Teacher–student interpersonal relationships and academic motivation within one school year: developmental changes and linkage

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The present study explored the developmental changes of teacher–student interpersonal relationships as well as that of academic motivation among first-grade secondary school students. In addition, the link between teacher–student interpersonal behaviour and academic motivation across the school year was investigated. The data were collected 5 times within a school year, from 566 students of 20 mathematics and English classes, from 3 secondary schools in The Netherlands. Multilevel growth curve modelling was applied. Analysis of within-year changes in teacher–student interpersonal relationships revealed that the quality of relationships decreased over time. The decrease was more pronounced for Proximity than for Influence. Moreover, students' controlled motivation increased slightly, while autonomous motivation decreased systematically over time. Teacher–student interpersonal relationships are significant predictors of autonomous motivation. Several determinants like subject taught, class type, teacher gender, and student gender can explain differences in developmental trajectories of both interpersonal behaviour and academic motivation over time.

Keywords: teacher–student interpersonal relationships; academic motivation; secondary education; student perceptions; multilevel growth curve modeling

Introduction

A growing body of research on learning environments has shown that teacher–student relationships are important determinants of the classroom environment. A healthy teacher–student relationship is argued to be the characteristic of productive classroom environment (Den Brok, Brekelmans, & Wubbels, 2004; Henderson, Fisher, & Fraser, 2000; Opdenakker & Maulana, 2010), while a problematic relationship is considered destructive to student outcomes and development (Deci & Ryan, 2002; Sansone & Harackiewicz, 2000; Schweinle, Meyer, & Turner, 2006; Opdenakker & Maulana, 2010). Consequently, there seems to be a velvet revolution in schooling paradigm from a student “neglected-affective” learning tradition to a more modern view of “included-affective” learning practice. Although many agree that supportive and conducive relationships are important to student learning,
aspects of relationships which are pivotal to student outcomes remain a subject of debate.

Many scholars argue that one of the important determinants of school success is motivation. Previous research has shown that motivation is an important predictor of many student outcomes such as self-efficacy (Harter & Connell, 1984; Ryan, Mims, & Koesnner, 1983), academic engagement (Deci & Ryan, 1985; Nurmi & Aunola, 2005; Opdenakker & Maulana, 2010), and academic achievement (i.e., Boggiano, 1998; Deci & Ryan, 2002; Den Brok, Van Tartwijk, Wubbels, & Veldman, 2010; Lepper, Corpus, & Iyengar, 2005). Surprisingly, other studies have shown that student motivation decreases across school years (Bouffard, Marcoux, Vezeau, & Bordeleau, 2003; Gottfried, Fleming, & Gottfried, 2001; Otis, Gruzet, & Pelletier, 2005; Ratelle, Guay, Larose, & Senecal, 2004) and has created a concern amidst educational researchers.

Poor motivational outcomes have been identified to be caused by poor quality of teacher–student relationships. Earlier research has proven the significance effect of teacher–student relationships on student motivation (i.e., Brekelmans & Wubbels, 1991; Den Brok et al., 2004; Wubbels & Brekelmans, 2005). They also find that teacher friendliness/cooperativeness is a strong predictor of many elements of student motivation, while the effect of teacher control is rather inconclusive. However, it is important to note that many of the previous studies may suffer from vagueness due to the nature of the prevalence of cross-sectional designs. We know little how motivation changes as context (i.e., teacher–student relationships) changes across time. Hence, studies that bring together effects of context on motivation in a developmental context are needed.

Studies on the development of teacher–student relationships and development of motivation are scarce. Even more scarce are studies that link the two evolutional tracks in a “true” longitudinal fashion. In response to this, the present study is aimed at adding to the knowledge base by focusing on the exploration of the development of several aspects of teacher–student interpersonal relationships (TSIR) in mathematics and English first-grade secondary classes (students 11–13 years old) within one school year and the investigation of several potential determinants in explaining the developmental trends. In addition, the exploration of the link between the development of TSIR and the development of academic motivation is of main concern. More specifically, the development of teacher Influence and Proximity and the development of controlled and autonomous motivation of classes within one school year are examined. We focus primarily on the first grade of secondary education based on the literature showing that problems related to learning engagement and motivation are frequently associated with the transition from primary to secondary education (Howard & Johnson, 2004; Maulana, Opdenakker, Den Brok, & Bosker, 2010; Opdenakker & Maulana, 2010).

**Developmental changes of teacher–student relationships**

In the present study, teacher–student interpersonal relationships were studied from the perspective of interpersonal behaviour incorporating the Model for Teacher Interpersonal Behaviour (MITB; Wubbels & Brekelmans, 2005). This model provides a theoretical underpinning for studying teacher–student interpersonal relationships. The model consists of two orthogonal dimensions as identifiers of interpersonal behaviour called Influence (dominance vs. submissiveness) and
Proximity (cooperation vs. hostility). These dimensions are independent to each other and assume that every individual’s interpersonal behaviour shares the characteristics of both dimensions. Influence refers to behaviours that emphasize control relative to others, while Proximity represents behaviours underlining one’s interpersonal bonds and cohesions towards others (see Figure 1).

The literature reporting the development of teacher behaviour, classroom environments, and student outcomes is rather limited. Some studies indicate relatively stable trends of classroom environments (Brekelmans, 1989; Mainhard, 2009; Ryan & Patrick, 2001; Skinner & Belmont, 1993), while others report some instability trends (Brekelmans, 1989; Evertson & Veldman, 1981; Flanders, Morrison, & Brode, 1968; Mainhard, 2009; Maulana et al., 2010; Ryan & Patrick, 2001; Skinner & Belmont, 1993). Although this remains a subject of debate, the overall trend indicates that the quality of the classroom environment seems to decline to some extent across the school year (Brekelmans, 1989; Mainhard, 2009; Maulana et al., 2010; Opdenakker & Maulana, 2010), as well as student attitudes and behaviour (Evertson & Veldman, 1981; Flanders et al., 1968).

Developmental changes of academic motivation

Over the last decades, research on student motivation in an educational context has shown a prolific growth. Various frameworks deriving from psychological theories such as the expectancy-value model, attribution theory, goal orientation theory, and

Figure 1. Model for Interpersonal Teacher Behaviour (MITB; Wubbels & Brekelmans, 2005).
self-determination theory, to name a few, have been adopted by educational researchers. Those frameworks have been useful in providing a basis for studying motivation and its complex interplay with classroom contexts. Currently, research on student motivation seems to be central to research in the learning and teaching context (Pintrich, 2003; Turner & Patrick, 2008).

In this study, the theoretical framework for conceptualizing student motivation refers to the theory of a motivational continuum originating from the *Self-Determination Theory* (SDT; Ryan & Deci, 2000). Among other theories, the SDT is preferred due to two reasons. First, the SDT provides a clear distinction concerning types of motivation that can be divided into *controlled regulation* (a more extrinsic type of motivation) and *autonomous regulation* (a more intrinsic type of motivation). Next, the SDT links motivation to learning environment contexts, while most motivational theories focus merely on motivational aspects within the person. According to this theory, human motivation can be distinguished based on its regulatory style into *extrinsic, introjected, identified*, and *intrinsic* regulation (see Figure 2).

External regulation is the first type of motivation that is least autonomous and has an external perceived locus of causality because individuals experience highly controlled behaviour. Students perform externally regulated behaviour to please an external demand or reward contingency. A second type of motivation is introjected regulation. An individual student takes a regulation but s/he does not totally accept it as one’s own. The regulation is relatively controlled in a way that, even though internally driven, it has an external perceived locus of causality, and it is not completely experienced as part of the self. Within this type of motivation, ego involvement plays a role in the performed behaviour, in which the behaviour is displayed to exhibit capability or evade failure in order to preserve the feeling of worth (Ryan, 1982). Another type is identified regulation. It is more autonomous and self-determined in a way that identification reflects consciousness of valuing the regulation and the action is accepted as personally important. Finally, intrinsic regulation is regarded as the most autonomous form of motivation in which regulation is fully assimilated to the self.

It is important to explore how these forms of motivation might change across time for two reasons. First, empirical evidence concerning the general trend of motivational growth across the school year is valuable information for teachers and educational researchers for setting up more effective classroom environments fostering student motivation. Next, motivational changes over time may provide

![Figure 2. Theoretical foundation of motivational continuum (adapted from Ryan & Deci, 2000).](image_url)
information concerning critical moments during the school year when students experience a considerable drop in motivation. This information is important particularly because it gives an indication for teachers and educational researchers interested in designing intervention aiming at increasing student motivation. Literature shows that there seems to be a fairly strong agreement across research tradition that intrinsic motivation tends to decrease over time (Ahmed, 2010; Bouffard et al., 2003; Corpus, McClintic-Gilbert & Hayenga, 2009; Harter, 1981; Otis et al., 2005). On the other hand, the developmental trends of extrinsic motivation are rather inconclusive. Some studies report declining developmental paths (Otis et al., 2005; Ratelle et al., 2004), while others indicate increasing developmental trajectories (Anderman, Maehr, & Midgley, 1999; Harter, 1981). In addition, some studies also indicate fairly stable trends of extrinsic motivation across time (Harter, Whitesell, & Kowalski, 1992; Lepper et al., 2005).

However, it is also important to note that many of the studies mentioned above are based merely on single cross-sectional studies or across different academic years (between-years changes). Although some studies were conducted with a more longitudinal approach and within-year changes (i.e., Corpus et al., 2009; Skinner & Belmont, 1993), these studies incorporated not more than two measurement occasions within a school year (beginning and end of the school year). Hence, this might obstruct the accuracy of the developmental paths over time during a school year.

**Linking developmental changes of TSIR and academic motivation**

Some studies discuss an association between the development of student attitudes and teacher behaviour. Flanders et al. (1968) argue that a greater decrease in students’ attitudes was related to students’ perception of teacher provision of praise and encouragement. Ryan and Patrick (2001) argue that students who perceived their teacher as more supportive and promoting respect in their classes were associated with less engagement in disruptive behaviour compared to the year before. Skinner and Belmont (1993) indicate that students’ behavioural engagement is primarily a function of student perceptions of teacher structure and that students’ emotional engagement is influenced by teacher involvement. Similarly, Corpus et al. (2009) report that changes in motivation can partially be explained by classroom environment factors. Wentzel (2010) and Opdenakker and Maulana (2010) argue that classroom environment plays a significant role in understanding motivation and engagement among young adolescents. In addition, Freiberg (2010) stresses the importance of the interpersonal domain in teaching as he argues that kids learn only from teachers promoting healthy interpersonal relationships.

Other studies indicate the importance of several class, teacher, and student characteristics for academic outcomes, although the effects of some variables remain inconclusive. Among others, class type (ability grouping) and subject taught are regarded as important determinants. Opdenakker (2004) and Opdenakker and Van Damme (2001) report that a better learning environment is more associated with high-ability group students than other groups. Concerning subject taught, Levy, Wubbels, Den Brok, and Brekelmans (2003) report that science and mathematics teachers are often perceived less favourable compared to other subject teachers. Moreover, Opdenakker and Van Damme (2007) found that teacher gender is an important predictor of teacher classroom management: Male teachers tend to maintain classroom order better than their female colleagues. Van Petegem,
Creemers, Rossel, and Aelterman (2005) found that classroom leadership and friendliness are more associated with male than with female teachers. In addition, Cornelius-White (2007) found that person-centred teacher variables (i.e., empathy, warmth) are related more strongly with student outcomes for students with female teachers than for those with male teachers. Finally, student gender is another important determinant of classroom environments. Research recognizes that female students tend to rate their teachers more favourable than do their male peers (Levy et al., 2003; Rickards, 1998) and that the effect of teacher–student relationships on learning behaviour may be different for boys than for girls (Baker, 2006).

Based on a rather scarce literature that has documented general developmental declines in teacher–student relationships and student motivation across increasing age of schooling, we expect to discover a within-year decrease with respect to teacher–student interpersonal relationships as well as student motivation during the first year of secondary education. Although the predictive power of class and student characteristics remains unclear, we expect that some characteristics such as class type might explain, in part, differences with respect to the developmental trajectories of TSIR and academic motivation because differences with respect to classroom practice between homogeneous and heterogeneous classes are expected. Finally, we expect that the association between TSIR and academic motivation might exist (see Figure 3 for the hypothesized model). Based on relevant literature, teacher Proximity is expected to predict intrinsic motivation more than teacher Influence because teacher cooperation and warmth tends to promote students’ interest in learning, while the direction of relationships between Influence and Proximity and extrinsic motivation is indecisive (see the conceptual model).

Objectives

The present study was designed to address the following aims: (1) to explore the development of several aspects of TSIR in mathematics and English first-grade

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![Theoretical model of the dynamic link between teacher interpersonal behaviour and student academic motivation.](image_url)
classes within one school year and to explore the role of class type, subject taught, teacher gender, and student gender; and (2) to examine the association between the development of TSIR and the evolution in academic motivation across the school year. More specifically, investigation was focused on the development of teacher Influence and Proximity (from the perspective of teacher behaviour and perceived by students) and the development of academic motivation (controlled versus autonomous) of classes during the first year of secondary education.

Method

Participants

The participants of this study included 566 first-grade students (boys, n = 306; age: 11–13 years old) from 10 Mathematics and 10 English classes (homogeneous classes, n = 12) of three schools in the north of The Netherlands. Schools and classes within schools were randomly selected. The students were taught by eight mathematics and seven English teachers (male, n = 7). A total of 458 students completed the questionnaires on all occasions; the rest completed the questionnaires on some of the four occasions because they were removed to other classes or were absent on the days of data collection. One hundred and nine students of one school completed the questionnaires in the first and the last occasions only.

Measures

Teacher–student interpersonal relationship (TSIR)

The measure of TSIR is the short version of the Questionnaire on Teacher Interaction (QTI; Den Brok, Wubbels, Veldman, & Van Tartwijk, 2009). The items of the QTI refer to the eight sectors of behaviour that jointly make up the MITB. It is scored on the basis of eight sectors of two underlying dimensions. The measure consists of 50 items provided on a never (1) to always (5) response. Examples of the items include: “This teacher is friendly”, “This teacher is hesitant”, and “This teacher is strict”. The reliability of the scales across measurements was good; a range between .60–.62 (Student Freedom) and .85–.89 (Understanding) at the student level and .80–.89 (Student freedom) and .86–.98 (Uncertain) at the aggregated class level (see Table 1). Testing construct validity of this measure (with Mplus; Muthe´n & Muthe ´n, 1999) shows that a perfect circumplex model (two dimensions with circular ordering of the scales) fits the data reasonably well ($\chi^2/df = 182.91/26$ with $p = .00$; CFI = .99; TLI = .97; RMSEA = .06; SRMR = .003).

The general descriptive statistics of this measure (see Table 2) show that teachers are moderately positively dominant/controlling and positively friendly/cooperative, which is in accordance with earlier findings of larger studies (e.g. Brekelmans, Wubbels, & Den Brok., 2002; Den Brok et al., 2004; Den Brok, Brekelmans, & Wubbels, 2006).

Academic motivation

Academic motivation was measured by means of the questionnaire of motivational dimensions (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). The questionnaire
Table 1. Reliability results and mean scores of the QTI scales across measurements.

<table>
<thead>
<tr>
<th>Scale (sectors)</th>
<th>Time 1</th>
<th></th>
<th>Time 2</th>
<th></th>
<th>Time 3</th>
<th></th>
<th>Time 4</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Student</td>
<td>Class</td>
<td>M</td>
<td>Student</td>
<td>Class</td>
<td>M</td>
<td>Student</td>
<td>Class</td>
</tr>
<tr>
<td>DC Leadership</td>
<td>0.79</td>
<td>0.93</td>
<td>0.61</td>
<td>0.81</td>
<td>0.91</td>
<td>0.61</td>
<td>0.79</td>
<td>0.94</td>
</tr>
<tr>
<td>CD Helpful/Friendly</td>
<td>0.80</td>
<td>0.89</td>
<td>0.73</td>
<td>0.86</td>
<td>0.95</td>
<td>0.68</td>
<td>0.84</td>
<td>0.95</td>
</tr>
<tr>
<td>CS Understanding</td>
<td>0.85</td>
<td>0.95</td>
<td>0.70</td>
<td>0.88</td>
<td>0.96</td>
<td>0.68</td>
<td>0.87</td>
<td>0.94</td>
</tr>
<tr>
<td>SC Student Freedom</td>
<td>0.61</td>
<td>0.83</td>
<td>0.46</td>
<td>0.60</td>
<td>0.81</td>
<td>0.47</td>
<td>0.62</td>
<td>0.89</td>
</tr>
<tr>
<td>SO Uncertain</td>
<td>0.75</td>
<td>0.91</td>
<td>0.22</td>
<td>0.84</td>
<td>0.97</td>
<td>0.28</td>
<td>0.86</td>
<td>0.98</td>
</tr>
<tr>
<td>OS Dissatisfied</td>
<td>0.82</td>
<td>0.95</td>
<td>0.20</td>
<td>0.88</td>
<td>0.94</td>
<td>0.26</td>
<td>0.88</td>
<td>0.96</td>
</tr>
<tr>
<td>OD Admonishing</td>
<td>0.83</td>
<td>0.94</td>
<td>0.25</td>
<td>0.85</td>
<td>0.93</td>
<td>0.32</td>
<td>0.85</td>
<td>0.95</td>
</tr>
<tr>
<td>DO Strict</td>
<td>0.73</td>
<td>0.87</td>
<td>0.38</td>
<td>0.70</td>
<td>0.86</td>
<td>0.39</td>
<td>0.75</td>
<td>0.91</td>
</tr>
<tr>
<td>Influence</td>
<td>0.32</td>
<td></td>
<td>0.25</td>
<td></td>
<td>0.20</td>
<td></td>
<td>0.72</td>
<td></td>
</tr>
<tr>
<td>Proximity</td>
<td>1.10</td>
<td></td>
<td>0.89</td>
<td></td>
<td>0.70</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
is based on the academic self-regulation scale of Ryan and Connell (1989). This measure assesses students’ reasons for studying, which consists of 16 items and 4 items per scale. The scales include external motivation (i.e., “I study this subject because my parents ask me”), introjected motivation (i.e., “I study this subject because I would feel ashamed if I don’t do it”), identified motivation (i.e., “I study this subject because it’s personally important to me”), and intrinsic motivation (i.e., “I study this subject because I find it interesting”). The first two scales refer to a more controlled regulation style of motivation (“controlled motivation”), while the last two scales refer to a more autonomous regulation style of motivation (“autonomous motivation”). Participants indicated on a 5-point Likert scale ranging from 1 (completely not true) to 5 (completely true).

Internal consistencies, as indicated by Cronbach’s alpha (see Table 3), were good across measurements; external motivation, $\alpha = 0.75–0.80$; introjected motivation, $\alpha = 0.78–0.81$; identified motivation, $\alpha = 0.82–0.84$; and intrinsic motivation, $\alpha = 0.91–0.94$. Following Vansteenkiste et al. (2004), composite scores for controlled motivation ($\alpha = 0.81–0.84$) were constructed by averaging external and introjected motivation scales, and autonomous motivation ($\alpha = 0.87–0.90$) was generated from the average of identified and intrinsic motivation scales. Checks of validity of this measure were conducted in our previous study (Maulana, Opdenakker, Den Brok, & Bosker, 2011; Vansteenkiste et al., 2004) and show a good property of the measure.

Overall, descriptive statistics analyses on both types of motivation show that students’ controlled and autonomous motivations were moderate; students were slightly more autonomous than controlled across the school year (see Table 4).

Table 2. Descriptive statistics of teacher Influence and Proximity across measurements.

<table>
<thead>
<tr>
<th></th>
<th>$M$</th>
<th>$SD$</th>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influence</td>
<td>.21</td>
<td>.24</td>
<td>.28</td>
<td>1.08</td>
</tr>
<tr>
<td>Proximity</td>
<td>.77</td>
<td>.53</td>
<td>.59</td>
<td>1.97</td>
</tr>
</tbody>
</table>

Note: Dimension scores range between $-3$ and $+3$. These numbers represent the amount of dominance vs submissiveness and cooperation vs opposition, respectively. The range of scores is 0–0.5 (moderately positive), 0.5–1 (positive), and $>1$ (very positive) (see Den Brok et al., 2006).

Table 3. Reliability results of the QMD scales across measurements.

<table>
<thead>
<tr>
<th>Dimension/Scale</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled</td>
<td>0.81</td>
<td>0.81</td>
<td>0.84</td>
<td>0.82</td>
<td>0.84</td>
</tr>
<tr>
<td>– External</td>
<td>0.75</td>
<td>0.77</td>
<td>0.79</td>
<td>0.80</td>
<td>0.80</td>
</tr>
<tr>
<td>– Introjected</td>
<td>0.78</td>
<td>0.79</td>
<td>0.81</td>
<td>0.80</td>
<td>0.78</td>
</tr>
<tr>
<td>Autonomous</td>
<td>0.89</td>
<td>0.88</td>
<td>0.90</td>
<td>0.87</td>
<td>0.86</td>
</tr>
<tr>
<td>– Identified</td>
<td>0.82</td>
<td>0.83</td>
<td>0.84</td>
<td>0.83</td>
<td>0.84</td>
</tr>
<tr>
<td>– Intrinsic</td>
<td>0.93</td>
<td>0.92</td>
<td>0.94</td>
<td>0.93</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Note: $T0 =$ Measurement occasion 0, $T1 =$ Measurement occasion 1, $T2 =$ Measurement occasion 2, $T3 =$ Measurement occasion 3, $T4 =$ Measurement occasion 4.
Time, class type, subject taught, teacher gender, and student gender

Time is coded in accordance with the survey intervals (in months) as follows: 0 (baseline), 1.5 months, 4 months, 7 months, and 10 months. Class type is divided into two categories: homogeneous and heterogeneous classes. A score of “0” was assigned to a homogeneous class (corresponding to a high-ability track) in which all the students follow the same track. In theory, a homogeneous class consists of students following the same track ranging from the highest track called “Gymnasium” to the lowest track called “VMBO” (prevocational secondary education). However, in our sample “homogeneous” refers merely to gymnasium classes (highest track) and atheneum classes (second highest track). A score of “1” was assigned to a heterogeneous class (corresponding to a mixed-ability track) in which the students follow a curriculum which does not differentiate yet between two tracks. Based on the results the students will have on their exams at the end of the first year of secondary education, they will be assigned to the lower (VMBO) or the higher track (HAVO) in the second grade. In our sample, “heterogeneous” refers to VMBO-HAVO classes (lowest–second lowest track) and HAVO-Atheneum classes (second lowest track–second highest track). Because of this, the distinction between heterogeneity and homogeneity also includes a distinction between high- and low-track classes in our sample. Teacher and student gender are included in the analyses as dummy variables with “0” for males and “1” for females and “0” for boys and “1” for girls respectively.

Procedure

Surveys were conducted during regular mentor hours on five occasions (for QMD) and four occasions (for QTI) during the 2008–2009 school year. The first survey was administered in the beginning of autumn (early September) to capture students’ initial academic motivation when entering secondary education (baseline). Over a course of the school year, the measures were repeatedly administered. The second survey was conducted after 6 weeks of the school year (November). The third survey was administered after 16 weeks of the school year (February). The next survey was done after 28 weeks of the school year. The last survey was administered around 40 weeks of the school year (June), which is comparable to the duration of the school year in The Netherlands. Prior to beginning the survey, respondents were given comprehensive instructions for using the 5-point Likert scale.

Analytical approach

Multilevel growth curve modelling (with MLwiN; Rasbash, Charlton, Browne, Healy, & Cameron, 2005) was applied to investigate the development of TSIR as well as that of controlled and autonomous motivation. Models with three levels were

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Controlled</td>
<td>2.63</td>
<td>0.21</td>
<td>2.03</td>
<td>3.09</td>
</tr>
<tr>
<td>Autonomous</td>
<td>3.14</td>
<td>0.31</td>
<td>2.25</td>
<td>3.85</td>
</tr>
</tbody>
</table>
included: measurement occasion (Level 1), student (Level 2), and class (Level 3). The general development (teacher Influence and Proximity) and the deviation to this development at class and student level are the primary focus. In addition, the link between teacher Influence and Proximity as well as controlled and autonomous motivation over time were examined.

Often, students with missing data are removed from the analysis. In our study, however, all students were included in the analysis. Multilevel growth curve analysis can handle missing values. In the case of repeated measures data, individuals with missing responses can be incorporated in the analysis without any special procedures, provided they have at least one response and responses can be assumed missing at random. Our data met these two criteria.

Modelling approach was done in a stepwise manner, and all models were tested subsequently, starting from estimating empty models to adding components (linear to polynomial terms) to obtain adequate representations of the data. Differences in changes between classes and between students within classes were examined by introducing random effects of time. Next, determinants and predictors were added to the model. In the final model, only significant predictors at $p < .05$ and $p < .10$ were retained. Nonsignificant predictors were removed stepwise from the model starting from the highest to the lowest $p$ values. The fixed effects in the model were tested by using $t$ ratio coefficients, considering that an absolute $t$ value should be greater than $\pm 1.96$ ($p < .05$) or $\pm 1.64$ ($p < .10$) for a significant effect of a variable (Snijders & Bosker, 1999). The analytical strategy was applied separately for each of the measures.

**Results**

**Development of teacher Influence and Proximity over time**

Multilevel growth curve analyses show that differences between classes and between students within classes and differences during a school year with respect to changes in Influence and Proximity are noticeable (see Table 5). Results also show that Proximity seems to be less stable than Influence over time.

Examination of the mean trajectories of the two dimensions of interpersonal behaviour reveals a general declining pattern in the quality of teacher Influence and Proximity (see Figure 4). Moreover, results of multilevel growth curve analyses confirm that teacher Influence and Proximity decrease systematically over time (see Table 6). In addition, the growth curve indicates that the decrease in Proximity is more pronounced than in Influence over time. Supplementary analyses indicate that the decrease for Influence is best represented by a linear model, while the decrease for Proximity is best illustrated by a quadratic model. With respect to differences between classes, the results show that, assuming normality, the 95% interval

<table>
<thead>
<tr>
<th>Table 5. Distribution of the total variance over the class, student, and occasion levels (percentages).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class level</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Student level</td>
</tr>
<tr>
<td>Occasion level</td>
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</tbody>
</table>
contains negative as well as positive time effects. Recalculating the interval limits for a period of 40 weeks (10 months; corresponding to a regular school year), the 95% interval ranges for Influence between $7.10$ and $.4$ and for Proximity between $7.2.1$ and $7.96$. Hence, the differences in Proximity are estimated to be larger than those in Influence.

Furthermore, growth curve models indicate that differences with regard to Influence can be predicted by subject taught and student gender (see Table 7; Figure 5). Ratings on Influence in both subjects decrease systematically over time, but a steeper decrease is more noticeable in English as a foreign language (EFL) classes than in mathematics classes. The effect of student gender on Influence is also
significant. The result shows that girls perceive teacher Influence lower than do boys over time. However, an additional analysis reveals that the strength of the growth across time is relatively similar for both gender groups.

Developmental differences in Proximity can be explained by class type and teacher gender (see Table 7; Figure 5). During the first half of the school year, students in heterogeneous classes report lower scores on Proximity than do students in homogeneous classes. Across the school year, students’ ratings in both class types show a continuous decline. The linear trend of time associated with class type reveals that the decrease in homogeneous classes is steeper than in heterogeneous classes. Differences with regard to decelerated growths of both class types are visible: In heterogeneous classes, almost no deceleration is visible. The effect of teacher gender on Proximity is also negative. This means that Proximity is perceived lower in classes with female teachers than in those with male teachers. The interaction effect between time (linear and quadratic) and teacher gender indicates no significant differences concerning the decrease over time between male and female classes.

Table 7. Results of final multilevel models of the development of teacher Influence and Proximity over time with effects of predictor variables.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Teacher Influence ( (n = 1747) )</th>
<th>Teacher Proximity ( (n = 1761) )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
</tr>
<tr>
<td>Fixed effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.31917*</td>
<td>.07507</td>
</tr>
<tr>
<td>Time</td>
<td>-.01728*</td>
<td>.00746</td>
</tr>
<tr>
<td>Time²</td>
<td>.01636*</td>
<td>.00723*</td>
</tr>
<tr>
<td>Subject taught</td>
<td>.12261</td>
<td>.10530</td>
</tr>
<tr>
<td>Time × Subject taught</td>
<td>-.01885°</td>
<td>.01055</td>
</tr>
<tr>
<td>Class type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time × Class type</td>
<td>.27146*</td>
<td>.11015</td>
</tr>
<tr>
<td>Student gender</td>
<td>-.07039*</td>
<td>.02209</td>
</tr>
<tr>
<td>Teacher gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time × Teacher gender</td>
<td>.10974</td>
<td>.09771</td>
</tr>
<tr>
<td>Time² × student gender</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Random effect

Level 3 variance (class)

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.04913</td>
<td>.01753</td>
</tr>
<tr>
<td>Intercept × Time</td>
<td>-.00235</td>
<td>.00142</td>
</tr>
<tr>
<td>Time</td>
<td>.00040</td>
<td>.00017</td>
</tr>
<tr>
<td>Intercept × Time²</td>
<td>-.00292</td>
<td>.00186</td>
</tr>
<tr>
<td>Time × Time²</td>
<td>-.00196</td>
<td>.00092</td>
</tr>
<tr>
<td>Time²</td>
<td>.00015</td>
<td>.00007</td>
</tr>
</tbody>
</table>

Level 2 variance (student)

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.05288</td>
<td>.01201</td>
</tr>
<tr>
<td>Intercept × Time</td>
<td>-.00326</td>
<td>.00153</td>
</tr>
<tr>
<td>Time</td>
<td>.00049</td>
<td>.00025</td>
</tr>
</tbody>
</table>

Level 1 variance (Occasion)

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual</td>
<td>.10170</td>
<td>.00539</td>
</tr>
</tbody>
</table>

Deviance

| Teacher Influence | 1507.98 |
| Teacher Proximity | 3672.65 |

\*p < .05; \*\*p < .10. The final models for Influence and Proximity are the parsimonious models in which only significant variables at \( p < .05 \) and \( p < .10 \) were retained. Nonsignificant variables were excluded stepwise from the model starting with the ones with the highest \( p \) values.
Figure 5. The developmental trajectories of teacher Influence and Proximity according to subject taught, class type, teacher gender, and student gender based on best-fitted multilevel models.
Development of academic motivation over time

Results of multilevel analysis on the investigation of academic motivation reveals that there are differences between classes, between students within classes, as well as between occasions across time (see Table 8).

Results on descriptive statistics with regard to the general trajectories of mean (raw scores) reveal that controlled motivation increases whilst autonomous motivation decreases over time (see Figure 6). The trajectory of controlled motivation shows stability (almost no change) during the first 4 months of the school year, and it continues to increase afterwards. In contrast, the developmental pattern of autonomous motivation shows a continuous decrease over time.

There is evidence that controlled motivation increases over time (see Figure 6 for the illustration of general trajectory and Table 9 for the multilevel analysis results). The effect of time on controlled motivation is linear. Differences between classes as well as between students within classes are found with respect to the linear trend. Inspection of the differences between classes concerning the linear trend reveals that, assuming normality, the 95% confidence interval includes only positive effects of time. Estimating the interval limits for a period of 40 weeks (10 months; comparable to a regular school year) based on the model with only time effect, the 95% interval varies from .07 to .23.

Teacher gender, student gender, and subject taught do not explain differences in controlled motivation (between classes), but class type does. Students in heterogeneous classes report higher controlled motivation than do their peers in homogeneous classes over time (see Figure 7). The interaction effect between time and class type indicates a (small) linear growth in homogeneous classes and almost no change in heterogeneous classes. Interestingly, although each class type indicates different levels of controlled motivation at the start of the school year, both class

<table>
<thead>
<tr>
<th></th>
<th>Controlled motivation</th>
<th>Autonomous motivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class level</td>
<td>3%</td>
<td>2%</td>
</tr>
<tr>
<td>Student level</td>
<td>39%</td>
<td>29%</td>
</tr>
<tr>
<td>Occasion level</td>
<td>59%</td>
<td>69%</td>
</tr>
</tbody>
</table>

Figure 6. General raw trajectories of controlled and autonomous motivation during the first year of secondary education (raw scores).
types report a similar level of controlled motivation at the end of the school year. Differences in controlled motivation are not linked with differences in teacher interpersonal behaviour (see Table 9). The results show that teacher Influence and Proximity do not significantly explain differences in controlled motivation over time.

With respect to within-year changes in autonomous motivation (see Figure 6 for the general trajectory and Table 10 for multilevel analyses results), it is found that autonomous motivation decreases systematically over time. Moreover, the growth across the year is curvilinear. Evidence is found for small differences between classes and between students within classes regarding the linear trend. Examination of the linear effect of time on differences between classes based on the model with only time effect included shows that, assuming normality, the 95% confidence interval consists of negative time effects. The estimate of the interval limits across the school year with the 95% interval ranges between \(-1.5\) and \(-.7\). This indicates rather moderate between-class differences over time.

Differences in autonomous motivation are associated with differences in teacher interpersonal behaviour. About 9% of the total variance in autonomous motivation can be explained by differences in teacher–student interpersonal relationships\(^2\) over time. Teacher Influence and Proximity explain 59% of the variance at class level, 24% of the variance at student level, and no variance at the occasion level. Additional analyses reveal that teacher Proximity alone has a significant unique effect on autonomous motivation, while the effect of teacher Influence is only significant in the absence of teacher Proximity. About 2% of the variance represents a joint effect of the two dimensions on autonomous motivation.

Table 9. Results of multilevel models of the development of controlled motivation over time.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>2.47814*</td>
<td>.05646</td>
<td>2.42600*</td>
<td>.06247</td>
</tr>
<tr>
<td>Time</td>
<td>.02417*</td>
<td>.00534</td>
<td>.03357*</td>
<td>.00744</td>
</tr>
<tr>
<td>Class type</td>
<td>.22250*</td>
<td>.08226</td>
<td>.30420*</td>
<td>.07881</td>
</tr>
<tr>
<td>Time \times Class type</td>
<td>-.02322*</td>
<td>.00837</td>
<td>-.03551*</td>
<td>.01068</td>
</tr>
<tr>
<td>Influence</td>
<td>-.05240</td>
<td>.04738</td>
<td>-.05240</td>
<td>.04738</td>
</tr>
<tr>
<td>Proximity</td>
<td>.01429</td>
<td>.02496</td>
<td>.01429</td>
<td>.02496</td>
</tr>
<tr>
<td>Random effect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Level 3 variance (class)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.01434</td>
<td>.00857</td>
<td>.00000</td>
<td>.00000</td>
</tr>
<tr>
<td>Intercept \times Time</td>
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<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
</tr>
<tr>
<td>Time</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
</tr>
<tr>
<td>Level 2 variance (student)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.35996</td>
<td>.03334</td>
<td>.41201</td>
<td>.05431</td>
</tr>
<tr>
<td>Intercept \times Time</td>
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<td>.00361</td>
<td>-.02113</td>
<td>.00639</td>
</tr>
<tr>
<td>Time</td>
<td>.00328</td>
<td>.00058</td>
<td>.00364</td>
<td>.00100</td>
</tr>
<tr>
<td>Level 1 variance (Occasion)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual</td>
<td>.32179</td>
<td>.01276</td>
<td>.33786</td>
<td>.01916</td>
</tr>
<tr>
<td>Deviance</td>
<td>5051.34</td>
<td>3666.50</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*\(p < .05\); The random effects of time and time quadratic are extremely small (close to zero) because the display precision in the models is restricted to 5 digits after the decimal point.
Figure 7. The developmental trajectories of controlled and autonomous motivation according to subject taught, class type, and student gender based on best-fitted multilevel models.
Furthermore, teacher gender is not associated with differences in autonomous motivation, but subject taught, class type, and student gender are (see Table 10). In general, students report that they are more autonomously motivated in EFL classes compared to homogeneous classes over time. No significant interaction effect with time is found for subject taught. Students in heterogeneous classes report lower autonomous motivation than do their peers in homogeneous classes over time. The interaction effect between time and class type indicates that the decrease in autonomous motivation over time is more pronounced for students in homogeneous classes compared to those in heterogeneous classes. Although autonomous motivation in both class types is reported at different rates at the beginning of the school year, it is reported at about the same rates at the end of the school year. With regard to the effect of student gender, the results show that girls report higher autonomous motivation than do boys over time. In addition, the interaction effect

### Table 10. Results of multilevel models of the development of autonomous motivation over time.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Autonomous Motivation (n = 2309)</th>
<th>Autonomous motivation with TSIR, class type and student gender (n = 1587)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>SE</td>
</tr>
<tr>
<td>Fixed effect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>3.35339*</td>
<td>.07445</td>
</tr>
<tr>
<td>Time</td>
<td>−.13322*</td>
<td>.01909</td>
</tr>
<tr>
<td>Time²</td>
<td>.00839*</td>
<td>.00181</td>
</tr>
<tr>
<td>Subject taught</td>
<td>.13190</td>
<td>.06803</td>
</tr>
<tr>
<td>Class type</td>
<td>−.23247*</td>
<td>.08209</td>
</tr>
<tr>
<td>Time × Class type</td>
<td>.08991*</td>
<td>.02989</td>
</tr>
<tr>
<td>Time² × Class type</td>
<td>−.00742*</td>
<td>.00292</td>
</tr>
<tr>
<td>Student gender</td>
<td>.21387*</td>
<td>.06962</td>
</tr>
<tr>
<td>Time × Student gender</td>
<td>−.02508*</td>
<td>.00887</td>
</tr>
<tr>
<td>Influence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proximity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Random effect

**Level 3 variance (class)**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.00543</td>
<td>.00781</td>
<td>.01132</td>
<td>.00766</td>
</tr>
<tr>
<td>Intercept × Time</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
</tr>
<tr>
<td>Time</td>
<td>.00180</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
</tr>
<tr>
<td>Intercept × Time²</td>
<td>.00006</td>
<td>.00009</td>
<td>.00000</td>
<td>.00000</td>
</tr>
<tr>
<td>Time × Time²</td>
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<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
</tr>
<tr>
<td>Time²</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
</tr>
</tbody>
</table>

**Level 2 variance (student)**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>.43292</td>
<td>.04144</td>
<td>.36649</td>
<td>.15376</td>
</tr>
<tr>
<td>Intercept × Time</td>
<td>−.02892</td>
<td>.00460</td>
<td>−.05463</td>
<td>.06154</td>
</tr>
<tr>
<td>Time</td>
<td>.00118</td>
<td>.00069</td>
<td>.00005</td>
<td>.02945</td>
</tr>
<tr>
<td>Intercept × Time²</td>
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</tr>
<tr>
<td>Intercept × Time²</td>
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<td>.00000</td>
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</tr>
<tr>
<td>Time × Time²</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
<td>.00000</td>
</tr>
</tbody>
</table>

**Level 1 variance (Occasion)**

<table>
<thead>
<tr>
<th></th>
<th>Coefficient</th>
<th>SE</th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual</td>
<td>.41772</td>
<td>.01662</td>
<td>.37189</td>
<td>.03248</td>
</tr>
<tr>
<td>Deviance</td>
<td>5402.02</td>
<td>3705.45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: *p < .05; 8p < .10. The random effects of time and time quadratic are extremely small (close to zero) because the display precision in the models is restricted to 5 digits after the decimal point.
between time and student gender indicates that the decrease of autonomous motivation for girls is more pronounced than for boys over time.

**Discussion and conclusions**

The study reveals several important findings that could arguably be of scientific and practical educational importance. Firstly, the results show that teacher Influence and Proximity decrease over time, with Proximity showing a more pronounced decline than Influence. As the literature indicates that a higher degree of teacher Influence and Proximity corresponds to better student outcomes, this finding suggests a potential deterioration of the current learning environment. This finding supports earlier research on developmental paths of classroom environments (Brekelmans, 1989; Evertson & Veldman, 1981; Mainhard, 2009). Based on a personal communication between the first author and several teacher participants, the decline related to the two interpersonal dimensions found during the first year of secondary education seems to suggest that, although many teachers try to accommodate students’ needs of substantial guidance and interpersonal involvement, the teachers may not realize that the provisions of satisfaction of these needs are decreasing over time, which is reflected in students’ perceptions. It may also be that many teachers do not realize that student motivation is decreasing, so they pay inadequate attention to maintaining (and increasing) interpersonal relationships over time. A more detailed research is needed to scrutinize whether this assumption makes sense.

Secondly, differences concerning the decrease in Proximity can be explained partly by class type and teacher gender. The decrease in teacher Proximity is more associated with homogeneous classes than heterogeneous classes. It seems that the more pronounced decrease in Proximity in homogeneous classes is related, to some degree, to a more self-regulated learning strategy applied in their classrooms. Some teachers of this class type in our study indicated that their students have good effort-regulated learning and that teachers are oriented to provide adequate challenges through instruction in order to keep students’ interest in learning.

This class will keep learning even if I have to leave them alone during the lesson. What I need to do is to give them (students) tasks and to let them know when they have to finish the task. I think they are quite motivated. (A Math teacher, personal communication, April 2009).

Perhaps, some teachers have focused too much on keeping students on tasks and have (unconsciously) neglected the interpersonal relationships (i.e., less involvement and less individual contacts) with their students over time. Surprisingly, Proximity is perceived lower in female teacher classes than in male classes. This indicates that cooperation/friendliness is associated more with male teachers, which contradicts previous research findings (Cornelius-White, 2007), while female teachers are possibly seen to be stricter. Moreover, subject taught and student gender can explain differences in teacher Influence. The level of teacher Influence seems to decrease more significantly in EFL classes compared to that in mathematics classes. In addition, girls perceive teacher Influence lower than do boys, although the strength of the growth across time is about similar for both genders.

Thirdly, it is found that controlled motivation, although small but significant, increases while autonomous motivation decreases across the school year. The decrease in autonomous motivation is more pronounced than the increase in
controlled motivation over time. Our finding that controlled motivation increases over time is in accordance with earlier studies on extrinsic motivation (Anderman et al., 1999; Harter, 1981), while the decreasing trend of autonomous motivation is in line with other distinct theoretical traditions regarding intrinsic motivation (Bouffard et al., 2003; Corpus et al., 2009; Eccles, Wigfield, & Schiefele, 1998; Harter, 1981; Otis et al., 2005). Class type can partly explain differences in the development of controlled motivation over time. Students in heterogeneous classes have somewhat higher controlled motivation than their peers in homogeneous classes. A small but significant decline in controlled motivation is evident in heterogeneous classes across time, whereas in homogeneous classes a small increase across time is visible. This suggests that students in homogeneous classes, at least in our sample, feel continuously more controlled in learning than their peers in heterogeneous classes over time, which requires more attention in the future if we are to prevent these students from suffering from detrimental effects of controlled motivation, as recognized by SDT. With respect to autonomous motivation, both class type and student gender can explain differences in the trajectory of autonomous motivation over time. In general, students in heterogeneous classes in our sample report lower autonomous motivation than those in homogeneous classes. However, the trajectory of autonomous motivation in homogeneous classes shows a steeper decrease over time than in heterogeneous classes, with a slight increase at the end of the school year. This small increase of autonomous motivation is probably related to teacher provision of (positive) encouragement. For example, teachers encourage students to put more efforts in learning during the first grade, and especially during the second semester of the school year, to keep in the high track and avoid to be downgraded to the lower track. Although their motivation may be more or less driven partly by external reasons in the beginning, they manage to internalize their motivation before the school year ends.

I [the teacher] always continuously encourage them [students] to maintain and improve their learning and tell them the consequence of not doing so. There is a big chance that a few students in this class will be sent to a lower track in the next school year. (An EFL teacher, personal communication, June, 2009).

Our findings seem to suggest that what is happening in homogeneous classes across the school year is less favourable compared to that in heterogeneous classes in terms of TSIR and motivational qualities. The increase in controlled motivation and the decrease in autonomous motivation experienced by homogeneous classes show faster rates over time. In addition, the decrease in teacher Proximity in homogeneous classes shows a much faster rate than that in heterogeneous classes, indicating a more problematic classroom relationship and its negative consequences for student motivation in this high-ability group. Furthermore, girls report higher autonomous motivation than boys. However, the decrease in autonomous motivation for girls is steeper than that for boys. This is probably related to the decrease in teacher Proximity over time. Previous research shows that girls may benefit more from close relationships with the teacher because Proximity is more reliable with girls’ orientations toward intimacy and connection in social relationships (Maccoby, 1998). By contrast, boys may generally accept conflict-related relationships more than girls (Ewing & Taylor, 2009).

Finally, the development of teacher Influence and Proximity is linked with that of student autonomous motivation. The development of controlled motivation cannot
be predicted by the development of teacher Influence nor teacher Proximity. In this regard, controlled motivation can arguably be more associated with other classroom environment factors such as peer relationships or parental involvement. Prior research indicates that students’ experience of peer relationships is positively related to students’ sociocognitive development (Krappmann, Oswald, Weiss, & Uhlendorf, 1993; Selman, 1980) and that parental involvement is related to student achievement (LaBahn, 1995; Turner, Nye, & Schwartz, 2004). In contrast, the development of both teacher Influence and Proximity significantly predicts the development of autonomous motivation over time, although the effect of teacher Proximity overwhelms the effect of teacher Influence. It seems that a smaller decline in Proximity can be a protective factor for the decline in autonomous motivation (and perhaps the increase in controlled motivation). The results suggest that the higher teacher Influence and Proximity across time, the better student autonomous motivation will likely be. The (small) positive effect of Influence on autonomous motivation is possibly related to teacher provision of guidance in learning. Students need a certain amount of control/leadership from their teachers but not too much, otherwise it will become a threat to the need to be autonomous. The more pronounced effect of teacher Proximity on autonomous motivation, on the other hand, is expected because autonomous motivation is likely to be promoted when students experience sufficient provisions of involvement (feel related), feel more secure about the learning environment, and engage in more challenging tasks, which is recognized by SDT (Opdenakker & Maulana, 2010; Skinner & Belmont, 1993).

This study is subject to possible limitations. First, although the study employs a multiple occasion measurement with a relatively large number of students, the amount of classes and teachers is rather limited. This may hamper the accuracy of the estimates of the between-class variations, which makes it rather tricky for generalization purposes. Hence, the findings should be interpreted with caution and should be replicated in larger samples. Next, one may expect that the observed changes of some variables in this study are probably caused by, to some extent, the regression towards the mean effects. Although there is no guarantee that this doubt is erroneous, an examination of the scatter plot of changes, as suggested by Barnett, Van der Pols, and Dobson (2005), does not seem to support the appearance of this phenomenon. In addition, the application of multiple occasion measurements and multilevel modelling may diminish this undesirable effect (Nesselroade, Stigler, & Baltes, 1980). Further research should incorporate more measurement occasions with larger samples and apply another advanced statistical technique such as multivariate multilevel latent growth curve modelling.

In conclusion, the findings of the study suggest a significant advance in our understanding of classroom environments and student academic motivation concerning their development in context as well as the role of TSIR in academic motivation during the first year of secondary education. Hence, this study suggests challenges for teachers and educational practitioners to be more aware of their behaviour and pay more attention to their interpersonal approach fostering student motivation. Explicitly, more attention is needed for homogeneous classes, as we found evidence, at least in our sample, for less favourable TSIR quality and motivational outcomes in this particular group, in order to prevent them from a detrimental socioemotional development and a negative image of their schooling period. Moreover, the longitudinal approach designed in this study represents more dynamic assessments of within-year changes of TSIR and academic motivation, the only study tracking “true” developmental changes.
in the field that is known to the authors until now. Recognition of the idea that motivation is not a stable characteristic and is linked to the learning environment context is supported. Finally, our findings demonstrate that teacher control and friendliness, to some extent, promote student learning for their own sake. The efforts to encourage persistence are suggested.

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Notes
1. The first and the second author contributed equally to this paper.
2. The calculation of the percentages of explained variance is based on the multilevel model with time (linear) and time² (quadratic) as fixed effects and on Influence and Proximity included. Teacher Influence explains 2% of the variance and teacher proximity 9%.

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