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Relationships between teacher practices in secondary education and first-year students' adjustment and academic achievement

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Abstract

To ease the transition to university, preparation in secondary school is often seen as a first step. This study investigated longitudinal relationships between teacher practices in secondary education (i.e., emotional support, autonomy support, and student-centred teacher practices) and first-year students' academic achievement and social and emotional adjustment at university. We focused on students' perceptions of their teachers' practices to, on the one hand, take individual differences into account and, on the other hand, to investigate differences in teacher practices between schools. In a three-wave longitudinal study, 235 students were followed from their final year of secondary school to the end of the first year at university. The results indicated that teacher practices related to students' social and emotional adjustment across the transition to university, but not to their academic achievement. Specifically, we found that perceived teachers' emotional support was related to students' social adjustment at university whereas autonomy support was associated with emotional adjustment. Differences in teacher practices between schools were quite small. This study indicated that teachers in secondary education might play a pivotal role in preparing students for university. This role goes beyond preparing students for academic achievement, as teachers may have a long-term impact on first-year students' social and emotional adjustment.

Keywords: Student success; Transition from secondary to university education; University preparation; Longitudinal study

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1. Introduction

By starting a university study, students leave their familiar secondary school to enter a new life-sphere in which they are faced with several academic, social, and intrapersonal changes inherent to university life. Most students are well able to deal with those changes, but for a substantial number of students this is not the case. A longitudinal study with first-year students in the United Kingdom showed that 60% found it hard to get used to their new university life when they just made the transition (Nightingale et al., 2013). Most of these students felt better adjusted after three months in the first year, but a group of 31% remained poorly adjusted even six months after starting their first year. Those students also demonstrated low academic achievement in the first year. Postareff, Mattsson, Lindblom-Ylanne, and Hailikari (2016) interviewed Finnish students about their experiences in the first year and found that almost 50% of them experienced negative emotions such as feeling tired, stressed out, and overwhelmed by their studies. A subset of these students (17% of the total sample) also demonstrated poor academic achievement. These adjustment and achievement difficulties are worrying because multiple studies have shown that students' first-year experiences are associated with their future psychological well-being and academic pathway (e.g., Allen & Robbins, 2008; Crede & Niehorster, 2012).

To ease the transition to university, preparation in secondary education is often seen as an important first step (Conley, 2010; Noyens, Donche, Coertjens, Van Petegem, 2017). Thus far, extensive research has shown that it is important 'how' first-year students enter university, for example with which secondary school grades and learning skills (see for an overview, e.g., Richardson, Abraham, & Bond, 2012). However, it is largely unknown how students are prepared for university in secondary schools and how that relates to their achievement and adjustment at university. Our study contributes to this literature by exploring how teacher practices in secondary education are associated with students' achievement and adjustment at university. In the current research, we adopted the Self-Determination Theory (SDT; Deci & Ryan, 1985, 2000) to explore whether teacher practices in secondary education that provide relevant conditions for students' basic psychological need-satisfaction can lead to better academic achievement, and social and emotional adjustment in the first year at university.

1.1 Outcomes in university: First-year student academic achievement and adjustment

In the current policy and research discourse on the effects of higher education, it is common to equate student success primarily with academic achievement. This tradition is driven by a neo-liberal view of education accompanied by a strong emphasis on accountability, efficiency, and performance (Glastra & van Middelkoop, 2018; Zajda & Rust, 2016). In this study, we focused on students' grade point average (GPA) as a measure of their academic achievement. Traditionally, this is the most commonly used indicator of academic achievement (e.g., Caskie, Sutton, & Eckhardt, 2014; Robbins et al., 2004), which is found to predict students' educational attainment and persistence throughout university (e.g., Allen & Robbins, 2008; García-Ros, Pérez-González, Cavas-Martínez, & Tomás, 2019).

First-year student success might not only be defined in terms of performance. As described by Evans, Forney, Guido, Patton, and Renn (2010) and Mayhew et al. (2016) in their books on college student development, psychosocial theories can help to understand how students' feelings, behaviours, and relationships change at university. The transition to university not only entails academic challenges (e.g., working more independently and regulating their own learning), but also social (e.g., meeting new people) and intrapersonal challenges (e.g., increasing responsibility and developing a student identity; Gale & Parker, 2014). Students should be able to manage these challenges in order to successfully adjust to the university environment. Most research on university adjustment is based on the work of Baker and Siryk (1989) who defined emotional adjustment as the level of psychological (e.g., worries) and physical distress (e.g., headaches), and social adjustment as how well students are able to deal with the social demands of university life (Credé & Niehorster, 2012).

As suggested by Credé and Niehorster (2012) and Robbins et al. (2004), some researchers see students' social and emotional adjustment as important university outcomes on their own while others see them as key determinants of students' academic achievement. A previous meta-analysis points to small relationships between students' social and emotional adjustment and academic achievement (Credé & Niehorster, 2012). Additionally, in an earlier review study, we found that high social and emotional adjustment does not necessarily relate to high academic achievement in the first year (van der Zanden, Denessen, Cillessen, & Meijer, 2018). As such, we see both outcomes as desirable and valued outcomes in their own right.

1.2 Preparing students for university in secondary education

Preparation is argued to be very important in order to support students to successfully make the transition to university (Conley, 2010; Kyndt, Donche, Trigwell, & Lindblom-Ylänne, 2017). In the Netherlands, the pre-university track of secondary education plays a major role in this preparation. Previous studies have already focused on what teachers in secondary education do to prepare students for university. Based on interviews with Dutch secondary school teachers, Van Rooij and Jansen (2018) found that teachers aimed to prepare students for university by talking with them about specific degree programmes and studying in general, and promoting their study skills, research skills, attitude of inquiry, and independence. Further, for the United States Conley (2010) showed that teachers from schools that are successful in preparing students for university contribute to students' cognitive strategies (e.g., problem solving), self-management skills, and academic behaviours (e.g., task prioritising) in their lessons.

Although the abovementioned studies showed ways in which teachers can contribute to student university preparation, they provide limited insight into long-term relationships between teachers' practices in *secondary education* and students' academic achievement and adjustment at *university*. In the current research, we aimed to expand the scope of previous research by adopting the Self-Determination Theory (SDT; Deci & Ryan, 1985, 2000) to explore whether teachers' practices in secondary education that provide relevant conditions for students' basic psychological need-satisfaction can lead to better adjustment and achievement at university. In this regard, the transition is seen as an ongoing process (i.e., instead of a single event) which unfolds over time and across school contexts (Ellerbrock & Kiefer, 2013).

According to the SDT, fulfilment of students' basic psychological needs of autonomy (i.e., perceiving one's behaviours as originating from the self), competence (i.e., being able to produce important outcomes), and relatedness (i.e., developing meaningful relationships with others) contributes to higher intrinsic motivation and better learning (Deci & Ryan, 1985; Niemiec & Ryan, 2009). Teachers can play a key role in supporting students' needs, and thereby contributing to students' learning and development (Niemiec & Ryan, 2009). In line with previous studies that adopt a SDT approach in relation to educational transitions (e.g., Ellerbrock & Kiefer, 2013; Madjar & Cohen-Malayev, 2016), we assumed that school contexts that meet students' needs promote a smooth transition from one school context to the next. Applied to the transition to university, this means that when students' needs for autonomy, competence, and relatedness are met in secondary education, students can already develop dispositions (i.e., more positive learner identities, self-confidence, and autonomous motivation) that are relevant for university education. In this way, it might be easier for students to adjust to the university environment as they can rely on them at university. Teachers in secondary education can foster students' needs in various ways. Based on the SDT, we focused in the current study on the following three teacher practices: Emotional support, autonomy support, and student-centred teaching. In the next paragraphs, we describe these teacher practices and how they relate to dispositions that might be useful at university more elaborately.

1.2.1. Teachers' emotional support

SDT posits that to support students' basic psychological needs, and the need for relatedness in particular, it is important that teachers provide emotional support to students (Niemic & Ryan, 2009). This refers to the extent to which teachers show affection, express their understanding, dedicate resources (e.g., aid, time), and are available in case of need (Stroet, Opdenakker, & Minnaert, 2013). Previous studies have shown that student perceptions of teachers' emotional support not only contributed to their actual engagement in learning, motivation, and achievement (see the reviews of Roorda, Koomen, Spilt, & Oort, 2011; Stroet et al., 2013), but might also have a lasting effect across a school transition (e.g., Langenkamp, 2010). Focused on the transition from middle to high school, Langenkamp (2010) found that positive relationships with middle school teachers prevented students from failing courses in the first year at high school. She explained that teachers' emotional support before the transition might foster students' love of learning and skills to find similar teacher relationships in the new school environment which might influence students' academic achievement afterwards.

1.2.2. Teachers' autonomy support

Teachers can also support students' needs according to SDT by providing autonomy support (Niemiec & Ryan, 2009; Stroet et al., 2013). This entails encouraging students to pursue their own goals and providing students with choice and freedom in study activities or giving a rationale when choice is constrained. Additionally, autonomy-supportive teachers use inviting language (e.g., 'you can') instead of controlling language (e.g., 'you should') and try to avoid explicit rewards and punishments. Several studies have shown that autonomy support positively related to students' academic achievement and well-being, for example, among Norwegian secondary school students (Diseth & Samdal, 2014) and university students (Ljubin-Golub, Rijavec, & Olčar, 2020). Further, it contributes to the development of dispositions among secondary school students that are highly valued in university environments such as academic efficacy and mastery goal orientation (Kenny, Walsh-Blair, Blustein, Bempechat, & Seltzer, 2010) and self-regulated learning (Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009). Additionally, in a recent study with university students, Hernández, Moreno-Murcia, Cid, Monteiro, & Rodrigues (2020) found that perseverance mediated the relationship between perceived autonomy supportive behaviours by teachers and academic achievement. It seems that if students perceived their teachers as autonomy-supportive they demonstrate a stronger desire to endorse in self-regulated behaviours and to complete quality work, which results in higher academic achievement.

1.2.3. Student-centred teaching

Student-centred teaching refers to practices in which the teacher is the facilitator of the learning process, characterized by the stimulation of knowledge construction, cooperative work, authentic assignments, and opportunities for self-regulated learning (Prosser & Trigwell, 1999). Need-supportive teaching behaviours share theoretical notions with a constructivist, student-centred approach to teaching (e.g., Stroet, Opdenakker, & Minnaert, 2015; Cents-Boonstra, Lichtwarck-Aschoff, Denessen, Aelterman, & Haerens, 2020). For example, Stroet et al. (2015) found that in constructivist student-centred classrooms teachers more often provided individual guidance to students, helped students in directing their learning processes, fostered the relevance of learning activities, and did not express their dissatisfaction.

A basic assumption in the approaches to teaching literature (Trigwell, Prosser, and Taylor, 1994) is that approaches to teaching influence students' learning approaches and their subsequent learning outcomes. Previous research (e.g., Beausaert, Segers, & Wiltink, 2013) has shown that student-centred teaching stimulated students to adopt a deep approach to learning, which is characterized by the search for meaning in a task and an intrinsic motive to attain understanding. This learning approach is often advocated as most appropriate for learning in higher education (e.g., Vanthournout, Gijbels, Coertjens, Donche, & Van Petegem, 2012). Research on the relationship between this type of learning and academic achievement have shown contradictory results. Nonetheless, studies have generally found a positive and weak relationship between a deep approach to learning and students' academic achievement (see for literature overviews, e.g., Richardson et al., 2012; Watkins, 2001). Further, Torenbeek, Jansen,

and Hofman (2011a) studied how the teaching approach at secondary school corresponded to the teaching approach at university, and how that related to the academic achievement of first-year students. They only found positive results when teaching at university was a bit more student-centred (i.e., teacher exerts less control) than in secondary school. When students joined a university program with less student-centred teaching than in secondary education, their academic achievement was lower. Additionally, related to students' emotional adjustment, applying a deep approach to learning related to less study-related stress (Asikainen, Salmela-Aro, Parpala, & Katajavuori, 2019).

1.3 Present study

The aim of our study was to explore longitudinally how specific teacher practices in secondary education related to first-year university students' adjustment and achievement. The following research question was addressed: How do students' perceptions of teachers' emotional support, autonomy support, and student-centred teaching in secondary education relate to students' academic achievement, and social and emotional adjustment in the first year at university? Hereby we focused on students' perceptions of their secondary education teachers' practices because previous research suggests that how students perceive their teachers' practices, rather than the practices themselves, affect their learning and development (Prosser & Trigwell, 1999). This also enabled us to investigate individual differences in students' perceptions, while, at the same time, allowed an examination of the degree of consensus among students from the same school about their teachers' preparation practices. Herewith, the study combined two levels of diversity needs as it is located at the boundary of the micro-level of student variability and the meso-level of the learning environment in secondary education. The innovative character of this study consists of moving beyond the individual by considering the role of secondary education teachers in the transition to university. Further, it used a longitudinal design with three measurement moments across the transition from secondary school to university.

2. Method

2.1 Transition to university in the Netherlands

In the Netherlands, secondary education is divided into different levels, namely pre-vocational secondary education, senior general secondary education, or pre-university education. Around the age of 12, students with the highest achievement levels are tracked in the pre-university level of secondary education. Normally, this track takes six years to complete (grade 7 to 12), but the actual duration may differ if students resit or skip classes or enrol after they have already completed senior general secondary education. Graduating from the pre-university track—consisting of both school and mandatory national examinations—grants direct access to degree programmes at research universities[1]. Additionally, most universities are public institutions with standard tuition fees determined by the Ministry of Education, Culture and Science (Nuffic, 2015). In 2016, 75% of the pre-university students directly made the transition to university after graduating (VSNU, 2017). The other students enrolled at professional higher education or did not enrol in post-secondary school education.

2.2 Sample

Eight schools in the south-east of the Netherlands participated in our study. Data were collected at the end of students' final year at secondary school (Time1, April 2016), two months after their transition to university (Time2, November 2016), and after finishing the first year at university (Time3,

[1] Some degree programmes have additional requirements such as compulsory courses in pre-university education or additional admittance policies (e.g., medicine).

October 2017). At Time1, 496 grade 12 students (51% female, ± 18 years of age) participated. Of these 496 students, 54 students indicated that they were not enrolled in university education after obtaining their secondary school degree. Of the remaining 442 students, 314 students (57% female) completed the questionnaire at Time2. These students started their studies in 19 different cities at 21 different educational institutions: 93% of the participants entered a research university and 7% enrolled at professional higher education. Four students went to study abroad and were not included in the analyses. We did not find differences between students who did and did not participate at Time2 on the secondary school they attended, educational profile in secondary school, and social and emotional adjustment in secondary school. At Time3, 235 students participated (61% female). Of these, 201 students had continued their study after the first year, 32 had switched to another study or university, and 2 had stopped studying. ANOVAs did not reveal differences between students who did and did not participate at Time3 on their academic achievement, and social and emotional adjustment in secondary school. Next to participant dropout over time, we noticed missing rates per variable ranging from 0 to 13% (n = 31).

2.3 Measures

Data were collected by means of questionnaires. Figure 1 provides an overview of the research design and the times at which the variables were measured.

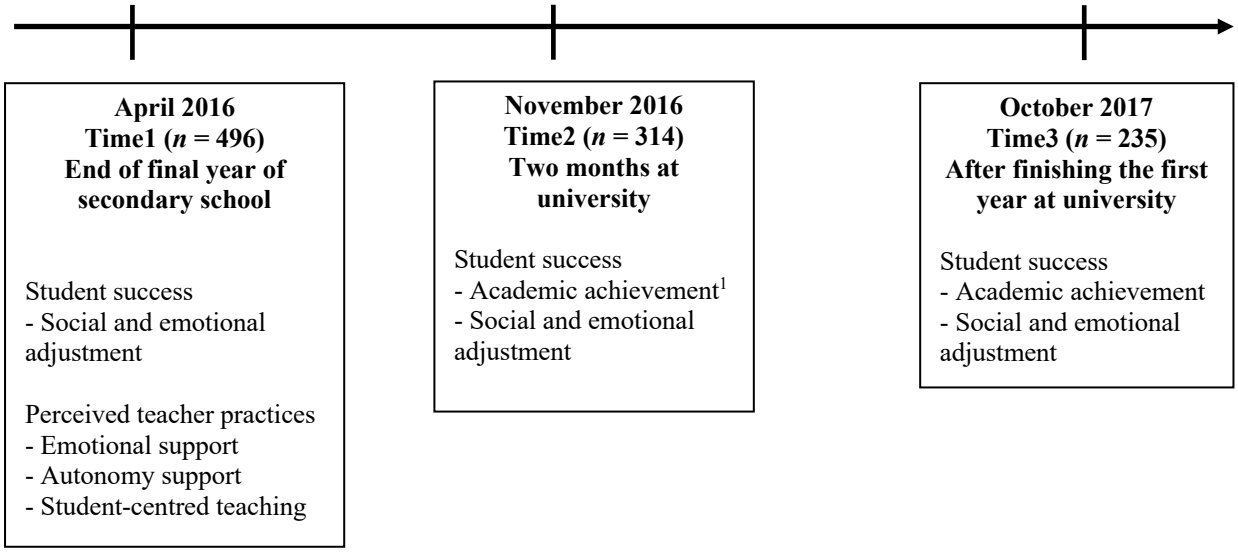

Figure 1. Overview of research design and times at which the variables were measured

[1] As the results of students' final exams in secondary school are announced in June, we asked students to report these results at Time2. As they concern students' academic achievement in secondary school, we refer to them in this manuscript as 'academic achievement Time1'.

Academic achievement. At Time2, students reported their grade point average (GPA) in subjects in which they did final exams in secondary school. These subject GPAs were averaged to form one composite score for students' secondary school GPA. At Time3, students were asked to report their average grade attained at courses in the first year at university. In the Netherlands, grades are measured on a scale of 1 to 10, with 10 being excellent and 5.5 the minimal score to pass exams.

Social and emotional adjustment. Students' social and emotional adjustment was measured with two subscales of the Student Adjustment to College Questionnaire (Baker & Siryk, 1989), which was translated and validated in the Dutch language by Beyers and Goossens (2002). The 6-item 'emotional adjustment' scale measures the level of psychological and physical stress students

experienced at secondary school (Time1) and university (Time2 and Time3). An example item was 'I have been feeling in good health lately'. The 4-item 'social adjustment' scale measures how well students were able to deal with the interpersonal demands of secondary school (Time1) and university (Time2 and Time3) (e.g., 'I had several close ties at school/university'). Answers were given on a 5-point scale (1 = strongly disagree, 5 = strongly agree). Cronbach's α for the emotional adjustment scale was .76 at Time1, .76 at Time2, and .78 at Time3. For social adjustment, Cronbach's α was .80, .77, and .82 for Time1, Time2, and Time3, respectively.

Teachers' emotional support. The 'relatedness' scale from the Teacher as Social Context Questionnaire (TASC; Belmont, Skinner, Wellborn, & Connell, 1988; Sierens et al., 2009) was used to measure whether students perceived their teachers as emotionally supportive. The scale comprises eight items (e.g., 'My teachers know me well') and students were instructed to respond to the items with respect to the teachers who teach them in their final year of secondary education. For each item students indicated on a 5-point scale how many of their teachers showed the behaviours (1 = none of my teachers, 5 = all of my teachers). We opted for this scale because if more teachers show the behaviour, students have more opportunities to get used to these practices and to develop associated skills and strategies which might make the transition to university easier. Cronbach's α was .80.

Teachers' autonomy support. The 8-item 'autonomy' scale from the TASC (Belmont et al., 1988) was used to measure the extent to which students perceived that their teachers support their autonomy. An example item was 'My teachers give me a lot of choices about how to do my schoolwork'. Answers were given on a 5-point scale (1 = none of my teachers, 5 = all of my teachers) and Cronbach's α was .72.

Student-centred teaching. The 8-item 'student-centred approach' scale from the Approaches to Teaching Inventory (Trigwell & Prosser, 2004)—translated to Dutch by Beausaert et al. (2013)—was used to measure whether students perceived their teachers' practices as learning-centred. An example item was 'My teachers create opportunities for us to discuss our changing understanding of the subject'. Again, a 5-point scale was used and Cronbach's α was .68.

2.4 Procedure

Approval for this study was granted by the ethics committee of the Faculty of Social Sciences of our university. After obtaining permission from the principals of the eight secondary schools, informed consent was obtained from the pre-university students and their parents. At time1, students filled out the questionnaire (± 30 minutes) during regular classes in secondary education. Students could report their e-mail address so that we could contact them for data collection at Time2 and Time3. At these time points, students received an online questionnaire by e-mail which took them 10 minutes to complete. To increase our response rate at Time2 and Time3, students were sent two online reminders to complete the survey. Further, a small incentive for participation was offered. Five gift cards (10 euro) were raffled among the participants at Time2 and Time3.

2.5 Statistical analyses

Following an examination of descriptive statistics and correlations, we investigated how teachers' practices in secondary education were associated with first-year students' academic achievement and social and emotional adjustment. For students' academic achievement—measured at two time points—a mediation analysis was conducted. The analysis was performed with the PROCESS macro version 3.0 for SPSS 23.0 developed by Hayes (2018). In this approach, effects are evaluated with bias corrected bootstrap 95% confidence intervals. These intervals are significant when the upper and lower bounds of the interval do not contain zero. Further, mediation effects can be significant regardless of the significance of the total effect (Hayes, 2018). Because our independent variables were moderately correlated, we reported structure coefficients in addition to beta coefficients, as suggested

by Kraha, Turner, Nimon, Reichwein Zientek, and Henson (2012). Structure coefficients provide insight in the bivariate relationship between an independent variable and the observed effect without influence of other variables.

Social and emotional adjustment were measured at all three time points. This allowed the measurements to be correlated within individuals. To account for these correlated observations, we performed a multilevel model for change—as suggested by Singer and Willett (2003, chapter 7, page 243) —in which we modelled within subject effects (time), between subject effects (emotional support, autonomy support, student-centred teaching), and interactions between them (e.g., time*emotional support). Including interaction effects in the analyses enabled us to model the influence of the teaching practices on students' adjustment on each of the three measurement moments. In a multilevel model for change, the model's random effects are embodied in its error covariance structure. We used the 'unstructured' function to account for unequal correlations and variances between time points. The 'unstructured' function allows each element of the error covariance structure to take on the value that the data demand (Singer & Willett, 2003). Thus, it is an appropriate method when you have just a few waves of data collection. To enhance interpretation of our parameters, we recentered the three teachers' practices by subtracting 1 from students' scores, to create a scale from 0 to 4 instead of 1 to 5. The analyses were performed with the 'nlme' package in R (Pinheiro, Bates, Debroy, & Sarkar, 2018).

3. Results

3.1 Preliminary analysis

The means and standard deviations for all measures are listed in Table 1. Significant gender differences were found. Male students rated themselves higher than female students did on emotional adjustment at Time1 (d = .61), Time2 (d = .49), and Time3 (d = .39). Further, male students perceived their teachers as more student-centred (d = .27) than female students. Hence, gender was included as a control variable in all analyses. Further, schools differed in the extent to which students perceived their teachers' practices as emotionally-supportive, autonomy-supportive, and student-centred (Table 1). However, the intraclass correlations (ICCs) indicated much more variation within schools than between schools, as less than 9% of the variance in students' perceptions of teacher practices could be explained by differences between schools.

As shown in Table 2, it was found that students with a higher GPA in secondary school obtained a better GPA in the first year at university (r = .53, p < .01). For students' adjustment, we saw different patterns of correlations for emotional and social adjustment. The correlations between emotional adjustment at Time1, Time2, and Time3 ranged between .56 and .60, indicating that students with higher emotional adjustment in secondary school obtained better emotional adjustment at university. Correlations for social adjustment at the three time points varied more; the correlation between Time2 and Time3 was stronger (r = .43, p < .01) than the correlations of Time1 with Time2 (r = .15, p < .01) and Time3 (r = .23, p < .01). Further, teacher practices in secondary education showed no significant correlations with students' academic achievement, but small correlations with social and emotional adjustment.

Table 1

Descriptive Statistics with Gender and School Differences for all Study Variables Measured on Time1 (n = 496), Time2 (n = 314), and Time 3 (n = 235)

	Male students	Female students	Total			School Mean		
	M (SD)	*M (SD)*	*M (SD)*	Range	*t*	Min.	Max.	ICC
Student success								
AA T1	6.97 (.63)	6.94 (.65)	6.96 (.64)	5.5-10	.40	6.80	7.20	.03
AA T3	7.16 (.87)	7.16 (.61)	7.16 (.72)	5.5-10	-.05	7.01	7.36	
SA T1	4.35 (.51)	4.35 (.66)	4.35 (.59)	1-5	.07	4.20	4.44	.00
SA T2	3.84 (.59)	3.74 (.70)	3.78 (.65)	1-5	1.39	3.50	3.89	
SA T3	3.78 (.71)	3.93 (.71)	3.87 (.71)	1-5	-1.59	3.74	4.19	
EA T1	3.79 (.57)	3.41 (.70)	3.60 (.67)	1-5	6.65*	3.26	3.71	.02
EA T2	3.85 (.57)	3.55 (.63)	3.68 (.62)	1-5	4.31*	3.33	3.77	
EA T3	3.74 (.65)	3.48 (.67)	3.58 (.67)	1-5	2.93*	3.38	3.84	
Teacher practices								
ES	3.65 (.53)	3.66 (.46)	3.65 (.50)	1-5	-.21	3.43	3.82	.06
AS	3.39 (.57)	3.40 (.45)	3.40 (.51)	1-5	-.34	3.23	3.58	.03
SC	3.02 (.48)	2.90 (.46)	2.96 (.47)	1-5	2.86*	2.76	3.11	.05

Note: AA = Academic achievement, SA = social adjustment, EA = emotional adjustment, ES = emotional support, AS = autonomy support, SC = student-centred; * $p < .01$.

Table 2

Correlations among the Study Variables Measured on Time1 (n = 496), Time2 (n = 314), and Time 3 (n = 235)

	AA T1	AA T3	SA T1	SA T2	SA T3	EA T1	EA T2	EA T3	ES	AS
Student success										
AA T1										
AA T3	.53*									
SA T1	-.02	-.08								
SA T2	-.00	.14	.15*							
SA T3	-.04	.09	.23*	.43*						
EA T1	.24*	.10	.38*	.11	.13					
EA T2	.04	.17*	.22*	.22*	.20*	.56*				
EA T3	.13	.13	.25*	.04	.23*	.59*	.60*			
Teacher practices										
ES	.10	.05	.31*	.16*	.10	.24*	.12*	.22*		
AS	.09	.04	.11*	.17*	.13	.21*	.19*	.27*	.44*	
SC	-.03	-.02	.12*	.06	.05	.14*	.07	.04	.40*	.44*

Note: AA = Academic achievement, SA = social adjustment, EA = emotional adjustment, ES = emotional support, AS = autonomy support, SC = student-centred; * $p < .01$.

3.2 Relations between teacher practices in secondary school and first-year academic achievement

With PROCESS, we examined whether teachers' emotional support, autonomy support, and student-centred teaching related to students' first-year GPA (measured at Time3), and whether these effects were mediated by students' GPA in secondary education. As shown in Table 3, none of the teacher practices was significantly related to students' GPA in secondary education ($R^2 = .03$), nor to their first-year university GPA ($R^2 = .01$). There was a direct effect of students' GPA in secondary education on their first-year university GPA, $b = .60$, $p < .01$, $R^2 = .28$. Structure coefficients were reported in Table 3, but because the teacher practices were not significantly correlated with students'

GPA at secondary school or at university, the regression coefficients were not suppressed by correlations between independent variables.

Table 3

Unstandardized Regression Coefficients (b) with Standard Errors (SE) and Structure Coefficients (r_s) Estimating Students' Academic Achievement in Secondary Education (Mediator) and in the First Year at University (n = 191)

	Academic achievement T1			Academic achievement T3[a]					
				Model 1			Model 2		
	b	*SE*	r_s	*b*	*SE*	r_s	*b*	*SE*	r_s
Constant	6.64	.49		6.95	.56		2.97	.67	
ES	.16	.12	.71	.09	.14	.55	-.00	.12	.10
AS	.10	.12	.51	.04	.13	.37	-.02	.11	.07
SC	-.03	.13	.03	.02	.15	.08	.04	.13	.02
Gender	-.12	.10	-.52	-.04	.11	-.23	.03	.10	-.04
AA T1							.60	.07*	1.00
R^2	.03			.01			.28		
F-ratio	$F(5,185) = 1.16$, $p = .33$			$F(5,185) = .26$, $p = .93$			$F(6,184) = 12.10$, $p < .01$		

Note: ES = emotional support, AS = autonomy support, SC = student-centred, AA = academic achievement.
[a] Model 1 shows the effects of the three teacher practices in secondary education on first-year students' academic achievement (controlled by gender); Model 2 shows the effects of the three teacher practices and students' academic achievement in secondary education on first-year students' academic achievement (controlled by gender); * $p < .05$.

3.3 Relations between teacher practices in secondary school and social adjustment

In Table 4, the reference category was Time1. On Time1, students' initial level of social adjustment was estimated to be 4.35. The within-subject effects of time showed that on average students' social adjustment significantly declined from Time1 to Time2 ($b = -.57$, $p < .01$), and from Time1 to Time 3 ($b = -.45$, $p < .01$). We also performed an analysis with Time2 as reference category, revealing that students' social adjustment increased from Time2 to Time3 ($b = .12$, $p = .01$).

Next, the between-subject effects of the three teacher practices on students' social adjustment were investigated. As can be seen in Table 4, students who perceived their secondary school teachers as *emotionally supportive* were more likely to experience social adjustment in general, $b = .32$, $p < .01$.

As we were especially interested in whether teacher practices in secondary school related to students' social adjustment at university, we included interactions between emotional support and time in our model to see whether the effects differed across the three measurement moments. Emotional support was significantly related to students' social adjustment at Time1, $b = .37$, $p < .01$. The interaction effects were not significant, indicating that the effect of emotional support on Time2 and Time3 is not significantly different from the effect on Time1. Further investigation in which we changed the reference category (from Time1 to Time2 and Time3, respectively) showed that emotional support was significantly associated with emotional adjustment at Time 2, $b = .23$, $p < .01$, but not at Time3, $b = .18$, $p = .08$. This indicates that the effect of teachers' emotional support on social adjustment extended to university, but faded away over time.

Table 4

Results of Fitting a Multilevel Model for Change on Students' Social Adjustment Data

	Model with within-subject effects		Model with within- and between subject effects		Model with within, between, and cross-subject effects	
	b	*SE*	*b*	*SE*	*b*	*SE*
Intercept	4.35*	.03	3.47*	.13	3.34*	.15
Time 2	-.57*	.04	-.58*	.04	-.20	.25
Time 3	-.45*	.05	-.46*	.05	.04	.29
ES			.32*	.05	.37*	.06
AS			.02	.05	.02	.05
SC			-.00	.05	-.00	.05
Male			.00	.04	.01	.04
ES*Time2					-.14	.09
ES*Time3					-.19	.10
AIC	1945.77		1901.96		1902.15	
BIC	1990.21		1966.14		1976.21	
Loglik	-963.89		-937.98		-936.07	
L. ratio test			$p < .01$		$p = .15$	

Note: ES = emotional support, AS = autonomy support, SC = student-centred; * $p < .05$.

3.4 Relations between teacher practices in secondary school and emotional adjustment

The first model, including within-subject effects of time, indicated that on Time1 students' initial level of emotional adjustment was 3.59 (Table 5). The within-subject effects of Time2 and Time3 were non-significant, indicating that on average students' emotional adjustment did not differ across the measurement moments.

Next, results of the second model with both within-subject and between-subject effects showed that teachers' *emotional support*, $b = .16$, $p < .01$, and *autonomy support*, $b = .20$, $p < .01$, were related to students' emotional adjustment in general (Table 5). This means that students who perceived their teachers' practices as emotionally supportive and autonomy-supportive were more likely to report higher emotional adjustment scores in secondary school and in the first year at university.

As we were especially interested in whether teacher practices in secondary school related to students' emotional adjustment at university, we included interactions between these variables (emotional support and autonomy support) and time in our model to see whether the effects differed across the three measurement moments (Table 5, right column). The results showed that teachers' emotional support contributed to students' emotional adjustment at secondary school (Time1), $b = .25$, $p < .01$. The interaction effects between emotional support and Time2, and emotional support and Time3 were both significant ($b = -.23$, $p < .01$, and $b = -.19$, $p = .04$, respectively) indicating that the effect of emotional support on emotional adjustment at Time2 and Time3 is significantly lower than at Time1. Further investigation in which we changed the reference category (from Time1 to Time2 and Time3, respectively) showed that emotional support indeed did not have a significant effect on students' emotional adjustment at Time2 ($b = .02$, $p = .82$) and Time3 ($b = .06$, $p = .52$).

Regarding the interactions between autonomy support and time, the results showed that autonomy support was associated with emotional adjustment at Time1, $b = .19$, $p < .01$. The interaction effects were not significant, indicating that the effect of autonomy support on Time2 and Time3 is not significantly different from the effect on Time1. Additional analyses in which we changed the reference category showed that autonomy support also was associated with emotional adjustment at Time2, $b = .18$, $p = .02$, and Time3, $b = .33$, $p < .01$. This indicates that autonomy support had both an effect on students' emotional adjustment in secondary school and in the first year at university.

Table 5

Results of Fitting a Multilevel Model for Change on Students' Emotional Adjustment Data

	Model with within-subject effects		Model with within- and between subject effects		Model with within, between, and cross-subject effects	
	b	*SE*	*b*	*SE*	*b*	*SE*
Intercept	3.59*	.03	2.62*	.16	2.44*	.17
Time 2	.06	.03	.07*	.03	.69*	.20
Time 3	-.02	.04	-.02	.04	.14	.23
ES			.17*	.06	.25*	.07
AS			.20*	.06	.19*	.07
SC			-.06	.06	-.06	.06
Male			.34*	.05	.35*	.05
ES*Time2					-.23*	.08
ES*Time3					-.19*	.09
AS*Time2					-.00	.07
AS*Time3					.14	.09
AIC	1789.76		1722.92		1716.35	
BIC	1834.12		1786.99		1800.14	
Loglik	-885.88		-848.46		-841.18	
L. ratio test			$p < .01$		$p = .01$	

Note: ES = emotional support, AS = autonomy support, SC = student-centred; * $p < .05$

4. Discussion

4.1 Discussion of main findings

Previous research underlined the pivotal role of teachers in secondary education in preparing students for university (e.g., Conley, 2010; Van Rooij & Jansen, 2018). Our study aimed to expand the scope of prior research by adopting a SDT approach to investigate how students' perceptions of specific teacher practices in secondary education related to first-year students' adjustment and achievement at university. With a longitudinal study including three measurement moments, we focused on student development over time and across school contexts. The results indicated that perceived teacher practices in secondary education related to students' social and emotional adjustment across the transition to university, but not to their academic achievement. Specifically, we found that perceptions of teachers' emotional support contributed to first-year students' social adjustment, whereas autonomy support related to students' emotional adjustment at university.

This study indicated that the secondary education learning environment is not school-specific. Instead, students perceive variability in features of the learning environment. These individual differences might arise because, for example, students from the same school have different teachers depending on the subjects they chose for their final exams, students perceive the same teacher behaviours differently (e.g., because of different needs) or because teachers behave differently towards different students (e.g., providing differentiated instruction). Investigating students' perceptions allowed us to take this individual diversity into account. The finding that students from the same school can have rather different perceptions of their teachers' practices emphasizes the need of taking student variability into account in the transition to university, instead of focusing on which secondary school students attend.

Our study adds to the growing body of literature concerning the SDT in relation to educational transitions (e.g., Ellerbrock & Kiefer, 2013; Madjar & Cohen-Malayev, 2016). It seems that when students perceive autonomy and emotional support in secondary education, they might already develop dispositions and skills that are relevant for university education, through which it might be easier for

them to adjust to the university environment. This corresponds to Conley's (2010) view who argued that creating a learning environment in secondary education that enables students to already internalize behaviours, such as working autonomously and taking responsibility for their learning, eases the transition to university, and to research of Langenkamp (2010) who described that positive relationships with teachers before a transition provide students with skills to find similar supporting relationships after a transition. However, with the present study we did not gain insight in the underlying mechanisms through which teacher practices in secondary education might enhance adjustment in the first year at university. This might be an interesting avenue for future research, for example by means of a qualitative retrospective study in which students reflect on their secondary school experiences and how they help them adjust to the university environment, or by investigating in a quantitative longitudinal study whether variables as autonomous motivation and academic self-confidence mediate the relationship between teacher practices and university outcomes.

For academic achievement we found in line with previous research (Richardson et al., 2012) that students who obtained higher grades in secondary education also obtained a higher GPA in the first year at university. Neither of the three secondary school teacher practices included in this study related to university GPA, explaining only 1% of the variance. Although this might suggest that teacher practices in secondary education do not matter for academic achievement at university, there may be other explanations for these findings. For example, we investigated the effects of teacher practices in secondary education on the academic achievement of first-year students from different study programs together, because previous research pointed to general differences between secondary school and university education. For example, Oolbekkink-Marchand, Van Driel, and Verloop (2014) found that secondary education teachers attached more value to shared regulation of learning activities with their students, whereas university teachers expected their students to work independently and to regulate their own learning. Nevertheless, the students in our sample enrolled in more than 100 different study programs that are likely to differ from each other (see, e.g., Lindblom-Ylänne, Trigwell, Nevgi, & Ashwin, 2006). Because of such differences, it is possible that teacher practices in secondary education have differential effects among study programs. Torenbeek, Jansen, and Hofman (2011b) found, for example, that first-year students from secondary schools with strong teacher control obtained more credit points in so-called 'soft' sciences (e.g., Psychology), whereas they did not find such effect for students in 'hard' sciences (e.g., Life Science and Technology). Because of the huge number of programs that the students in our sample were enrolled in, we were not able to analyse the effects of these programs. Future research could focus on the variation between study programs to gain deeper insight into the effects of teacher practices in secondary education on students' academic achievement in different university contexts.

Further, our results indicated that student-centred teacher practices did not relate to students' adjustment or achievement at university. A possible explanation for this is that student-centred teacher practices may take many forms and different factors in the student-centred environment might encourage or discourage students' learning, for example the assessment mode, students' workload, or type of feedback (Baeten, Kyndt, Struyven, & Dochy, 2010; Postareff, Mattsson, & Parpala, 2018). This indicates that it is not a student-centred environment in itself but specific aspects in the environment that might contribute to student outcomes, which were not specifically included in our assessment of student-centred teacher practices.

4.2 Limitations and recommendations for future research

In interpreting our results, some limitations should be considered. First, we focused on students' perceptions of teacher practices in secondary education, rather than teachers' self-assessments or classroom observations. This is because multiple studies have shown that how students perceive their teachers' practices affect their learning and development, instead of the practices in itself (e.g., Prosser & Trigwell, 1999; Stroet et al., 2013). Further, we asked students how they perceived the practices of their teachers in general, rather than using domain- or subject-specific (e.g., math or English) measures.

Nevertheless, what one teacher does can have a large impact on a student irrespective of other teachers' behaviours (e.g., a physics teacher's practices for a student who pursues a physics degree). This is not reflected in the current scale. For future research, it is interesting to explore whether the perceived quantity or quality of teacher practices in secondary education matter for the transition to and success at university. Further, we recommend to add other measures of teacher practices next to student perceptions (e.g., teacher interviews or classroom observations) to gain richer insights in how the three included teacher practices manifest themselves in secondary education. This might also be useful for professional development programmes for (student) teachers on how to prepare students for university success.

A second limitation of this study is that we did not explicitly focus on students' needs in relation to teacher practices. However, by focusing on students' perceptions of teachers' behaviours, we implicitly take diversity in student needs into account. Students' perceptions of their teachers' behaviours might be different because, for example, students perceive the same teacher behaviours differently because of different needs, or because teachers adapt their behaviour to individual student needs. In future research, it might be interesting to investigate whether students' needs in general and the fit between students' needs and teachers' practices (in secondary education) in specific influence the transition to university. It might be, for example, that students whose secondary school and university fit the individual's developmental needs experience a more positive transition than students who experience a misfit between their learning environments and needs.

Third, because we focused in this study on student success – defined as students' academic achievement and social and emotional adjustment – we focused on students who continued their studies in the second year. Students who dropped out or switched studies were not taken into account in our analyses, as these are complex phenomena in itself. Focusing on student dropout and switching behaviour would be an interesting avenue for future research, involving a different way of data collection, which might shed an additional light on how teacher behaviours might contribute to how students experience the first year. Additionally, it is possible that students who obtained lower grades in secondary school did not respond to our requests to fill out the questionnaires at Time2 and Time3, and therefore, we should interpret our findings with caution.

Fourth, the present study was limited by the methods we used. The internal reliability of our scales ranged from moderate to good. Especially the scales to measure teachers' practices in secondary education (e.g., student-centred teaching practices) may need further refinement. Furthermore, although variables were measured over time, it is still difficult to make causal claims because we have neither been able to control (many) possible confounding variables, nor to include a control group. Our study supports causal theories (e.g., self-determination theory which assumes that perceived emotional support contributes to students' well-being; Niemiec & Ryan, 2009), but strong inferences about causal direction cannot be made. This is especially a concern at Time1 because there perceived teachers' practices and students' adjustment are measured simultaneously. An interesting avenue of further investigation is to examine the nature and complexity of these associations allowing for more conclusive statements about the associations between (perceived) teacher practices in secondary education and students' adjustment and achievement. Further, while we performed a multilevel model for change other analyses can be used as well, for example a latent-growth model. The statistical models of these analyses are identical (Willett, 2004) but latent-growth models might be useful because they permit the modelling of change in several domains simultaneously.

Fifth, this study took place in the Netherlands which might have consequences for the generalisability of the findings. Secondary education in the Netherlands is a differentiated system in which students are tracked by ability into specific educational programmes. At first sight, our findings are therefore specifically transferable to countries that also have a differentiated secondary education system (i.e., academic and vocational streaming) such as Austria, Belgium, and Japan (Chmielewski, 2014). However, they might also be applicable to other educational systems in which some form of differentiation by student achievement levels is used in the curricula. For example, in the United States and Australia, courses in one subject are often offered at varying levels of difficulty within a school

(Chmielewski, 2014). The high-ability level courses might be comparable to the courses in the Dutch pre-university track. In future research it would be useful to perform our research in other educational systems and/or countries to gain more insight into the generalisability of the findings.

4.3 Conclusion and practical implications

This study indicated that teachers in secondary education can play a role in preparing students for university success. This role goes beyond preparing students for academic achievement at university, as teachers also have a long-term impact on first-year students' social and emotional adjustment. Very general teacher behaviours as emotional support and autonomy support related to students' social and emotional adjustment in the first year at university.

The results provide useful insights for educational policy in secondary education. One way in which secondary education usually prepares students for university is by enabling them to pass the standardised secondary school examinations and to obtain high grades. The average grade of students in secondary education indeed is strongly correlated with their academic achievement in the first year at university. In this way, secondary education already plays a large role in preparing students for first-year academic success. However, there is more to student success than academic performance in which secondary education plays a role. Student preparation for university also has a social-emotional dimension which means paying attention to how students cope with problems and emotions. Our findings argue for an increasing awareness of the role of secondary education teachers play in student preparation for university that goes beyond mere academic preparation, and the increasing embeddedness of this multi-domain perspective in educational policy.

Teachers in secondary schools can employ a range of different practices to prepare students for university success. Most obviously, they can stimulate the academic achievement of future first-year students by ensuring that they pass their final secondary school examinations with good grades. A previous meta-analysis by Richardson et al. (2012) showed that students' secondary school GPA correlated .40 with university GPA. In addition, it is important that students perceive their learning environment as autonomy-supportive and emotionally-supportive. According to Stroet et al. (2015), teachers can support students' autonomy, for example, by creating opportunities for students to work in their own way and by incorporating students' interests into their lessons. Teachers may provide emotional support by showing interest to what students are saying and to what is of importance for them. By incorporating those general teacher behaviours in secondary education, teachers can help students to make a smooth transition to university. However, we should bear in mind that these effects might be subtle as the correlations between perceived emotional and autonomy support and adjustment at university ranged from .16 to .27.

Next to (teachers in) secondary education, university faculty also play a major role in students' transition to university. More contact and cooperation between secondary education and university is needed to equip university faculty with greater insight into what they can expect from incoming students, on which they can build during their courses in the first year at university. They can, for example, provide autonomy support in the first year – thereby creating a continuous development process with secondary education – to allow students to internalise behaviours as autonomous and independent learning which make it easier for them to adjust to the university environment. In this way, university education can be better attuned to students' previous academic experiences and developed skills, to facilitate first-year students' success

Keypoints

- This study investigated how teachers' practices in secondary education related to first-year students' academic achievement and social and emotional adjustment.
- In a three-wave longitudinal study, 235 students were followed from their final year of secondary school to the end of the first year at university.
- Results indicated that emotional support related to students' social adjustment at university whereas autonomy support was associated with emotional adjustment.
- No relationships between teachers' practices in secondary education and students' first-year academic achievement were found.
- This study indicated that secondary education teachers' practices might have a long-term impact on first-year students' adjustment at university.

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