are related to higher parent-reported parental monitoring (Affuso et al., 2022; Howard Caldwell et al., 2011). Consequently, gender, school grades, and parental education were included as covariates in the current study.

Current Study

As reviewed above, little research has tested the associations between parental monitoring and school motivation, and extant studies present some shortcomings. Few studies have used a longitudinal design. Also, important distinctions between different dimensions of school motivation or parental monitoring were neglected when global measures of the two constructs were used. Last, to the best of our knowledge, past research has been constructed based on the premise that parental behavior would affect youth adjustment in a unidirectional fashion. Still, youth influences on their parents' behavior are also very likely, according to the bioecological model and emerging evidence (Bronfenbrenner & Morris, 2006; Kerr et al., 2012). This study seeks to overcome these limitations from past research by examining the associations between two dimensions of perceived parental monitoring and three dimensions of school motivation, using a bidirectional model, while controlling for known predictors of parental monitoring and students' motivation, that is, gender, school grades and parental education.

In light of the studies outlined above, we generated the following hypotheses. First, we expected bidirectional positive associations between parental solicitation and autonomous motivation. Second, we expected bidirectional positive associations between parental control and controlled motivation. Our third hypothesis was that parental solicitation would be related to a decrease in amotivation, while high amotivation would trigger an increase in parental solicitation, as parents try to counteract this lack of motivation. In the same fashion, our fourth hypothesis was that parental control through rules would be associated with a decrease in amotivation, but in contrast, high amotivation would be related to an increase in parental control through rules (see Figure 1).

Method

Participants and Procedure

This study included 328 adolescents (212 girls, 116 boys) recruited directly through two secondary schools located in the province of Québec (Canada). The schools were selected for their location in disadvantaged neighborhoods, according to government surveys (MEES, 2020), because our larger research project sought to better understand high school dropout, and at-risk student populations were specifically targeted. After sending a letter to the parents to describe the study and having obtained written consent from parents and their children, we invited adolescents to fill out an online questionnaire. The questionnaire was hosted on our institution's server and data collection took place in the school's computer laboratory, during regular class hours, under the supervision of trained research assistants. The assessment took place at the end of the school year, while students were in their third (n = 222) or fourth (n = 106) year of secondary school (T1), M age = 15.78 years, SD = 0.81 years. Participants were invited for a follow-up survey one year later (T2), which took place in the same conditions. All variables were assessed using self-reports, except for grades that we obtained directly from the schools. The institutional review board approved the study protocol and proper permissions were obtained from the school board and administrators. Participants were compensated with a free movie ticket at each time point.

Of the 328 participants, 67.7% identified themselves as White, 7.0% as Black, 6.3% as Hispanic, 3.2 % as Arab, 0.9% as Asian, 0.6%, as People of the First Nations, and 18% did not report. Parental education data revealed that most parents had a post-secondary degree, either from a CEGEP or a university. Unique to Québec, Canada, CEGEPs are colleges that are for the most part publicly funded and affordable, and that prepare youth to enter the workforce or pursue university studies through their vocational and pre-university programs. Among mothers, 11,6% did not finish high school, 16,8% had an high school degree, 25.3% had a CEGEP degree, and 26.2% had a

university degree. Among fathers, 12,8% did not finish high school, 17.7% had a high school degree, 16.2% had a CEGEP degree, and 29.0% had a university degree. Of the full sample, 20.1% of students reported not knowing their mother's education level or did not want to answer; this was the case for 24.4% of participants regarding their father's education. The institutional review board approved the study protocol and proper permissions were obtained from the school board and administrators. Participants were compensated with a free movie ticket at each time point.

High levels of attrition were to be expected due to the important mobility of families and the elevated dropout rate in disadvantaged neighborhoods. From the 328 students who filled the T1 questionnaire, 171 students completed the follow-up assessment (52% retention rate). Compared to the students who completed both assessments, those with missing data at T2 had lower levels of autonomous motivation, $t(324) = -3.12$, $p < .01$ and parental solicitation at T1, $t(299) = -2.55$, $p = .01$, parental education, $t(278) = -3.25$, $p = .001$, and school grades at T1, $t(275) = -2.53$, $p < .05$. Because the pattern of missing data was related to several variables included in the model, we were able to implement full information maximum likelihood (FIML) to account for missing data in the statistical analyses (more information below under *Analytic plan*).

Measures

Perceived Parental Monitoring

Perceived parental monitoring was assessed through scales created by Stattin and Kerr (2000), translated into French by Keijsers and Poulin (2013). The questionnaire uses a four-point Likert-type scale ranging from 1 (*never*) to 4 (*always or almost always*). Two subscales are used in this study. The Parental Control Through Rules subscale includes four items and measures how parents provide rules and boundaries for their adolescent's activities and friendships. Items of this section include, for instance, "Do your parents demand that they know where you are in the evenings, whom you are going to be with, and what you are going to do?", T1 $\alpha = .77$ and T2 $\alpha = .83$. The Parental Solicitation subscale includes four items and assesses how often parents spend time with their adolescents discussing and asking about their unsupervised time, T1 $\alpha = .81$ and T2 $\alpha = .84$. Although the Parental Solicitation scale is not school-focused, there is one item related to school: "How often do your parents initiate a conversation about things that happened during a normal day at school?" This item is related to the three other items of the subscale, $r = .65$, $p < .001$, which suggests that adolescents with high levels of perceived parental solicitation have frequent conversations with their parents about their schooling.

School Motivation

The French version of the Academic Motivation Scale (AMS; Vallerand et al., 1989) was used to assess school motivation. The general question introducing this scale asks students "Why do you go to school?" and items constitute possible answers reflecting adolescents' motivation types. Answers vary from 1 (*highly disagree*) to 4 (*highly agree*). The Autonomous Motivation score includes 16 items, and is an aggregated score obtained by averaging the intrinsic motivation subscale (e.g., "Because I experience pleasure and satisfaction while learning new things") and the identified motivation subscale (e.g., "Because eventually it will enable me to enter the job market in a field that I like"), T1 $\alpha = .93$ and T2 $\alpha = .91$. Autonomous motivation also includes integrated motivation, the most internalized form of extrinsic motivation. It develops when the individual feels self-determined and has internalized the reasons for engaging in an action. However, it is not assessed by the AMS because adolescents have difficulties differentiating identified and integrated motivation (Vallerand et al., 1989). The Controlled Motivation score is obtained by averaging 8 items from the introjected motivation subscale (e.g., "To prove to myself that I am capable of completing my high-school degree") and the external regulation subscale (e.g., "Because I need at least a high-school degree in order to find a high-paying job later on"), T1 $\alpha = .74$ and T2 $\alpha = .79$. Lastly, the Amotivation subscale includes 4 items, such as "Honestly, I don't know; I really feel that I am wasting my time in school", T1 $\alpha = .85$ and T2 $\alpha = .79$. This subscale assesses the extent to which the adolescent lacks motivation. The structure of the Academic Motivation Scale does not vary across gender (Guay et al., 2015).

Gender

Gender was measured using participants' self-reports and coded as 0 (*boys*) and 1 (*girls*).

School Grades

School grades were obtained through end-of-year report cards provided directly by the schools. Results from French (first language) and mathematics were used to calculate the average academic performance of each adolescent.

Parental Education

Students were asked to report on their parents' education on a scale from 1 (*did not obtain their high school diploma*) to 4 (*university diploma*). A parental education score was obtained by averaging maternal and paternal levels of education, $r = .47$, $p < .001$.

Analytic Plan

Descriptive statistics and bivariate correlations were examined. Next, a cross-lag panel model was estimated using path analyses in Mplus 8.6 (Muthén & Muthén, 2017). Goodness of fit was evaluated using the following cut-off values: Comparative Fit Index (CFI) > .95, Tucker and Lewis Index (TLI) > .90, Root Mean Square Error of Approximation (RMSEA) < .05, and a nonsignificant chi-square statistic (Grimm et al., 2017; Kline, 2016). Figure 1 presents the hypothesized associations among the two perceived parental monitoring strategies and the three motivation dimensions from T1 to T2. Additional paths were included in the model but not in the figure to enhance clarity. These include direct paths from the three control variables at T1 (gender, school grades, and parental education) to the five core variables at T2, stability paths for repeated measures of the five core variables, as well as correlations among all variables at Time 1, and correlations among residual variances at Time 2.

The FIML estimator was used to avoid discarding individuals with some missing data, thus increasing statistical power. Using a missing data management strategy such as FIML is preferred to the listwise deletion strategy, as using the latter would cause several biases in the estimation, notably by excluding vulnerable populations who are at highest risk for attrition (Dong & Peng, 2013). Missing data in the current study are considered "Missing at Random" (MAR) because they relate to other variables in our dataset (i.e., autonomous motivation, parental solicitation, parental education, and school grades at T1). As recommended, the final model included these variables (Enders, 2010).

Results

Preliminary Analyses

Descriptive statistics are presented in Table 1. All variables had normal distributions, as normality indices were well below the cut-offs (skewness < |2.0|; kurtosis < |7.0|; Curran et al., 1996; Kline, 2016). Mean values indicate overall stability of school motivation and parental monitoring across T1 and T2. Zero-order correlations between all main variables and covariates are displayed in Table 2. Expectedly, all variables showed moderate positive correlations across time, and thus, were positively correlated between T1 and T2. Perceived parental solicitation and control were positively correlated at each time point. Finally, autonomous motivation was positively correlated with controlled motivation. As expected, both autonomous and controlled motivation were negatively related to amotivation.

Parental education was positively associated with parental solicitation at both time points. Grades at T1 were positively related to perceived parental control at both time points, autonomous motivation at T1, and negatively associated with amotivation at T1 and controlled motivation at T2. Finally, adolescents' gender was associated with most core variables at T1 and T2, revealing that girls tended to have higher scores on perceived parental monitoring variables and on autonomous motivation. Boys had higher scores on amotivation than girls, and no gender differences were detected in controlled motivation.

Main Analyses

Results from the final model are displayed in Figure 2. Only significant paths are depicted, but all associations described in the **Analytic Plan** section are included in the model. Structural equation modeling revealed an excellent model fit, $\chi 2$ (8) = 7.70, p = .46, CFI = 1.00, TLI = 1.00, RMSEA < .001, SRMR =.03. Controlling for gender, parental education, and grades at T1, three transactional paths in the final model were significant. It is noteworthy that one set of bidirectional associations was evidenced, as perceived parental solicitation and autonomous motivation predicted each other over time, supporting our first hypothesis. In contrast with parental solicitation, perceived parental control through rules did not predict change in controlled motivation over time, and controlled motivation did not predict change in parental control either. Therefore, our second hypothesis was not supported. Furthermore, our third hypothesis was that high levels of parental solicitation would be related to a decrease in amotivation, and that high levels of amotivation would be associated with an increase in parental solicitation. Parental solicitation at T1 predicted a decrease in amotivation during the following year, partly supporting our third hypothesis. However, amotivation was not associated with changes in parental solicitation. Finally, we expected that parental control through rules would be associated with a decrease in amotivation, and that high amotivation would be related to an increase in parental control through rules. However, perceived parental control and amotivation were unrelated over time, thereby rejecting our fourth hypothesis. Among covariates, only school grades at T1 were related to a decrease in controlled motivation, b = –.21, p = .009. With regards to stability paths, amotivation showed relatively low stability from T1 to T2, whereas all other motivation and parenting variables showed moderate to high stability.

Although they are not included in Figure 2 for clarity, all intercorrelations between variables were included in the final model at T1. All main variables (i.e., parenting and motivation) were significantly inter-correlated at T1, rs = –.38 to .69, all ps < .05, except for perceived parental solicitation and amotivation, r = –.11, p = .113. With

regard to covariates, parental education and gender were positively correlated with parental solicitation at T1, r = .16, p = .009, and r = .15, p = .005, respectively. Gender was correlated with amotivation, r = –.24, p < .001, and autonomous motivation, r =.13, p = .021. In addition, grades at T1 were correlated with amotivation, r = –.28, p < .001, autonomous motivation, r = .12, p = .045, gender, r = .20, p < .001, and parental education, r = .23, p < .001.

Residuals were allowed to intercorrelate at T2. Because a significant amount of variance was explained by T1 predictors, several of these correlations were nonsignificant. However, the residual variance from perceived parental control at T2 was positively related to those of both perceived parental solicitation, r = .23, p = .021, and autonomous motivation, r = .18, p = .027. The residual variance associated with amotivation was negatively correlated with that of autonomous motivation, r = –.31, p = .001. Last, the residual variance of controlled motivation was positively associated with that of autonomous motivation, r = .52, p < .001.

Considering all the predictors included in the model (including baseline levels of the core variables measured at T1 and covariates), the explained variance was significant for all T2 variables; 28.5% for perceived parental solicitation, 40.8% for perceived parental control, 33.7% for autonomous motivation, 27.1% for controlled motivation, and 15.1% for amotivation, all ps < .001, except for amotivation, p = .029.

Discussion

This study's primary purpose was to investigate the bidirectional associations between adolescents' perceptions of parental monitoring and school motivation during adolescence. Results suggest that parental solicitation played an important role in school motivation. Higher levels of solicitation were related to an increase in autonomous motivation and a decrease in amotivation the following year. Conversely, parental control was unrelated to changes in school motivation. Examination of child-to-parents effects revealed that only autonomous motivation was related to changes in parental monitoring—not controlled motivation nor amotivation.

Autonomous Motivation and Perceived Parental Monitoring

Our finding that adolescent autonomous motivation and perceived parental solicitation predict each other over time, as predicted by our first hypothesis, extends those of previous studies, which only examined one side of this reciprocal process. In fact, we knew that parental monitoring, as reported by both youth and parents, was related to an increase in autonomous motivation over time (e.g., Affuso et al., 2022; Lowe & Dotterer, 2013), but the association between those variables in the opposite direction had not been tested yet. The bidirectional associations

reflect the reciprocal and dynamic nature of the parent–child relationship highlighted by theorists (e.g., Bronfenbrenner & Morris, 2006). It is essential to keep in mind that the associations found in this study result from years of interactions and are likely tributary to other aspects of the parent–child relationships, such as warmth and closeness. Parental solicitation aims to initiate conversations about adolescents' daily life, and parents enact strategies to this end as early as kindergarten (Racz et al., 2019). Thus, parents who regularly initiate conversations with their adolescent about their activities outside of their supervision may also be the ones who build closeness, trust and autonomy support in their relationship with their adolescent.

One possible explanation for the relation between perceived parental solicitation and youth school motivation may reside in the basic psychological needs defined in SDT: relatedness, autonomy, and competence (Vansteenkiste et al., 2020). Parents who use solicitation may contribute to the satisfaction of their adolescent's need for relatedness because adolescents can perceive that their parents care about them (Rodríguez-Meirinhos et al., 2020). Adolescents' perception of parental solicitation may also contribute to increasing their sense of autonomy as during their conversations, parents have a chance to acknowledge their feelings and experiences and to validate their views and decisions. Moreover, parental solicitation may help adolescents develop social and emotional competences through their interactions. Relatedly, previous evidence suggest that school-related parental monitoring can increase adolescents' sense of competence (i.e., academic self-efficacy; Affuso et al., 2022). Through solicitation, research suggests that parents can enhance their youth need satisfaction, known to foster autonomous school motivation among students (Ryan & Deci, 2020).

It is noteworthy that successful parental solicitation behaviors may promote another aspect important of the parental monitoring dynamic, that is, adolescent disclosure (Stattin & Kerr, 2000). When the parent–adolescent relationship is characterized by acceptance and trust, parental solicitation has been shown to promote adolescents' disclosure of out-of-home activities (Keijsers & Laird, 2010). Adolescents with higher levels of autonomous motivation may be willing to share more information about what they liked and found important at school with their parents. As adolescents spend most of their days at school, their out-of-home activities are often school-related. Thus, they may also share more about their friends and whereabouts in general. Higher adolescents' disclosure may then increase parents' own need satisfaction and lead to positive parent–child interactions, thereby increasing their future solicitation behaviors. Accordingly, using observational data, adolescent disclosure has been associated with parents' need satisfaction, suggesting that they felt high levels of relatedness and autonomy (Wuyts et al., 2018).

Accordingly, our findings suggest that adolescents who enjoyed school perceived that their parents increased their solicitation behaviors. Conversely, if autonomous motivation is low and the adolescents do not like school or find it important, the parents may not want to open conversations on their school day or evening activities to avoid conflicts or negative interactions with their youth. According to the bioecological model and parental monitoring literature, these dynamic processes evolve over time between the parent and adolescent, such that disclosure and solicitation are not independent (Bronfenbrenner & Morris, 2006; Stattin & Kerr, 2000).

Controlled Motivation and Perceived Parental Monitoring

Our second hypothesis regarding bidirectional associations between perceived parental control through rules and adolescents' motivation was not supported. On one hand, the high stability of parental control through rules from T1 and T2 likely made it difficult to find antecedents of change in this variable. On the other hand, parental control through rules can be interpreted differently and have different outcomes depending on the broader context of youth's relationship with their parents (Lowe & Dotterer, 2013; Rodríguez-Meirinhos et al., 2020). It may be that in relationships with high levels of warmth and autonomy support, the rationale behind the rules and limits are more frequently explained and integrated, thus fostering motivation in youth. In contrast, if parental control is harsh, imposed on children without clear explanations, warmth or considerations for their perspective, it may not lead to positive academic outcomes. A broad range of reactions from adolescents to their parents' control through rules would make it difficult to detect a significant association between this parenting behavior and adolescents' motivation, whether it be positive or negative. Future research needs to take into account the broader relational context in which parental define and set rules. Another explanation may be that the items used to assess parental control were general, and not school-specific, contrary to parental solicitation, which included an item focused on schooling. While studying academic outcomes, it may be necessary to include school-specific rules to better understand the role of parental control.

Our results also suggest that parents may not increase their parental monitoring behaviors if they perceive that their adolescent is motivated by extrinsic reasons such as getting a diploma in order to get a prestigious job, especially if their youth's controlled motivation does not appear to be directly associated with problematic outcomes (e.g., not associated with poor grades or truancy). In line with this, some scholars suggest that increasing parental monitoring behaviors may be especially helpful if parents sense that their youth is experiencing problems (Omer et al., 2016). When their youth is motivated for external reasons, parents may conclude that the rules and limits already

established within the family context are sufficient to keep their youth away from activities likely to interfere with their schooling. Finally, it is also important to keep in mind that controlled school motivation during high school may be impacted by broader social factors, such as behaviors from teachers and peers or social norms at the class or school levels (Ricard & Pelletier, 2016). Future research measuring school climate and implementing multilevel modeling could help take such factors into account.

Amotivation and Perceived Parental Monitoring

Our findings reveal that parental solicitation is an effective strategy to reduce amotivation, thus partially supporting our third hypothesis. Considering the numerous adverse effects of amotivation (Cannard et al., 2016), our findings on the presumable protective effects of solicitation are particularly relevant. Amotivation develops when youth do not find a purpose in schoolwork. Parental solicitation may however provide opportunities for adolescents to discuss and think about their educational aspirations, which are positively related to school motivation and engagement during high school, thereby decreasing amotivation (Gutman & Schoon, 2018). Simple parenting behaviors such as making room for open conversations with one's teenager about their day and showing interest in hearing about their life may counteract youth psychological disengagement from school. In addition, parental solicitation may increase adolescents' disclosure, thereby increasing parental knowledge of their out-of-home activities. If parents are aware that youth engage in activities likely to promote amotivation, they may also feel the need to increase their monitoring behaviors in order to reduce these problematic activities and prevent school disengagement (Omer et al., 2016).

Contrary to our fourth hypothesis, parental control was unrelated to changes in amotivation. It may be that parental behavioral control provides general rules and boundaries that are not sufficient to bring the adolescents to think about why school is important for them. Our findings support that autonomy support including discussions with adolescents about the rationale behind parental rules may be essential to promote better adjustment (Rodríguez-Meirinhos et al., 2020). Furthermore, amotivation was not related to changes in parental monitoring, in contrast with our third and fourth hypotheses. It is likely that amotivation during the end of secondary school is the result of long-term disengagement. It may be that as youth showed high levels of amotivation, parents also disengaged from their child's schooling. In line with this idea, Kerr et al. (2012) found that school maladjustment was predictive of higher levels of neglectful parenting and lower levels of authoritative parenting, which suggests that parents reduce their warmth, control through rules, and autonomy support in response to youth amotivation. Future longitudinal studies

including earlier developmental periods would allow to examine if and how parental disengagement develops as a response to unmotivated behaviors and attitudes in their youth. School amotivation may also result from affiliation with delinquent peers, substance use, and other youth behaviors associated with lower parental monitoring (Omer et al., 2016). In this context, parent–child conversations about school, friendships, and whereabouts may be highly conflictual, leading parents to avoid monitoring behaviors.

Controlled Motivation and School Grades

None of the covariates included in our final model predicted the outcomes, except for school grades, which predicted a decrease in controlled motivation. Achieving higher grades can help satisfy adolescents' need for competence, which in turn can decrease controlled school motivation. Need satisfaction is related to self-determined motivation, which is characterized by lower controlled motivation (Vansteenkiste et al., 2020). This result is consistent with the positive links between school grades and other types of motivation at baseline. At the first time point, adolescents who had higher school grades also had higher autonomous motivation and lower amotivation than their peers.

Strengths and Limitations

The primary strength of this study is its longitudinal, cross-lagged design allowing us to examine a model of the bidirectional associations between parenting and school motivation at the end of the secondary school curriculum. Moreover, perceived parental solicitation and control have rarely been examined simultaneously with regard to school outcomes. Similarly, this study includes unique contributions of qualitatively different aspects of school motivation in its analytic model (i.e., autonomous motivation, controlled motivation, and amotivation), which has rarely been done. Also, the challenges encountered by schools in low-socioeconomic neighborhoods often decrease their participation in studies like ours, so the data we have gathered is unique to understand the roots of school persistence in populations who present elevated risks of school dropout.

Nonetheless, this study has some limitations. First, the attrition rate was high; however, the FIML estimator used in this study decreased the risk that model results be biased toward low-risk youth from the sample, who were most likely to provide complete data. This study also relied on adolescents' self-reports as measures of the central variables. It would be important for future studies to include parental reports of parental monitoring, as they are known to differ from adolescent reports (Lionetti et al., 2019), and these perceptions would be crucial to take into account if we were to translate our findings into parenting interventions. It is also important to keep in mind that

although this study unfolds across a one-year period, parent–child relationships have developed for over a decade prior to this study. Therefore, studies spanning several developmental periods are needed. Finally, the two waves of data collections were conducted at the end of the school year. Because autonomous and controlled motivation are known to fluctuate across a school year (Opdenakker et al., 2012), it would be relevant for future studies to include repeated measures of school motivation within the same school year.

The effect sizes reported in this study are modest, but their practical significance should not be overlooked. Modest effect sizes are expected as parental monitoring is relatively stable over time, and therefore variations over time due to other variables are limited. Furthermore, parental monitoring behaviors only constitute one core aspect of many factors influencing school motivation among adolescents. Their teachers, peers, the broader family context and other aspects of the parent–adolescent relationship are also likely to influence motivation (Affuso et al., 2022; Guay et al., 2019; Wentzel et al., 2017). However, it is noteworthy that parents have a unique contribution to their adolescents' school motivation, beyond the roles of teachers and peers (Ricard & Pelletier, 2016).

Conclusion and Implications

This study supports the need to empirically consider bidirectional influences of parent–adolescent interactions. Our results have theoretical implications as they provide additional support for the reciprocal nature of parent–child relationships, which has been at the center of the bioecological model (e.g., Bronfenbrenner & Morris, 2006). Furthermore, our results support Stattin and Kerr's (2000) assertion that examining different types of monitoring behaviors is important, and future studies should move away from using a single score of parental knowledge. The current study suggests that higher perceived parental solicitation, but not parental control, was related to both higher autonomous motivation (i.e., *want-to* motivation) and lower school amotivation. Therefore, family-focused interventions that help parents develop listening skills, set expectations, and track their adolescents' activities and whereabouts may prove useful in fostering autonomous school motivation among high school students. In sum, the current study shows that parents and youth both have a role to play to foster optimal school motivation, and efforts from both sides to engage in open communication on a regular basis appear to be crucial in fostering healthy motivation and academic success at this crucial time of life.

References

Affuso, G., Zannone, A., Esposito, C., Pannone, M., Miranda, M. C., De Angelis, G., Aquilar, S., Dragone, M., & Bacchini, D. (2022). The effects of teacher support, parental monitoring, motivation and self-efficacy on academic performance over time. *European Journal of Psychology of Education.* Advance online publication. https://doi.org/10.1007/s10212-021-00594-6

Bronfenbrenner, U., & Morris, P. A. (2006). The Bioecological Model of Human Development. In R. M. Lerner & W. Damon (Eds.), *Handbook of child psychology: Theoretical models of human development* (pp. 793–828). John Wiley & Sons Inc.

Cannard, C., Lannegrand-Willems, L., Safont-Mottay, C., & Zimmermann, G. (2016). Brief report: Academic amotivation in light of the dark side of identity formation. *Journal of Adolescence*, *47*, 179–184. https://doi.org/10.1016/j.adolescence.2015.10.002

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to non-normality and specification error in confirmatory factor analysis. *Psychological Methods, 1*, 16–29. https://doi.org/10.1037/1082-989X.1.1.16.

Davidov, M., Knafo-Noam, A., Serbin, L. A., & Moss, E. (2015). The influential child: How children affect their environment and influence their own risk and resilience. *Development and Psychopathology, 27*, 947–951. https://doi.org/10.1017/S0954579415000619

Dong, Y., & Peng, C. Y. J. (2013). Principled missing data methods for researchers. *SpringerPlus, 2*(1), 1–17. https://doi.org/10.1186/2193-1801-2-222

Enders, C. K. (2010). *Applied missing data analysis*. The Guilford Press.

Gnambs, T., & Hanfstingl, B. (2016). The decline of academic motivation during adolescence: An accelerated longitudinal cohort analysis on the effect of psychological need satisfaction. *Educational Psychology*, *36*(9), 1691–1705. https://doi.org/10.1080/01443410.2015.1113236

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation from childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology*, *93*(1), 3–13. https://doi.org/10.1037//0022-0663.93.1.3

Gottfried, A. E., Nylund-Gibson, K., Gottfried, A. W., Morovati, D., & Gonzalez, A. M. (2017). Trajectories from academic intrinsic motivation to need for cognition and educational attainment. *The Journal of Educational Research*, *110*(6), 642–652. https://doi.org/10.1080/00220671.2016.1171199

Grimm, K. J., Ram, N., & Estabrook, R. (2017). *Growth modeling: Structural equation and multilevel modeling approaches.* Guilford Press.

Guay, F., Morin, A. J., Litalien, D., Valois, P., & Vallerand, R. J. (2015). Application of exploratory structural equation modeling to evaluate the academic motivation scale. *The Journal of Experimental Education, 83*(1), 51–82. https://doi.org/10.1080/00220973.2013.876231

Guay, F., Stupnisky, R., Boivin, M., Japel, C., & Dionne, G. (2019). Teachers' relatedness with students as a predictor of students' intrinsic motivation, self-concept, and reading achievement. *Early Childhood Research Quarterly*, *48*, 215–225. https://doi.org/10.1016/j.ecresq.2019.03.005

Gutman, L. M., & Schoon, I. (2018). Emotional engagement, educational aspirations, and their association during secondary school. *Journal of Adolescence, 67*, 109–119. https://doi.org/10.1016/j.adolescence.2018.05.014

Henry, C. S., Plunkett, S. W., & Sands, T. (2011). Family structure, parental involvement, and academic motivation in Latino adolescents. *Journal of Divorce & Remarriage*, *52*(6), 370–390. https://doi.org/10.1080/10502556.2011.592414

Howard Caldwell, C., Bell, L., Brooks, C. L., Ward, J. D., & Jennings, C. (2011). Engaging nonresident African American fathers in intervention research: What practitioners should know about parental monitoring in nonresident families. *Research on Social Work Practice, 21*(3), 298–307. https://doi.org/10.1177/1049731510382923

Keijsers, L., & Laird, R. D. (2010). Introduction to special issue. Careful conversations: Adolescents managing their parents' access to information. *Journal of Adolescence*, *33*(2), 255–259. https://doi.org/10.1016/j.adolescence.2009.10.009

Keijsers, L., & Poulin, F. (2013). Developmental changes in parent–child communication throughout adolescence. *Developmental Psychology, 49*(12), 2301–2308. https://doi.org/10.1037/a0032217

Kerr, M., Stattin, H., & Özdemir, M. (2012). Perceived parenting style and adolescent adjustment: Revisiting directions of effects and the role of parental knowledge. *Developmental Psychology, 48*(6), 1540–1553. http://doi.org/10.1037/a0027720

Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). Guilford Press.

Laird, R. D., Pettit, G. S., Bates, J. E., & Dodge, K. A. (2003). Parents' monitoring-relevant knowledge and adolescents' delinquent behavior: Evidence of correlated developmental changes and reciprocal influences. *Child Development, 74*(3), 752–768. https://doi.org/10.1111/1467-8624.00566

Lavigne, G. L., Vallerand, R. J., & Miquelon, P. (2007). A motivational model of persistence in science education: A self-determination theory approach. *European Journal of Psychology of Education, 22*(3), 351–369. https://doi.org/10.1007/BF03173432

Lionetti, F., Palladino, B. E., Moses Passini, C., Casonato, M., Hamzallari, O., Ranta, M., Dellagiulia, A., & Keijsers, L. (2019). The development of parental monitoring during adolescence: A meta-analysis. *European Journal of Developmental Psychology*, *16*(5), 552–580. https://doi.org/10.1080/17405629.2018.1476233

Lowe, K., & Dotterer, A. M. (2013). Parental monitoring, parental warmth, and minority youths' academic outcomes: Exploring the integrative model of parenting. *Journal of Youth and Adolescence*, *42*(9), 1413–1425. https://doi.org/10.1007/s10964-013-9934-4

Milyavskaya, M., Inzlicht, M., Hope, N., & Koestner, R. (2015). Saying "no" to temptation: Want-to motivation improves self-regulation by reducing temptation rather than by increasing self-control. *Journal of Personality and Social Psychology, 109*(4), 677–693. https://doi.org/10.1037/pspp0000045

Ministère de l'Éducation et de l'Enseignement supérieur (MEES). (2020). *Indices de défavorisation (2015-2016)*. http://www.education.gouv.qc.ca/references/tx-solrtyperecherchepublicationtx-solrpublicationnouveaute/resultats-de-la-recherche/detail/article/indices-de-defavorisation/

Muthén, L. K., & Muthén, B. O. (2017). *Mplus user's guide* (8th ed). Authors.

Núñez, J. L., & León, J. (2015). Autonomy support in the classroom: A review from self-determination theory. *European Psychologist, 20*(4), 275–283. https://doi.org/10.1027/1016-9040/a000234

Omer, H., Satran, S., & Driter, O. (2016). Vigilant care: An integrative reformulation regarding parental monitoring. *Psychological Review*, *123*(3), 291–304. https://doi.org/10.1037/rev0000024

Opdenakker, M.-C., Maulana, R., & den Brok, P. (2012) Teacher–student interpersonal relationships and academic motivation within one school year: Developmental changes and linkage. *School Effectiveness and School Improvement, 23*(1), 95–119, https://doi.org/10.1080/09243453.2011.619198

Pardini, D. A. (2008). Novel insights into longstanding theories of bidirectional parent–child influences: Introduction to the special section. *Journal of Abnormal Child Psychology, 36*(5), 627–631. https://doi.org/10.1007/s10802-008-9231-y

Paschall, K. W., & Mastergeorge, A. M. (2016). A review of 25 years of research in bidirectionality in parent–child relationships. *International Journal of Behavioral Development, 40*(5), 442–451. https://doi.org/10.1177/0165025415607379

Plunkett, S. W., & Bámaca-Gómez, M. Y. (2003). The relationship between parenting, acculturation, and adolescent academics in Mexican-origin immigrant families in Los Angeles. *Hispanic Journal of Behavioral Sciences, 25*(2), 222–239. https://doi.org/10.1177/0739986303025002005

Racz, S. J., McMahon, R. J., King, K. M., Pinderhughes, E. E., & Bendezú, J. J. (2019). Kindergarten antecedents of the developmental course of active and passive parental monitoring strategies during middle childhood and adolescence. *Development and Psychopathology, 31*(5), 1675–1694. https://doi.org/10.1017/S0954579419000993

Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., & Senécal, C. (2007). Autonomous, controlled, and amotivated types of academic motivation: A person-oriented analysis. *Journal of Educational Psychology*, *99*(4), 734–746. https://doi.org/10.1037/0022-0663.99.4.734

Renaud-Dubé, A., Guay, F., Talbot, D., Taylor, G., & Koestner, R. (2015). The relations between implicit intelligence beliefs, autonomous academic motivation, and school persistence intentions: A mediation model. *Social Psychology of Education*, *18*(2), 255–272. https://doi.org/10.1007/s11218-014-9288-0

Ricard, N. C., & Pelletier, L. G. (2016). Dropping out of high school: The role of parent and teacher self-determination support, reciprocal friendships and academic motivation. *Contemporary Educational Psychology*, *44–45*, 32–40. https://doi.org/10.1016/j.cedpsych.2015.12.003

Rodríguez-Meirinhos, A., Vansteenkiste, M., Soenens, B., Oliva, A., Brenning, K., & Antolín-Suárez, L. (2020). When is parental monitoring effective? A person-centered analysis of the role of autonomy-supportive and psychologically controlling parenting in referred and non-referred adolescents. *Journal of Youth and Adolescence, 49*(1), 352–368. https://doi.org/10.1007/s10964-019-01151-7

Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Basic psychological needs in motivation, development, and wellness.* Guilford Press.

Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology, 61*, Article 101860. https://doi.org/10.1016/j.cedpsych.2020.101860

Stattin, H., & Kerr, M. (2000). Parental monitoring: A reinterpretation. *Child Development*, *71*(4), 1072–1085. https://doi.org/10.1111/1467-8624.00210

Symonds, J., Schoon, I., Eccles, J., & Salmela-Aro, K. (2019). The development of motivation and amotivation to study and work across age-graded transitions in adolescence and young adulthood. *Journal of Youth and Adolescence*, *48*(6), 1131–1145. https://doi.org/10.1007/s10964-019-01003-4

Taylor, G., Jungert, T., Mageau, G. A., Schattke, K., Dedic, H., Rosenfield, S., & Koestner, R. (2014). A self-determination theory approach to predicting school achievement over time: The unique role of intrinsic motivation. *Contemporary Educational Psychology, 39*(4), 342–358. https://doi.org/10.1016/j.cedpsych.2014.08.002

Vallerand, R. J., Blais, M. R., Brière, N. M., & Pelletier, L. G. (1989). Construction et validation de l'échelle de motivation en éducation (EME). *Canadian Journal of Behavioural Science/Revue Canadienne Des Sciences Du Comportement*, *21*(3), 323–349. https://doi.org/10.1037/h0079855

Vansteenkiste, M., Ryan, R. M., & Soenens, B. (2020). Basic psychological need theory: Advancements, critical themes, and future directions. *Motivation and Emotion, 44*(1), 1–31. https://doi.org/10.1007/s11031-019-09818-1

Wentzel, K. R., Muenks, K., McNeish, D., & Russell, S. (2017). Peer and teacher supports in relation to motivation and effort: A multi-level study. *Contemporary Educational Psychology*, *49*, 32–45. https://doi.org/10.1016/j.cedpsych.2016.11.002

Wuyts, D., Soenens, B., Vansteenkiste, M., & Van Petegem, S. (2018). The role of observed autonomy support, reciprocity, and need satisfaction in adolescent disclosure about friends. *Journal of Adolescence, 65*, 141–154. https://doi.org/10.1016/j.adolescence.2018.03.012

Table 1

Indices of Central Tendency and Distributional Properties of the Study Measures

Variables	*N*	*Min–Max*	*M*	*SD*	*Skewness*	*Kurtosis*
Parental solicitation						
T1	302	1.00–4.00	2.39	0.80	0.16	–0.69
T2	155	1.00–4.00	2.45	0.78	0.01	–0.52
Parental control						
T1	310	1.00–4.00	3.17	0.76	–0.81	–0.08
T2	156	1.00–4.00	3.20	0.79	–0.91	0.10
Autonomous motivation						
T1	326	1.00–4.00	3.13	0.52	–0.57	0.31
T2	170	1.29–4.00	3.15	0.48	–0.83	1.40
Controlled motivation						
T1	327	1.75–4.00	3.26	0.52	–0.47	–0.51
T2	170	1.38–4.00	3.27	0.53	–0.91	0.65
Amotivation						
T1	327	1.00–4.00	1.49	0.66	1.78	3.14
T2	170	1.00–3.75	1.47	0.62	1.53	1.86
Age at T1	328	14.17–18.48	15.78	0.81	0.88	0.36
Parental education at T1	280	1.00–4.00	2.80	0.96	–0.33	–1.04
Grades at T1	277	16.63–94.00	70.78	11.48	–0.90	2.60

Note. T1 = time 1; T2 = time 2.

Table 2

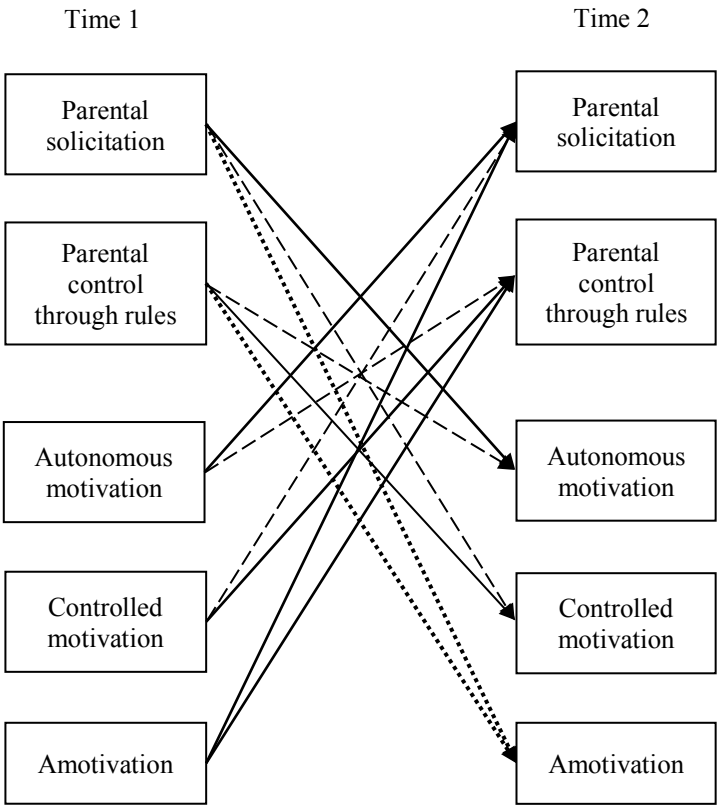
Correlations Between All Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. PS T1	–	.46***	.31***	11	.21***	.30***	.13*	.11	–.11	–.22**	–.02	.16**	.15**	.07
2. PS T2	45***	–	.15	22**	.19*	.27**	.03	.12	.02	–.06	.00	.17*	.02	–.01
3. PC T1	31***	.10	–	62***	.20***	.25**	.12*	.10	–.23***	–.24**	–.06	.10	.36***	.33***
4. PC T2	05	.20*	.59***	–	.15*	.26***	.02	.03	–.12	–.20*	–.12	.09	.27***	.28***
5. AM T1	19**	.15	.19**	14	–	.55***	.69***	.32***	–.38***	–.29***	–.11*	.08	.13*	.12*
6. AM T2	24**	.23**	.21**	25**	.51***	–	.37***	.57***	–.23**	–.43***	–.09	–.01	.11	.01
7. CM T1	12*	–.06	.12*	00	.69***	.30***	–	.46***	–.19***	–.25***	–.08	–.02	.09	–.02
8. CM T2	03	.07	.10	02	.29***	.55***	.45***	–	–.06	–.23**	–.01	–.16*	.01	–.21**
9. Amotivation T1	-.12*	–.01	–.22***	-.09	-.38***	–.18*	–.19**	–.02	–	.32***	.06	–.09	–.24***	–.28***
10. Amotivation T2	-.18*	–.03	–.22**	-.18*	-.23**	–.41***	–.20**	–.21**	.27***	–	.06	.04	–.20**	–.12
11. Age T1	-.01	.01	–.06	-.11	-.11	–.06	–.08	.02	.05	.04	–	.05	–.07	–.04
12. Parental education	15*	.18*	.10	09	.07	–.01	–.03	–.16	–.06	.04	.04	–	–.03	.23***
13. Gender [a]	15**	.01	.35***	28***	.13*	.06	.09	–.01	–.24***	–.15*	–.07	–.04	–	.20***
14. Grades T1	08	.05	.33***	25**	.12*	.03	–.02	–.17*	–.28***	–.11	–.02	.25***	.20**	–

Note. PS = parental solicitation; PC = parental control through rules; AM = autonomous motivation; CM = controlled motivation; T1 = time 1; T2 = time 2.
[a]0 = boys and 1 = girls. Results under the diagonal are based on the raw dataset, whereas the results above are estimated using the full information maximum likelihood estimator.
*$p < .05$. **$p < .01$. ***$p < .001$.

Figure 1

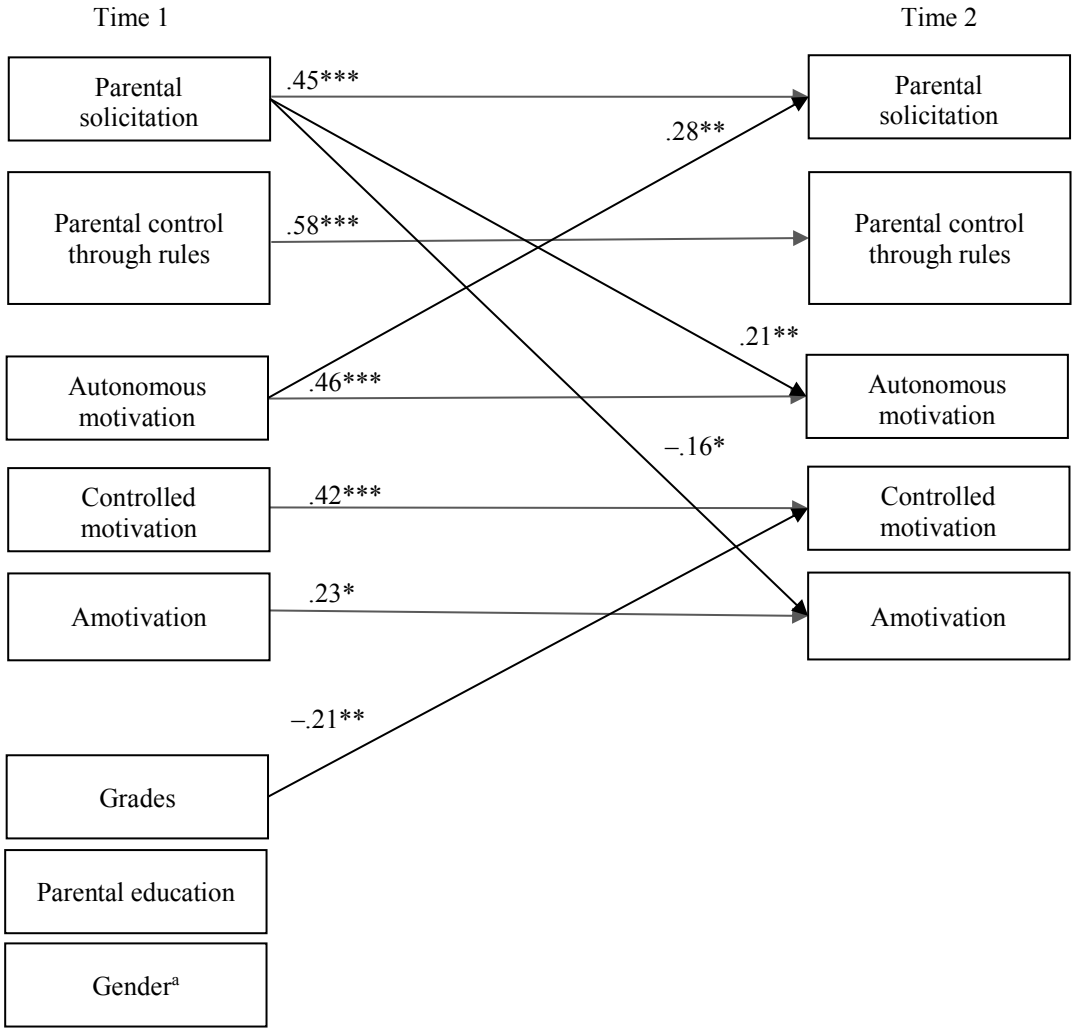
Model of the Bidirectional Associations Examined in the Current Study



Note. Solid lines are expected to be positive associations, whereas dotted lines are expected to be negative. The dashed lines represent transactional paths estimated in the model to control for possible associations. Stability paths and intercorrelations at each time points are not shown here for better comprehensibility, but are estimated in the final model.

Figure 2

Final Bidirectional Model



Note. Final model with standardized path coefficients. Nonsignificant transactional paths presented in Figure 1 and nonsignificant paths between covariates and all Time 2 variables are not shown here for better comprehensibility but are estimated in the model. Correlations coefficients for Time 1 and Time 2 are described in text. [a]0 = boys and 1 = girls. $\chi 2$ (8) = 7.70, p = .46, CFI = 1.00, TLI = 1.00, RMSEA < .001, SRMR =.03.
*p < .05. **p < .01. ***p <.001.