Perceptions of the Teacher–Student Relationship Climate and the Development of Academic Motivation in High School: A Transactional Analysis

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The Version of Record of this manuscript has been published and is available in the *Educational Psychology* journal. Prepublication online effective on February 12, 2024. http://www.tandfonline.com/ 10.1080/01443410.2024.2311672

The authors have no conflict of interest to report. This study was supported by the Quebec Research Funds – Society and culture (establishment of new professors 2013-NP-167302 to MHV; infrastructure grant for research teams, 2013-SE-164393 to MHV as a regular team member; doctoral fellowships to YCV and OG), the Quebec Research Funds – Health (establishment of new researchers, 28802, and Research Scholar, 26858 and 266652, granted to MHV) and the Faculty of Human Sciences at UQAM (start-up funds to MHV, doctoral awards to YCV and OG). We thank the students, parents and school staff of schools who participated in this study, as well as students and research assistants who made this project possible.

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The last author on the list (MHV) is the senior author of this study. She is the principal investigator on the grants that made this project possible, and contributed significantly to this study.

Abstract

High school teachers often struggle to engage students who have little or no motivation to learn. We argue that improving students' perceptions of affective relationships with teachers may have the potential to positively influence their motivation, and vice versa. This study looks at reciprocal associations between students' perceptions of the teacher–student relationship climate (PTSRC) and three components of academic motivation (autonomous, controlled, and amotivation), measured at two time points, over a 12–month period. We recruited 328 students (on average 15 years of age, 65% girls) from public high schools in disadvantaged areas of a Canadian suburb. We found that students' autonomous motivation predicted an increase in positive PTSRC. In contrast, we did not find evidence that PTSRC predicted either autonomous or controlled motivation. Nonetheless, a positive perception of the teacher–student relationship climate predicted a decrease in students' amotivation. This finding suggests that high school students' positive PTSRC can help them find purpose in their schooling. Knowing that motivation typically declines during high school years, this study is important because it suggests that promoting positive teacher–student relationships can contribute to ward off such decline.

Keywords: motivation, adolescence, high school, student–teacher relationships, longitudinal analyses

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Motivation plays a crucial role in youth's academic success. Motivation predicts positive school attitudes, higher academic self-esteem, performance, well-being, persistence, and the internalization of school-related values and regulations (Deci & Ryan, 2000; Vansteenkiste et al., 2004). According to self-determination theory (SDT; Ryan & Deci, 2020), motivational experiences are varied, as they are the product of a combination of self-driven and externally regulated influences for engaging in diverse daily activities. The theory's motivational orientation can be classified into three broad components: autonomous motivation, controlled motivation and amotivation (Ryan & Deci, 2020). In line with the self-concordance model, individuals who behave in accordance with personally endorsed values or interests should experience autonomous motivation (Sheldon & Elliot, 1999). When a person's behavior is motivated by a willingness to please others or by the need to obtain something in return, and not because they deem that performing the action is important, they experience controlled motivation. Amotivation occurs when a person fails to find compelling reasons to engage in certain behaviors, like attending school or doing homework.

To understand how those different motivational components develop in high school, it is important to recognize that adolescence is a period of profound developmental change in which interpersonal relationships play a major role in shaping youth's interests and future. Indeed, autonomous motivation has the most potential to foster academic success (Ratelle et al., 2007; Ryan & Deci, 2000b). In addition, positive teacher–student relationships are associated with positive behavioral, social, and academic achievement outcomes through childhood and adolescence (Ryan & Patrick, 2001; Yu et al., 2018). Teachers can influence students'

motivation through various actions. For example, achievement goal theory suggests that enhanced learning and motivation occur when teachers encourage youth to focus on the mastery of school tasks and on self-improvement, rather than on performance and social comparison (Elliot & Hulleman, 2017). The SDT framework provides a complementary perspective by emphasizing teachers' roles beyond their direct pedagogical support of student classwork. SDT rather highlights how teachers encourage high-quality motivation by building a positive social climate in the school, thus fostering students' need to belong to the school community.

Students' PTSRC reflect the quality, warmth, and supportiveness of their interactions with teachers; as such, these perceptions serve as a key determinant of their experience of the school's relational climate. Teachers are in a privileged position to support adolescents' well-being and motivation, as they are trained to provide a structured environment that helps youth make positive behavioral choices (Yu et al., 2018). In this way, teachers foster the satisfaction of their students' needs for autonomy, competence and relatedness, which are the underlying mechanisms of self-determined motivation (Ryan & Deci, 2020). According to SDT, positive and autonomy-supportive relations between students and teachers should promote a good balance of autonomous and controlled academic motivation among adolescents. Yet, just like students, teachers' ability to support students' motivation depends on their benefiting from a positive social climate in the school (Ryan & Deci, 2020; Taylor et al., 2008). To better understand the development of adolescents' school motivation, we need to move beyond simple models wherein students are only recipients of social influences in school and acknowledge that teachers' behaviors may also depend on students' academic motivation. This idea is consistent with a transactional model of human development (Sameroff, 2009). Evidence of transactional associations between students' well-being and the quality of their interpersonal relationships at

school has emerged for the early secondary years (Kiuru et al., 2020). Thus, in this study, we propose a longitudinal, transactional design to look at bidirectional associations between the three types of academic motivation and adolescents' perceptions of teacher–student relationship climate (PTSRC) across one school year, in later secondary school years.

Motivation in School

While in school, adolescents experience autonomous motivation when they perform academic tasks out of pleasure and interest or when they attribute a sense of personal volition and meaning to their objectives, even when these are not immediately enjoyable (Deci & Ryan, 2000). For example, a student who chooses to spend time reading optional course material may do so out of interest to learn about the subject, while another student may do so because academic achievement is compatible with their personal values. Autonomous motivation is generally associated with positive outcomes such as psychological well-being and academic performance (Ryan & Deci, 2000b). This type of motivation becomes increasingly important as children reach adolescence and experience a growing need for autonomy (Deci & Ryan, 2000).

Controlled motivation is characterized by extrinsically regulated, "instrumental" behavior (Deci & Ryan, 2000). For example, students experiencing controlled motivation do their homework out of fear of parental punishment, or to avoid feeling guilty. Some authors argue that the rise in controlled motivation associated with school transitions, like the one occurring from elementary to secondary school, is problematic (Otis et al., 2005; Longobardi et al., 2016). They note that elevated levels of controlled motivation are associated with low autonomous motivation, maladaptive behavior in school, and decreased academic persistence. In contrast, other studies suggest that autonomous motivation, on its own, is not enough for high school students to successfully navigate the competitive and sometimes controlling high school

environment. Specifically, Ratelle and colleagues (2007) and Petit and colleagues (2023) found that highly adjusted students have a motivational profile composed of *both* autonomous and controlled motivation. In this respect, Ryan and Deci (2000) specify that controlled motivation can be detrimental when it is not counterbalanced by a relatively sufficient amount of autonomous motivation.

Students who do not demonstrate any interest in school, display boredom, and disengage from academic tasks are said to be amotivated (Ryan & Deci, 2000a). Amotivated students experience a range of maladaptive outcomes. For instance, a meta-analysis revealed that amotivation was the strongest predictor of low achievement, absenteeism, anxiety, and low self-esteem (Howard et al., 2021).

In sum, extant studies support the multiple facets of motivation proposed by SDT. SDT also highlights that these facets co-exist within each individual and evolve over time, as a function of environmental influences—a process encapsulated by the organismic integration theory (OIT), which is a subcomponent of SDT (Ryan & Deci, 2000). OIT suggests that individuals have a natural propensity to internalize their regulatory processes and to develop increasingly autonomous motivation for their behaviors over time. Motivation usually evolves from “controlled” to “autonomous” when the values underlying behavior are endorsed and communicated by significant individuals who support the satisfaction of one’s psychological needs. Accordingly, significant social figures in the school milieu deserve special attention when studying the development of motivation in high school students.

The Relevance of Teacher–Student Relationships in High School

Past studies exploring motivation in school shed light on the importance of teacher–student relationships (Guay et al., 2021; Ryan et al., 1994; Ryan & Patrick, 2001). For instance,

Ryan and colleagues (1994) found that middle school students' feelings of connectedness with their teachers were related to students' motivational orientations and school adjustment. Similarly, Murray (2009) found that middle school students' perceptions of teachers' closeness were a significant factor in student–reported academic engagement. Finally, in a review of research on teacher–student relationships in secondary school and their affective outcomes, Wubbels and Brekelmans (2005) found that students who perceived high levels of teacher–student proximity in their school also had high levels of academic motivation.

While the benefits of positive teacher–student relationships are well documented in elementary and middle school, there is a gap in the literature regarding such relationships in high school (Yu et al., 2018). Because dropout rates increase in high school (Eccles & Roeser, 2011), the social factors that might influence academic motivation during that period deserve special attention. Additionally, analyses of the associations between teacher–student relationships and motivational outcomes have often focused on the quality of relationships between students and specific teachers, thus helping to understand the development of motivation or performance in the context of specific school subjects (Guay & Bureau, 2018; Roorda et al., 2019). Studies showed how teacher–student relations enhance or impede school motivation (e.g., Engels et al., 2021) and shed light on why girls tend to have higher school engagement than boys in early adolescence (e.g., Lietaert et al., 2015). Yet, the school climate literature shows that students' PTSRC is a crucial dimension of school climate that relates to students' engagement (Fatou & Kubiszewski, 2018). Students' positive perceptions and trust in teachers promote a cohesiveness school climate and play an essential role in their academic success (Barksdale et al., 2021). By and large, autonomous motivation has been central to past research in this domain (Guay et al.,

2010; Guo, 2018; Vansteenkiste et al., 2004), and therefore more attention needs to be devoted to controlled motivation and amotivation to get a fuller understanding of the processes at play.

Differences in how girls and boys perceive and experience student-teacher interactions also deserve additional attention. Previous studies show that teachers are generally warmer and more supportive with students for whom they hold high expectations (Meece et al., 2006). As girls tend to be more engaged in school, teachers might afford them with more opportunities to demonstrate their academic abilities (Lietaert et al., 2015). Furthermore, girls appear to give more importance to how much they think teachers like them than boys do, so their school motivation might be more dependent on their PSTRC (Lightbody et al., 1996). In short, the current state of research calls for studies on teacher–student relationships across school subjects, as they relate to all components of student motivation, particularly during the high school period, and further attention to gender differences is warranted.

Changes in Students' Academic Motivation in Adolescence

There is a decline in autonomous academic motivation during adolescence (Ryan & Patrick, 2001). Such decline is marked during students' transitions from elementary to middle school and even more so from middle to high school (Otis et al., 2005). High school students experience an increase in the perceived importance of school grades, competition, and performance evaluations. These factors might be responsible, at least in part, for students' decreased academic motivation (Roorda et al., 2017). Additionally, teacher–student relationships in high school tend to be less personal, less positive and increasingly distant, in comparison to elementary school (Roorda et al., 2017). Eccles and Roeser (2011) consider such perception of decreased proximity and emotional support to be one of the factors that negatively influence students' academic motivation in high school.

Despite the distance that develops between teachers and students, Roorda and colleagues (2017) argue that middle and high school students become more sensitive to the warmth and support they obtain from teachers, making their interactions more salient. Indeed, research suggests that teachers remain significant socializing agents able to influence adolescents' academic motivation (Guay et al., 2017; Longobardi et al., 2016). Teachers can motivate students by providing a warm, fair, and supportive classroom climate. When teachers are unable or unwilling to be a positive source of relational support, the quality of students' academic motivation suffers (Davis, 2003; Ryan & Deci, 2000b).

Directionality of Student–Teacher Influences

While there is robust evidence for a positive association between quality teacher–student relationships and students' academic motivation, the likelihood that students' motivation might influence their perception of student–teacher relationships has received less attention. Correlational studies based on a single assessment have provided preliminary evidence that teachers present more positive attitudes toward students and strategies aimed at supporting students' self-determined motivation when they perceive students as motivated and engaged (Taylor et al., 2008; Roorda et al., 2017). A two-week diary study revealed that early-career teachers' experience of stress in class, including teaching students who lack motivation, predicts low levels of relatedness with students, with negative consequences on their work enthusiasm and emotional exhaustion (Aldrup et al., 2017). As teachers witness their students' autonomous motivation contributing to improved academic achievement, this may foster teachers' self-efficacy and feelings of competence. In addition, students who display autonomous motivation are likely to be active and engaged in class (Guo, 2018). In such context, teachers should also feel autonomously motivated in their work, thus increasing their positive interactions with

students (Košir & Tement, 2014; Roth et al., 2007). Reciprocal influences between students' achievement and their perceptions of teacher support were also uncovered in a longitudinal study using measurements at the beginning and at the end of the school year (Košir & Tement, 2014). This suggests that bidirectional associations may exist between student-teacher relationships and student motivation. Yet, a longitudinal design using repeated measures of these constructs would be needed to test the hypothesis of reciprocal links between these variables.

To our knowledge, only one study has tested for bidirectional associations, in younger children (7 to 11 years old). Skinner and Belmont (1993) explored the possibility that teachers' perceptions of student engagement and students' perceptions of teacher involvement might influence the quality of teacher–student interactions and found reciprocal associations involving teachers' behavior and students' engagement in class. However, this study did not consider the various subtypes of student motivation as put forward by SDT, which is an important piece when trying to understand the underlying psychological mechanisms that activate students' academic behaviors. Furthermore, some researchers have suggested that highly motivated students draw more relational support from teachers, or that teachers and students create an environment of social reciprocity in which students who display motivation and engagement in school can expect teachers to afford them positive interactions and support (Ryan et al., 1994; Wentzel, 2016). However, the authors have not empirically tested these hypotheses.

The Present Study

This study aims to fill the gap in the literature by testing for the bidirectional associations between adolescents' perceptions of the relationship climate between teachers and the quality of adolescents' motivation, considering the three types of motivation included in SDT (Ryan & Deci, 2020), that is, autonomous motivation, controlled motivation, and amotivation. We also

focus on the high school years, a period that has been understudied in relation to the variables of interest, but is nevertheless crucial to preparing students for a successful transition to postsecondary studies, as presented in the literature reviewed above. We thus propose a longitudinal, transactional study with adequate control of potentially confounding variables like age, academic achievement, and gender.

Our longitudinal design is also grounded in a transactional framework (Sameroff, 2009); thus, repeated measures of these variables were collected over two time points, enabling us to analyze the associations of student motivation and the perception of the teacher–student relationship climate in both directions. This approach will allow us to model underlying processes of mutual influence between students' academic motivation and their PTSRC, by controlling for initial levels of both variables and for potential confounding variables.

We hypothesize that the fit of the fully transactional model will be superior to that of unidirectional models (H1). Unidirectional models include a relationship-driven model (PTSRC predicting motivation, but not the other way around) and a motivation-driven model (perceptions of motivation predicting PTSRC, but not the other way around). Then, within the transactional model, we hypothesize that autonomous motivation will increase in adolescents who initially have a positive PTSRC (H2). Reciprocally, adolescents' PTSRC will be more positive among students with high autonomous motivation at first (H3). In contrast, both controlled motivation and amotivation will predict a more negative PTSRC (H4), and these two suboptimal forms of motivation will increase among students whose PTSRC are initially negative (H5). We hypothesize that results will generalize to boys and girls (H6).

Method

Participants

The sample consisted of 328 students (65% girls), mostly Caucasian (74%), recruited from two French-speaking secondary schools in underprivileged suburban areas of a metropolitan area in Quebec, Canada, as part of a project named “Univers Social” (Social World). In Quebec, students finish elementary school in Grade 6 and enter secondary school in Grade 7. They remain in the same school until graduation, after completing Grade 11. Participating students in this study were in their third (n = 222) or fourth (n = 105) year (Grade 9 or 10) at the first measurement, and in their fourth or fifth year (the last two years of high school in Quebec) at the second time point. This design enabled us to tap into the age range when the reported increase in school dropout usually occurs, and thus capture a wide range of school motivation levels. Participants were on average 15.78 years old at T1 (SD = .81).

Procedure

Participants were assessed during regular class hours, with an online self-report questionnaire, in the schools’ computer laboratory, supervised by research assistants. The IRB from the University of Quebec at Montreal approved the study protocol [approval # 2013-614]. Informed consent was obtained from students and their parents through letters distributed to the students at school and a signed consent form. After each assessment, participants were compensated with a free movie pass.

Measures

Perceptions of Relationship Climate between Students and Teachers

PSTRC was assessed using the subscale “Relationship between teachers and students” of the Perceptions of School Context Questionnaire (original French version; Galand & Philippot, 2005) at T1 and T2. This ten-item questionnaire included statements such as “In this school,

teachers treat students with respect" scored on a scale from 1 (*totally false*) to 4 (*totally true*; α = .87 at T1 and .86 at T2).

Motivation

The Academic Motivation Scale (AMS; original French version, Vallerand et al., 1989) was used to assess students' school motivation. The 28-item scale measured the motivational styles advanced by SDT. Participants responded to the following stem: "Indicate how well each statement currently corresponds to one of the reasons why you go to school." Items were scored on a scale from 1 (*highly disagree*) to 4 (*highly agree*). As in previous research (e.g., Bonneville-Roussy et al., 2017; Sheldon & Elliot, 1998), we combined the 12 intrinsic motivation items ("Because I experience pleasure and satisfaction when learning new things") into an aggregate score of autonomous motivation (α = .93 at T1 and .90, at T2). We calculated controlled motivation by combining the identified ("Because I think that a high-school education will help me prepare for the career I have chosen"), introjected ("To show myself that I am an intelligent person") and external regulation ("In order to obtain a more prestigious job later on") subscales (α = .74 at T1 and .71 at T2, respectively). The amotivation score ("Honestly, I don't know; I really feel that I am wasting my time in school") was calculated from the original questionnaire (4 items, α = .84 at T1 and .78 at T2).

Academic Achievement

End-of-year report cards were collected to assess academic achievement based on school grades in French and Mathematics.

Gender and Age

Participants' gender and age were self-reported.

Analytical Strategy

Preliminary analyses consisted in examining missing value patterns, descriptive statistics, and correlations. *T*-tests were applied to identify gender differences for variables used in the hypothesized models. Primary analyses consisted of cross-lag path analyses with MPlus v.8 (Muthén & Muthén, 2017). To obtain a well-adjusted model, fit indices need to meet certain criteria: a non-significant χ^2, a *Comparative Fit Index* (CFI) and a *Tucker Lewis Index* (TLI) higher than 0.95, a *Root Mean Square Error of Approximation* (RMSEA) lower than 0.06 and a *Standardized Root Mean Square Residual* (SRMR) lower than 0.08 (Kline, 2005). Multiple group analyses were performed on the final model to verify whether results differed across genders.

Results

Preliminary Analyses

Missing Values, Descriptives and Correlations.

Missing data were handled using full information maximum likelihood (FIML), allowing the usage of all available information from participants with occasional missing data. As indicated by a significant Little's Missing Completely at Random (MCAR) test, $\chi 2$ (67, N = 328) = 105.37, $p < .01$, patterns of missing values were not completely random (Enders, 2010). To investigate those patterns, we calculated the number of variables with a missing value for each participant and used bivariate correlations to verify which characteristics of participants predicted a lower response rate. The number of missing values was higher for participants with low academic achievement (r = -.11, $p < .05$) and low autonomous motivation at T1 (r = -.18, $p < .01$).

Means, standard deviations and correlations are presented in Table 1, along with indicators of normality and the number of participants with valid data for all variables. On

average, participants “agreed” with statements representing autonomous and controlled motivations for attending school, with a mean score slightly above the third anchor on the four-point Likert scale, at both times of measurement. Conversely, participants “disagreed,” on average, with statements that suggest that they lacked motivation to go to school.

Correlations between the variables of interest were significant and in the expected direction. The lower correlations for T1 and T2 measurements of autonomous motivation (r = .29, $p < .001$) and amotivation (r = .27, $p < .001$) as compared to controlled motivation (r = .41, $p < .001$) reflect greater stability of the latter construct. *T*-tests performed on students who were present at both time points confirmed a significant decrease in controlled motivation from T1 to T2, $t(168) = 2.04$, $p < .05$. No significant difference emerged for autonomous motivation, $t(168) = 1.42$, *ns* and amotivation, $t(169) = –0.44$, *ns*. The failure to find an upward or downward change in autonomous motivation and amotivation in the overall sample does not preclude that individual students experienced sizable changes in those types of motivation. These results are partly consistent with studies showing greater consistency of self-determined motivation across school subjects (Guay & Bureau, 2018) at the lower end compared to the higher end of the self-determination continuum.

Table 1

Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8	9	10	11
1. Gender	-										
2. Age	-.03	-									
3. PSTRC T1	.06	.08	-								
4. PSTRC T2	-.03	.23**	.46***	-							
5. Autonomous motivation T1	.13*	-.07	.26***	.23**	-						
6. Autonomous motivation T2	.03	-.05	.18*	.20**	.29***	-					
7. Controlled motivation T1	.09	-.05	.10†	.09	.69***	.11	-				
8. Controlled motivation T2	-.01	-.09	.09	.15†	.39***	.40***	.41***	-			
9. Amotivation T1	-.24***	.02	-.34***	-.13†	-.38***	-.16*	-.19**	-.09	-		
10. Amotivation T2	-.15*	.00	-.31***	-.20**	-.23**	-.33***	-.20**	-.20**	.27***	-	
11. Academic achievement T1	.13*	-.08	.18**	.11	.14*	.13†	-.02	-.05	-.21**	-.04	-
Mean	1.65	15.76	2.77	2.79	3.13	3.17	3.26	3.21	1.49	1.47	72.24
SD	.48	.85	.60	.57	.52	.40	.52	.55	.66	.62	10.98
Skewness	-.62	.58	-.08	-.14	-.57	-.23	-.48	-.85	1.78	1.53	-.36
Kurtosis	-1.63	.86	-.14	.08	.31	1.33	-.51	.77	3.14	1.86	.42
n	326	328	317	165	326	170	327	170	327	170	324

Note. Gender : 1 = boys, 2 = girls. PSTRC = perceptions of the teacher–student relationship climate. T1 = Time 1. T2 = T2. † $p < .10$ * $p < .05$ ** $p < .01$ *** $p < .001$.

Gender Differences.

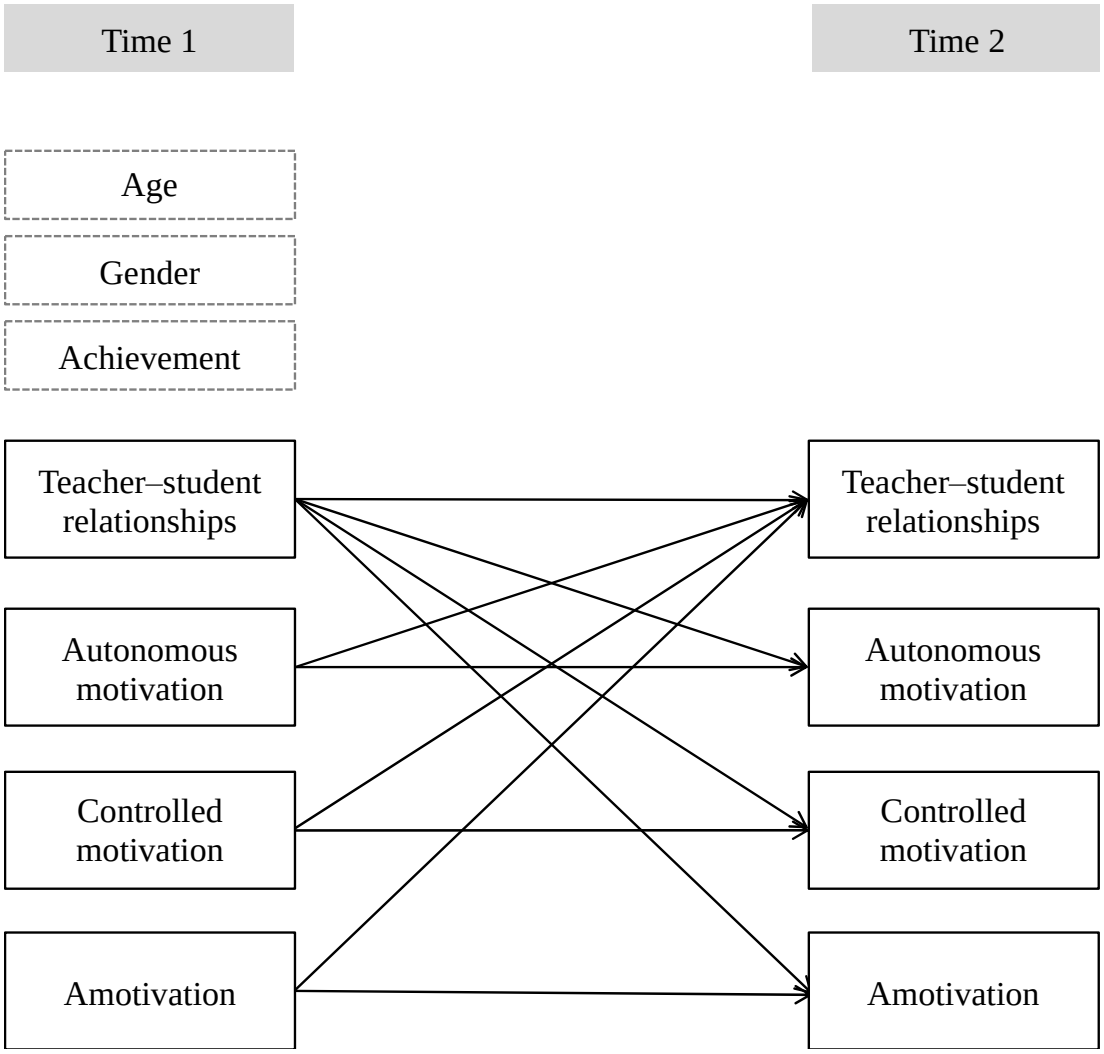
T-tests indicated that girls had higher academic achievement at T1 than boys, $t(320) = -2.26$, $p < .05$ ($M_{girls} = 73.29$, $SD = 10.30$; $M_{boys} = 70.41$, $SD = 12.00$) and higher autonomous motivation at T1, $t(323) = -2.27$, $p < .05$ ($M_{girls} = 3.18$, $SD = .50$; $M_{boys} = 3.05$, $SD = .54$). Girls showed lower amotivation than boys at T1, $t(324) = 4.37$, $p < .001$ ($M_{girls} = 1.37$, $SD = .55$; $M_{boys} = 1.69$, $SD = .77$) and at T2, $t(168) = 2.02$, $p < .05$ ($M_{girls} = 1.40$, $SD = .56$; $M_{boys} = 1.60$, $SD = .72$).

Primary Analyses

Figure 1 presents the initial model. In addition to the cross-lag paths involving the three types of motivation and PTSRC, we controlled for the stability of those variables from T1 to T2, for intercorrelations among variables measured at the same time point, and for age, gender, and academic achievement as predictors of T2 variables. Variables measured at the same time point were intercorrelated (*r* values ranged from .10 to .36, *p*-values ranged from .001 to .05). We used robust maximum likelihood estimation (MLR) because this method is robust to deviations in normality. Fit indices of the initial model met some of the cut-offs for satisfactory adjustment, but not all of them, $\chi^2 (7) = 16.06$ $p = .02$, $N = 328$, CFI = .92, TLI = .59, RMSEA = .06, 90% CI = 0.021 – 0.104, SRMR = .05.

Figure 1

Hypothesized model.



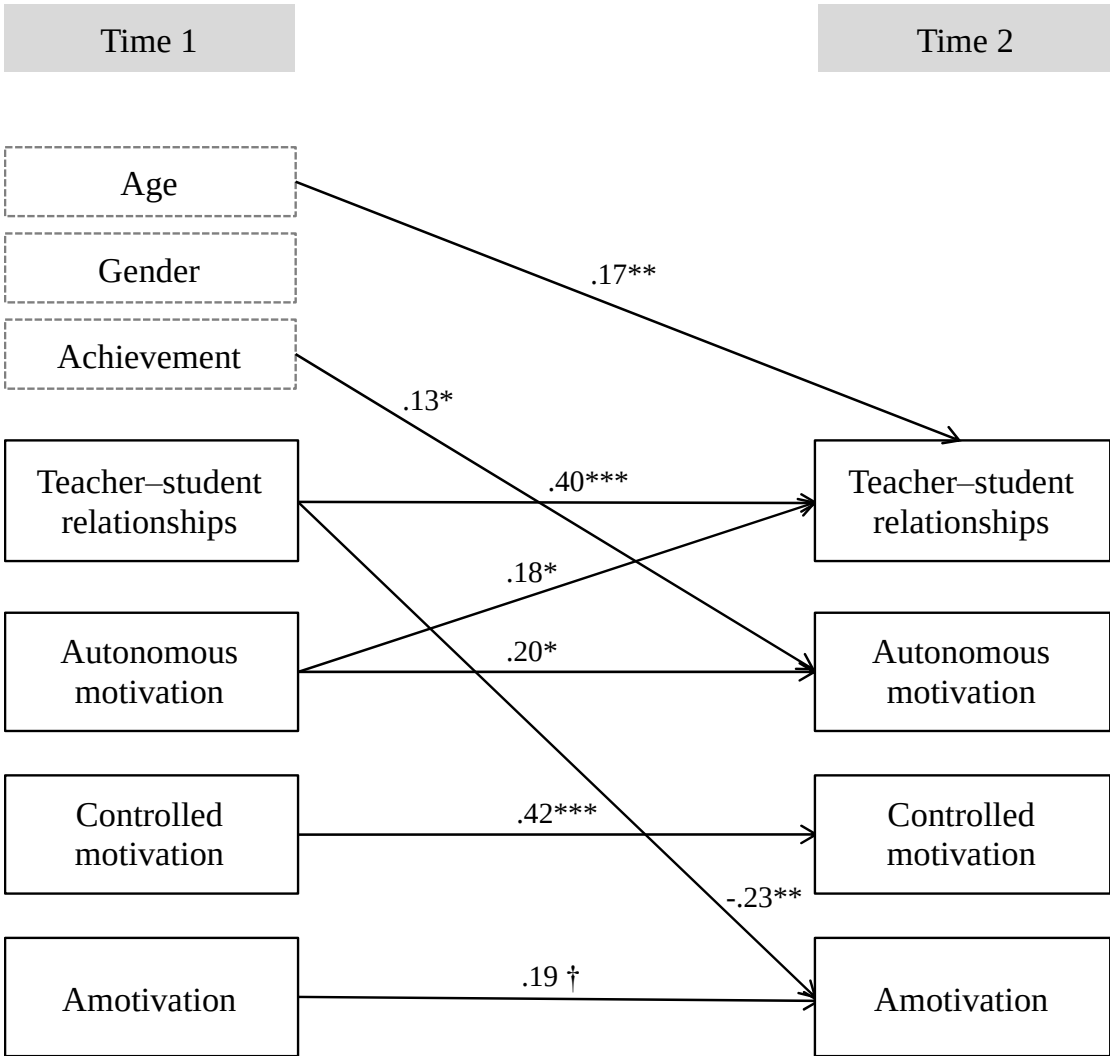
Note. Control variables (boxes with dashed borders) are expected to influence all variables at T2. Intercorrelations among variables measured at the same time point are included in the model.

The fully transactional model was compared to alternative models. The first alternative model was a relationship-driven model: it included only PTSRC as predictors of motivation components a year later. It excluded any path from motivation to PTSRC. The chi-square test revealed a poor model fit, $\chi^2(14) = 55.01$, $p < .001$, and the Satorra-Bentler test allowing to compare it with the transactional model revealed that the latter provided a better fit, $\chi^2(7) = 35.68$, $p < .001$. The second alternative model was motivation-driven: it included only the motivation components as predictors of PTSRC a year later. It excluded any path from PTSRC to motivation a year later. The chi-square test revealed poor model fit, $\chi^2(22) = 70.39$, $p < .001$, and the Satorra-Bentler provided evidence that the transactional model had a better fit to the data, $\chi^2(15) = 52.84$, $p < .001$.

These analyses provided evidence that the transactional model provided a better portrait of the associations among the study variables than unidirectional models. This suggested that some, but perhaps not all, of the transactional associations were valid. We thus proceeded to adjust the transactional model to remove paths with nonsignificant p-values one at a time to improve its heuristic value. The final model (Figure 2) presented an excellent fit to the data, suggesting that a simplified version of the transactional model adequately represented the associations among our variables, $\chi^2(34) = 36.03$, $p = .37$, $N = 328$, CFI = .98, TLI = .98, RMSEA = .01, 90% CI = 0.000 – 0.043, SRMR = .08.

Figure 2

Final, Adjusted Model



Note. Fit indices: $\chi^2(34) = 36.03$, $p = .37$, $N = 328$, CFI = .98, TLI = .98, RMSEA = .01, 90% CI = 0.000 – 0.043, SRMR = .08. † $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$. Intercorrelations among T1 variables and among T2 variables were significant and in the expected direction.

One significant longitudinal association from students' motivation to PTSRC emerged: autonomous motivation predicted a more positive PTSRC over one year (β = .18, $p < .05$). Controlled motivation and amotivation did not predict changes in PTSRC. We found one longitudinal association from PTSRC to future motivation: positive PTSRC predicted a decrease in amotivation a year later (β = -.23, $p < .01$). PTSRC did not predict changes in either autonomous motivation or controlled motivation. Students' academic achievement (a control variable) predicted an increase in autonomous motivation (β = .13, $p < .05$).

The stability of the three motivation components observed in the bivariate correlations (Table 1) is replicated in the final model. The overall model shows that amotivation and autonomous motivation fluctuated over time due to their positive relations with achievement and teacher-student relationship at T1, respectively, and had relatively low autocorrelations (.19, $p < .10$ and .20, $p < .05$). However, none of the predictors was associated with a change in controlled motivation from T1 to T2, which presented a high autocorrelation (.40, $p < .001$).

Multiple Group Analysis to Assess Generalizability Across Genders

Multiple group analysis was applied to verify whether the final model was generalizable to boys and girls. A first model wherein all path coefficients were free to vary across genders was tested, $\chi 2$ (50) = 70.58, $p < .05$. A second model wherein those path coefficients were constrained to be identical across the groups was subsequently modeled, $\chi 2$ (58) = 80.39, $p < .05$. The Satorra-Bentler test revealed that the constraints added at the second step did not lead to a significant deterioration in model fit, $\chi 2$ (8) = 9.81, $p = .27$, indicating that the final model is valid for boys and girls.

Discussion

This study evaluated the reciprocal associations between PTSRC and adolescents' academic motivation. H1 was corroborated, as the transactional model was superior to alternative unidirectional models. Yet, because several of the transactional paths did not reach significance, this finding must be interpreted cautiously. We found no support for H2, as autonomous motivation did not increase in adolescents who initially had a positive PTSRC. Yet, adolescents' PTSRC became more positive among students with high autonomous motivation at first, in support of H3. H4 was not supported as neither controlled motivation nor amotivation predicted a more negative PTSRC (H4). Yet, H5 was partially supported as amotivation (but not controlled motivation) decreased in students whose PTSRC were initially positive. H6 was corroborated, as results from the final model generalized to boys and girls (H6).

Evidence for transactional processes was found for PTSRC and students' autonomous motivation. Results suggest that autonomously motivated students are more likely to perceive teachers as caring and fair. Autonomously motivated students tend to be engaged in their learning activities, to participate actively and to be prosocial (Wentzel, 2016). Such attitudes and behavior might contribute to creating a relational context that facilitates positive teacher–student exchanges. This, in turn, might encourage teachers to behave in ways that these students perceive as warm, fair, and caring. From a theoretical perspective, autonomous motivation is likely to foster the experience of positive emotions (Fredrickson, 2001) and the satisfaction of the needs for autonomy, competence, and relatedness (Ryan & Deci, 2020), which are key mechanisms contributing to the quality of students' relationships, including with their teachers. Future

research is needed to test these hypotheses, however. In contrast, our findings indicate that PTSRC might not foster autonomous motivation among students at this stage over one year. Perhaps such influences unfold over longer periods.

Our results contrast with studies on younger students which reveal that when children perceive their teachers as being caring, friendly, and understanding, they are more likely to be engaged in school and to report higher levels of autonomous motivation (Ryan & Patrick, 2001; Ryan & Deci, 2000b). It remains to be tested whether positive PTSRC help promote students' academic success in other ways that were not measured in this study. For example, students might be more likely to ask their teachers for help in planning postsecondary studies or in dealing with social difficulties that might affect their achievement if they have positive PTSRC.

Contrary to our expectations, we found no association between PTSRC and controlled motivation, thus revealing that the proposed model was not fully transactional. Theoretically, the stage–environment fit theory (Eccles, 2004) might help complement SDT in explaining this finding. According to the former model, the organization of secondary schools as larger, less intimate structures than elementary schools does not foster the connection between adolescents and their teachers. We speculate that while some students engage in schoolwork to avoid their parents' disappointment or punishment, the decline in closeness between teachers and students in secondary school makes it less likely that a similar process would take place in the relationship between a majority of students and their teachers. This is especially true in large, public schools like those attended by our participants.

A promising finding is that positive PTSRC predict a decrease in amotivation one year later. This helps to validate SDT principles (Ryan & Deci, 2020) showing that fostering a supportive environment, wherein teachers respect and care for students, might positively influence students who fail to see the purpose of attending school. A decrease in students' amotivation might make room for more adaptive forms of motivation, increasing students' engagement, well-being, and achievement. It is also plausible that amotivated students who think that teachers are caring and fair might approach them to discuss their academic concerns. For instance, in a study on minority students from at-risk backgrounds (Brody et al., 2002), teachers who fostered decision-making and planning in the classroom positively influenced the self-regulation and academic adjustment of students living in unstable families.

Amotivation did not predict future PTSRC, again suggesting that the model is not fully transactional. This finding is encouraging as we had anticipated a detrimental impact of amotivation on PTSRC. However, such result might reflect the fact that disengaged students invest in relationships outside of school, and do not think much about their relationships with teachers. Thus, perhaps amotivated students' PTSRC remains stable, but negative.

A secondary finding from our analysis is that academic achievement predicts an increase in autonomous motivation. A few studies have longitudinally tested the relation between autonomous motivation and academic achievement (Vallerand et al., 1997; Vallerand & Bissonnette, 1992). However, the association has seldom been studied in the opposite direction (Guay et al., 2008). Our results suggest that reciprocal influences

between academic achievement and autonomous motivation should be investigated in the future, as the two variables might influence one another in a virtuous cycle.

Another secondary finding of this study is that the autocorrelations among the measures of autonomous motivation and amotivation at the two time points are positive but weak. It is plausible that as students near the conclusion of secondary school, they face pivotal decisions regarding their future, which may bring about shifts in their school engagement. For example, students who are amotivated because they would rather do outdoor or manual work than sit in class may regain motivation as the opportunity to enroll in a vocational program draws near. Conversely, autonomously motivated students might shift toward a more controlled form of motivation as they realize that they need to achieve a certain grade point average to enter a specific college program.

Limitations and Future Research

This study has some limitations. Aside from academic achievement based on school records, other data was self-reported, so we cannot contrast students' views to those of their teachers. However, students are arguably the best sources of information for the reasons why they attend school and of their PTSRC. Such perceptions are likely to be more important than objective (external) measures of relationship quality. Also, perhaps our measure of perceived school relational climate yielded weaker associations than a measure of individual student experiences with teachers. Such empirical questions can only be answered by additional research.

While our longitudinal design is a strength and improvement over previous studies, using only two measurement points comes with limitations. It did not allow us to analyze the full cycle of mutual influence between our variables nor to extend our results

to younger or older adolescents. In addition, we did not have enough data points to implement a more robust method known as the random-intercept cross-lagged panel model (Hamaker et al., 2015), which allows for transactional effects while controlling for within-person stability. Finally, despite using established and reliable measures, we are aware that there may be inherent measurement error. Thus, future studies should account for this by using structural equation modeling with correlated residuals.

To analyze the influence of PSTRC on academic motivation, future studies should use a longitudinal design following adolescents before, during and after school transitions. The periods of school transitions during adolescence merit particular attention, as these phases tend to be the riskiest in the academic trajectory (Longobardi et al., 2016), when struggling students are at highest risk of dropout (Eccles & Roeser, 2011). Research suggests that negative teacher–student relationships might exacerbate conduct problems (Ryan & Deci, 2000a). In contrast, students' positive perception of teachers in elementary and middle school can be protective during school transitions and foster academic achievement (Longobardi et al., 2016). It is thus necessary to learn more about its protective effect in older youth. Last, the low level of stability found for autonomous motivation and amotivation suggests that further studies should investigate unmeasured variables, including possible meditators, that could explain the instability of these constructs over time.

Implications and Conclusion

This study suggests that positive teacher–student relationships help reduce amotivation among high school students. Improving PTSRC may increase the likelihood that students maintain and gain the motivation necessary for achieving long-term

academic objectives. Our findings support previous studies that put forth the usefulness of interventions that increase justice and respect in the classroom, both among students and between teachers and students, to enhance academic motivation (Howard et al., 2021; Molinari et al., 2013). Interventions focusing on how teachers and students interact have the potential to reduce amotivation in students at risk of school disengagement or dropout. Teachers can foster healthy motivation by creating an environment that helps students feel like they belong, that teachers care, listen, and treat them fairly. Encouraging group work could make learning more enjoyable to students who are not intrinsically motivated by the material and this, in turn, could translate into improved achievement.

In conclusion, teachers must be aware of the influence that their relations with students, and the climate they help create in the classroom, influence students' motivation in school beyond the effects of their teaching methods. Teachers play a crucial role in their students' academic success. They are in a privileged position to rekindle amotivated students' interest and academic engagement in high school, when risk of dropping out is particularly high.

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