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Autonomy-Supportive, Structuring, and Psychologically Controlling Teaching: Antecedents, Mediators, and Outcomes in Late Adolescents

Proefschrift aangeboden tot het verkrijgen van de graad van
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Promotor: Prof. Dr. L. Goossens
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This Ph.D. thesis investigates (a) the relationship between important teaching dimensions and late adolescent outcomes (i.e., primarily self-regulated learning) (b) the mediating role of students' quality of motivation in these relationships, and (c) the antecedents of psychologically controlling teaching.

Chapter 1 presents a discussion of teaching style and elaborates on the basic research questions. *Chapter 2* provides a theoretical outline of the core concepts of this Ph.D. thesis, that is teaching style dimensions, self-regulated learning, and quality of motivation. In *Chapter 3*, we examined through a variable-oriented approach the relation between teacher autonomy support and structure and their association with students' self-regulated learning. Perceived teacher autonomy support and structure were positively correlated and could be distinguished through confirmatory factor analysis. Furthermore, the main effect of perceived structure on self-regulated learning was qualified by a significant interaction between perceived teacher autonomy support and structure. It seemed that structure needed to be coupled with at least a moderate amount of autonomy support to have a positive association with self-regulated learning. In *Chapter 4*, we examined through a person-oriented approach the relation between perceived teacher autonomy support and clear expectations, possibly the most central aspect of structure, and their associations with student outcomes. Perceived teacher autonomy support and clear expectations were positively correlated and could be distinguished through confirmatory factor analysis. Furthermore, four perceived teaching constellations emerged, defined by high and low scores on both of these variables. The teaching constellation characterized by both high autonomy support and clear expectations yielded the most positive pattern of outcomes, whereas the opposite teaching constellation characterized by low autonomy support and vague expectations yielded the most negative pattern of outcomes. In *Chapter 5*, we examined in a longitudinal study how perceived teacher autonomy support and structure develop and are related over time and how their development is related to the development of students' functioning. The mean level of perceived teacher autonomy support remained stable across time, whereas perceived teacher structure somewhat decreased. Furthermore, substantial interindividual differences existed in the initial level and rate of change of autonomy support and structure and both variables were positively interrelated across time. Finally, changes in perceived autonomy support and structure were positively related to changes in students' autonomous study motivation, which, in turn, were positively related to changes in students' self-regulated learning. In *Chapter 6*, we examined associations between psychologically controlling teaching and student outcomes and between psychologically controlling teaching and perceived antecedents. Psychologically controlling teaching was negatively related to students' self-regulated learning which, in turn, was positively related to academic achievement. Students' relative autonomy for studying played an intervening role in the association between psychologically controlling teaching and self-regulated learning. Furthermore, both pressure from above (e.g., pressuring school administration) and pressure from within (i.e., teachers' low relative autonomy for teaching), but not pressure from below (i.e., students' low relative autonomy for studying), were related to psychologically controlling teaching and these associations were accounted for by the depersonalization component of burnout. Finally, *Chapter 7* discusses the main findings, along with limitations, suggestions for further research, and practical implications.

ELINE SIERENS. Autonomieondersteuning, structuur en psychologische controle: Antecedenten, mediatoren en uitkomstmaten bij laat-adolescenten
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Dit proefschrift onderzoekt (a) de relatie tussen leerkrachtdimensies en uitkomsten bij laat-adolescenten (vooral zelf-gereguleerd leren), (b) de mediërende rol van de kwaliteit van de motivatie bij studenten in deze relaties en (c) de antecedenten van psychologisch controlerend lesgeven.

In *Hoofdstuk 1* bespreken we leerkrachtstijl en werken we onze onderzoeksvragen uit. In *Hoofdstuk 2* geven we een theoretisch overzicht van de kernconcepten in dit proefschrift, namelijk leerkrachtstijldimensies, zelf-gereguleerd leren en kwaliteit van motivatie. In *Hoofdstuk 3* onderzochten we de relatie tussen autonomieondersteuning en structuur bij leerkrachten en hun verband met zelf-gereguleerd leren bij leerlingen en studenten. Gepercipieerde autonomieondersteuning en structuur waren positief gecorreleerd en konden onderscheiden worden met confirmatorische factoranalyse. Het hoofdeffect van gepercipieerde structuur op zelf-gereguleerd leren werd afgezwakt door een significante interactie tussen gepercipieerde autonomieondersteuning en structuur. Structuur moest aangeboden worden met minstens een matig niveau van autonomieondersteuning om een positief verband te hebben met zelf-gereguleerd leren. In *Hoofdstuk 4* onderzochten we de relatie tussen gepercipieerde autonomieondersteuning en duidelijke verwachtingen, een centraal aspect van structuur, bij leerkrachten en hun verband met uitkomsten bij leerlingen. Op basis van hoge en lage scores voor deze twee variabelen konden vier gepercipieerde leerkrachtstijlen onderscheiden worden. De leerkrachtstijl gekenmerkt door hoge autonomieondersteuning en duidelijke verwachtingen had het meest positieve patroon van leerlinguitkomsten terwijl de tegenovergestelde leerkrachtstijl, gekenmerkt door lage autonomieondersteuning en vage verwachtingen, het meest negatieve patroon van leerlinguitkomsten had. In *Hoofdstuk 5* onderzochten we hoe gepercipieerde autonomieondersteuning en structuur bij leerkrachten ontwikkelen en gerelateerd zijn over tijd en hoe hun ontwikkeling gerelateerd is aan de ontwikkeling in het functioneren van leerlingen. Er waren substantiële interindividuele verschillen in het initiële niveau en de verandering in gepercipieerde autonomieondersteuning en structuur en beide variabelen waren positief gerelateerd over tijd. Ten slotte waren veranderingen in gepercipieerde autonomieondersteuning en structuur positief gerelateerd aan veranderingen in autonome studiemotivatie bij leerlingen, die op hun beurt positief gerelateerd waren aan veranderingen in zelf-gereguleerd leren. In *Hoofdstuk 6* onderzochten we verbanden tussen psychologisch controlerend lesgeven en uitkomsten bij leerlingen en tussen psychologisch controlerend lesgeven en gepercipieerde antecedenten. Psychologisch controlerend lesgeven was negatief gerelateerd aan de relatieve autonome studiemotivatie van leerlingen dat op zijn beurt positief gerelateerd was aan zelf-gereguleerd leren. Zelf-gereguleerd leren was positief gerelateerd aan schoolse prestaties. Daarnaast waren druk van bovenaf (bijv. schoolse administratie) en druk van binnenuit (lage relatieve autonomie om les te geven), maar niet druk van onderaf (lage relatieve autonomie bij leerlingen om te studeren), gerelateerd aan psychologisch controlerend lesgeven en deze verbanden werden gemedieerd door de depersonalisatie-component van burnout. *Hoofdstuk 7* bespreekt onze voornaamste bevindingen, enkele beperkingen, suggesties voor verder onderzoek en praktische implicaties.

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Voor mijn echtgenoot en kinderen…

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1

Introductory Chapter

In this Ph.D. thesis, we examine antecedents, late adolescent outcomes, and mediational factors of various dimensions of teaching style. In this introductory chapter, we first briefly discuss the concept of teaching style. Second, we describe the three core dimensions of teaching style in some detail. Third, while outlining the basic questions addressed in our research, we discuss the outcomes, mediators, and antecedents we examined in this Ph.D. thesis. Fourth, we describe the various methods and samples used in our studies. Finally, we provide an overview of the present thesis.

Teaching Style

Teaching style is at the heart of effective teaching because it has a strong effect on developmental and academic student outcomes, such as externalizing problem behavior and learning attitudes (e.g., Midgley, Feldlaufer, & Eccles, 1989; Wubbels & Levy, 1993). In line with the parenting literature (Darling & Steinberg, 1993), the first guiding framework for this Ph.D. thesis, it is argued that it is not a single teaching behavior, practice, or strategy that determines developmental or learning outcomes, but rather the teaching style that accompanies the behavior (Pianta, Hamre, & Stuhlman, 2003). For example, a deadline imposed by a teacher is likely to affect students in a negative way because it weakens intrinsic motivation. However, to the extent that students have a voice in imposing deadlines, the detrimental effects of externally imposed deadlines are diminished (Burgess, Enzle, & Schmaltz, 2004). Cleary, deadlines can be established in different ways, using different teaching styles.

Teaching style respresents the overall constellation of individual teaching behaviors or strategies (Teichman & Contreras-Grau, 2006). Put differently, teaching style refers to a pattern of behavioral teacher

interactions or a global style of relating to students in the classroom. It is the generalized interpersonal style of a teacher toward his students. Specifically, according to Self-Determination Theory (SDT; Ryan, 1995), the second guiding framework for this Ph.D. thesis, teaching style refers to the interpersonal and motivational context created by the teacher as it influences students' basic psychological needs for *autonomy* (i.e., the experience of volition), *competence* (i.e., the experience of effectiveness and efficiency), and *relatedness* (i.e., the experience of having close and meaningful relations). We turn to the latter issue in more detail in the following section, where three teaching dimensions, nurturing the basic needs, are proposed.

Three Teaching Dimensions

A few decades ago, the educational teaching style literature stated that being exposed to different teaching styles has more benefits than being exposed to a single teaching style because there are many effective styles of instruction that can match the learning style of the students. Hence, every teacher should preferably be skilled in several teaching styles (Dunn & Dunn, 1979; Wetzel, Potter, & O'Toole, 1982). Consequently, according to Turner (1979), the assumption that there is a single best style of teaching was widely considered as problematic. However, from the 1980s on, the predominant theoretical position has changed substantially, as outlined in Chapter 2. In line with the parenting literature, SDT distinguishes between three teaching dimensions that are universally effective because they nurture psychologically fundamental needs in students. These teaching dimensions are autonomy support, structure, and involvement. *Autonomy support*, the first teaching dimension, primarily nurtures students' need for autonomy. Autonomy support refers to identifying and fostering students' inner

motivational resources by affording choices, fostering understanding and interest regarding learning, giving rationales, allowing criticism and encouraging independent thinking, and taking students' frame of reference (Assor & Kaplan, 2001; Reeve, 2002). Extant cross-sectional, experimental, and longitudinal research indicates that autonomy-supportive teachers facilitate positive educational and developmental outcomes in students, as indexed by, for example, deep-level learning (Grolnick & Ryan, 1987; Vansteenkiste, Simons, Lens, & Sheldon, 2004; Vansteenkiste, Simons, Soenens, & Lens, 2004), engagement (Reeve, Jang, Carrell, Jeon, & Barch, 2004), persistence (Vallerand, Fortier, & Guay, 1997) and achievement (Black & Deci, 2000; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005). In contrast, *controlling* teachers interfere with and bypass students' inner motives and pressure students to act, feel, and think in particular, teacher-preferred ways (Assor, Kaplan, Kanat-Mayman, & Roth, 2005; Reeve, 2009; Reeve et al., 2004). They do so by giving directives, restraining criticism and independent opinions, and making many "should" statements. Adopting only their own perspective, controlling teachers shape an environment that emphasizes control, duty, and coercion. Controlling teaching is negatively related to intensive academic engagement, optimal motivation, and performance (Assor et al., 2005; Deci, 1971; Vansteenkiste et al., 2005). For an overview of the outcomes of teacher control versus autonomy support, we refer to Reeve (2009). In Table 1, we provide a list of the manifest instructional behaviors of autonomy-supportive versus controlling teaching, differentiating them from each other.

Table 1

Autonomy-Supportive Versus Controlling Teaching Behaviors

Autonomy support	Control
Use informational, flexible, non-controlling language	Use directives, should-, must-, and have to-type statements, controlling, coercive language
Allow criticism and encourage independent thinking Respect and value students' feelings, thoughts, and behaviors Be open to complaints to imposed demands, uninteresting activities, and structures Have an empathic listening attitude	Restrain criticism and independent opinions Make criticisms and use threats and rigid coercion Counter negative emotions
Nurture intrinsic motivational resources ("I want to do this") by providing challenges and choices, taking into account students' preferences and interests, stimulating curiosity, identifying students' interests	Rely on extrinsic motivational resources, external influences and controls by referring to strict deadlines, evaluation, and consequences (i.e., rewards and punishments) and seeking compliance
Help students to grasp the contribution of schoolwork to the attainment of personal goals or articulate the usefulness of teacher's requests (relevance-clarifying actions) Offer interesting and relevant activities	Force meaningless and uninteresting activities, neglect value and importance of tasks and lessons
Allow students time to work independently and in their own way. Give students the opportunity to be self-managers, take initiative during learning activities	Display impatience and push students toward specific, predetermined solutions, behaviors, and answers. Display strict supervision and management and "my way or the highway" attitude

An important form of controlling teaching is *psychologically controlling teaching*. During the past two decades, psychological control and its negative outcomes in children and adolescents has been broadly examined in the parenting context (Soenens & Vansteenkiste, 2010). Parental psychological control refers to the use of manipulative behaviors, such as shaming and love withdrawal, to control children's behaving, feeling, and thinking (Barber, 1996). Using these techniques, parents intrude into the psychological world of children (Smetana & Daddis, 2002). Similar intrusive behaviors may be displayed by teachers. Teachers who act in a psychologically controlling way manipulate their students to ensure compliance, through behaviors as guilt-induction, constraining verbal expression, and personal attack. Teachers who are psychologically controlling show disapproval or withdrawal toward students who do not achieve or behave according to their standards. Parental psychological control is negatively related to parent-child relational qualities, such as mutual trust between parent and child (Shek, 2006), and to externalizing (e.g., Pettit, Laird, Dodge, Bates, & Criss, 2001) and primarily internalizing behavior problems (e.g., Garber, Robinson, & Valentiner, 1997; Soenens, Luyckx, Vansteenkiste, Duriez, & Goossens, 2008; see Barber & Harmon, 2002, for an overview). Few studies have examined the relationship between psychologically controlling practices and school outcomes in students. There are two notable exceptions. One study (Aunola and Nurmi, 2004) demonstrated the negative impact of maternal psychological control on children's math performance and another study (Bean, Bush, McKenry, & Wilson, 2003) demonstrated the negative relationship between maternal

(not paternal) psychological control and academic achievement among European-American adolescents.

Structure, the second teaching dimension, primarily nurtures students' need for competence. Structure refers to monitoring learning processes by providing clear information to students about teachers' expectations and by clarifying how students can realize those expectations (Skinner & Belmont, 1993). Actually, structure consists of three key components: (a) setting limits on behavior, providing clear expectations, guidelines, procedures, rules, and goals and conveying the consequences of meeting or not meeting expectations, (b) providing help, guidance, assistance, and advice in demanding situations, and (c) giving timely positive and informative feedback and reinforcement (Reeve, 2002, 2006). Research shows that structuring elements, like clear rules, contingency, and positive feedback, are positively associated with perceived control (Skinner, Wellborn, & Connell, 1990), an optimal quality of motivation (Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008), efficient learning (Brophy, 1986), and engagement (Brooks, 1985; Tucker et al., 2002). In contrast, a classroom without objectives and without well-organized help and feedback opportunities is said to be *chaotic* (Reeve, 2009). In case of chaos, teachers are confusing and contradictory and fail to provide ways of effectively achieving clear outcomes (Jang, Reeve, & Deci, in press).

Involvement, the third teaching dimension, primarily nurtures students' need for relatedness. Involvement refers to sensitivity and responsiveness of teachers toward their students. It involves providing a pedagogical caring context, and being a friendly, warm, favorable, and supportive teacher (Ryan & Patrick, 2001; Wentzel, 1997). Involvement is

positively related to engagement in the classroom (Skinner & Belmont, 1993) and to optimal motivation outcomes, such as intrinsic motivation, interest, and academic effort (Ryan & Grolnick, 1986; Wentzel, 1997, 1998). Its opposite is *rejection* or *neglect* (Skinner & Belmont, 1993).

Summarizing the above, it is clear that autonomy support, structure, and involvement are each positively related to student functioning and that autonomy support has received the greatest research attention. Joint effects of the three teaching dimensions are rarely studied (e.g., Skinner & Belmont, 1993). Nevertheless, SDT states that they are all essential for motivation and learning to flourish (e.g., Deci & Ryan, 1985; Ryan & Grolnick, 1986). Therefore, in this Ph.D. thesis, we take an initial step towards elucidating the combined and unique effects of the teaching dimensions. Specifically, we try to deepen our understanding about the relationship between perceived teacher autonomy support and structure and their association with functioning, and primarily self-regulated learning, in students. In this manner, we provide a more differentiated picture of the aspects of teaching style that predict students' functioning.

Outcomes, Mediators, and Antecedents

Relationships Between Teaching Dimensions and Self-Regulated Learning Outcomes

Contemporary education, generally based on constructivist principles (Brophy, 2002; Richardson, 1997), stresses the importance of *self-regulated learning* (SRL). SRL refers to goal-directed learning characterized by applying a set of varied skills, such as deliberating about different strategies and making modifications when confronted with obstacles (Schunk & Zimmerman, 2008; Winne, 1995). Creating a powerful learning

environment where SRL is promoted is a hot issue for educational researchers and practitioners because SRL is seen as a key to school success, especially in the upper grades of one's school career (Kuhl, 1992; Zimmerman & Martinez-Pons, 1986). Recognizing the importance of SRL, we investigate how teachers' motivating style promotes or hinders students' SRL during instruction. More specifically, we address the following two research questions. First, in Chapters 3 through 5, we examine whether teacher autonomy support and structure are both necessary for late adolescents' functioning, especially their SRL skills. Second, in Chapter 6, we examine whether psychologically controlling teaching practices hamper SRL and, eventually, late adolescents' academic achievement.

SDT states that combining high autonomy support with optimal structure is essential for fostering active engagement and, hence, SRL (Jang et al., in press). Indeed, it seems necessary to take the students' level of regulatory skills into account (Henderson, 1986; Schunk, 1998), to encourage students to self-regulate their learning process, and to explain the relevance of SRL strategies. These teaching behaviors refer to an autonomy-supportive stance. Also, at times, providing explicit instruction along with verbal modeling of a specific skill, for instance, goal setting, is desirable (Harris & Graham, 1994; Schunk, 1990). Moreover, offering suggestions and coaching while students work on a learning task and providing constructive feedback on the strengths and weaknesses of their SRL skills, together with communicating clear expectations, seem appropriate in fostering SRL (Zimmerman, Bonner, & Kovach, 1996). These teaching behaviors refer to structure. So, both perceived autonomy support, which energizes one's learning process and enhances feelings of autonomy and

volition, and structure, which enhances feelings of competence and efficacy, were predicted to relate positively to SRL.

Conversely, based on SDT, it is suggested that controlling teaching in general and psychologically controlling teaching in particular, is likely to hamper the development of SRL (Vansteenkiste, Zhou, Lens, & Soenens, 2005). Indeed, it can be argued that impeding the development of autonomy and self-direction through psychologically controlling teaching (e.g., shaming and expressing disappointment) does not grant students sufficient self-confidence and "psychological space" to try out SRL, to dare, and to fail occasionally.

In our studies, we focus on deep-level cognitive and meta-cognitive skills as the central aspects of SRL (see Chapters 2 through 6). Deep-level cognitive strategy use refers to high-level cognitive processing or approaching one's study material thoroughly so as to reach a deep understanding of and meaning in the learning material (Baeten, Kyndt, Struyven, &, Dochy, 2010; Segers, Martens, & Van den Bossche, 2008). Examples of deep-level cognitive skills are thinking up concrete examples for the learning content and asking critical questions about text materials. Meta-cognitive strategy use refers to monitoring one's comprehension or regulating one's cognition to gauge one's learning process in meeting preset goals (Pintrich, 2002). Examples of meta-cognitive strategies involve planning and giving self-feedback. Moreover, some attention is paid to persistence (see Chapter 4), denoting students' capacities to mobilize and sustain their learning efforts (Zimmerman, 1995).

Summarizing, based on SDT tenets, our first general hypothesis states that perceived autonomy support and structure are both necessary for

students' SRL to flourish, both cross-sectionally and longitudinally. Our second hypothesis states that psychologically controlling teaching, as an important form of controlling teaching, should be negatively related to students' use of SRL strategies. The complementary role of perceived autonomy support and structure in fostering SRL is a central focus in this Ph.D. thesis and is theoretically reviewed in Chapter 2 and empirically investigated in Chapters 3 through 5. The relationship between psychologically controlling teaching and students' SRL and performance is outlined in Chapter 6 (Study 1). Extending the range of student outcomes, in Chapter 4, we pay some attention to student motivation and externalizing problem behavior variables as outcomes of teacher autonomy support and structure. However, in this Ph.D. thesis, student motivation is primarily seen as a mediator, as explained in the next section.

Motivational Orientation as a Mediator

Interestingly, self-regulation is a key concept within educational, constructivist theories as well as within SDT. As noted, according to the constructivist perspective, SRL refers to students' use of particular strategies, such as self-evaluation or time management, to achieve academic goals. Being self-regulated, students are not passive recipients of education, but actively take responsibility for their learning process (Zimmerman, 2001). According to SDT, a learning process could be more or less self-regulated, referring to students' motivational orientation, motive, or reasons for engaging in school-related activities. In this respect, SDT distinguishes autonomous from controlled motivation (Deci & Ryan, 2000). Autonomous motivation implies that students engage in the learning process quite volitionally or willingly, being self-governing and the initiator of their own

actions. Autonomous motivation includes intrinsic motivation (i.e., pursuing a learning activity because of its inherent satisfaction and spontaneous interest) and identified regulation (i.e., pursuing a learning activity because of its estimated value and personal relevance or preference). The opposite of autonomous motivation is controlled motivation which implies that students engage in the learning process with a sense of pressure and coercion. Controlled motivation includes introjected regulation (i.e., pursuing a learning activity because of internal pressuring contingencies, such as feelings of guilt and shame) and external regulation (i.e., pursuing a learning activity because of external pressuring contingencies, such as rewards and punishments). For example, a student can learn because he wants to get a good grade or because he wants to avoid negative reactions of his parents and teachers (external regulation). It is also possible that the student studies to avoid feelings of guilt (introjected regulation) or because he really wants to because he recognizes the personal advantages of studying (identified regulation). Finally, the student can study for no other reason than experiencing pleasure while studying (intrinsic motivation).

To conclude, within constructivist theories about education, self-regulation encompasses the "how"-component of learning behavior as it refers to the use of specific strategies, whereas within SDT, self-regulation refers to the "why"-component of learning behavior as it refers to the motives behind the strategies. Integrating both perspectives and elaborating on previous research on the outcomes of autonomy-supportive versus controlling teaching (Reeve, 2009), our third research question asks whether late adolescents' quality of motivation does play an intervening role in the relationship between teaching dimensions and late adolescents' SRL skills.

Specifically, we investigate in Chapters 5 and 6 the potential role of students' degree of self-regulation (i.e., motivational orientation) as a mediator in the (longitudinal) relationship between teaching dimensions and SRL. In these mediational studies, self-regulatory learning behavior is seen as an outcome of the self-regulatory orientation the student adopts (see also, e.g., de Bilde, Vansteenkiste, & Lens, 2010). Put differently, students' motivational orientation is considered as a pathway through which teaching dimensions contribute to subsequent student learning (Connell & Wellborn, 1991).

Antecedents of Teaching Dimensions

Because teaching dimensions are important predictors of school functioning, and especially students' SRL, it becomes important to consider antecedents of the teaching dimensions. Articulating the conditions under which controlling teaching is likely to occur, is particularly important because teachers often adopt a controlling style (see, e.g., Reeve, 2009). Consequently, our fourth research question asks which conditions place teachers at risk for psychologically controlling teaching, given that in this Ph.D. thesis the outcomes of psychologically controlling teaching are studied.

Paralleling theorizing in the parenting literature (Grolnick, 2003), Reeve (2009) proposes that controlling teaching is a teacher's understandable reaction to daily pressures imposed from above, from below, and from within. Pressure from above refers to influences imposed by outside agents or significant others, such as parents, colleagues, school administration, and society. Pressure from within refers to influences that arise from within the teacher himself, such as maladaptive motivational

orientations and personality traits. Pressure from below refers to influences that arise from the students, such as student passivity, noncompliant behavior, or a controlled motivational orientation. All three sources of pressure have indeed been found to impact negatively upon the quality of teacher behavior and interactions with students (see Reeve, 2009). However, unique associations between the three sources of pressure and teacher behavior have rarely been examined. Moreover, explanatory processes in the relationships between the sources of pressure and teachers' functioning are hardly explored. In our work, we aim to fill these gaps in Chapter 6 (Study 2), by shedding light on how the three sources of pressure are related to teachers' functioning in terms of psychologically controlling teaching. Moreover, we examined the role of burnout as a possible mediator in the relationships between sources of pressure and psychologically controlling teaching. We considered burnout as a possible mediating mechanism because of its well-established relations with pressuring antecedents, such as negative teacher thoughts and traits (see Byrne, 1994, for an overview). Additionally, because burned-out teachers would have less energy available to stay attuned to their students' wishes and would have the inclination to let their cynicism show in their actions, we hypothesize that burnout would relate to psychologically controlling teaching. Adding to the existing evidence, we think each of the three different sources of pressure may be related to teacher burnout which, in turn, may be related to psychologically controlling teaching.

Methodology

To have accurate and reliable assessments of teaching style, we conducted our studies with students not before November because at the

beginning of the school year, late-adolescent students have had limited interaction with their teachers. As outlined in Table 2, we set up four correlational, questionnaire-based studies in students to study the relationship between perceived teaching dimensions and student outcomes. The study reported in Chapter 3 used a variable-oriented approach, focusing on SRL as a correlate of the relationship between perceived teacher autonomy and structure (von Eye & Bogat, 2006). For this study, 526 students from the 11th and 12th grade from the academic track of two secondary schools and from the first year of teacher education were sampled in the Winter of 2005. The study reported in Chapter 4 used a person-oriented approach (i.e., cluster analysis). In this study we (a) categorized students into groups with similar perceptions of teacher autonomy support and structure and (b) examined the external validity of the clusters in terms of students' motivation, learning, and problem behavior (von Eye & Bogat, 2006). For this study, 1036 students from diverse tracks in 7th through 12th grade and an additional, optional year for specialization in one school were sampled in the Spring of 2008. The longitudinal study reported in Chapter 5 investigates the role of changes in perceived teacher autonomy support and structure in the prediction of changes in students' SRL. For this study, two samples of 533 and 535 students from the 11th and 12th grade from the academic track of seven secondary schools were sampled in the Autumn of 2005 (Wave 1) and Spring of 2006 (Wave 2). In the first study reported in Chapter 6, we investigated the outcomes of perceived psychologically controlling teaching. For this study, the first wave of the first sample from the study reported in Chapter 5 was used. Furthermore, we set up one correlational, questionnaire-based study in teachers in the Spring of 2006.

Questionnaires were filled out by 317 teachers from the academic track of six secondary schools to study the relationship between three sources of pressure experienced by teachers (i.e., antecedents) and teacher burnout and psychologically controlling teaching in the second study reported in Chapter 6.

Throughout this Ph.D. thesis, we used well-established measures of our key constructs or developed new measures based on existing ones. As shown in Table 2, in Chapters 3, 5 and 6 we used the short form of the Teacher as Social Context Questionnaire (Student and Teacher Report; TASCQ; Belmont, Skinner, Wellborn, & Connell, 1988) to measure perceived autonomy support and structure. In Chapter 4, we also used the TASCQ to measure perceived autonomy support and we used the subscale Structure as a source of inspiration to formulate perceived "clear expectations" items. In Chapter 6, based on the parenting literature, we created the Psychologically Controlling Teaching-Scale to measure psychologically controlling teaching from both the students' (Study 1) and the teachers' perspective (Study 2). In Chapters 3, 5, and 6, we used subscales of the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) to measure students' SRL, whereas we used subscales from a validated Dutch version (Lacante & Lens, 2005) of the Learning and Study Strategies Inventory (LASSI; Weinstein & Palmer, 2002) to measure SRL in Chapter 3. In Chapters 4 through 6, we used an adapted Dutch version (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009) of the Self-Regulation Questionnaire-Academic (SRQ-A; Ryan & Connell, 1989) to measure students' and teachers' quality of motivation.

Table 2

Outline of This Ph.D. Thesis

Chapter	Nature	Topic	Method of analysis	Sample	Time	Important scales
2	Theoretical	Defining key concepts and their relationships				
3	Empirical	Autonomy support and Structure → SRL	Cross-sectional Regression moderation analysis	526 students 11th-12th grade of academic track of secondary education + first year of teacher education 3 schools	Winter 2005	TASCQ MSLQ
4	Empirical	Autonomy support and Structure → learning, motivation, and problem behavior	Cross-sectional Cluster analysis	1036 students 7th -12th grade + additional year of specialization 1 school	Spring 2008	TASCQ LASSI SRQ-A

Table 2 (continued)

Chapter	Nature	Topic	Method of analysis	Sample	Time	Important scales
5	Empirical	Autonomy support and Structure → Motivation → SRL	Longitudinal Latent change analysis	533 (Sample 1) and 535 (Sample 2) students 11th-12th grade of academic track of secondary education 7 schools	Autumn 2005 - Spring 2006	TASCQ MSLQ SRQ-A
6	Empirical	1) Psychologically controlling teaching → Motivation → SRL → Performance 2) Antecedents → Burnout → Psychologically controlling teaching	Cross-sectional Structural equation modeling	533 students 11th-12th grade of academic track of secondary education 7 schools (Study 1) 317 teachers academic track of secondary education (Study 2) 6 schools	Autumn 2005 (Study 1) – Spring 2006 (Study 2)	TASCQ PCT-scale MSLQ SRQ-A

Note. SRL = Self-regulated learning. PCT-scale = Psychologically Controlling Teaching-Scale. TASCQ = Teacher a Social Context Questionnaire. MSLQ = Motivated Strategies for Learning Questionnaire. LASSI = Learning and Study Strategies Inventory. SRQ-A = Self-Regulation Questionnaire-Academic.

Overview of the Present Ph.D. Thesis

In Chapter 2, we present a theoretical outline of the core concepts of this Ph.D. thesis. In Chapters 3 through 6, we empirically investigate through four methodologically diverse journal manuscripts the relation between teaching style, as defined by SDT, and students' functioning, primarily students' use of SRL strategies. In Chapter 7, we discuss our research findings, describe some limitations of our work and, based on these limitations, we offer suggestions for future research. We conclude this final chapter by outlining practical recommendations of our findings.

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2

The Authoritative Teaching Style: A Model for the Study of Teaching Styles

Sierens, E., Soenens, B., Vansteenkiste, M., Goossens, L., & Dochy, F. (2006). *Pedagogische Studiën, 83*, 419-431.

Abstract

There is a trend in education to stimulate students' self-regulatory skills through student-activating instruction. Implementing student-activating teaching methods, however, is not without its problems and negative effects are occasionally observed. Therefore, we expect that the context in which these methods are used – and more specifically the teaching style adopted – contributes in crucial ways to stimulating self-regulatory skills. In this paper, we provide a description of the construct of teaching style, because a theoretical framework for this concept is lacking. To this aim, we draw on theories on parenting styles and Self-determination theory. An integration of both perspectives reveals three dimensions that instantiate the notion of teaching style, that is, autonomy-support, structure, and involvement. Next, we demonstrate how these dimensions can facilitate self-regulated learning through the fostering of autonomous motivation. We conclude the contribution with a discussion of a number of research issues that emerge from the model.

Recent educational theories state that self-regulated learning (SRL) capacities are essential for optimal learning (see, e.g., Zimmerman & Tsikalas, 2005). In line with this statement, research shows rather consistently that effective self-regulatory skills are positively related to self-reported school competence and, eventually, academic performance (see, e.g., Paris & Newman, 1990). Because of the positive outcomes of self-regulated learning, it becomes imperative to study how SRL can be taught and fostered. Previous studies have focused on specific teaching methods activating SRL, such as project-based and problem-based education (see, e.g., De Corte, Verschaffel, & Masui, 2004).

In practice, a lot of teachers enthusiastically try out these activating teaching methods (Moust, Van Berkel, & Schmidt, 2005). However, they often become disappointed when their students claim that they are drowning in the chaos of learning materials or say that they do not understand the added value and meaningfulness of the teaching method. No matter how active a particular teaching method may be, students can have the feeling that the new method lacks structure, relevance, and clear guidelines or that the teaching method is imposed from above (Dolmans, De Grave, Wolfhagen, & van der Vleuten, 2005). Such feelings, in turn, can undermine the effectiveness of student-activating teaching methods. These practical examples show that the implementation of a specific student-activating teaching method will not bring universal happiness in and by itself. The way in which the teaching method is implemented and the quality of interaction and communication accompanying this method are perhaps more important in fostering SRL.

The assumption that the teaching style, that is, the general communication style of teachers towards their students, could be crucial in fostering SRL, is analogous to an important statement within the parenting literature. This statement suggests that the context of a behavior moderates the effects of that behavior (Darling & Steinberg, 1993). For example, a study by Steinberg, Lamborn, Dornbusch, and Darling (1992) demonstrated that parents' active engagement in their children's homework predicts better school performance only when this engagement takes place within the context of an authoritative parenting style. Applied to the teaching context, this implies that the effects of specific teaching methods and specific teacher behaviors could be dependent on the teaching style (Maxwell, Mergendoller, & Bellisimo, 2005). Based on this reasoning, the implementation of a student-activating teaching method will be positively related to enthusiasm and deep-level learning in students when a teacher clearly structures the teaching method and gives students the feeling that they have a choice. Conversely, the implementation of a student-activating teaching method will be related to rather negative student outcomes when the teacher introduces the teaching method in a compulsory manner with few guidelines and no objectives.

Until now, we have illustrated the importance of the general teaching style in promoting SRL. However, within the SRL literature there is no clear definition of the teaching style construct. Moreover, the role of the teaching style construct has received limited attention. In this contribution, we want to fill those gaps by proposing a clear description of the teaching style construct, by demonstrating how the teaching style can play an essential role

in teaching SRL skills, and by describing the processes that explain the effects of teaching style on SRL.

We draw on the parenting literature to describe the concept of teaching style. This is deemed acceptable given the strong parallels between the parent-child and the teacher-student relationship (e.g., the hierarchical relationship between adult and child and the important role of teachers and parents in the socialization of children and adolescents; Pianta, 1994). In line with the definition of parenting style (Steinberg et al., 1992), we define teaching style as a global relational construct referring to the nature and quality of the emotional climate between the teacher and the students. This implies that we consider teaching style as the general attitude of teachers towards their students.

To specify this attitude and to demonstrate how teaching style can optimize SRL, we additionally draw on Self-determination theory (SDT; Deci & Ryan, 2002). SDT states that the quality of the teaching style primarily influences the quality of motivation of students. Specifically, an authoritative teaching style would positively influence an autonomous motivation rather than a controlled motivation. Autonomous (or volitional) motivation, in turn, would be positively related to students' SRL. This general hypothesis – depicted in Figure 1 – serves as the guiding principle in this contribution. First, we describe the concept of SRL and we demonstrate how the quality of motivation is related to this concept (i.e., the second arrow in Figure 1). Second, we describe the concept of teaching style based on the parenting literature and SDT, and we demonstrate how the teaching style influences students' quality of motivation (i.e., the first arrow in Figure 1) which, in turn, fosters the development of SRL competencies.

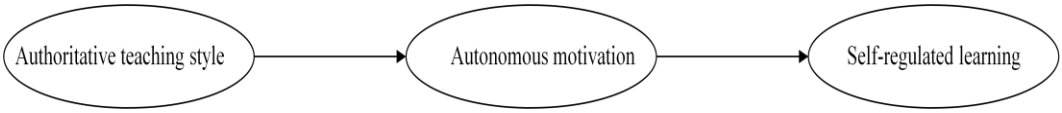

Figure 1. The positive influence of the authoritative teaching style on self-regulated learning through students' autonomous motivation.

A Student-Centered Learning Environment and SRL

Within the literature on student-centered learning environments, SRL is an important competence of the active knowledge builder, that is, the student. In this context, SRL means that the student activates his own learning process and monitors his learning process toward the achievement of certain goals (Schunk, 1990). To reach this objective, the student uses SRL strategies, such as making a study plan and sticking to it, evaluating one's own achievements, and motivating oneself to persist when learning difficult course materials. Specifically, SRL implies a set of processes (Zimmerman, Bonner, & Kovach, 1996). Initially, the student analyzes the task requirements and evaluates his initial study capacities. Next, he sets himself appropriate task goals. These goals function as criteria for choosing adequate learning strategies. When enacting these learning strategies, the student monitors the effectiveness and efficiency of his study behavior. This means that he is continually checking whether he is working toward his goals and whether he provides feedback to himself. This feedback can lead to a new task approach. In addition to this meta-cognitive orientation, the student also monitors his meta-emotional and meta-motivational skills (Masui, 2002). This means that the student keeps his motivation and emotions under control in a constructive way. For example, when a student is convinced that he has done poorly at an exam, he probably feels shattered and despondent. In order to achieve his goal, that is, to get through to the

next grade, he can try to encourage himself for the following exams. Empirical research shows that SRL fosters academic achievement. For example, the study by Zimmerman and Martinez-Pons (1986) showed in adolescents aged 14 to 16 that high achievers used significantly more SRL strategies, such as setting goals and seeking help, than low achievers.

The concept of SRL is found not only in views on student-centered education but also in general motivational theories, like SDT (Deci & Ryan, 2000; Vansteenkiste, Lens, & Deci, 2006). However, within SDT, SRL has a different meaning. Whereas in student-centered education SRL primarily refers to the efficiency and effectiveness with which a certain learning goal is transferred into learning activities, SDT defines SRL as the degree to which a learning goal is perceived as self-chosen and authentic. Central to SDT is the assumption that learning goals are perceived as volitional and self-chosen after a process of internalization. The concept of internalization is defined as the process through which individuals actively and gradually transform externally conveyed beliefs, behavioral regulations, or goals into personal values, behavioral styles, or objectives (Deci & Ryan, 1985). The more initially uninteresting activities are internalized, the more they will be performed with a feeling of autonomy, volition, or psychological freedom. The self-determination continuum, as explained below, is depicted in Figure 2 (Deci & Ryan, 2000).

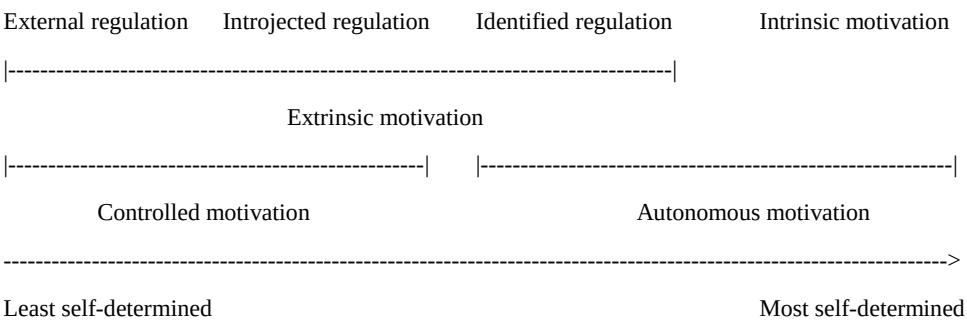

Figure 2. Self-determination continuum (see Deci & Ryan, 2000).

External regulation is the least self-determined form of behavioral regulation. In this case, behaviors are performed to meet external requirements (e.g., deadlines), to obtain rewards, or to avoid punishments. Individuals feel as if they have no choice regarding the decision to perform or not to perform the behavior. For example, a student who studies hard to obtain a good grade because otherwise his parents would punish him, is externally regulated in his study behavior. *Introjected regulation* (or *introjection*) is a type of regulation that is still rather controlling because in this case people also perform behavior under pressure. Specifically, one enacts the activity to avoid shame, guilt, or anxiety or to boost one's ego and experience pride. This kind of behavior is situated somewhat further to the right on the self-determination continuum than is externally regulated behavior. The regulation for the behavior is in the person, but the behavior is not considered as part of the self because it is source of tension and conflict. Hence, one has the feeling of being under pressure, but the pressure does not come from the outside, as is the case with external regulation, but from the inside. Students who study because they would feel guilty if they

would not, are characterized by introjected regulation. *Identified regulation* (or *identification*) is a more autonomous or self-determined behavioral regulation. In this case, the person has identified with the value of the behavior and, hence, has accepted the regulation as a part of himself. Put differently, one sees the importance of the behavior in light of the goals one wants to achieve. The person experiences a stronger feeling of free choice. For example, when the student accomplishes a task because he sees and experiences the personal relevance of it, he is said to show identified regulation. The three behavioral regulations just described are forms of extrinsic motivation because behaviors are performed to achieve a goal that lies outside the activity. Therefore, the activity is not performed out of spontaneous interest. By contrast, in the case of *intrinsic motivation*, activities are performed because they are inherently interesting and fascinating. Put differently, the performance is experienced as inherently satisfying and pleasurable. As a consequence, intrinsic motivation lies to the outer right on the self-determination continuum, because it is the prototype of self-determined or autonomous behavior. For example, the student who studies because he genuinely experiences pleasure is intrinsically motivated.

In the case of identified regulation and intrinsic motivation, the activity is performed with a feeling of volition and psychological freedom. Therefore, these forms of motivation are subsumed under the construct of *autonomous motivation* (see, e.g., Vansteenkiste, Lens, De Witte, De Witte, & Deci, 2004). Autonomously motivated students are said to be self-determined because the student himself takes the decision to regulate his behavior. Autonomous motivation is contrasted with *controlled motivation*. Students who show controlled motivation have the feeling they have no

other choice but to perform the behavior. This is the case for external and introjected regulation where the pressure and obligation to perform the behavior comes from the outside or from the person himself, respectively.

Autonomously motivated students take on personal responsibility for their own learning process and optimally process course material which is not intrinsically motivating (Grolnick, Kurowski, & Gurland, 1999). Therefore, SDT posits that autonomous forms of motivation will be associated with better learning results than controlling forms of motivation. Empirical research has very consistently provided evidence in support of this hypothesis. For example, autonomous motivation predicts relatively more feelings of school and academic competence than controlled motivation (Fortier, Vallerand, & Guay, 1995), the use of better learning strategies (Yamauchi, Kumagai, & Kawaski, 1999), less use of ineffective coping styles (Ryan & Connell, 1989), and better school performance (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004).

Although self-regulation is defined in a different way within views on student-centered education and SDT, the two concepts are not independent of one another. Based on SDT, we can predict that the more students subscribe to a certain learning goal, and thus the more they are autonomously motivated, the more they will use efficient and effective strategies to achieve their learning objectives. In turn, these strategies will positively influence academic performance. In contrast, we can predict that students with a controlled motivation will use fewer effective learning strategies and will, in turn, perform poorer because the learning process is not regulated out of their own initiative. Put differently, based on SDT, we predict that an autonomous relative to a controlled study motivation will be

related to better learning and achievement outcomes through the use of more goal-oriented learning strategies. A recent study by Vansteenkiste, Zhou, Lens en Soenens (2005) clearly confirmed this prediction. In a sample of Chinese university students, the positive relationship between an autonomous study motivation and achievement was largely explained by the effect of goal-oriented learning strategies. These findings show that an autonomous study motivation is crucial in stimulating self-regulated, goal-oriented learning in students which, in turn, fosters higher performance. Therefore, the next important question is how teachers can promote an autonomous motivation in students.

Influence of Teaching Style on Autonomous Motivation

Previous studies showed that the combination of certain teaching behaviors, or so-called teaching style dimensions, promote a student-centered learning environment. For example, the influence of dimensions such as teacher support and encouraging mutual respect on academic and social-psychological functioning of students has been examined (Wentzel, 2002). Next, several of these teaching behaviors and teaching dimensions are categorized in descriptive studies – in a fragmented way – into certain teaching styles, such as the (in)dependent teaching style (Wetzel, Potter, & O'Toole, 1982), the reproductive versus productive style (Curtner-Smith, Hasty, & Kerr, 2001), and the eight different types of interpersonal teaching behavior, such as the directive or tolerant type (Brekelmans & Wubbels, 1994).

Because of this fragmentation, these studies display a lack of a coherent conceptual background. Put differently, there is no clear theoretical framework for classifying specific teaching behaviors into higher-order

categories, such as teaching styles and teaching style dimensions. As a consequence, there is ambiguity about the most crucial and fundamental dimensions of teaching style (Sava, 2002). To fill this gap in the literature, we rely on theories about parenting styles and SDT from the motivation literature.

Integrating both perspectives, we identify three crucial dimensions of an effective teaching style, that is, autonomy support, structure, and involvement. These dimensions are important because they promote an autonomous motivation. First, the two perspectives, that is, theories about parenting styles and SDT, are described in general terms. Second, both perspectives are integrated and applied to the study of teaching styles.

Theories About Parenting Styles

In the study of parenting styles we distinguish the configurational from the dimensional approach (Gray & Steinberg, 1999). According to Baumrind's (1991) configurational approach, the effects of parenting cannot be explained in terms of independent parenting dimensions. Instead, parenting effects can be explained in terms of the pattern of parenting dimensions. During the last decades, these parenting configurations are considered as parenting styles. In this configurational approach to parenting, the authoritative parenting style is the central concept. Authoritative parents combine a high degree of responsiveness and warmth with sufficient control and supervision over their children's behavior. This means that they emphasize their children's positive characteristics, but at the same time they use clear rules and conventions for behavior (Maccoby & Martin, 1983).

In recent research within the dimensional approach, there is an increasing interest in studying the unique effects of the three parenting

dimensions which define the concept of parenting style. There is an increasing consensus in the parenting literature that three dimensions are crucial when defining parenting style, that is, *psychological control* (versus autonomy support), *behavioral control* and *responsiveness* (Barber, 1996).

Psychological control (versus autonomy support) is a form of control which influences emotions, goals, and thoughts of the child in an intrusive way, for example through excessive use of guilt-induction and conditional acceptance (Barber, Olsen, & Shagle, 1994). Due to the intrusive character of this form of control, it is expected that psychological control hinders the development of autonomy in children, which, in turn, results in decreased well-being (Barber, 1996). Research shows that psychological control is predictive of internalizing problems, such as depression and anxiety (Soenens, Vansteenkiste, Luyten, Duriez, & Goossens, 2005). Furthermore, the feeling of being under pressure and being controlled by parents has a negative impact on study concentration, time management, and school attitude. Finally, it induces feelings of stress and fear of failure (Vansteenkiste, Zhou et al., 2005) and undermines deep-level learning (Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005).

Behavioral control refers to the extent of monitoring children's behavior, setting rules, and also checking whether these rules are followed consistently (Barber et al., 1994). Low scores for behavioral control are systematically and uniquely associated with externalizing behavioral problems in adolescents, such as delinquency and substance use (Soenens, Vansteenkiste, Luyckx, & Goossens, 2006).

Parental responsiveness, finally, refers to the extent of support, warmth, and love in the relationship between parent and child. Research has

shown that parental responsiveness is associated with various positive developmental outcomes, such as academic and social self-regulation (Gray & Steinberg, 1999).

Self-Determination Theory

As noted earlier, SDT considers autonomous motivation as the driving force behind the use of self-regulatory skills. Important for the subject of this paper is that SDT has explicit hypotheses about the way in which teachers can foster autonomous motivation, that is, intrinsic and identified regulation. Three dimensions are considered crucial: autonomy support, structure, and involvement (Grolnick, Deci, & Ryan, 1997). *Autonomy support* concerns offering age-appropriate choices, giving students opportunities to pursue their own goals, and avoiding over-controlling techniques, such as frequently giving commands or not allowing critical remarks. *Structure* concerns the extent to which clear expectations are spelled out, constructive feedback on performance is given, and students get the opportunity to perform challenging learning tasks. Finally, *involvement* refers to the extent to which socialization figures (i.e., teachers) provide warmth and are concerned about their students, show active interest in their students, and are empathic. According to SDT, each of these dimensions has a positive influence on autonomous study motivation because they foster the psychological needs of autonomy, relatedness or belongingness, and competence (Skinner & Belmont, 1993). In fact, we can talk about the ABC-needs: 'Autonomy', 'Belongingness', and 'Competence'.

As noted previously, autonomy refers to the experience of volitional engagement in the learning process because the learning activity is in line with one's authentic interests and values (Deci & Ryan, 1985). Generally

speaking, the term refers to the feeling of initiating and regulating one's own activities based on authentic values and personal interests or goals. The need for relatedness comprises not only the need for feelings of secure and satisfying attachments, but also the need for experiencing oneself as worthwhile and capable of love. Put differently, the term refers to the emotional and personal bonds between individuals (Baumeister & Leary, 1995). Finally, based on motivation psychology, the importance of feeling competent in interaction with one's physical and social environment is emphasized. This emphasis on the human experience of self-control and control over the environment has led to the identification of competence as a basic need (White, 1959).

Applying Both Perspectives to the Concepts of Teaching Style, Autonomous Motivation, and Self-Regulated Learning

Based on the preceding review of the literature, it seems that there is a striking convergence between parenting style theories and SDT concerning the crucial dimensions for fostering autonomous motivation and, ultimately, creating a learning environment where the use of self-regulatory strategies is stimulated. This convergence is striking because, within each perspective, the consensus about these three dimensions is established in a very different way. In the parenting literature, the taxonomy of three dimensions is developed in a rather descriptive way, for example based on interviews with parents and factor analyses on data from extensive exploratory survey studies. By contrast, SDT rather follows a top-down approach where the three dimensions were formulated based on fundamental theoretical principles about human functioning. Given this convergence between both perspectives, in the remainder of this contribution, we describe in greater

detail the specific meaning and relevance of the three dimensions distinguished earlier for the concepts of *teaching style* and *autonomous motivation*.

Parental autonomy support means that parents are able to take the perspective of their child, to offer choices, to help their child in exploring his personal interests and values, and to minimize the use of controlling techniques (e.g. punishing; Grolnick, 2002). In line with this conceptualization, *teacher* autonomy support involves that the student gets the opportunity to have a say in determining his goals and study strategies. The teacher respects the feelings and views of his students and encourages them to think independently, to solve problems, and formulate goals (Grolnick et al., 1999). When objectives have to be imposed, the teacher provides a rationale, so that the student grasps the relevance of the objective and then gradually adopts this objective (i.e., internalization) and takes responsibility for it. At that point, the student is autonomously motivated to perform his learning behavior. A high degree of teacher autonomy support is necessary for primarily fostering the human need for autonomy (Deci, Vallerand, Pelletier, & Ryan, 1991). More specifically, autonomy support promotes the experience that the learning process is a volitional engagement.

The opposite of autonomy support is the use of forceful, controlling strategies, such as teacher psychological control. Just as parents can manipulate the psychological world of their children, teachers can use this subtle, implicit form of control by, for example, using guilt-inducing strategies, expressing disappointment, and using conditional regard (Assor, Roth, & Deci, 2004). Such teacher psychological control leads mainly to

students who are motivated to learn out of feelings of guilt and shame and fear of failure, which involves an introjected and thus controlled regulation.

Does autonomy support imply a laissez-faire attitude of the teacher and a complete independence of the student? Does it imply that each student can freely choose what he wants and does not want to learn and thus has a "boundless freedom"? No! The essence of autonomy support implies that the teacher guides the learning process of his students and helps them in formulating and realizing personal goals and interests (Reeve, Deci, & Ryan, 2004). The teacher can try to act as a coach who helps his students in determining and internalizing objectives, increasing the likelihood that the objectives are pursued autonomously. This notion of a coach brings us to the second dimension, that is, structure.

Whereas the parenting literature uses the term behavioral control, we talk about *structure* as provided by teachers. We prefer this term over *control* to avoid the negative connotations of control, but related to content, they mean the same thing: setting guidelines which offer the child or the student a firm footing. Structure primarily nurtures students' need for competence or, put differently, the need to effectively apply their own knowledge and skills (Reeve, 2002). Offering structure involves giving information in order to perform tasks to optimally reach one's learning goals. Examples of structuring behaviors are expressing and explaining expectations, regularly offering informative feedback, and consistently offering individualized help. Through these behaviors, the student experiences that he is able to direct his own learning process. This feeling fosters autonomous motivation in that the student will genuinely be inclined to learn when he experiences he is really able to accomplish the learning

task. In contrast, there is a lack of structure when the teacher's expectations are confusing for the student and when the teacher reacts unpredictably or inconsistently (Reeve et al., 2004).

In the ideal case, *autonomy support* and *structure* are complementary. This complementarity is especially reflected in the image of the teacher as a coach. This task as supervisor of the learning process essentially means that the teacher offers optimal challenges. A challenging learning task stirs up the authentic interests and goals of the student (i.e., autonomy support) and simultaneously tries to expand on them by offering structure, for example through individualized assistance. Concerning the relationship between autonomy support and structure, Reeve (2002, p. 193) writes that *"they can, and should, exist side-by-side in a mutual supportive way"* .

Finally, autonomy support and structure have to be provided in a pedagogical caring context with warm, responsive, and involved significant others (Ryan & Stiller 1991). This third dimension of *involvement* (or *responsiveness*), which primarily nurtures the need for relatedness (Skinner & Belmont, 1993), corresponds with a responsive or warm and loving attitude of the parents or teachers with respect to their children or students. Therefore, involvement refers to the quality of the interpersonal relationship between teachers and students. It implies that the teacher makes time for his students with pleasure and dedication and is attuned to their needs. Involvement further entails expressing affection for and showing genuine interest in the students. As such, the teacher creates a secure climate where the students venture to set their own goals and are prepared to internalize the goals teachers propose them. Students incorporate teachers' goals until they pursue those goals willingly (Ryan, Connell, & Grolnick, 1992).

For educational contexts, some authors (e.g., Ryan & Powelson, 1991) often emphasize different dimensions. However, we state that each of these dimensions are complementary to one another and that they have to be integrated into a single teaching style so that the student will formulate goals for himself, or will internalize academic values, norms, and objectives. The three dimensions jointly nurture the three basic needs and only when these are fulfilled, can students develop fully and function autonomously. Based on the notion of complementarity, we consider each of these dimensions individually as insufficient for fostering autonomous motivation. When these dimensions are integrated, we use the term *authoritative teaching style* (Hughes, 2002) in line with the parenting literature (Baumrind, 1971). Just as authoritative parents combine the necessary monitoring of their children's behavior within an autonomy-supportive context with sustaining a loving relationship, authoritative teachers succeed in integrating structure, autonomy support, and involvement.

However, the translation of the dimensions into specific behaviors is dependent on the developmental stage of the student (Marchant, Paulson, & Rothlisberg, 2001). For example, adolescents seek opportunities to take decisions on their own more than children do. As a consequence, autonomy support in both age groups probably takes on a somewhat different, age-specific form. It is also plausible that student characteristics, such as fear of failure and giftedness, influence the actual content of the dimensions. For example, an 8-year-old with ADHD needs extra structure. This structure can be provided by visually presenting the various steps of a problem solving process.

Recommendations for Future Research

Based on the theoretical framework outlined above, we offer a few recommendations for future research. First, until now, we have discussed the relationships between the three teaching dimensions and students' autonomous motivation. However, research shows that this relationship is bidirectional. So, students' behavior and motivation also influence the behavior and the style of the teacher (Skinner & Belmont, 1993). Particularly, there are cyclical interactions between the teacher and his students where cause and effect are often indistinguishable. Therefore, longitudinal research is needed to show if the influence, as noted, primarily goes from the teaching dimensions to students' functioning, or if there is rather an interaction between teacher and students. To shed light on this topic, cross-sectional research does not suffice because it does not allow statements of a causal nature.

Second, in the literature the dimension *autonomy support* is split into different behaviors. Based on these behaviors, researchers operationalize autonomy support. So researchers distinguish between offering choices (Boggiano, Flink, Shields, Seelback, & Barrett, 1993), asking questions to students concerning what they want to learn, making time to listen, and taking the perspective of the students (Reeve, Bolt, & Cai, 1999). This classification is based on the finding that these clusters of behaviors have specific influences on students' behavior. However, each author defines autonomy support in a rather idiosyncratic way, thereby hampering communication among themselves and with practitioners. As a consequence, it is recommended to engage more often in in-depth theoretical work that leads to a clear operationalization of *autonomy support*

through conceptual clarification. In line with this recommendation and in line with the parenting literature (Grolnick & Slowiaczek, 1994), future research should refine the dimensions *structure* and *involvement* of our conceptual framework into clear and specific behaviors. For example, for *structure* one can think of setting expectations for students, offering help, and responding contingently to their behavior. For *involvement* possible subdimensions are giving affection and showing interest in the student as a person. In this way, pure measures of the dimensions *autonomy support*, *structure*, and *involvement* can be developed and the effects of these dimensions can be examined.

Third, given the negative effects of controlling teaching behavior, it is desirable to explore in which educational contexts this behavior arises and through which educational policies this behavior is stimulated. Generally speaking, it is recommended to study which cultural, structural, and intra-individual factors hamper or sustain the development of the three dimensions in educational practice (Grolnick, 2002). For example, we think of the influence of subjective theories (Kelchtermans, 1994), the personality of the teacher (Reeve et al., 1999), the actual situation in teacher education which often teaches students to control pupils' behavior (Reeve, 2002), the present reality of the teaching profession that pays a lot of attention to achievement (Pelletier, Séguin-Lévesque, & Legault, 2002) and in which one frequently experiences antisocial and subversive behavior of large numbers of unmotivated students (Hughes, 2002), and the cultural ideal of the good teacher (Reeve, 2002).

Finally, quasi-experimental and action research in which teachers – whether or not in collaboration with researchers – are taught to translate the

three dimensions into practice, need to get further attention. Positive results have already been obtained in the studies by Reeve (1998) and Reeve, Jang, Carrell, Jeon and Barch (2004). In these studies, the authors succeeded in letting pre-service teachers with an autonomy-supportive orientation and with a controlling orientation teach in a more autonomy-supportive way. In line with the previous issue, it is recommended to study which conditions are stimulating or hindering in teaching the three dimensions and their implementation in practice.

Conclusion

From various sides, teachers hear the call for stimulating self-regulatory skills in their students. This is no easy task partly because of the increasing demotivation among students to go to school and to learn. One way to respond to this problem effectively could be to use teaching methods in a climate characterized by autonomy support, structure, and involvement in continuous interaction with each other. These teaching dimensions influence students' autonomous motivation positively because they foster their psychological basic needs (i.e., the "ABC-needs"). Autonomous motivation, in turn, fosters self-regulated learning and a self-regulatory, in-depth learning process is thought to have a positive effect on academic performance.

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3

The Synergistic Relationship of Perceived Teacher Autonomy Support and Structure in the Prediction of Self-Regulated Learning

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Abstract

Background. Self-determination theory defines two important dimensions of teaching style: autonomy support and structure.

Aims. The purpose of the present study was to investigate the synergistic relationship of perceived teacher autonomy support and the provision of structure in the prediction of self-regulated learning.

Sample and method. Students (N = 526) completed questionnaires assessing perceived autonomy support, structure, and self-regulated learning.

Results. First, autonomy support and structure were found to be positively correlated, suggesting that the support of student autonomy generally goes hand in hand with the provision of structure and order in the classroom. Second, moderated regression analyses indicated that structure but not autonomy support yielded a main effect on self-regulated learning, although this main effect was qualified by a structure by autonomy support interaction.

Conclusion. The interaction suggests that structure was associated with more selfregulated learning under conditions of moderate and high autonomy support only. Therefore, when teachers want their students to evaluate themselves, to plan their study activities, and to think about themselves as learners, the teachers are encouraged to provide help, instructions, and expectations in an autonomy-supportive way.

The question how teachers can promote Self-Regulated Learning (SRL) is of critical importance as self-regulation is a key to school success (Zimmerman & Martinez-Pons, 1986). SRL is defined as a goal-directed process where students engage in self-reflection and self-evaluation to obtain desired learning outcomes (Miller & Brickman, 2004). Self-regulating students set a particular learning standard, deliberately select strategies to achieve that goal (e.g., planning), engage in a variety of skills (e.g., self-testing) to monitor their progress, and make modifications (e.g., resetting their standard) when confronted with obstacles (Winne, 1995). In other words, self-regulated learners know "how" they can become successful learners by using the appropriate (meta)-cognitive, motivational, and affective strategies (Boekaerts, 1995).

However, SRL does not take place automatically (Winne, 2005) and is not easily induced (Struyven, Dochy, Janssens, Schelfhout, & Gielen, 2006). Therefore, research about the conditions that facilitate SRL merits greater attention (Richardson & Placier, 2001). To study the antecedent teaching style dimensions of SRL, the present research draws on Self-Determination Theory (SDT; Deci & Ryan, 2000; Vansteenkiste, Lens, & Deci, 2006). Based on this theory, we aim to examine whether an adaptive engagement in learning activities will be fostered by teachers who are providing autonomy support and structure. It is expected that teacher autonomy support and teacher structure both promote SRL as they allow satisfaction of learners' basic psychological needs for autonomy and competence.

Basic Need Satisfaction and Learning

According to SDT, human beings have three innate psychological needs: the need for autonomy, competence, and relatedness (Deci & Ryan,

2000). In an educational setting, autonomy refers to the experience of choice and psychological freedom with respect to one's study activities. It involves being self-organizing and having a sense of choice over one's study behavior. Competence involves the experience of efficacy while completing a learning task. The need for relatedness concerns feeling connected to significant others, like teachers.

Within SDT, the satisfaction of these needs is said to represent a necessary condition for students' optimal learning. This is because need satisfaction yields an energizing effect, which enables learners to get more fully immersed in the learning process. In line with this idea, several studies have shown that the satisfaction of these needs predicts a variety of positive learning outcomes, including higher intrinsic motivation and more SRL (see Reeve, Deci, & Ryan, 2004, for an overview). Various studies have also explored the contextual variables that support the satisfaction of these needs, including instructors' and parents' teaching and rearing style (e.g., Soenens & Vansteenkiste, 2005).

The present research aimed to add to this body of work by examining whether and how the teaching dimensions perceived teacher autonomy support and structure are related to SRL, an issue that has received little attention from a SDT-perspective. Examining the contextual antecedents of SRL deserves attention within the SRL literature as such knowledge would help to enrich our understanding of how instructors can promote SRL. Because SDT specifies the contextual environments that foster optimal learning, this theory represents a potentially interesting framework for studying favorable conditions for SRL. Specifically, according to SDT,

teacher autonomy support and structure contribute to SRL by satisfying students' basic psychological needs.

Teacher Autonomy Support and Structure

Within SDT, autonomy support implies facilitating and encouraging students to pursue their personal goals and supporting students' endorsement of classroom behaviors (Assor, Kaplan, & Roth, 2002). Autonomy-supportive teachers do so by providing students with an amount of choice (Katz & Assor, 2007), by giving a rationale when choice is constrained, by trying to empathize with the learners' perspective, and by avoiding the use of controlling language (e.g., "you should"). Several studies have demonstrated that autonomy-supportive teaching is related to educational benefits, including higher intrinsic motivation (e.g., Reeve & Jang, 2006), better time management and concentration (e.g., Vansteenkiste, Zhou, Lens, & Soenens, 2005), and higher performance (e.g., Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004), presumably because autonomy support allows for the satisfaction of the need for autonomy (Reeve, Ryan, Deci, & Jang, 2007).

Structure involves the communication of clear expectations with respect to student behavior. Structuring teachers will set limits to students' behavior and will consistently follow through. Moreover, structure involves providing learners with help for engaging in a task, so that they better know how to accomplish goals (Skinner & Belmont, 1993). Finally, teachers who provide structure will give competence-relevant feedback and express confidence in students' abilities to achieve the required class activities (Connell, 1990; Reeve et al., 2004). The positive outcomes of structure for high-quality learning are well-established. Research shows that structure is

related to more student engagement (e.g., Tucker et al., 2002) and less passive and avoidant academic behavior (Patrick, Turner, Meyer, & Midgley, 2003), presumably because structure allows for the satisfaction of the need for competence (Grolnick & Ryan, 1989).

SDT not only suggests that teacher autonomy support and structure are critical for students' optimal learning, but equally suggests that the positive relations of teacher structure to outcomes might depend on the way in which the structure is brought about (Reeve et al., 2004). When structure is communicated in a context of respect for the learners' perspective, when instructors rely on non-controlling language to communicate expectations, and provide a meaningful rationale when introducing limits, students are more likely to follow the structure with a greater sense of psychological freedom. However, structure can also be imposed in a controlling way, for instance by linking external contingencies (e.g., punishments) to the (mis)attainment of the standards, by using pressuring language when communicating expectations and by countering negative emotions that signal resistance. In such cases, the structure is less likely to yield educational benefits, as students feel pressured and consequently fail to endorse the expectations.

A few studies have provided evidence for SDT's hypothesis that the relation of structuring elements to outcomes is moderated by an autonomy-supportive versus controlling communication style. For instance, Burgess, Enzle, and Schmaltz (2004) demonstrated in a group of university students that setting deadlines in an autonomy-supportive fashion resulted in higher intrinsic motivation and free-choice persistence compared to an externally imposed deadline group. The present study extends this small body of

research by examining the independent and interactive contribution of autonomy support and structure in relation to SRL.

The Present Study

This study used a correlational design to study the interplay between teacher autonomy support and structure in its relation to SRL. Two measures of SRL were used, that is, the use of cognitive strategies and self-regulation (i.e., meta-cognitive and effort management strategies; Pintrich & De Groot, 1990). Cognitive strategy use refers to the actual cognitive strategies students use during their learning process, such as elaboration or rehearsal strategies. The use of meta-cognitive strategies implies monitoring the learning process, such as planning and giving self-feedback (Wolters, 2003). Using effort management strategies denotes students' capacities to create and enact a learning intention, such as persisting in the face of competing attractions (Pintrich & De Groot, 1990). The present study involves students in their last years of secondary education and their first year in higher education. The selection of this age group is inspired by the notion that self-regulation is necessary for good school achievement, especially in the upper grades of one's school career (Zimmerman & Martinez-Pons, 1986).

We formulated three hypotheses. First, realizing that autonomy support and structure are both characteristics of an optimally motivating teaching style and based on previous research (Noels, 2003), it is assumed that autonomy support and structure can be differentiated through factor analysis, but that both will be positively correlated. Teachers who are effective in supporting students' need for autonomy on average tend to be effective in offering help and positive feedback, setting limits, and

introducing rules (i.e., structure). This would be the case because teachers can better first empathically adopt learners' internal frame of reference (i.e., autonomy-support) as to act in accordance with students' goals and desires and, hence, to provide differentiated help and feedback (i.e., structure). Thus, an autonomy-supportive stance might allow for a more student-attuned provision of structure, so that teachers who are perceived as autonomy-supportive are likely to be well structuring as well. Moreover, autonomy support and structure both reflect student-centered teaching dimensions, which might further help to explain why they are positively correlated.

Second and third, we examined the independent and interactive relations of teacher autonomy support and structure to SRL. Although both might yield an independent positive relation to SRL, we especially expected both dimensions to interact, so that the positive association of structure with SRL would become more evident in combination with high levels of autonomy support.

Structure is critical for students' SRL as, in order for SRL to take place, students need to be clearly explained how to regulate their study activities. Structuring precisely involves the provision of guidance and constructive feedback to students, which is likely to increase students' confidence to effectively monitor their study behavior. Thus, well structuring teachers are likely to satisfy students' need for competence, which might lead students to engage in SRL. In addition, when teachers are highly structuring in their own teaching, students might begin to imitate these techniques in their own learning. Thus, highly structuring teachers are likely to foster SRL through a modelling process as well.

Although structure allows students to know how they can regulate their learning, it might not be sufficient to effectively do so. Learners also need to be energized to use these self-regulatory strategies and autonomy support might represent the "fuel" for this to take place. This is because autonomy support nurtures students' interest and intrinsic motivation and promotes the endorsement of their classroom activities, so that students engage in their studies in a more volitional way. This enhanced volitional functioning (i.e., feelings of autonomy) would, in turn, allow for a more willing use of self-regulating learning strategies.

In short, structure and autonomy support were expected to interact because structure primarily provides the necessary "know-how" (competence) for SRL, whereas autonomy support primarily provides the willingness (autonomy) to initiate these self-regulatory strategies. Therefore, we expect structure to be especially related to SRL under autonomy-supportive conditions.

Method

Participants and Procedure

Participants were 264 male and 262 female Belgian middle to late adolescents (Grade 11 and 12) from the academic track of two secondary schools and students from the first year of teacher education. Their age varied from 15 to 27 years (M = 17.9 years, SD = 1.22 years). Five students did not disclose their age. The participants filled out questionnaires in their regular classrooms and were assured of confidentiality. Teachers were asked to leave the room while the questionnaire was being filled out.

Measures

The instruments were initially developed in English and were translated into Dutch according to the guidelines of the International Test Commission (Hambleton, 1994). All items were answered using a 5-point answer format, which ranged from 1 (*Completely Disagree)* to 5 (*Completely Agree*).

Teacher autonomy support and structure. Teacher context was assessed through students' reports of their interactions with the teacher. Half of the secondary school students rated their Dutch teacher while the others rated the mathematics teacher. All students from the teacher training institute described their teacher of educational sciences. These subjects were chosen because they represent the most common subjects in the curriculum and because they carry a heavy weight in the final achievement scores. We used the subscales Autonomy Support (8 items; e.g., "This teacher gives me a lot of choices about how to do my schoolwork") and Structure (8 items; e.g., "If I can't solve a problem, this teacher shows me different ways to try to") of the shortened version of the Teacher as Social Context Questionnaire (TASC; Belmont, Skinner, Wellborn, & Connell, 1988). Scale scores were calculated by averaging the items within the scale (negative items were reverse coded). The construct validity of autonomy support and structure was examined with Confirmatory Factor Analysis (CFA) using Lisrel 8.7 (Jöreskog & Sörbom, 1993). Two models were estimated and compared, that is, a model in which all teaching style items were used as indicators of a single underlying construct and a model in which items tapping structure and autonomy support were used as indicators of two separate constructs. A chi-square comparison of the two models showed that a two-factor solution

fitted the data significantly better ($\Delta\chi^2$ (1) = 29.39, $p < .001$) than a one-factor solution. Furthermore, various indices were used to evaluate model fit of our two-factor solution (Kline, 1998). The Standardized Root Mean Square Residual (SRMR), the Root Mean Square Error of Approximation (RMSEA), and the Comparative Fit Index (CFI) were .08, .07, and .94 respectively. These values indicated that the two-factor model yields an adequate fit (Hu & Bentler, 1999), suggesting that teacher autonomy support and structure represent two different constructs. Cronbach alphas were .78 for autonomy support and .72 for structure.

Self-regulated learning. The use of self-regulatory strategies was assessed with students' reports of their study behavior. The shortened version of the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991) as developed by Pintrich and De Groot (1990) was used. This version consists of two subscales, that is, Cognitive strategy use (13 items), which pertains to the use of diverse cognitive strategies (i.e., elaboration strategies; e.g., "When I study I put important ideas into my own words") and Self-regulation (9 items), which refers to the use of meta-cognitive strategies (i.e., planning; e.g., "Before I begin studying I think about the things I will need to do to learn") and management of effort strategies (i.e., putting effort in and persisting at difficult tasks; e.g., "When work is hard I either give up or study only the easy parts" (reverse coded)). Summary scores were calculated by averaging the items within a scale (after reversing the negatively worded items). Previous research indicates that reliability and validity of the scale is acceptable (see Pintrich & De Groot, 1990). In the present study, the

Cronbach alphas were .72 for the Cognitive strategy use scale and .68 for the Self-regulation scale.

Results

Preliminary Analyses

The correlations between the two teaching style dimensions and the measures of SRL appear in Table 1. As predicted, autonomy support and structure were positively correlated. Both were positively correlated with both aspects of SRL. Cognitive strategy use and Self-regulation were positively correlated as well.

To examine possible effects of domain (Dutch versus mathematics versus educational sciences), we performed a MANOVA with domain as between-subjects variable and all measured variables as dependent variables. Domain had an overall multivariate effect (Wilks' $\lambda = .77$; F (8, 1034) = 17.86; $p < .001$; $\eta^2 = .12$). Follow-up univariate F-values, η^2, and pairwise comparisons (using Tukey's Honestly Significance Difference test) are shown in Table 2. The educational sciences subsample scored highest on all outcomes compared to both the Dutch and mathematics subsamples, while both did not differ from one another except for autonomy support, with the Dutch subsample scoring significantly lower than the mathematics subsample. Given the small differences between the two high school subsamples (Dutch and mathematics) and given that both differ substantially from the teacher education sample, we merged the Dutch and math subsample and contrasted this subsample with the teacher education sample. Consequently, we controlled for type of education (i.e., high school versus teacher education) in the regression analyses.

To examine possible effects of gender, we compared the mean scores of male and female students for all measured variables in the secondary school and teacher training institute. The mean scores did not differ significantly (t (523) = -.30, *ns*; t (523) = -.73, *ns*; t (520) = -1.32, *ns*, and t (522) = -1.83, *ns* for autonomy support, structure, cognitive strategy use, and self-regulation, respectively). Therefore, we did not control for gender in the regression analyses.

Table 1

Correlations Among Study Variables

Variable	1	2	3	4
1. Perceived teacher autonomy support	-	.67**	.31**	.25**
2. Perceived teacher structure		-	.39**	.35**
3. Cognitive strategy use			-	.59**
4. Self-regulation				-

** $p < .01$.

Table 2

Means and Standard Deviations of Three Domains of Study Together With Univariate ANOVAs and Post-hoc Comparisons Based Upon Tukey HSD Tests

	Domain				
Variable	Dutch (n = 193)	Math (n = 193)	Educational sciences (n = 140)	$F(2, 522)$	η^2
Perceived teacher autonomy support	3.08_c (.69)	3.30_b (.73)	3.86_a (.57)	54.31***	.17
Perceived teacher structure	3.07_b (.60)	3.14_b (.67)	3.59_a (.56)	31.95***	.11
Cognitive strategy use	3.30_b (.55)	3.36_b (.52)	3.63_a (.49)	17.59***	.06
Self-regulation	3.07_b (.57)	3.14_b (.70)	3.43_a (.50)	15.21***	.06

Note. Means with a different subscript are significantly different from one another at $p < .05$.

*** $p < .001$.

Primary Analyses

To examine the independent and interactive effects of perceived teacher autonomy support and structure on SRL, we performed a series of hierarchical regression analyses. In Step 1, type of education, autonomy support, and structure were entered as simultaneous predictors. In Step 2, all the two-way interactions between the predictors were entered. In Step 3, finally, the three-way interaction between autonomy support, structure, and type of education was entered to determine whether the two-way interaction between autonomy support and structure is consistent across type of education. Interaction terms were created by multiplying the centered means of the predictors (Aiken & West, 1991).

Although the CFA indicated that teacher autonomy support and structure are distinct constructs, they were found to be highly positively correlated, which might cause problems of multicollinearity. To detect multicollinearity, we examined its impact on the precision of estimation of the regressors, which is reflected in the Variance Inflation Index (VIF; Fox, 1991). When entering autonomy support and structure in the first step, we found that no single VIF exceeds the cut-off criterion of 4 (maximum VIF = 1.81). Similarly, the collinearity diagnostics table, which represents an alternative method of assessing the problem of multicollinearity, yielded no condition indices over 15 (Belsley, Kuh & Welsch, 1980; maximum condition index = 2.24). These observations allowed us to conclude that there is no serious degrading in the precision of estimation of parameters (Miles & Shevlin, 2001) and that the main effects of perceived teacher autonomy support and structure can be interpreted in a reliable manner.

The results of our regression analyses can be found in Table 3. As can be noticed in Step 1, teacher structure, but not teacher autonomy support, yielded a positive effect on both aspects of SRL. In Step 2 the interaction between autonomy support and structure significantly added to the prediction of both types of SRL, that is, $\Delta R^2 = .03$, $p < .001$ for cognitive strategy use and $\Delta R^2 = .03$, $p < .001$ for self-regulation. This interaction was interpreted by examining simple regression lines for low (Mean – 1 SD; $N = 74$), moderate (Mean; $N = 366$) and high (Mean + 1 SD; $N = 86$) levels of perceived autonomy support (see Jaccard & Turrisi, 2003). It was found that structure was a significant positive predictor of both types of SRL in average ($\beta = .33$, $p < .001$ and $\beta = .29$, $p < .001$ for cognitive strategy use and self-regulation, respectively) and high autonomy-supportive climates ($\beta = .46$, $p < .001$ and $\beta = .51$, $p < .001$ for cognitive strategy use and self-regulation, respectively) but not in low ($\beta = .06$, *ns* and $\beta = .06$, *ns* for cognitive strategy use and self-regulation respectively) autonomy-supportive climates.[1] Figures 1 and 2 provide a graphical representation of these interaction effects using the simple slopes. The particular situation of high autonomy support and low structure was not represented in our sample. Finally, it should be noted that type of education did not interact with the two teaching style dimensions in relation to the SRL outcomes.

As the three-way interaction between autonomy support, structure, and type of education also was not significant and as adding this three-way interaction did not alter the initially observed effects in Steps 1 and 2, these results are not reported in Table 3. The lack of a three-way interaction indicates that the interaction between autonomy support and structure is not moderated by type of education. This finding justifies our approach where

the samples from both types of education were examined together rather than separately.

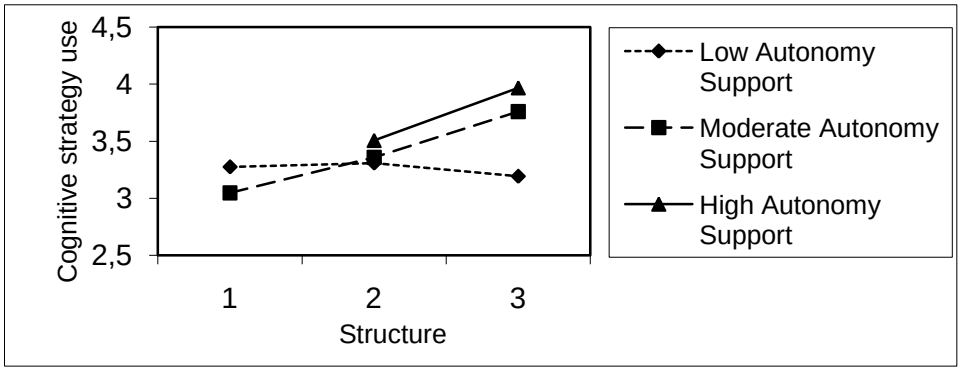

Figure 1. Simple slopes of perceived teacher structure predicting cognitive strategy use at varying levels of perceived teacher autonomy support. High levels are 1 *SD* above the mean; low levels are 1 *SD* below the mean.

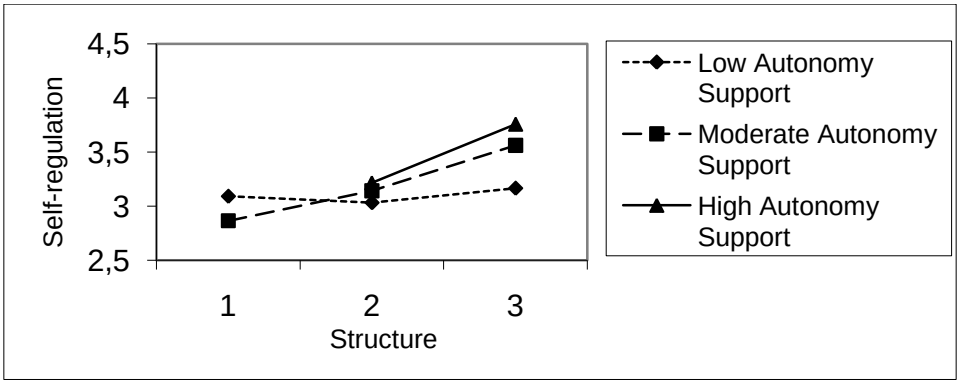

Figure 2. Simple slopes of perceived teacher structure predicting self-regulation at varying levels of perceived teacher autonomy support. High levels are 1 *SD* above the mean; low levels are 1 *SD* below the mean.

Table 3

Results of Hierarchical Regression Analyses Predicting Self-Regulated Learning by Type of Education, Autonomy Support, and Structure

	Self-regulated learning			
	Cognitive strategy use		Self-regulation	
Step	1	2	1	2
1. Main effects				
Autonomy support	.06	.10	-.02	.00
Structure	.30***	.28***	.32***	.31***
Type of education	-.12**	-.11*	-.13**	-.14**
R^2	.17***		.14***	
2. Two-way interactions				
Autonomy support x Structure		.18***		.20***
Autonomy support x Type of education		-.02		.04
Structure x Type of education		.05		.03
R^2		.20***		.17***
ΔR^2		.03***		.03***

Note. Type of education was dummy coded with secondary school students = 0 and teacher training students = 1.

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

Discussion

This study examined the relations between the teaching style dimensions autonomy support and structure and SRL. The following results emerged. First, perceived teacher autonomy support and structure could be empirically differentiated. Furthermore, both components of teaching style were positively correlated, suggesting that when teachers provide the necessary guidelines, rules, and feedback to guide students' behavior, they, on average, tend to use an autonomy-supportive style. This finding confirms previous research (e.g., Noels, 2003) and is predictable from the SDT-perspective, as both autonomy support and structure share a student-centred focus. That is, autonomy-supportive teachers try to take the internal frame of reference of their students and highly structuring teachers try to provide student-attuned feedback, help, and optimal challenge. Furthermore, the empathic stance that characterizes highly autonomy-supportive teachers might allow for the provision of individualized structure, which might further explain why teachers who are perceived as autonomy-supportive are more likely to be highly structuring as well.

Second, it was found that structure, but not autonomy support was positively related to the self-regulatory outcomes. Third, the main effect of structure, however, needed to be interpreted with caution, as it was qualified by a significant interaction between autonomy support and structure. Specifically, as hypothesized on the basis of SDT (Deci & Ryan, 2000), structure was found to have different relations with students' SRL depending on the level of autonomy support. It seems that structure needs to be coupled with at least a moderate amount of autonomy support to have a positive association with SRL. Under low autonomy-supportive conditions,

students who experienced their teachers as offering structure were not likely to use self-regulatory strategies. These findings are in line with SDT, which suggests that structure provides students the necessary know-how to use self-regulatory strategies, while autonomy support provides students with the necessary energy to effectively engage in these self-regulatory strategies. Both components seem to be needed, so that their simultaneous presence works in a synergistic fashion to facilitate SRL, presumably because students' basic needs for autonomy and competence are simultaneously supported.

Autonomy support and structure were each assessed with a rather brief 8-item scale. However, it would be interesting to assess subcomponents of autonomy support (e.g., choice and non-controlling language; see Assor & Kaplan, 2001 and Reeve & Jang, 2006) and structure (e.g., help and positive feedback).This would allow for greater insight in these important teaching dimensions and their interrelations. Moreover, it could then be examined whether specific subcomponents of both structure and autonomy support interact in the prediction of SRL.

Limitations and Further Directions for Future Research

Some limitations should be taken into consideration when interpreting these findings. First, the cross-sectional design of the study does not allow drawing conclusions concerning the direction of effects although educational research typically assumes that teaching influences learning. It may be useful to collect longitudinal data and to use cross-lagged analyses in future studies to look for reciprocal effects of the dimensions of teaching style and the use of self-regulatory skills (see e.g., Skinner & Belmont, 1993). A second limitation refers to the possibility of shared method

variance because our data are based on student self-reports. A multi-informant approach can prevent this problem. Furthermore, the sole reliance on self-reports makes it difficult to determine true teacher effects because we based our conclusions on perceived teaching. On the other hand, the way students interpret the teaching climate will most likely determine their study engagement, as the students are the ultimate recipients of teaching style. Third, future research might examine whether the current findings can be replicated and generalized to younger populations and to other aspects of SRL, such as affect regulation (Boekaerts, 1995). Finally, further research will be necessary to identify characteristics associated with adequate, or beyond-adequate, autonomy support.

Conclusion

Regardless of these limitations, our study is the first, to our knowledge, to demonstrate the interacting role of autonomy support and structure in relation to SRL. Because a central goal of educators is to optimize students' self-regulatory learning skills, our findings have some practical significance. They give indications as to how one can create conditions that promote active learning. Teachers can help students to generate their own planning, self-monitor, and evaluate their goal progress by providing differentiated help and clear expectations. It seems, however, critical that these structuring components are provided in an autonomy-supportive fashion to facilitate SRL, that is, by being respectful for students' opinion, allowing students to participate in the decision process, and by providing a rationale when giving guidelines.

Footnote

1. To test the curvilinear relations between autonomy support and structure in the prediction of SRL, we initially entered the quadratic interaction effect in the third step. No evidence was found for curvilinear structure effects on SRL.

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4

How Teachers Optimize Learning and Motivation and Prevent Problem Behavior: It is a Matter of Offering Both Autonomy Support and Clear Expectations

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Abstract

The aim of this study was (a) to examine naturally occurring patterns of teaching constellations based on perceived teacher autonomy support and clear expectations, as a central aspect of structure, and (b) to investigate links with study motivation, learning behavior, and problem behavior. Based on person-centered analyses (i.e., cluster analysis) in a large sample of high school students (N = 1036), four different perceived teaching constellations emerged: high autonomy-support – clear expectations, low autonomy-support – vague expectations, moderately high autonomy-support – moderately vague expectations, and average autonomy-support – clear expectations. The perceived teaching constellation characterized by both high autonomy support and clear expectations yielded the most positive pattern of outcomes, whereas its opposite characterized by low autonomy support and vague expectations yielded the most negative pattern of outcomes. The two remaining groups fell in between. Implications for the understanding of teaching configurations are discussed.

"If I would allow too much autonomy in my classroom, chaos would break out". This statement represents a concern of many teachers. Their anxiety results from the conviction that autonomy-supportive teaching stands for the provision of unlimited freedom to students. This freedom, where students can completely go their own way, would then cause chaos, such that the classroom would be characterised by a complete lack of structure. As such, teacher provision of autonomy support cannot go hand in hand with the provision of structure. Instead, within this view, teacher autonomy support is seen as antithetical to the provision of order such that autonomy support and structure would represent the opposite ends of a single continuum.

However, every-day experience, theoretical accounts, such as Self-Determination Theory (SDT; Deci & Ryan, 2000; Vansteenkiste, Niemiec, & Soenens, in press), and recent research (e.g., Cleveland & Reese, 2005) indicate that teacher autonomy support can be both conceptually and empirically distinguished from structure. Moreover, SDT suggests that autonomy support and structure are two necessary ingredients of an optimally motivating teaching style (Jang, Reeve, & Deci, in press). The objective of our study is to address the question how autonomy support and clear expectations, possibly the most central aspect of structure, relate to one another, thereby using a person-centered analytic approach. That is, we examine how both teaching dimensions naturally co-occur according to students and we relate the retained perceived teaching constellations to several indicators of students' functioning, both in terms of their motivation, learning pattern (i.e., concentration, time management, information

processing, persistence, and test anxiety), and problem behavior (i.e., externalising problem behavior and skipping classes).

Defining Autonomy Support and Structure

Within the teaching literature, two different views on autonomy support have been distinguished. Some researchers (e.g., Karagozoglu, 2009) define teacher autonomy support as the promotion of independence, whereas others define teacher autonomy support as the promotion of volitional functioning (e.g., Reeve, Bolt, & Cai, 1999). Teachers who promote independent functioning leave their students by themselves. This attitude implies that teachers grant their students unlimited freedom and require that their students resolve issues by themselves, even without help of the teacher. Indeed, teachers who promote independence expect that students take personal responsibility for their learning process by acting independently.

When defined as the promotion of volitional functioning, autonomy support means that teachers enable students to pursue self-endorsed goals (Assor, Kaplan, & Roth, 2002). They do so by providing students with the desired amount of choice (Katz & Assor, 2007), by giving a rationale when choice is constrained (Jang, 2008), by empathizing with the learners' perspective so that learners feel understood, and by avoiding controlling language (e.g., "you should"; Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Conceptualized in this way, autonomy support primarily nurtures students' need for autonomy as students who experience autonomy support from their teacher likely function according to their personal interests and values (Skinner & Belmont, 1993).

When teachers promote independence and thus grant unlimited freedom to their students, it is unlikely that they will offer directions, set goals, and communicate expectations (i.e., structure). Thus, the likely consequence of promoting independence is that teachers create a laissez-faire stance where students lack sufficient guidance. In contrast, when defined as the promotion of volitional functioning, autonomy support does not imply a lack of structure. Indeed, the opposite of teacher autonomy support is a controlling teaching environment (Deci, Schwartz, Sheinman, & Ryan, 1981) in which teachers frustrate students' need for autonomy by intrusively directing their activities. Controlling teachers use pressure and coercion by relying on internally controlling strategies, such as guilt-trips or conditional regard, or rather externally controlling strategies, such as threatening with tests or harsh sanctions to get compliance (Soenens & Vansteenkiste, 2010).

In the current teaching literature within the SDT tradition, dozens of cross-sectional, longitudinal, and experimental studies have demonstrated the benefits of promoting learners' volitional functioning for students' motivation, learning, achievement, and even socio-emotional development (Reeve, 2009). On the other hand, controlling teaching has been related to negative feelings toward learning, such as boredom and stress, maladaptive forms of motivation, restricted engagement, and poor academic achievement (Assor & Kaplan, 2001; Sierens, Soenens, Vansteenkiste, Goossens, & Dochy, 2010).

Given that high autonomy support is not treated as low structure, the question arises how structure has been defined within SDT. Reeve (2006) argued that structure yields three components depending on the timing of

the learning process, that is, (a) presenting clear goals, rules, and expectations *before* a learning activity, (b) offering help, guidance, and supervision *during* a learning activity, and (c) giving positive, constructive feedback *after* a learning activity. Conceptualized in this way, structure primarily nurtures students' need for competence as students who are given sufficient structure likely feel able to effectively deal with the study tasks at hand (Skinner & Belmont, 1993). Similar to the positive description of structure, the lack of structure can be described along three subcomponents. These subcomponents are: (a) chaos as opposed to providing clear expectations, (b) lack of help as opposed to offering assistance, and (c) critical and competence-thwarting feedback as opposed to positive and constructive feedback.

Previous research within the SDT tradition has primarily examined the correlates and consequences of the feedback component. For instance, the provision of positive feedback has been found to promote intrinsic enjoyment of the activity (e.g., Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008) through fostering a sense of competence (e.g., Vansteenkiste & Deci, 2003). Other studies showed that positive feedback promoted engagement (e.g., Koka & Hein, 2003), and protected against feelings of helplessness and discouragement (e.g., Mouratidis et al., 2008).

Combining Autonomy Support and Structure

When defined as the promotion of volitional functioning, autonomy support and structure do not constitute opposing teaching dimensions that would be situated on a single continuum. Instead, "they can, and should, *exist side-by-side* in a mutual supportive way" (Reeve, 2002, p. 193; our italizing). In line with this, Sierens, Vansteenkiste, Goossens, Soenens and

Dochy (2009) found through confirmatory factor analysis that autonomy support (i.e., promoting volitional functioning) and structure could better be modeled as separate teaching style components. Moreover, rather than being negatively related, both dimensions were moderately positively correlated. Similarly, Jang et al. (in press), relying on observer ratings, found that autonomy support and structure positively co-varied rather than being antagonistic or curvilinear.

Due to the recent call to consider autonomy support and structure as separate and compatible teaching dimensions (e.g., Jang et al., in press), researchers have paid more attention to the effects of combining autonomy support and structure on students' learning, adjustment, and grades. These studies have generally shown that both teacher autonomy support and structure play a role in the initiation and regulation of learning behavior. For instance, Trouilloud, Sarrazin, Bressoux, and Bois (2006) showed that teachers' communication of expectations yielded a more positive effect on students' perceived competence when provided in an autonomy-supportive rather than controlling fashion. Furthermore, using observational assessments of autonomy support and structure, Jang and colleagues (in press), showed that both teaching dimensions predicted student engagement. Finally, Sierens et al. (2009) demonstrated that perceived teacher structure only had positive effects on self-regulated learning when it was combined with at least a moderate amount of perceived teacher autonomy support.

The Present Study: Differentiating Between Diverse Teaching Configurations

All previous studies on the effects of teacher autonomy support and structure adopted a variable-oriented approach in the sense that they

examined the correlates of these dimensions. However, if teacher autonomy support and structure truly form different dimensions, they should be perceived to co-occur in different degrees across teachers. Such distinct subgroups of perceived teaching configurations with their appropriate parameters can best be modeled by a person-oriented approach, such as cluster analysis (von Eye & Bogat, 2006). Thus, the first aim of our study was to examine naturally occurring constellations of perceived teacher autonomy support and structure through cluster analysis. In our study, we focused on clear expectations to operationalize structure because clear expectations can be communicated in an autonomy-supportive way, for instance, by providing a rationale for the offered expectations, or in a rather controlling way, for instance, by threatening with punishments if students fail to comply with the expectations. For this reason and based on SDT's claim that autonomy support and structure are different and compatible teaching dimensions, we expected to find two groups of teachers offering clear expectations: (a) teachers who are experienced as offering clear expectations and scoring high on autonomy support and (b) teachers who are experienced as offering clear expectations and scoring low on autonomy support. In addition, crossing the two dimensions of autonomy support and clear expectations results also in the following teaching configurations, (c) vague expectations and low autonomy support and (d) vague expectations and high autonomy support (Jang et al., in press). Conversely, if autonomy support and structure would rather be situated on a single continuum, only two clusters would emerge: a high autonomy support with vague expectations and a low autonomy support with clear expectations cluster.

The second aim of this research was to examine the external validity of the subgroups (i.e., clusters). We investigated whether students that belong to different retained clusters would display a different pattern of motivation and learning outcomes. Moreover, we broadened the range of outcomes by including measures of externalizing problem behavior, such as stealing, drug use, and skipping classes. In keeping with previous research (e.g., Trouilloud et al., 2006) and SDT, we expected that the cluster consisting of students perceiving their teachers as scoring high on autonomy support and offering clear expectations would show the most adaptive pattern of outcomes because students' psychological needs for autonomy and competence are best met in this case. Conversely, the cluster of students scoring low on both perceived teaching dimensions is hypothesized to yield the most detrimental set of outcomes because both the needs for autonomy and competence are most likely to be frustrated. The two remaining clusters are hypothesized to score in between. This hypothesis is based on the idea that in these two clusters, autonomy or competence is satisfied, whereas the other basic need is not supported or might even be frustrated. It is possible that the perceived presence of one teaching dimension (i.e., either autonomy support or clear expectations) would compensate to a certain degree for the damaging effect of the absence of the other teaching dimension. Yet, we examine in a rather exploratory way whether these compensatory effects might be somehow outcome specific. First, we assume that providing clear expectations might increase any kind of motivation (i.e., controlled and autonomous motivation) as one needs to know what is expected to be motivated to engage in the requested activity. Therefore, it is possible that controlled motivation will be higher in students involved in the cluster

consisting of clear expectations and low autonomy support compared to students involved in the high autonomy support and vague expectations cluster. As for autonomous motivation to fully develop, we assume that both autonomy support and clear expectations need to be present instead of only one of the two dimensions. Second, in light of previous research (e.g., Jang et al., in press; Sierens et al., 2009) showing that both autonomy support and structure are beneficial for adaptive learning outcomes, we tentatively explored whether differences in learning outcomes would be found between the clusters consisting of high autonomy support and vague expectations and of low autonomy support and clear expectations. Third, abundant research in the parenting domain and in developmental psychology in general, has shown that especially clear rules and expectations could prevent adolescents' problem behavior (Barber, Olsen, & Shagle, 1994). Consequently, one might expect less problem behavior in students within the cluster of clear expectations and low autonomy support than in students within the cluster of vague expectations and high autonomy support.

Method

Participants and Procedure

Participants were 1036 students in 7th through 12th grade and an additional, optional year for specialization. They were evenly divided by gender (50% male). Their age ranged from 12 to 21 years with a mean age of 15.52 years (*SD* = 1.98). In terms of education, 292 students in the 7th and 8th grade followed a common track and 20 students followed a vocational training. In the remaining grades, 54 students followed an academic track, 628 followed a technical track, and 42 followed a vocational training. Each class filled out the questionnaire during a class period of 50 minutes in the

computer lab. Because the students could not proceed when they skipped a question, there were no missing values.

Measures

We used a five-point Likert scale (1 = strongly disagree to 5 = strongly agree) for all scales, unless otherwise indicated.

Autonomy support. Autonomy support (8 items) was assessed using the short version of the Teacher as Social Context Questionnaire – Student Report (TASC; Belmont, Skinner, Wellborn, & Connell, 1988). This scale aims to measure students' perception of teachers' promotion of volitional functioning. All negatively stated items were reverse coded. A sample item reads: "My teachers give me a lot of choices about how I do my schoolwork". Cronbach's alpha was .77.

Clear expectations. Ten statements were formulated to rate teachers' provision of clear expectations. Hereby, the subscale Structure of the short version of the TASC was an important source of inspiration. A sample item reads: "My teachers clearly explain what will happen if someone breaks the rules (concerning tasks, tests,…)". In this sample, the internal consistency was .83.

Self-regulation – academic. In order to measure quality of study motivation, students completed an adapted, Dutch version of the Self-Regulation Questionnaire-Academic (SRQ-A; Ryan & Connell, 1989). This version was developed and validated by Vansteenkiste, Sierens, Soenens, Luyckx, and Lens (2009). The scale was designed to assess autonomous and controlled study motivation. Specifically, autonomous motivation consists of intrinsic motivation, referring to learning out of pleasure and curiosity (4 items, e.g., "I'm studying because I enjoy doing it"), and identified

regulation, referring to learning because one recognizes and endorses the value of learning (4 items, e.g., "I'm studying because it is personally important to me"). Controlled motivation consists of introjected regulation, referring to learning because of pressure-inducing internalizing forces (4 items, e.g., "I'm studying because I would feel guilty if I wouldn't do so"), and external regulation, referring to learning because of external contingencies (4 items, e.g., "I'm studying because I am supposed to do so"). Cronbach's alpha was .85 for autonomous motivation and .77 for controlled motivation.

Learning outcomes. Students' learning outcomes were assessed with five scales of a validated Dutch version (Lacante & Lens, 2005) of the Learning and Study Strategies Inventory (LASSI; Weinstein & Palmer, 2002). Each scale contains 8 items, except the 5-item scale "information processing". Concentration reflects students' ability to direct and maintain their attention when studying (e.g., "I pay attention fully when studying"; α = .80). Time management assesses students' use of planning and efficient scheduling of their school work (e.g., "When I decide to do schoolwork, I set aside a certain amount of time and stick with it"). By dropping one item, Cronbach's alpha increased from .57 to .62). Persistence assesses students' willingness to exert the effort necessary to successfully complete academic requirements (e.g., "When work is difficult I either give up or study only the easy parts" (reverse coded); α = .74). Information processing refers to students' use of deep-level learning strategies (e.g., organization strategies) to build bridges between prior knowledge and what they are learning (e.g., "I translate what I am studying into my own words"; α = .80). Test anxiety assesses the extent to which students worry about their study and

performance (e.g., "Worrying about doing poorly interrupts my concentration on tests"; 8 items; α = .76).

Externalizing problem behavior. We used two subscales to assess students' externalizing problem behavior. Following Soenens, Vansteenkiste, Luyckx, and Goossens (2006), participants were administered five items from the Deviant Behavior Scale (DBS; Weinmann, 1992) tapping their frequency of substance use during the last year. A sample item reads: "I smoked soft drugs (like marihuana and hash)". To measure delinquency, we used the questionnaire developed by Baerveldt (1992; Houtzager & Baerveldt, 1999). Students had to indicate how many times they committed 23 different offenses, such as vandalism, stealing, and unarmed fights, over the last year. We dropped the two school skipping items and treated them as a separate variable because of their specific relevance in the school context. For both substance use and delinquency items, students answered on a scale ranging from 0 (*never*) to 3 (*4 times or more*). By averaging all items, we created a composite score of externalizing problem behavior. Cronbach's alpha was .88.

Skipping classes. The two school skipping items from the questionnaire of Baerveldt (1992) were treated as one scale. The items were highly positively correlated (r = .54, p < .001).

Results

Correlational Analyses

Correlations among the study variables can be found in Table 1. As expected, autonomy support and clear expectations were significantly positively related. Also, both were positively correlated with students' autonomous study motivation, time management, concentration, information

processing, and persistence and negatively correlated with test anxiety, externalizing problem behavior, and skipping classes. Finally, clear expectations were positively related to students' controlled motivation, whereas autonomy support was not related to controlled motivation.

Confirmatory Factor Analysis

In order to examine the construct validity of the teaching scales (i.e., autonomy support and clear expectations), a confirmatory factor analysis was performed. Item loadings ranged between .19 and .76 with a mean loading of .55. Fit indices of this two-factor solution were: RMSEA = .08, CFI = .94, and SRMR = .07, indicating good model fit. This fit was superior in comparison to a one-factor model, RMSEA = .11, CFI = .89, and SRMR = .08; ΔSBS-χ^2 (1) = 36.22, $p < .001$.

Table 1

Intercorrelations Among Measured Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Autonomy support	-	.54**	.32**	.04	.33**	.34**	.28**	.37**	-.12**	-.25**	-.15**
2. Clear expectations		-	.23**	.12**	.23**	.27**	.22**	.36**	-.07*	-.23**	-.12**
3. Autonomous motivation			-	.27**	.36**	.33**	.41**	.46**	.00	-.18**	-.11**
4. Controlled motivation				-	.07*	-.06	.11**	.14**	.21**	-.02	.01
5. Time and study environment					-	.55**	.27**	.65**	-.10**	-.39**	-.30**
6. Concentration						-	.14**	.56**	-.54**	-.31**	-.20**
7. Information processing							-	.40**	.14**	-.13**	-.10**
8. Persistence								-	-.06*	-.38**	-.29**
9. Test anxiety									-	.05	-.04
10. Externalizing problem behavior										-	.55**
11. School skipping											-

* $p < .05$. ** $p < .01$.

Cluster Analysis

Prior to running the cluster analysis, scores on autonomy support and clear expectations were standardised to guarantee that differences in scale variability would not influence the cluster classifications. In addition, because outliers can significantly affect the results of a cluster analysis (Garson, 1998), we removed univariate and multivariate outliers. Univariate outliers were those participants who scored higher than 3 standard deviations above or below the mean on one or both teaching dimensions. Multivariate outliers were identified using the Mahalanobis distance measure (Garson, 1998). In all, 11 participants were removed, resulting in a final sample of 1025 students.

Next, cluster analysis was performed on autonomy support and clear expectations following a two-step procedure (Gore, 2000). In the first step, Ward's hierarchical clustering procedure was applied. This procedure is based on the Euclidean distance between clusters, an appropriate measure of cluster similarity (Everitt, Landau, & Leese, 2001). In stepwise fashion, clusters that were similar in terms of their squared Euclidean distance were combined (Asendorpf, Borkenau, Ostendorf, & van Aken, 2001). We considered two- to five-cluster solutions and inspected the percentage of explained variance in the two teaching dimensions in each cluster solution. This variance should be at least 50% for each of these dimensions (Milligan & Cooper, 1985). The three-, four-, and five-cluster solutions met this criterion and were thus considered for the second step of the cluster analysis to optimize the solutions. Dropping the two-cluster solution indicates that autonomy support and clear expectations do not fall along a single dimension, because only two clusters should emerge in such a case.

In the second step, the cluster centers for the three-, four-, and five-cluster solutions were used as non-random initial cluster centers for a non-hierarchical iterative clustering procedure or the so-called *k*-means procedure (Asendorpf et al., 2001). Iteratively, participants are displaced between clusters and new cluster centers were computed on the basis of Euclidean distances. The resulting cluster solutions were evaluated based on SDT and parsimony (von Eye & Bogat, 2006). Because the five-cluster solution was not interpretable, we retained the three- and four-cluster solutions for stability analyses.

To compare the three- and four-cluster solutions with regard to their replicability across random splits of the sample, a double-split cross-validation procedure was used on each solution (Breckenridge, 2000). For this procedure, the total sample was randomly split into halves. Then, the two-step procedure (Ward and *k*-means) was applied in each subsample. Next, the participants of each half of the sample were assigned to new clusters on the basis of their Euclidean distances to the cluster centers of the other half of the sample. The two solutions were then compared for agreement with the original clusters by means of Cohen's kappa (κ). The two resulting kappa's were averaged. A Cohen's kappa of at least 0.60 was considered acceptable (Asendorpf et al., 2001). In our study, stability and replicability were acceptable only for the four-cluster solution with a kappa of .70. The three-cluster solution provided a kappa of .36. Therefore, only the four-solution was further analyzed. Figure 1 presents the final cluster solution. The four-cluster solution accounted for 69% of the variance in autonomy support and 71% in clear expectations.

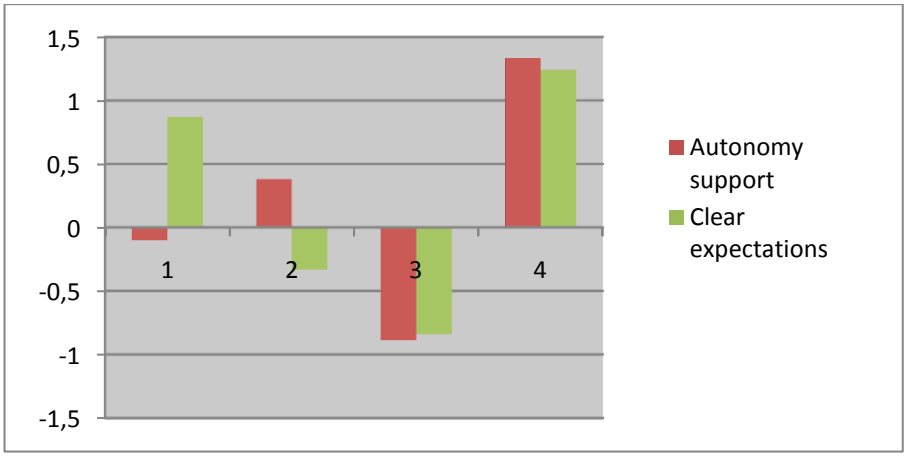

Figure 1. Z-scores for autonomy support and clear expectations in the 4-cluster solution.

The z-scores of autonomy support and clear expectations are reported in Table 2. Cluster 1 (*N* = 199, 19.41%) was characterised by students who perceived their teacher as average on autonomy support and offering clear expectations. The average level of autonomy support supposedly involved perceptions of elements of autonomy-supportive teaching combined with moments of managing the class in a more controlling way. Cluster 2 (*N* = 294, 28.68%) was characterized by students who perceived their teacher as moderately high on autonomy support, but offering moderately vague expectations. The relative (i.e., compared to the rest of the sample) lack of clear expectations supposedly involved perceptions of some chaos. Cluster 3 (*N* = 348, 33.95%) was characterized by students who perceived their teacher as low on autonomy support and offering relatively vague expectations. Likely, compared to the other clusters, perceptions of chaos and control dominate. Finally, Cluster 4 (*N* = 184, 17.95%) was characterized by students who perceived their teacher as very high on autonomy support and offering very clear expectations. In this case, students

experienced that rules were offered and conventions were made in an autonomy-supportive fashion. Overall, these findings confirm the idea that autonomy support and clear expectations represent two different teaching dimensions that can be crossed into four teaching configurations.

Relations Between Cluster Membership and Outcomes

External correlates of the four clusters were examined to determine the validity of our cluster solution. To do so, a MANOVA was conducted with cluster membership as independent variable and the student outcome variables as dependent variables. Based upon Wilks' Lambda, statistically significant multivariate cluster differences were found ($F(30; 2971) = 102.29$, $p < .001$, $\eta^2 = .50$). Next, we tested differences between the four clusters by using follow-up univariate *F*-values, η^2, and pairwise comparisons based on Tukey's Honestly Significant Difference test. These results are shown in Table 2.

Motivation correlates. Although the four groups differed in terms of both their autonomous and controlled motivation, the differences in autonomous motivation were more pronounced. Specifically, students in the high autonomy support - clear expectations cluster reported the highest degree of autonomous motivation, followed by the students in the clusters consisting of average autonomy support - clear expectations and of moderately high autonomy support - moderately vague expectations. Contrary to our expectations, students in the average autonomy support - clear expectations and moderately high autonomy support - moderately vague expectations clusters did not significantly differ from each other on controlled motivation. If any differences for controlled motivation emerged, it was found that perceiving clear expectations was associated with greater

controlled motivation, especially if teachers were not perceived as being highly autonomy-supportive.

Learning correlates. As expected, analyses of the learning outcomes revealed that the students in the high autonomy support - clear expectations cluster reported more time management, concentration, deep-level learning (i.e. processing information), and persistence, whereas they scored lower on test anxiety compared to all other groups. Students in the low autonomy support - vague expectations cluster systematically scored lower on time management, concentration, deep-level learning, and persistence in comparison with students in both the average autonomy support - clear expectations and moderately high autonomy support - moderately vague expectations clusters, but the three clusters did not differ for test anxiety. Furthermore, the average autonomy support - clear expectations and moderately high autonomy support - moderately vague expectations clusters did not differ from each other and scored in between the two other clusters for time management, concentration, deep-level learning, and persistence.

Problem behavior correlates. Concerning externalizing problem behaviors, students in the high autonomy support -clear expectations cluster scored lowest followed by students in both the average autonomy support - clear expectations and moderately high autonomy support - moderately vague expectations clusters and, finally, students in the low autonomy support - vague expectations cluster. Similarly, the scores for skipping classes of the average autonomy support - clear expectations and moderately high autonomy support - moderately vague expectations clusters fell in between the scores for the high autonomy support - clear expectations and the low autonomy support - vague expectations clusters, without differing

significantly from the high autonomy support - clear expectations cluster. Furthermore, the cluster consisting of students perceiving clear expectations and average autonomy support did not differ significantly from the low autonomy support - vague expectations cluster. Thus, it appears that the absence of both autonomy support and structure is associated with the greatest risk for externalizing problem behavior, whereas the presence of both has the strongest buffering effect.

Table 2

Univariate ANOVA's and Post-hoc Cluster Comparisons Based Upon Tukey HSD Tests for the Four Clusters (N = 1025)

	Clusters					
Variable	Average autonomy support – clear expectations	Moderately high autonomy support – moderately vague expectations	Low autonomy support – vague expectations	High autonomy support – clear expectations	$F(3, 1021)$	η^2
Cluster dimensions						
Perceived autonomy support	$-.10^{b}$	$.38^{c}$	$-.89^{a}$	1.33^{d}	764.11***	.69
Perceived clear expectations	$.87^{c}$	$-.33^{b}$	$-.84^{a}$	1.24^{d}	821.16***	.70
Motivational measures						
Autonomous motivation	2.85^{b}	2.92^{b}	2.62^{a}	3.28^{c}	36.09***	.10
Controlled motivation	3.00^{b}	2.92^{ab}	2.80^{a}	2.88^{ab}	3.50*	.01
Learning outcomes						
Time management	2.89^{b}	2.93^{b}	2.69^{a}	3.57^{c}	31.65***	.09
Concentration	3.06^{b}	3.06^{b}	2.78^{a}	3.45^{c}	38.18***	.10
Information processing	3.24^{b}	3.29^{b}	3.04^{a}	3.50^{c}	24.58***	.07
Persistence	3.43^{b}	3.38^{b}	3.04^{a}	3.72^{c}	57.06***	.14
Test anxiety	2.90^{b}	2.90^{b}	2.95^{b}	2.72^{a}	4.45**	.01
Problem behavior						
Externalizing problem behavior	$.32^{b}$	$.36^{b}$	$.47^{c}$	$.21^{a}$	22.40***	.06
Skipping classes	$.25^{ab}$	$.24^{a}$	$.38^{b}$	$.11^{a}$	8.66***	.03

Note. A cluster mean is significantly different from another mean if they have different superscripts.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

The current state of the literature on the relationship between autonomy support and structure is one of confusion (Reeve, 2008). In an attempt to remove some of this confusion, we used both a variable-oriented (i.e., factor analysis) and a person-oriented approach (i.e., cluster analysis) to advance our knowledge about (a) the relation between autonomy support and a central aspect of structure, that is, clear expectations and (b) their relation with motivation, learning, and problem behavior outcomes.

Differentiating Autonomy Support and Structure

In support of SDT's proposition that autonomy support and structure form two different teaching dimensions (e.g., Assor & Kaplan, 2001) and replicating results from previous research (e.g., Sierens et al., 2009), confirmatory factor analysis indicated that imposing the hypothesized two-factor model produced an acceptable fit. Furthermore, autonomy support and clear expectations were found to be positively related rather than negatively, as might be expected when autonomy support and structure would fall along a single continuum. Thus, this is a first indication that autonomy support does not imply a lack of structure. Second, further in line with the SDT view that both teaching dimensions are compatible, results of our person-centered analyses showed that perceived teacher autonomy support and structure do naturally covary. In one of the four retained groups, students perceived their teachers as providing both high autonomy support and clear expectations. Students in this cluster almost certainly view their teachers as nurturing their inner motivational resources, relying on informational language, and acknowledging negative affects (Jang et al., in press) while at the same time establishing clear rules and fair expectations.

The cluster-analytic results also reveal that a combination of the absence of both autonomy support and clear expectations is possible. Probably, these teachers are perceived as using controlling tactics in a more chaotic way compared to the other clusters. Pressuring strategies, such as criticisms and punishments, are likely to be used inconsequently. As a result, these students might feel pressed, but they do not know which goals they have to achieve, how they have to behave, or how they have to handle learning tasks.

Finally, expanding on variable-oriented studies, our study showed through cluster analysis that there actually are students who perceive their teachers as offering moderately high autonomy support, but moderately vague expectations or who perceive their teachers as offering clear expectations, but only an average level of autonomy support. Students in the former group perceive their teachers as giving opportunities do develop their own talents and interests, but potentially sometimes in a rather chaotic manner. The latter group of students seem to perceive their teachers as not truly stimulating their autonomous functioning. Most likely, these students perceive their teachers as behaving sometimes in a rather controlling manner, urging students to follow the clear expectations that are imposed by them.

Relationships With School Developmental and Adjustment Outcomes

It was postulated that a teaching configuration characterized by high autonomy support and clear expectations would yield the most adaptive student outcomes. In contrast, a teaching configuration characterized by low autonomy support and vague expectations was expected to yield the least adaptive student outcomes. Finally, the teaching configurations

characterized by moderately high autonomy support and moderately vague expectations or characterized by an average level of autonomy support and clear expectations were expected to yield student outcomes falling in between. Overall, the findings confirmed the expectation of such an ABC-pattern.

The positive outcomes experienced by students in the cluster high on autonomy support and clear expectations appeared in both the academic and social adjustment domains. Those students reported the highest level of autonomous study motivation made more use of deep-level cognitive strategies (i.e., information processing), were more concentrated in classes, were more competent in time management, were more persisting, reported less test anxiety, were less behaviorally disordered, and reported the lowest level of skipping classes compared to students in the other clusters. Probably, teacher autonomy support and clear expectations work together to enhance adaptive school functioning and to deflect students from problem behaviors. The finding that students benefit from teachers who integrate an autonomy-supportive and structuring teaching style has been confirmed in other, variable-oriented studies. For example, the study by Jang and colleagues (in press) showed that autonomy support and structure both uniquely positively predicted high school students' behavioral engagement. Also, in the study of Skinner and Belmont (1993) teacher provision of both autonomy support and structure predicted children's engagement across the school year. It is important to note that our study is the first, to our knowledge, to use a person-oriented approach to demonstrate the complementary nature of autonomy support and clear expectations (i.e.,

structure). Our results obtained through a different approach enhance the validity of earlier findings.

Students perceiving their teachers as offering low autonomy support and vague expectations reported the lowest level of autonomous as well as controlled motivation, were less likely to concentrate, to use time management strategies and deep-level cognitive strategies, and to persist compared to students in the other clusters. Furthermore, generally speaking, they were more likely to show aggressive and socially defiant behavior, to use drugs, and to skip classes than students from the other clusters. Apparently, offering autonomy support nor structure is associated with poor student functioning. Our results are in agreement with prior, variable- and person-oriented studies carried out in educational and parenting contexts showing that need-frustrating teaching and parenting styles are associated with maladaptive adolescent functioning (e.g., Soenens, Vansteenkiste, & Sierens, 2009).

Our study offered empirical evidence concerning the effects of the presence of one teaching dimension (i.e., moderately high autonomy support or clear expectations, respectively) in the relative absence of the other (i.e., moderately vague expectations or average autonomy support, respectively). Our results showed that students perceiving such teaching configurations are likely to have lower levels of autonomous study motivation, time management strategies, concentration, deep-level learning strategies, and persistence and higher levels of test anxiety and externalizing problem behavior in comparison to students in the high autonomy support and clear expectations cluster. However, students in these two groups reported higher autonomous motivation, better learning outcomes, and lower externalizing

problem behavior than students lacking autonomy support and receiving vague expectations.

Related to skipping classes, the average autonomy support – clear expectations and moderately high autonomy support – moderately vague expectations did not differ from each other and scored in between the high autonomy support – clear expectations and low autonomy support – vague expectations clusters. However, their differences with the high autonomy support – clear expectations cluster were not significant. Moreover, the average autonomy support – clear expectations cluster did not differ significantly from the low autonomy support – vague expectations cluster for school skipping. Nevertheless, taking into control the low variance in school skipping because of its two composing items together with the finding that the average autonomy support – clear expectations and the moderately high autonomy support – moderately vague expectations clusters scored in between for externalizing problem behavior, we conclude that there is a clear tendency for individuals in both clusters to report less problems than students in the low autonomy support - vague expectations cluster, but more problems than students in the high autonomy support - clear expectations cluster. Furthermore, clear expectations did not have a unique role in preventing students from problem behaviors as students in the average autonomy support – clear expectations cluster did not report less problem behavior than students in the moderately high autonomy support – moderately vague expectations cluster. Taken together, this leads us to conclude that our results show an ABC-pattern. Yet, there are two exceptions to this pattern.

First, in line with our hypothesis that clear expectations are especially important in developing a controlled motivation, we found the highest level of controlled motivation in students within the cluster of average autonomy support and clear expectations. However, their level of controlled motivation was not significantly different from students in the high autonomy support – clear expectations and in the moderately high autonomy support – moderately vague expectations clusters. Second, the average autonomy support – clear expectations and moderately high autonomy support – moderately vague expectations clusters did not differ significantly from the low autonomy support - vague expectations cluster for test anxiety. Apparently, in our sample, autonomy support and clear expectations are both necessary for reducing test anxiety whereas the presence of one of those teaching dimensions partially suffice for stimulating learning outcomes as concentration, time management, deep-level learning, and persistence. Future replication research should further investigate the conditions under which test anxiety is reduced. Possibly, the structure subcomponent positive feedback primarily reduces test anxiety because positive feedback is directly linked with feelings of competence which are undermined in the case of test anxiety (Vansteenkiste & Deci, 2003).

Limitations and Further Suggestions for Future Research

Although the results provide support for the bi-dimensional nature of autonomy support and structure and their relations with outcomes, the current study has some limitations. One limitation involves the rather narrow operationalization of teacher structure as it referred to clear expectations only. It seems indicative to examine whether other aspects of teacher structure (i.e., guidance during the learning activity and feedback

during and after the learning activity; Reeve, 2006) are also moderately positively correlated with teacher autonomy support and whether their perceived presence equally yields desirable motivation, learning, behavior correlates. Second, only student perceptions were collected such that the four teaching configurations represent prototypes in student lay perceptions of teaching behavior. It is recommended in future research to corroborate students' report with teacher perceptions and with direct observations (e.g., Hughes, Cavell, & Jackson, 1999). However, we believe the use of student reports is legitimate because the manner in which the students perceive teaching constellations – and not teachers' actual behavior – is likely the primary determinant of student outcomes (Shuell, 1996).

Third, we were somewhat surprised by the ABC-pattern of our findings. Specifically, it was difficult to distinguish the average autonomy support – clear expectations and the moderately high autonomy support – moderately vague expectations clusters on the outcome variables implying a lack of outcome specificity of autonomy support and clear expectations. This lack of obvious distinctiveness is probably due to the finding that these clusters were less differentiated on the two clustering variables as compared to the other two clusters. Therefore, we recommend future research to examine the replicability of our findings by including other outcomes, such as internalizing problem behavior and motives. For example, it is conceivable that students with teachers rather low on autonomy support, but offering clear and strict expectations will act in a rebellious manner because their autonomy is restricted. Conversely, students with teachers offering high autonomy support, but rather vague expectations, will experience boredom because their competence is not challenged. It is also possible that

these clusters have different antecedent profiles. So, an additional suggestion for future research would be to identify contextual variables responsible for the development of both clusters. For example, it is possible that the prevalence of constraints and inflexible structures in the school climate leads to the development of teachers towards offering low autonomy support, but clear expectations. Otherwise, a laissez-faire school climate can promote the development of teachers towards offering high autonomy support, but vague expectations.

Implications for Practice

From an applied perspective, structuring elements, such as clear expectations, can best be introduced in an autonomy-supportive way to promote adolescents' school development and to protect them from problem behaviors. Probably, the combination of autonomy support and structure is necessary because autonomy support primarily develops in students a sense of being autonomous and self-directing whereas structure primarily develops in students a sense of being effective and competent. This means that teachers are advised to employ consistent managerial procedures and expectations while at the same time listening to students' ideas, offering choices, and minimizing the use of controlling strategies.

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5

Dynamics of Perceived Teacher Autonomy Support and Structure: Longitudinal Associations With Students' Autonomous Motivation and Self-Regulated Learning

Sierens, E., Soenens, B, Luyckx, K, Vansteenkiste, M., Goossens, L, & Beyers, W. (2010). *Manuscript submitted for publication.*

Abstract

Perceived teacher autonomy support and structure, two necessary components of an optimal teaching style, are associated positively with students' motivation and learning. However, longitudinal research examining these associations is scarce. In the present longitudinal study among two samples of secondary school students (total N = 1068), latent change models revealed that the mean level of perceived teacher autonomy support remained stable across a school year, whereas perceived teacher structure somewhat decreased. Further, substantial interindividual differences existed in the rate of change of autonomy support and structure and the changes in both variables were positively interrelated. Finally, changes in perceived autonomy support and structure were related positively to changes in students' autonomous study motivation, which, in turn, were related positively to changes in students' use of self-regulated learning strategies (i.e., deep-level cognitive and meta-cognitive strategy use). These findings enhance our understanding of how autonomy support and structure develop over time and how these teaching dimensions are related to student functioning across time. Implications for future research and educational practices are discussed.

Within Self-Determination Theory (SDT; Deci & Ryan, 2000), a motivational theory intensively studied and applied within educational psychology, it is argued that teacher autonomy support and structure are necessary ingredients of a student-centered teaching style (Reeve, Deci, & Ryan, 2004). Although research findings generally have shown that both teaching dimensions are positively associated with students' learning and well-being, most of this research has been cross-sectional in nature. Consequently, important questions about the dynamics of these teaching dimensions have remained unaddressed. For instance, do students' perceptions of their teachers change across the school year or do these perceptions stabilize after the first months of interaction with their teachers? Is there a trade-off between teacher autonomy support and structure across time, such that increasing levels of perceived autonomy support are related to decreased perceptions of structure? Are changes in perceived autonomy support and structure related to changes in students' motivational orientation and subsequent learning? The current short-term longitudinal study aims to explore (a) how perceived teacher autonomy support and structure develop and are related over time and (b) how their perceived development is related to the development of students' study motivation and self-regulated learning.

Mean Level Change and Intraindividual Change in Perceived Autonomy Support and Structure

According to SDT, teacher autonomy support refers to the promotion of students' volitional functioning, that is, teachers encourage students to regulate their learning according to personally valued interests and preferences. Autonomy-supportive teachers attune to their students'

perspective and views, provide choice when possible, avoid the use of controlling strategies and language, make connections between students' learning activities and their interests and personal values, and apply the course material to real world problems (Reeve, 1998). Teacher structure consists of three key features that, in combination, provide the basis for a well-organized classroom climate. First, structuring teachers provide clear rules and expectations and unambiguously intervene when rules are violated. Second, they guide and supervise students during the learning process and, third, they provide effectance-relevant information by means of constructive feedback (Reeve, 2006).

Previous research, using correlational and experimental methodologies, has consistently confirmed the numerous benefits of teacher autonomy support for students' school functioning, as indexed by higher creativity (e.g., Amabile, 1979), deep-level learning (e.g., Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005), greater persistence (e.g., Vallerand, Fortier, & Guay, 1997), better grades (e.g., Soenens & Vansteenkiste, 2005), and higher well-being (e.g., Chirkov & Ryan, 2001; see Reeve, 2009, for an overview). Although less frequently studied, research also shows positive relations between elements of structure (e.g., positive feedback) and students' quality of motivation and engagement (e.g., Amorose & Horn, 2000; Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008b; Tucker et al., 2002).

Although autonomy support and structure have been identified as important features of an adaptive teaching style, little is known about their development across time. The few studies that examined changes in these teaching dimensions addressed rank-order change only. Skinner and

Belmont (1993), for instance, reported rank-order stability coefficients of .67 and .65 for structure and of .79 and .60 for autonomy support for teacher and student reports respectively, indicating that initial between-person differences in perceived autonomy support and structure are maintained across time. However, rank-order stability vs. change does not inform us about stability vs. change at the intraindividual level (i.e., within persons). That is, it does not indicate how much students' perceptions change relative to their baseline level. We think it is important to examine this type of change because this allows testing two contrasting hypotheses about how students' perceived teaching styles change across a school year. These hypotheses are related to mean-level changes and interindividual variability in student-perceived autonomy support and structure.

Similar to the primacy-effect identified in social psychology (Asch, 1946), the *initial impression* hypothesis states that students form impressions of their teachers' teaching style in the first months of the school year and do not alter these impressions during the school year. Students' initial representations of their teachers may be influenced by students' personality or history of past school experiences. For instance, students high on openness to experience and curiosity or students with a history of academic competence may be more likely to experience their teachers as autonomy-supportive compared to students low on curiosity or to students with a history of academic failure. Students' initial perceptions of their teachers may also be rooted in actual stable teacher behavior which may, in turn, be driven by teachers' personality (Deci, 1995; Jia et al., 2009; Struyven, Dochy, & Janssens, 2008). Irrespective of whether these initial impressions are mainly influenced by students' own functioning or by

teachers' actual behavior, they may function as a self-fulfilling prophecy such that students perceive and interpret subsequent teacher behavior in line with their initial impressions. Both stable personality features and history of school experiences in students as well as stable behavioral patterns of teachers may thus contribute to a lack of mean-level change and to a lack of variation in intraindividual change in perceived autonomy support and structure across a school year.

Research on parenting has shown that, although child rearing practices are characterized by substantial rank-order stability, they are still characterized by significant intra-individual change and variation across time (Holden & Miller, 1999). Given such findings from the parenting literature, it seems unlikely that teaching practices would be uniquely characterized by stability. Thus, in contrast to the initial impression hypothesis, the *change* hypothesis entails that there is room for change within students' perceptions of teaching style across the school year. This perceived change can be manifested as either mean-level intraindividual change or interindividual differences in intraindividual change, or as a combination of both types of changes simultaneously (Caspi, 1998). Mean-level change may occur in one of two directions. Teachers may be perceived as increasingly autonomy-supportive and structuring because students may feel that their teachers are better able to attune their teaching style according to students' interests, values, and preferences during a school year. Alternatively, teachers may be perceived as decreasing in autonomy support and structure. Although this is speculative, such a decreasing trend could be the result of a decrease in teachers' energy resources during the school year and an according heightened sensitivity to sources of stress, such as student

misbehavior (Reeve, 2009). Because both increases and decreases in the level of perceived autonomy support and structure seem possible, we did not formulate any a priori predictions regarding mean-level change. Furthermore, we expected that there would be substantial interindividual differences in students' intraindividual changes in perceived teaching. It is likely that, depending on students' individual experiences and encounters with teachers (de Jong & Westerhof, 2001), some students may experience their teachers as increasingly autonomy-supportive and structuring whereas others may not perceive such an increase or even experience decreasing teacher autonomy support and structure.

A first aim of this study is to examine these contrasting hypotheses. If the initial impression hypothesis holds true, we anticipate a lack of mean-level intraindividual change, together with a lack of interindividual differences in perceived change in the teaching dimensions. In contrast, if the change hypothesis holds true, we anticipate significant mean-level change in perceived teaching dimensions, significant interindividual differences in perceived change, or a combination of both.

Associations Between Intraindividual Changes in Autonomy Support and Structure

One criticism occasionally leveled against the concept of autonomy support is that teacher autonomy support is at odds with the provision of structure and may at times even give rise to a chaotic and unpredictable class environment (e.g., Walker, 2008; see also Reeve, 2006). Within this view, autonomy-supportive socialization is typically defined as characteristic of teachers who allow unrestricted freedom to their students and who do not provide requests and advice for students to rely on (e.g.,

Gray & Steinberg, 1999; Karagozoglu, 2009). Granting students such unlimited freedom would involve a climate of "laissez-faire" and permissiveness. With a conceptualization of autonomy support as permissiveness it is indeed logical to expect a negative relationship with structure, meaning that autonomy support is essentially incompatible with structure (Reeve, 2002).

SDT, however, does not define autonomy support as unrestricted freedom. Instead, it defines autonomy support as the promotion of volitional functioning in students and it maintains that autonomy support and structure represent fully compatible teaching dimensions (Reeve, 2002). For example, within SDT's view, teacher autonomy support involves that teachers take the students' perspective in order to identify their preferences and resources. This capacity to understand and attune to students' preferences, and, hence, to be student-directed, is also necessary in order to provide students with effective and differentiated structure. This example illustrates that the dynamics involved in autonomy support and structure are complementary and mutually supportive (Connell & Wellborn, 1991). In line with SDT's view, cross-sectional research has shown that both teaching dimensions are positively interrelated (e.g., Jang, Reeve, & Deci, in press; Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2010).

A second aim of this study is to provide further support for SDT's notion of compatibility between autonomy support and structure by examining their interrelationship from a longitudinal perspective. It is expected that perceived autonomy support and structure go hand in hand across time and display positively correlated change.

Autonomy Support and Structure and Students' Functioning

Due to the dearth of longitudinal research on the relationship between teacher autonomy support and structure and student outcomes, little is known about the dynamic interplay between these variables across time. In one of the few longitudinal studies, Skinner and Belmont (1993) found a reciprocal relationship between autonomy support and structure and students' engagement in the classroom using cross-lagged analyses. Such analyses, however, only address rank-order changes in teaching style and student outcomes, thereby failing to capture intraindividual change in these constructs. As a consequence, it is unknown to date how intraindividual changes in perceived autonomy support and structure relate to intraindividual changes in important student outcomes.

The target outcome in the present study is students' self-regulated learning (SRL), one of the main aims of education (PISA, 2004). SRL refers to the generation of deliberate steps towards the attainment of self-set academic goals (Zimmerman, 2000). SRL encompasses both deep-level cognitive strategies (e.g., summarizing) and meta-cognitive strategies (i.e., monitoring one's learning process through strategies such as concentration). Cross-sectional research demonstrated that both teacher autonomy support and structure are related to higher levels of student engagement and to self-regulated learning, such as meta-cognitive strategy use (e.g., Jang et al. in press; Sierens et al., 2010; Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009). To explain how teaching relates to SRL, a number of SDT-based studies have examined the mediating role of students' quality of motivation, that is, whether students' motivation is autonomous or controlled in nature. Autonomous motivation is a type of motivation

characterized by a sense of psychological freedom and personal choice (Ryan & Deci, 2000). SDT distinguishes between engaging in a learning activity for its own sake (i.e., intrinsic motivation) and because of its perceived personal importance (i.e., identified regulation) as two components of autonomous motivation. The opposite of autonomous motivation is controlled motivation, which is accompanied by a sense of pressure and coercion. SDT distinguishes between engaging in a learning activity because of external pressuring contingencies, such as rewards and punishments (i.e., external regulation), and because of internal pressuring contingencies, such as feelings of guilt and shame (i.e., introjected regulation) as two components of controlled motivation.

On the basis of SDT, it can be predicted that perceived autonomy-supportive and structuring teaching contributes to autonomous motivation which, in turn, provides energy and opportunities for deep-level learning and meta-cognitive strategy use. Consistent with this prediction, research documented the mediating role of students' quality of motivation in the relationship between teacher autonomy support and learning (e.g., Reeve, Jang, Hardre, & Omura, 2002; Vansteenkiste, Zhou, Lens, & Soenens, 2005). Although mediation is in essence a dynamic process that develops over time (Preacher & Hayes, 2008), there is a lack of longitudinal studies testing the full mediational sequence wherein student motivation plays an intervening role in the relationship between the teaching dimensions and student outcomes. (Parts of) this mediational sequence have been tested longitudinally in a few studies (e.g., Guay, Boggiano, & Vallerand, 2001; Otis, Grouzet, & Pelletier, 2005; Williams & Deci, 1996).

Consequently, to explain why changes in perceived teaching dimensions would be related to changes in students' SRL, the third aim of this study is to examine whether intraindividual changes in students' autonomous study motivation play a mediating role in this association. We focus on changes in autonomous study motivation because autonomous motivation has been shown to be more relevant to the adaptive learning outcomes studied here (i.e., deep-level cognitive and meta-cognitive strategy use) than controlled motivation, which seems more relevant to maladaptive outcomes, such as test anxiety and problematic behavior in the classroom (Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009).

The Present Study

This longitudinal study compromised two samples of secondary school students who were followed during an entire school year. At the beginning and end of the school year, we tapped into perceived teaching style (i.e., autonomy support and structure), students' autonomous motivation, and students' SRL (i.e., deep-level cognitive and meta-cognitive strategy use). The time span of one school year was chosen because we were interested in perceptions of autonomy support and structure of the same teachers at both waves whereas teaching staff typically changes every school year in secondary schools. We explored three main issues. First, we investigated how perceived autonomy support and structure unfold over time, thereby examining both mean-level change and interindividual differences in intraindividual change. Second, we investigated the longitudinal relationship between perceived teacher autonomy support and structure, thereby examining whether there is a trade-off between both teaching dimensions across a school year or whether they are positively

interrelated and develop in tandem. Third, we tested an integrated model that posits intraindividual changes in students' autonomous motivation as a mediating variable in the relation between changes in perceived autonomy support and structure and changes in students' SRL.

These questions and hypotheses were addressed in two independent samples. In the first sample, students reported on their perceptions of teachers in general and about their global study motivation and SRL. In contrast, in the second sample students reported on their perceptions of a specific teacher (i.e., the teacher for the course on Dutch, the participants native language) and on their motivation and SRL for Dutch. This approach allows us to test whether our findings are replicable and consistent across different ways to of tapping into teaching style, motivation, and learning. One possibility, for instance, is that there is less intraindividual change in students' perception of teachers in general compared to their perception of a specific teacher because such a general perception may be more strongly determined by students' own dispositions.

In examining these research questions, we also addressed the role of gender differences in students' perceptions of autonomy support and structure and their autonomous motivation and SRL. Female students have been shown to score higher than male students on autonomous motivation (e.g., Vallerand et al., 1992). Research focusing on gender differences in perceived adaptive teaching and SRL outcomes led to relatively more inconclusive results (e.g., Hong, Peng, & Rowell, 2009; Sierens et al., 2009; Vansteenkiste et al., 2009). We also examined whether the associations between changes in the perceived teaching dimensions, changes in autonomous motivation, and changes in students' SRL would replicate

across or, conversely, would be moderated by gender. To the best of our knowledge, no research to date has addressed possible gender differences in associations among adaptive teaching, students' autonomous motivation, and learning.

Method

Participants and Procedure

Participants were Dutch-speaking Belgian students in the 11th and 12th grade from nine academic-track schools. Participants provided data in November and May of the same school year. Sample 1 comprised 533 students. The students in this sample filled out the questionnaire with respect to their teachers, study motivation, and learning behavior in general. At the start of the study, mean age was 16.9 years (*SD* = 0.7) and there were 219 male (41.1%) and 314 female (58.9%) students. Of all students in the subsample, 94% (*n* = 501) participated at both waves and 6% (*n* = 32) participated at Wave 1 only. Sample 2 consisted of 535 students. The students in this sample filled out the questionnaire with respect to their teacher of Dutch and their study motivation and learning behavior for the Dutch classes. At the start of the study, mean age was 17 years (*SD* = 0.7) and there were 201 male (37.6%) and 334 female (62.4%) students. Of all students in the subsample, 93.5% (*n* = 500) participated at both waves and 6.5% (*n* = 35) at Wave 1 only.

Participants filled out the questionnaires in class and this took place during a regular 50-minute course. The first author administered the questionnaires and answered individual questions. All participating students received a unique but anonymous code to match the data from the two measurement points. The students were guaranteed that their responses

would be treated with confidentiality and were informed that they could end their participation in the study at any time.

Measures

All items were scored on 5-point Likert scales ranging from 1 = *"strongly disagree"* to 5 = *"strongly agree"*.

Autonomy support and structure. Autonomy support and structure were examined using the short form of the Teacher as Social Context Questionnaire (TASC; Belmont, Skinner, Wellborn, & Connell, 1988). Both teaching dimensions were assessed by an 8-item subscale. Previous studies reported Cronbach's alphas above .71 and relatively good fit indices from a confirmatory factor analysis in high school and teacher education samples (Belmont et al., 1988; Sierens et al., 2009). In this study, Cronbach's alphas ranged from .70 to .81. Example items are: "My teachers/ My Dutch teacher listen/s to my ideas" (autonomy support) and "My teachers/ My Dutch teacher do/es not make it clear what they expect of me in class" (structure; reverse coded).

Autonomous motivation for learning. Using two subscales of the Dutch version (Vansteenkiste et al., 2009) of the Academic Self-Regulation Questionnaire (SRQ-A; Ryan & Connell, 1989), we measured intrinsic motivation and identified regulation for studying as subcomponents of autonomous motivation. Participants responded to the stem: "Why are you studying in general/ for Dutch? I'm studying (Dutch) because...". Example items are: "it's an exciting thing to do" (intrinsic motivation) and "it is personally important to me" (identified regulation). We calculated autonomous motivation scores by averaging the items of intrinsic motivation and identified regulation. Such measures of autonomous

motivation have been shown to have good Cronbach's α and have been successfully used in previous studies (e.g., Vansteenkiste et al., 2009). In this study, Cronbach's alphas were .86 and .89 at Time 1 and .87 and .91 at Time 2 for Samples 1 and 2, respectively.

Deep-level cognitive strategy use. To measure students' use of deep-level cognitive strategies, we used three subscales from the often used and psychometrically established Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991). Elaboration (6 items) refers to the degree to which students connect new information with other information and prior knowledge. A sample item reads: "When reading (for this class), I try to relate the material to what I already know". Critical thinking (5 items) refers to the degree to which students apply prior knowledge to critically analyze the learning material. A sample item reads: "I try to play around with ideas of my own related to what I am learning (in this course)". Organization (4 items) refers to the degree to which students select appropriate information and main ideas. A sample item reads: "When I study (for this course), I go through the readings and my class notes and try to find the most important ideas". These three subscales were positively correlated (mean *r* at Time 1 = .41 and .47 for Sample 1 and Sample 2, respectively, all *p*s < .01 and mean *r* at Time 2 = .42 and .46 for Sample 1 and Sample 2, respectively, all *p*s < .01). We calculated the overall mean across the three subscales to reflect deep-level cognitive strategy use. Cronbach's alphas were .87 and .87 at Time 1 and .91 and .90 at Time 2 for Samples 1 and 2, respectively.

Meta-cognitive strategy use. Meta-cognitive self-regulation was assessed with the subscales Meta-cognitive self-regulation (12 items) and

Time and study environment (8 items) of the MSLQ (Pintrich et al., 1991). Meta-cognitive self-regulation refers to the degree to which students plan, monitor, and regulate as they proceed on a learning task. A sample item reads: "If course materials are difficult to understand, I change the way I read the material". Time and study environment refers to the degree to which students manage and regulate their study time and place. A sample item reads: "I usually study in a place where I can concentrate on my course work". Both scales were positively correlated (r = .48; p < .01 at Time 1 and r = .44; p < .01 at Time 2 for Sample 1 and r = .51; p < .01 at Time 1 and r = .51; p < .01 at Time 2 for Sample 2) and we calculated the overall mean of both subscales to capture meta-cognitive strategy use. Cronbach's alpha was .77 at both times for Sample 1 and .77 at Time 1 and .80 at Time 2 for Sample 2.

Results

Correlational Analyses and Descriptive Statistics

Table 1 reports the correlations of all study variables at both measurement waves. All correlations were highly comparable across both samples. At both times of measurement, teacher autonomy support and structure were positively related and both were significantly and positively correlated with students' autonomous motivation, deep-level cognitive strategy use, and meta-cognitive strategy use. Furthermore, students' autonomous study motivation was positively related to both SRL components which were positively interrelated. All stability coefficients were significant and ranged from .52 to .73 in Sample 1 and from .43 to .69 in Sample 2.

Table 1

Correlations Among the Study Variables in Sample 1 (N = 533) and Sample 2 (N = 535)

Variable	1	2	3	4	5	6	7	8	9	10
1. Autonomy support T1	-	.57**	.27**	.16**	.24**	.52**	.47**	.25**	.20**	.20**
2. Structure T1	.62**	-	.18**	.16**	.21**	.43**	.58**	.16**	.12**	.15**
3. Autonomous motivation T1	.34**	.29**	-	.38**	.43**	.25**	.22**	.73**	.40**	.39**
4. Deep-level cognitive strategy use T1	.22**	.22**	.44**	-	.52**	.13**	.10*	.32**	.64**	.44**
5. Meta-cognitive strategy use T1	.23**	.30**	.42**	.49**	-	.19**	.16**	.38**	.47**	.65**
6. Autonomy support T2	.53**	.42**	.22**	.17**	.18**	-	.64**	.36**	.30**	.31**
7. Structure T2	.43**	.43**	.21**	.19**	.26**	.65**	-	.31**	.23**	.30**
8. Autonomous motivation T2	.25**	.25**	.69**	.35**	.33**	.35**	.36**	-	.48**	.48**
9. Deep-level cognitive strategy use T2	.14**	.17**	.40**	.58**	.43**	.23**	.29**	.47**	-	.60**
10. Meta-cognitive strategy use T2	.22**	.30**	.38**	.43**	.59**	.29**	.35**	.48**	.59**	-

Note. T1 = Wave 1; T2 = Wave 2. Sample 1 correlations above the diagonal; Sample 2 correlations below the diagonal.

* $p < .05$. ** $p < .01$.

To assess gender differences in the study variables, MANOVAs were conducted with gender as the independent variable and all study variables as the dependent variables (see Table 2). A significant multivariate effect of gender was obtained in both Sample 1 and Sample 2 (Wilks' $\lambda = .93$; $F(10, 478) = 3.69$, $p < .001$, $\eta^2 = .07$ and Wilks' $\lambda = .89$; $F(10, 484) = 5.86$, $p < .001$, $\eta^2 = .11$, respectively). In Sample 1, follow-up univariate analyses revealed significant gender differences for autonomy support, autonomous motivation, and meta-cognitive strategy use at Time 1 and for autonomy support, structure, autonomous motivation, and meta-cognitive strategy use at Time 2. In Sample 2, follow-up univariate analyses revealed significant gender differences for autonomy support, autonomous motivation, and meta-cognitive strategy use at Time 1 and for autonomy support, autonomous motivation, deep-level cognitive strategy use, and meta-cognitive strategy use at Time 2. On all these variables in both samples, girls scored higher than boys.

Table 2

Mean Differences by Gender in Sample 1 (N = 533) and Sample 2 (N = 535)

Variable	Total	Males	Females	*F* (10, 478)/ (10, 484)	η^2
Autonomy support T1	3.23 (.58)/ 3.46 (.68)	3.14 (.04)/ 3.35 (.05)	3.34 (.03)/ 3.53 (.04)	14.57***/ 8.55**	.03/ .02
Autonomy support T2	3.26 (.57)/ 3.44 (.68)	3.16 (.04)/ 3.32 (.05)	3.34 (.03)/ 3.52 (.04)	12.25**/ 9.74**	.03/ .02
Structure T1	3.11 (.58)/ 3.25 (.64)	3.08 (.04)/ 3.22 (.05)	3.17 (.03)/ 3.28 (.04)	2.87/ 1.09	.01/ .00
Structure T2	3.06 (.59)/ 3.19 (.65)	2.94 (.04)/ 3.16 (.05)	3.14 (.03)/ 3.20 (.04)	13.44***/ .45	.03/ .00
Autonomous motivation T1	2.61 (.73)/ 2.52 (.83)	2.51 (.05)/ 2.29 (.06)	2.73 (.04)/ 2.65 (.05)	10.77**/ 22.40***	.02/ .04
Autonomous motivation T2	3.64 (.73)/ 2.46 (.84)	2.49 (.05)/ 2.33 (.06)	2.76 (.04)/ 2.52 (.05)	16.96/ 5.63*	.03/ .01
Deep-level cognitive strategy use T1	3.02 (.56)/ 2.90 (.57)	3.01 (.04)/ 2.87 (.04)	3.04 (.03)/ 2.93 (.03)	.26/ 1.02	.00/ .00
Deep-level cognitive strategy use T2	3.04 (.59)/ 2.92 (.60)	2.98 (.04)/ 2.83 (.05)	3.08 (.03)/ 2.97 (.03)	3.04/ 6.02*	.01/ .01
Meta-cognitive strategy use T1	3.19 (.49)/ 3.19 (.54)	3.15 (.04)/ 3.11 (.04)	3.24 (.03)/ 3.26 (.03)	4.29*/ 9.43**	.01/ .02
Meta-cognitive strategy use T2	3.22 (.49)/ 3.16 (.53)	3.13 (.04)/ 3.01 (.04)	3.30 (.03)/ 3.24 (.03)	15.33***/ 21.07***	.03/ .04

Note. T1 = Wave 1; T2 = Wave 2. Standard deviations are in parentheses. In each cell, the first coefficient shown is for Sample 1, the second coefficient shown is for Sample 2.

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

Changes in Teaching Dimensions, Students' Motivation, and Students' SRL

Intraindividual changes in perceived autonomy support and structure and their relationship with changes in students' motivation and SRL were estimated using latent change models (LCMs; Gottfried et al., 2007; Hertzog & Nesselroade, 2003) in LISREL 8.7 (Jöreskog & Sörbom, 1996) in the two samples separately. LCMs estimate intraindividual change across two waves, using latent variables for intercept (level) and slope (change over time) (Beyers & Goossens, 2008). Variance in the slope factor can be seen as representing interindividual differences in intraindividual change over time.

Each latent change model consists of two parts: (a) a longitudinal measurement model defining the latent variables of interest (teacher autonomy support, teacher structure, motivation, and SRL) at each time point by their respective indicators and (b) a structural model defining latent level and change factors for each latent variable and specifying how these levels and changes are interrelated (Hertzog, Dixon, Hultsch, & MacDonald, 2003). In the longitudinal measurement model, each latent construct was represented by three parcels, consisting of randomly assigned items (Little, Cunningham, Shahar, & Widaman, 2002). Furthermore, covariances among the residuals of the same indicators (i.e., parcels) over time were specified (Sörbom, 1975).

Model fit was evaluated by means of three goodness-of-fit indices. Specifically, we used the comparative fit index (CFI; Bentler, 1990), the standardized root mean square residual (SRMR; Steiger, 1990), and the root mean square error of approximation (RMSEA; Hu & Bentler, 1999). A CFI

above .90, and an SRMR and RMSEA below .08 are considered to be indicators of good model fit (Browne & Cudeck, 1993; Hu & Bentler, 1999).

Stability of the study variables. Univariate LCMs were estimated for the study variables (see Figure 1 for a description of such a model for autonomy support). Table 3 gives an overview of the parameter estimates and fit indices. The LCMs fitted the data adequately. On average, no significant intraindividual change was found in autonomy support and deep-level cognitive strategy use in both samples and in autonomous motivation and meta-cognitive strategy use in Sample 1. However, a significant, but small decline in structure was found in both samples as well as a small decline in students' autonomous motivation and meta-cognitive strategy use in Sample 2. As suggested by Hertzog and Nesselroade (2003), we also looked at interindividual variance. We found significant variance estimates, pointing to considerable interindividual differences in initial levels and rates of change in the study variables.

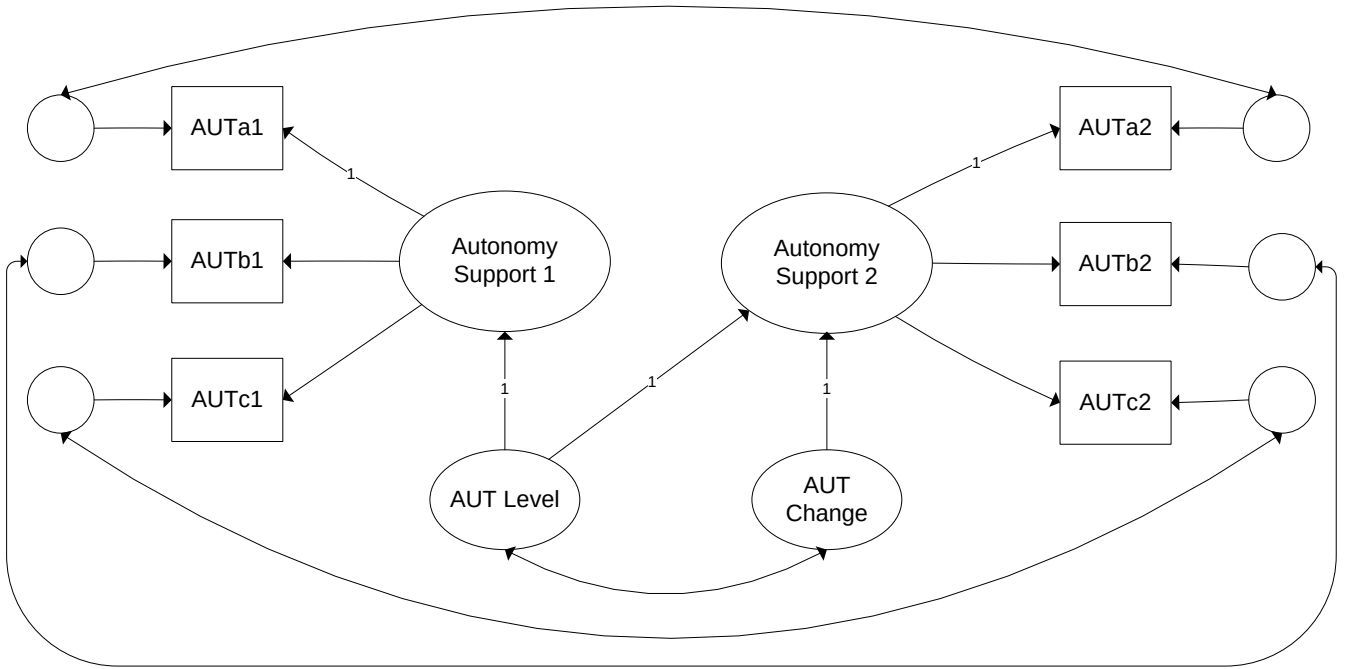


Figure 1. Univariate latent change model for teacher autonomy support (AUT), measured at two points in time (Waves 1 and 2).

Table 3

Parameter Estimates and Fit Indices of the Univariate Latent Change Models in Sample 1 (N = 533) and Sample 2 (N = 535)

	Parameter estimates							
	Level		Change			Fit indices		
Variable	*M*	s^2	*M*	s^2	Range	RMSEA	CFI	SRMR
Autonomy support	3.28***/3.34***	.23***/.32***	.01/-.02	.17***/.26***	-1.67 - 1.49/ -1.77 - 2.14	.09/.07	.95/.98	.06/.04
Structure	3.08***/3.17***	.22***/.29***	-.08**/-.07*	.14***/.24***	-1.43 - 1.02/ -2.14 - 2.14	.06/.09	.99/.97	.04/.06
Autonomous motivation	2.27***/2.46***	.59***/.58***	.01/-.06*	.25***/.32***	-2.00 - 1.44/ -2.14 - 2.43	.04/.08	1/.99	.04/.07
Deep-level cognitive strategy use	3.17***/3.08***	.24***/.26***	.01/.02	.16***/.22***	-1.60 - 1.68/ -2.23 - 2.21	.08/.07	.98/.98	.03/.05
Meta-cognitive strategy use	3.06***/3.30***	.19***/.29***	.02/-.05**	.05***/.11***	-0.68 - 0.69/ -1.03 - 0.94	.02/.00	1/1	.04/.03

Note. In each cell, the first coefficient is from Sample 1, the second coefficient is from Sample 2. RMSEA = Root mean square error of approximation; CFI = Comparative fit index; SRMR = Standardized root mean square residual.

** $p < .01$. *** $p < .001$.

Longitudinal relationship between autonomy support and structure. In both samples, we tested a multivariate LCM for teacher autonomy support and structure, where level and change factors of both variables were estimated simultaneously. This model fitted the data adequately, RMSEA = .03, CFI = .99, SRMR = .03 in Sample 1; and RMSEA = .03, CFI = 1.00, SRMR = .03 in Sample 2. As can be seen in Figure 2, the intercepts of the teaching dimensions were highly positively interrelated (r = .81, p < .001 in Sample 1; and r = .82; p < .001 in Sample 2), as were the changes in both dimensions (r = .64, p < .001 in Sample 1; and r = .72, p < .001 in Sample 2). These interrelationships suggest that autonomy support and structure develop in tandem.

Furthermore, strong negative relationships were found between the latent level and change factors of both dimensions (β = -.54 and -.55, for autonomy support and structure, respectively; p < .01 and p < .001 respectively in Sample 1; and β = -.51 and -.43, for autonomy support and structure, respectively; both ps < .01 in Sample 2), indicating that relatively high levels of each dimension predicted decreases in that dimension over the school year. Finally, there were non-significant relationships between the level factor of autonomy support and the change factor of structure and vice versa (β = .31 and .30, *ns* in Sample 1; and β = .06 and .17, *ns* in Sample 2), indicating that initial scores on one teaching dimension were not related to changes in the other teaching dimension.

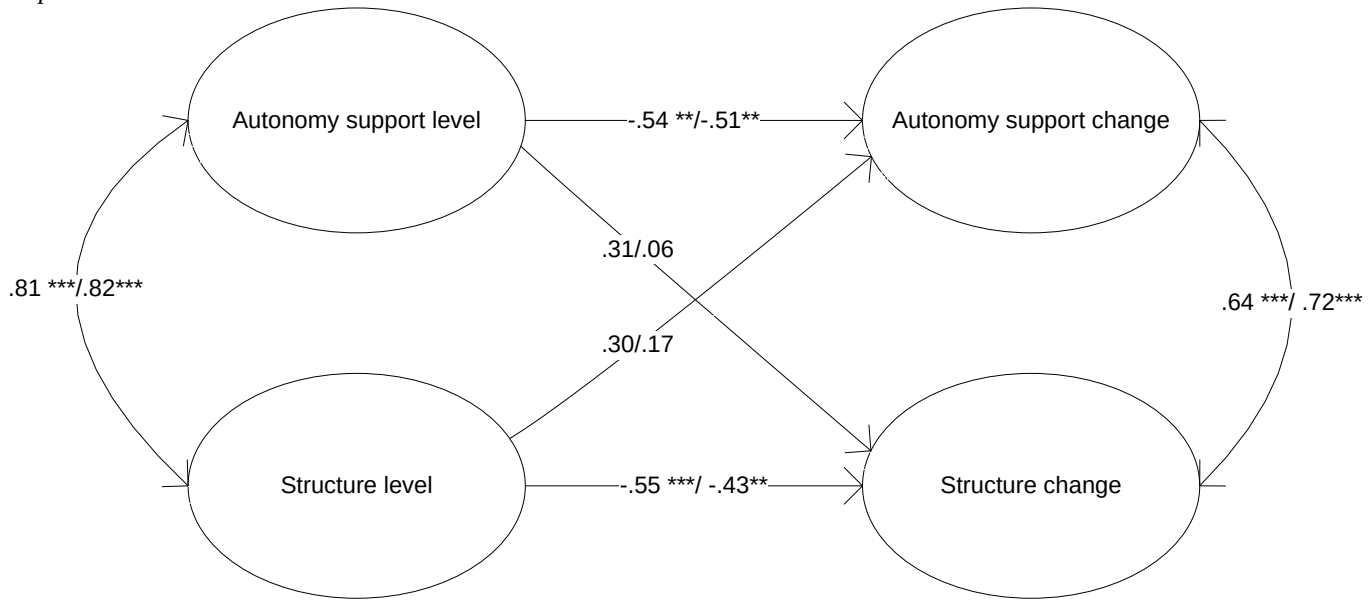


Figure 2. Multivariate latent change model of the longitudinal relationship between teacher autonomy support and structure.
** $p < .01$. *** $p < .01$.

Correlated changes in teaching dimensions and students' motivation and SRL. Multivariate LCMs examined whether the intraindividual changes in autonomy support and structure were related to changes in students' functioning, and more specifically students' SRL, and mediated by students' autonomous motivation. Initial level and change factors were specified for all study variables. As outlined by Dubois et al. (2002), we allowed the initial-level factors to covary freely with each other and with their respective change factors in the structural equation models. Both SRL outcomes were modelled separately and in each model we controlled for students' gender. To test the mediation, three models were estimated and compared (Holmbeck, 1997). First, in the direct effects model, changes in perceived autonomy support and structure were entered simultaneously in the prediction of changes in students' SRL. Second, the full mediation model only includes indirect paths between changes in the perceived teaching dimensions and changes in students' SRL through the mediator, that is, changes in students' autonomous study motivation. Third, the partial mediation model adds direct paths between changes in the perceived teaching dimensions and changes in students' SRL to the previous model. Full mediation is demonstrated when the addition of direct paths in the third model does not improve model fit compared to the second model including only indirect paths. Fit indices for all path models are given in Table 4.

Table 4

Fit Indices of the Multivariate Latent Change Models for Both Self-Regulated Learning Outcomes in Sample 1 (N = 533) and Sample 2 (N = 535)

Outcome	RMSEA	CFI	SRMR
Deep-level cognitive strategy use			
Direct effects model	.05/.05	.98/.98	.06/.07
Full mediation model	.05/.04	.98/.97	.06/.07
Partial mediation model	.05/.04	.98/.99	.06/.04
Meta-cognitive strategy use			
Direct effects model	.04/.05	.99/.98	.05/.07
Full mediation model	.04/.04	.99/.99	.05/.07
Partial mediation model	.04/.04	.99/.99	.05/.07

Note. In each cell, the first coefficient is from Sample 1, and the second coefficient is from Sample 2. RMSEA = Root mean square error of approximation; CFI = Comparative fit index; SRMR = Standardized root mean square residual.

Deep-level cognitive strategy use. In the first step, the paths from perceived changes in autonomy support and structure to changes in deep-level cognitive strategy use in Sample 1 were (marginally) significant (β = .32, p < .01 and β = .16, p < .10, respectively). In Sample 2, however, the path from changes in perceived autonomy support to changes in deep-level cognitive strategy use was not significant (β = .08, p = ns), whereas the path from changes in perceived structure to changes in deep-level cognitive strategy use did reach significance (β = .29, p < .001). In the second step, changes in perceived autonomy support and structure both positively predicted changes in students' autonomous motivation (β = .36, p < .001 and β = .17, p < .05, respectively, in Sample 1; and β = .21, p < .01 and β = .28, p < .001, respectively, in Sample 2). Furthermore, changes in students' autonomous motivation positively predicted changes in students' deep-level cognitive strategy use (β = .42, p < .001 in Sample 1 and β = .37, p < .001 in Sample 2).

In the third step, we tested models with direct and indirect relations. In Sample 2, however, we did not add a direct path between changes in perceived autonomy support and changes in deep-level cognitive strategy use because in Step 1 we found that there was no direct relationship. The models including both direct and indirect relations fitted the data significantly better than models with only indirect relations (*SBS*-$\chi^2\Delta$ (2) = 16.59, p < .001 in Sample 1; and *SBS*-$\chi^2\Delta$ (1) = 69.23, p < .001 in Sample 2). In Sample 1, the direct path from changes in perceived teacher autonomy support to changes in students' use of deep-level cognitive strategies was significant (β = .28, p < .05), suggesting partial mediation. The direct path from changes in perceived teacher structure to changes in students' use of

deep-level cognitive strategy use was not significant (β = .13, p = ns), suggesting full mediation. In Sample 2, this direct path was significant (β = .24, $p < .001$), suggesting partial mediation.

Finally, in Sample 1, we trimmed our model by deleting the non-significant path between changes in perceived teacher structure and changes in students' use of deep-level cognitive strategies. Indirect effects from changes in the perceived teaching dimensions to changes in students' use of deep-level cognitive strategies were generally significant (z = 2.58, $p < .05$ and z = 1.52, p = ns for autonomy support and structure, respectively, in Sample 1; and z = 2.67, $p < .01$ and z = 3.44, $p < .001$ for autonomy support and structure, respectively, in Sample 2). Figure 3 provides a graphical representation of the final models in both samples.

Meta-cognitive strategy use. Repeating the previous steps with changes in students' use of meta-cognitive strategies as outcome variable yielded similar results. Modeling direct paths in Sample 1 showed that both changes in perceived autonomy support and structure positively predicted changes in students' meta-cognitive strategy use (β = .27, $p < .01$ and β = .40, $p < .001$, respectively). In Sample 2, however, the path from changes in perceived autonomy support to changes in meta-cognitive strategy use was not significant (β = .06, p = ns) whereas the path from changes in perceived structure to changes in meta-cognitive strategy use did reach significance (β = .28, $p < .001$). Adding indirect paths showed, as expected, that both changes in perceived teacher autonomy support and structure significantly positively predicted changes in students' autonomous motivation (β = .35, $p < .001$ and β = .19, $p < .05$, respectively, in Sample 1; and β = .21, $p < .01$ and β = .28, $p < .001$, respectively, in Sample 2). Furthermore, changes in

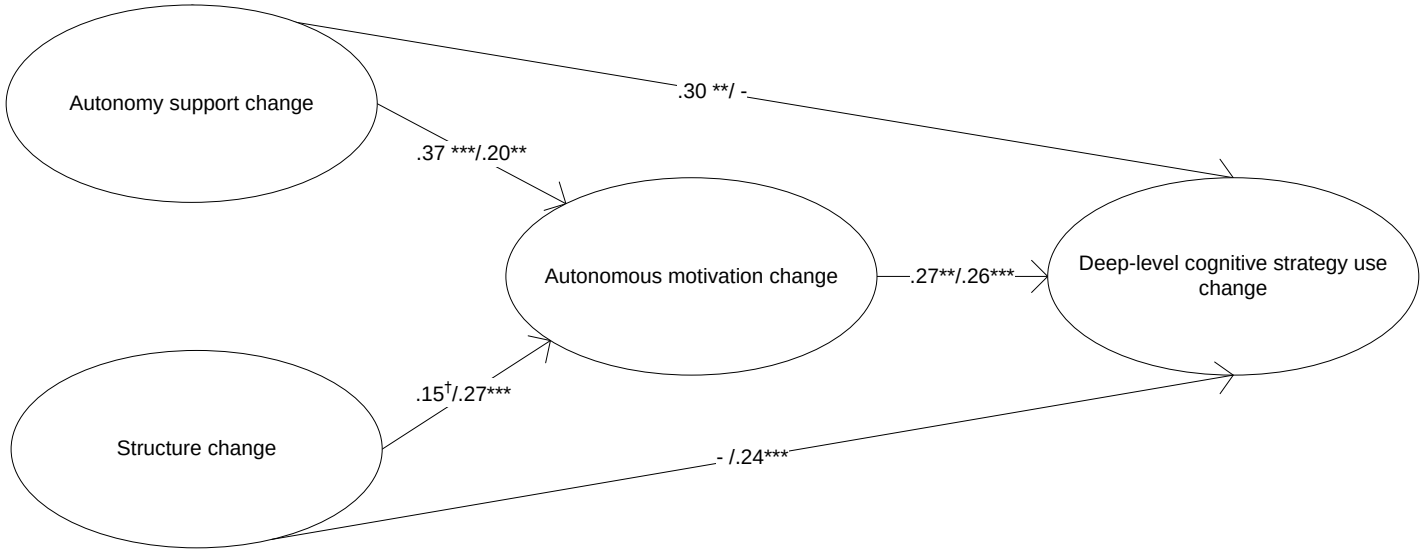
students' autonomous motivation significantly positively predicted changes in students' use of meta-cognitive strategies (β = .48, p < .001 in Sample 1; and β = .51, p < .001 in Sample 2).

Next, in Sample 1, a path model with direct and indirect paths between changes in the perceived teaching dimensions and changes in students' use of meta-cognitive strategies fitted the data better than the model with only indirect paths (*SBS*-$\chi^2\Delta$ (2) = 8.87, p < .05). The direct path from perceived changes in teacher structure to changes in students' use of meta-cognitive strategies was significant (β = .37, p < .001), suggesting partial mediation, whereas the direct path from changes in perceived teacher autonomy support to changes in students' use of meta-cognitive strategies was not (β = .19, p = ns), suggestion full mediation. In Sample 2, we did not add a direct path between changes in perceived autonomy support and changes in meta-cognitive strategy use because in Step 1 we found that there was no direct relationship. Then, the model with a direct path between changes in perceived teacher structure and changes in meta-cognitive strategy use fitted the data better than the model with only indirect paths (*SBS*-$\chi^2\Delta$ (1) = 3.92, p < .05). The direct path from perceived teacher structure to students' use of meta-cognitive strategies was significant (β = .16, p < .05), suggesting partial mediation.

Finally, in Sample 1, we trimmed our model by deleting the non-significant path between changes in perceived teacher autonomy support and changes in students' use of meta-cognitive strategies. Again, the indirect effects from changes in the perceived teaching dimensions to changes in students' use of meta-cognitive strategies were generally significant (z = 2.79, p < .01 and z = 1.82, p < .10 for autonomy support and

structure, respectively, in Sample 1; and $z = 2.75$, $p < .01$ and $z = 3.58$, $p < .001$ for autonomy support and structure, respectively, in Sample 2). Figure 3 depicts the standardized solution for the structural regressions in both samples.

Multi-group analyses with gender. To assess whether the structural relationships in the final models were invariant across gender, multi-group analyses were performed for both SRL outcomes separately. Multi-group analysis compares a constrained model (i.e., constraining the structural coefficients to be invariant across gender) with an unconstrained model (i.e., allowing the structural coefficients to vary across gender). The chi-square differences between both models were not significant, indicating that gender did not moderate the structural relations in the final models (SBS-χ^2diff[8] = 7.76, $p = .46$ in Sample 1; and SBS-χ^2diff[8] = 12.17, $p = .14$ in Sample 2 for deep-level cognitive strategy use; and SBS-χ^2diff[8] = 8.35, $p = .40$ in Sample 1, and SBS-χ^2diff[7] = 8.24, $p = .31$ in Sample 2 for meta-cognitive strategy use).


Autonomy support change
.30 **/ -
.37 ***/.20**
Autonomous motivation change
.27**/.26***
Deep-level cognitive strategy use change
.15†/.27***
Structure change
- /.24***

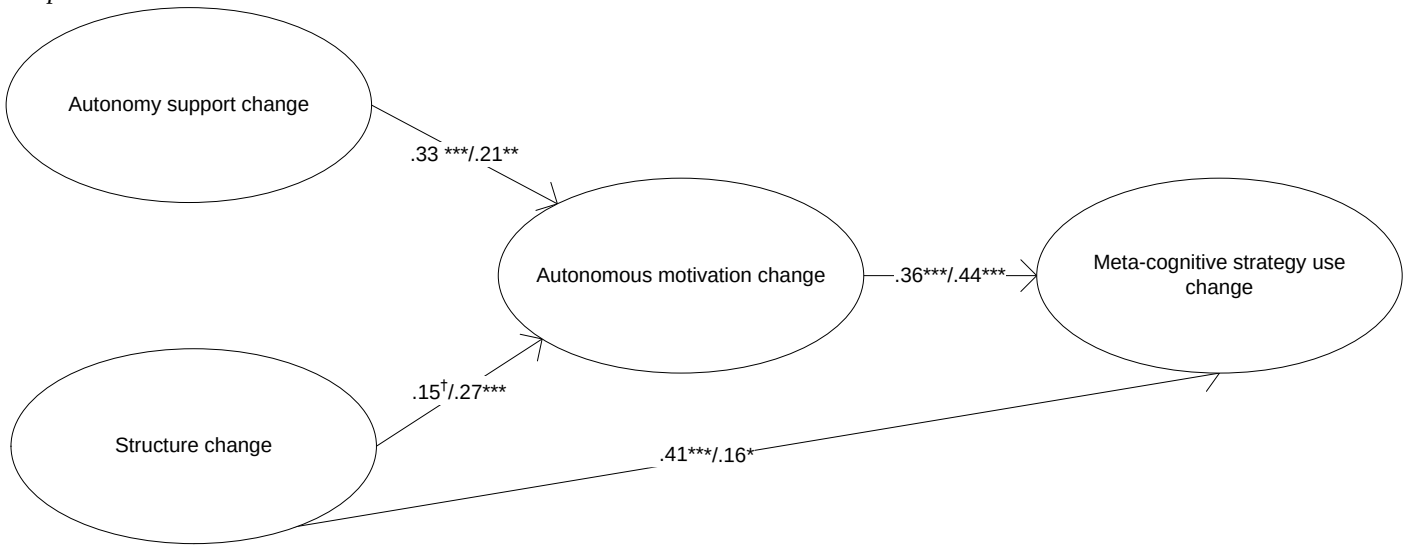


Figure 3. Multivariate latent change model of the longitudinal relationship between teacher autonomy support and structure and students' use of self-regulated learning strategies. For clarity reasons, the paths from gender to each of the latent constructs are not shown.

† p < .10. * *p* < .05. ** *p* < .01. *** *p* < .01.

Discussion

The focus of this study was on intraindividual changes in the perceived teaching dimensions of autonomy support and structure over a single school year and their relation to changes in autonomous motivation and self-regulated learning in students. Our findings add to the limited body of longitudinal research on the dynamic interplay between teaching, student motivation, and student learning. More specifically, our study aimed to provide insight into (a) how perceptions of the crucial teaching dimensions autonomy support and structure develop across the term of a school year and (b) the associations of these changing perceptions with changes in student functioning.

Longitudinal Development and Relations Between Autonomy Support and Structure

Our longitudinal investigation elucidates the developmental nature of perceived autonomy support and structure during one school year. Understanding how those teaching dimensions fluctuate is deemed important given their strong effects on students. The high rank-order coefficients obtained parallel the results of Skinner and Belmont (1993) and are in line with findings in parenting research with respect to parenting dimensions (e.g., Luyckx, Soenens, Vansteenkiste, Goossens, & Berzonsky, 2007). Our findings indicate that across a school year, students generally hold their relative position in comparison with their fellow students when it comes to perceiving teacher autonomy support and structure.

This relative absence of change at the between-students level does not imply that there is no change at the within-student level, however (Caspi, 1998). Therefore, the present research extends beyond reporting

interindividual stability in autonomy support and structure by highlighting intraindividual differences. Using univariate LCMs (Hertzog & Nesselroade, 2003), we estimated absolute changes of perceived teacher autonomy support and structure. The change scores in these models are useful descriptions of intraindividual change between two points in time (Hertzog & Nesselroade, 2003). We found no perceived mean changes in perceived autonomy support and small perceived decreases in perceived structure at the group level. However, the absence of large average changes could be the result of increases in the perception of some students and decreases in the perception of other students, canceling out each other. Indeed, we found substantial interindividual variability in reported changes in perceived autonomy support and structure across students. Clearly, there is heterogeneity in the perceived change of autonomy support and structure. Some students experience increases in teachers' autonomy support and structure whereas other students experience stability or decreases. Apparently, students' initial impressions of the teaching competencies of their teachers change over the course of a school year. In conclusion, the relative lack of change in perceived autonomy support and structure at the group level seems to support the initial impression hypothesis, emphasizing the persistence of initial impressions working as a self-fulfilling prophecy. However, the substantial variability around the mean trajectories of perceived autonomy support and structure more strongly supports the change hypothesis, emphasizing the malleability of initial impressions.

Using a multivariate latent change model, the longitudinal relationship between perceived teacher autonomy support and structure was examined. The initial levels of autonomy support and structure were significantly

related to each other, as were the change factors of both perceived teaching dimensions. Hence, autonomy support and structure seem to develop in tandem, indicating that those teaching dimensions are highly compatible constructs. Accordingly, consistent with previous research (e.g., Skinner & Belmont, 1993), structure is not at all incompatible with autonomy support. On the contrary, both teaching dimensions appear to be dynamically interrelated aspects of a supportive and student-directed teaching style. The compatibility of perceived teacher autonomy support and structure as found in the present study contrasts with the notion that autonomy support would be similar to permissiveness (e.g., Baumrind, 1971; Karagozoglu, 2009).

Student Outcomes of Changes in Autonomy Support and Structure

Multivariate LCMs, relating changes in perceived teacher autonomy support and structure to changes in student outcomes, revealed interesting results. Generally in line with our hypothesis, we found that when teacher autonomy support and structure increase, students' autonomous motivation and ultimately their SRL competencies become stronger. In total, we tested mediation of eight paths, namely the paths from changes in perceived teacher autonomy support and structure to changes in students' use of deep-level and meta-cognitive strategies in two samples. In six of the eight paths, changes in students' autonomous motivation did play at least a partial mediating role. The finding that fluctuations in teaching dimensions are mirrored by fluctuations in students' school functioning is in accordance with a recent study by Mouratidis, Vansteenkiste, Lens, and Sideridis (2008a), showing that students' intrinsic motivation for physical education and vitality followed the perceived variability in the teaching dimensions autonomy support and relatedness support from class to class.

Furthermore, our findings fit with SDT's claim that teachers engender adaptive school development (i.e., motivation and learning) by providing an autonomy-supportive and structuring climate (Reeve, 2002). Moreover, our results are in agreement with cross-sectional studies demonstrating the mediating role of students' autonomous motives in the relationship between autonomy support and student outcomes (e.g., Vansteenkiste et al., 2005). Admittedly, it appears that students' autonomous study motivation is not a strong mediator when considered longitudinally because the direct paths from changes in the perceived teaching dimensions to changes in students' SRL were often reduced only to a limited extent when the effect of changes in students' autonomous motivation on students' SRL was taken into account. Moreover, in some cases, there was no direct effect of changes in perceived autonomy support or structure to students' SRL. We conclude from our results that changes in perceived autonomy support and structure are both directly and indirectly, through changes in students' autonomous motivation, related to changes in students' SRL. The direct paths could imply that changes in teacher autonomy support and structure have a direct vitalizing influence on changes in students' SRL, or that other mediators, such as the students' competence, play a role in their relationship with students' SRL.

The results of the present study also add to the limited literature on gender differences in perceived teaching, autonomous study motivation, and SRL. Replicating findings from previous research that women tend to have a more adaptive motivational profile compared then men (e.g., Vallerand et al., 1992), our study showed that girls scored higher on autonomous study motivation than boys in both samples and at both waves. Extending mixed

findings from previous research concerning gender differences in perceived teaching dimensions and SRL, in some cases, girls scored higher than boys whereas in other cases there were no differences. More importantly, in spite of the mean gender differences observed, we found that changes in perceived teacher autonomy support and structure were related to changes in students' use of SRL through changes in students' autonomous study motivation in similar ways for boys and girls. These findings underscore SDT's assumption that autonomy support and structure and an autonomous motivation are beneficial regardless of gender, possibly because these resources appeal to the fundamental and universal needs for autonomy, competence, and relatedness (Ryan & Deci, 2000).

Limitations and Directions for Future Research

A first limitation deals with shared method variance. All variables in this study were assessed with student self-report measures and this approach may have artificially inflated some of the associations between study variables. Future research could examine whether teacher reports of their own teaching style or observational data of the teaching style yield similar results.

Second, the question why teachers increase in autonomy support and structure during the school year in the perception of some students, whereas teachers decrease in the perception of other students, remains unanswered. Therefore, it is instructive for future research to examine how perceived change varies depending on the influence of relevant antecedents. For example, students' personal experiences with teachers may play a major role in determining whether those teachers are increasingly positively or negatively perceived (see e.g., Kunter, Baument, & Köller, 2007).

Third, for reasons of generalizability, the models tested in the present study should be replicated by focusing on other aspects of self-regulated learning, such as emotion regulation and action control (Barrett, Gross, Christensen, & Benvenuto, 2001; Boekaerts, 1995), but also on other important school outcomes, such as pro-social and rule-guided behavior. Finally, the significant variances associated with the mean-level trends could imply the existence of some developmental subgroups among students in the perceptions of their teachers. Those subgroups could be identified in future research by means of latent class growth analysis (Nagin, 2005).

Conclusions and Educational Implications

Latent change analysis proved to be a fruitful statistical procedure for demonstrating changes in perceived autonomy support and structure and their dynamic relationship with change in students' functioning. It was demonstrated that there is no initial impression maintenance regarding students' perceptions of teacher autonomy support and structure. In contrast, students' initial perceptions of their teachers at the beginning of the school year can shift in the following months. This malleability of initial impressions leaves room for potential interventions which may be developed to improve the teaching competencies of teachers (see Reeve, Jang, Carrell, Jeon, & Barch, 2004).

Furthermore, our findings underscore the general idea of compatibility of autonomy support and structure and the importance of both teaching dimensions for an optimal motivational and learning pattern in students. These findings suggest important implications for supporting an autonomous motivation in students and teaching SRL skills. Teachers are advised to give help and constructive feedback and to set transparent rules

and expectations in accordance with students' view, requests, and needs by offering choice where possible and providing a meaningful rationale where needed.

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Psychologically Controlling Teaching: Examining Outcomes, Antecedents, and Mediators

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Abstract

Psychologically controlling teaching (PCT) refers to the use of often subtle and intrusive behaviors that pressure students to act, think, and feel in particular ways (e.g., guilt-induction and shaming). The goal of the present research was to examine the dynamics involved in PCT. Study 1 examined self-regulated learning and achievement outcomes of PCT, whereas Study 2 examined antecedents (i.e., individual and environmental pressures). Study 1 found that PCT was negatively related to students' use of self-regulation strategies which, in turn, was positively related to academic achievement. Students' relative autonomy for studying played an intervening role in these associations. Findings of Study 2 revealed that both pressure from above (e.g., pressuring school administration and parents) and pressure from within (i.e., teachers' low relative autonomy for teaching), but not pressure from below (i.e., students' low relative autonomy for studying) were related to PCT. These associations could be accounted for by depersonalization, one component of teacher burnout. The discussion focuses on how PCT represents one aspect of the "dark side" of teaching, which is understudied. (172 words)

"Most of you scored really poorly on the last test and in the last few days you have been behaving like little children. I am really disappointed in this class!" Such a statement is indicative for teachers' use of psychologically controlling teaching. Psychologically controlling teaching (PCT) refers to the use of often subtle and intrusive behaviors that pressure students to act, think, and feel in particular ways. Common to these intrusive behaviors (e.g., guilt-induction and the expression of disappointment) is that they convey a conditionally approving attitude from teachers towards students. In this article, we introduce PCT in the teaching literature, drawing on Barber's work in the parenting literature (Barber, 1996; Barber & Harmon, 2002) and Self-Determination Theory (SDT; Deci & Ryan, 2000; Vansteenkiste, Niemiec, & Soenens, in press).

Psychological Control: From Parenting to Teaching

Psychological control has been examined extensively during the past two decades in developmental and parenting research (Barber & Harmon, 2002; Soenens & Vansteenkiste, 2010). Parents who use psychological control interfere in children's psychological development through the excessive use of intrusive and often insidious pressures, such as guilt-induction, personal attack, and blaming (Barber, 1996). Parental psychological control essentially involves a conditionally approving attitude towards children, only expressing love and care when children succeed at parentally valued tasks (Assor, Roth, & Deci, 2004). Numerous studies have shown that psychologically controlling parenting is related to maladaptive developmental outcomes in children and adolescents, including depression and low self-esteem (e.g., Soenens, Luyckx, Vansteenkiste, Duriez, & Goossens, 2008). In the academic domain, parental psychological control

vs. autonomy support has been found to relate to maladaptive learning strategies, such as impaired time management (Vansteenkiste, Zhou, Lens, & Soenens, 2005).

In the parenting literature, psychologically controlling behaviors were identified in an inductive, bottom-up fashion (Soenens & Vansteenkiste, 2010), that is, based on factor analyses on a large set of parenting behaviors (Schaefer, 1965). Similar behaviors may be displayed by teachers. PCT is apparent when teachers use their own opinion and values as a frame of reference and ignore the psychological world and autonomy of their students. Using devices such as guilt-induction, shaming, and expressing disappointment, those teachers then try to motivate learners to comply with their frame of reference. Similar to parents who use psychological control (see, for example, Barber & Harmon, 2002; Soenens, Vansteenkiste, Duriez, & Goossens, 2006), teachers who rely on psychologically controlling practices explicitly show more appreciation when students reach imposed standards and show reduced concern when students fail to reach those standards. In essence, PCT is a teaching dimension characterized by an intrusive and conditionally approving orientation towards students that can be expressed in different behaviours, including guilt-induction, shaming, and expression of disappointment (see Soenens & Vansteenkiste, 2010; Soenens, Vansteenkiste, & Luyten, 2010). Clearly, PCT provides a contrast to adaptive teaching dimensions, as distinguished by SDT.

Self-Determination Theory

On the basis of SDT, it can be assumed that PCT is largely incompatible with the adaptive teaching dimension autonomy support (Grolnick, 2003; Vansteenkiste, Zhou et al., 2005). Autonomy-supportive

teachers encourage self-initiation and choice, acknowledge the students' perspective, provide a rationale when choice is constrained, and foster interest in the learning material (Assor & Kaplan, 2001). Clearly, psychological control stands in opposition to this adaptive teaching dimension as it is a form of "control that constrains, invalidates, and manipulates children's psychological and emotional experience and expression" (Barber, 1996, p. 3296) and, hence, inhibits autonomous functioning. SDT research has primarily focused on adaptive teaching dimensions and their beneficial effects on students. As a result, the "dark" side of teaching has received less attention, thereby obscuring the fact that teachers can also create a maladaptive environment (but see, for example, Deci, Schwartz, Sheinman, & Ryan, 1981). To fill this gap, this study focuses on PCT.

PCT shows important similarities with the theory-driven or top-down concepts of internally and externally controlling socialization in SDT (Soenens & Vansteenkiste, 2010), and with the former concept in particular, but can be distinguished from them. Internally controlling teaching refers to triggering internally pressuring forces in learners by appealing to students' feelings of guilt, shame, anxiety, and self-worth. Activating those internal pressures often happens in a covert and subtle way (e.g., Plant & Ryan, 1985). Externally controlling teaching refers to activating a sense of external obligation in students by using rather overtly controlling strategies, such as punishments, pressuring rewards, and explicitly controlling language, like "you must" (e.g., Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005).

A common aspect of these two types of controlling teaching and PCT is that they involve pressure. When using one of them, teachers force students

to think, feel, and behave in particular ways, thereby ignoring and frustrating their students' basic need for autonomy. PCT is largely equivalent to internally controlling teaching. Specifically, PCT mainly involves internally controlling behaviors, such as guilt-induction and instilling anxiety, because PCT primarily appeals to forces that reside within the student. However, PCT is a somewhat broader concept than internal control (Soenens & Vansteenkiste, 2010). When trying to interfere in the psychological world and intimacy of their students, teachers can also use strategies that are not purely internally controlling in nature, such as interrupting students' activities or showing erratic emotional behavior.

The Present Series of Studies

We present the results of two studies, intended to address two aims. First, we aimed at developing a self-report measure of perceived PCT and demonstrating its reliability and validity. Second, we wanted to study the dynamics of perceived PCT by examining both outcomes (Study 1) and antecedents (Study 2) of perceived PCT. Specifically, we hypothesized that perceived PCT will be negatively associated with students' autonomous motivation and self-regulated learning (Study 1, outcomes) and will be positively related to rigid and controlling forces in teachers' own functioning and working climate (Study 2, antecedents). The hypothesis that controlling dynamics would be involved in PCT fits with SDT, which maintains that both teachers and students will function in a more controlled and dysfunctional fashion when encountering pressuring events or persons (Deci & Ryan, 2000).

Study 1
Motivation, Self-Regulated Learning, and Achievement as Outcomes of PCT

The first goal of Study 1 was to develop and validate a measure of perceived PCT. To externally validate our scale, we examined associations between perceived PCT and well-validated measures of the adaptive teaching dimensions *autonomy support* (i.e., promoting students' volitional functioning), *structure* (i.e., regulating students' behavior, providing help, and supporting confidence), and *involvement* (i.e., giving emotional support; Skinner & Belmont, 1993).

The second goal of Study 1 was to examine associations between perceived PCT and students' learning and performance. Although parental psychological control has been related to diminished psycho-social functioning (Soenens et al., 2008), few efforts have been made to examine the relation between psychologically controlling practices and school functioning. In the few correlational studies on this matter, parental psychological control was found to negatively predict performance (Aunola & Nurmi, 2004; Bean, Bush, McKenry, & Wilson, 2003) and self-regulated learning (Vansteenkiste, Zhou et al., 2005). Further, the experimental activation of internal control, relative to autonomy-support, among early adolescents has been found to undermine conceptual (but not rote) learning (Vansteenkiste, Simons, et al., 2005). The present study builds on this latter work by investigating how PCT is related to students' self-regulated learning (SRL) and, in turn, performance. SRL has been defined as a set of proactive and self-focused processes in which students constructively monitor their learning toward the completion of academic tasks

(Zimmerman, 2008). In our study, as in many other studies (e.g., Case, Harris, & Graham, 1992), we concentrated on the cognitive and meta-cognitive components of SRL. Cognitive strategies comprise deep-level cognitive strategies (e.g., critical thinking and summarizing), among others. Students who use deep-level processing avoid simply memorizing the learning material by repetition, but want to master the learning material thoroughly (Rozendaal, Minnaert, & Boekaeets, 2005). Meta-cognitive strategies refer to planning, organizing, and self-monitoring one's learning process (Winne, 1995). In line with previous research, we hypothesized that perceived PCT would be negatively related to both types of self-regulatory capacities. Because a lack of self-regulatory capacities represents a risk factor for low academic achievement (e.g., Pintrich & De Groot, 1990), we also examined whether perceived PCT is related to lower school achievement through its negative association with self-regulation strategies.

The final goal was to examine whether autonomous, relative to controlled, motivation for studying would account for (i.e., mediate) the relation between PCT and SRL. *Autonomously motivated* students learn in a self-endorsed or volitional fashion because of the perceived value (i.e., identified regulation) or because of the inherent satisfaction (i.e., intrinsic motivation) of the learning activity (Ryan & Connell, 1989). Conversely, students with a *controlled motivation* learn to meet external (e.g., rewards; external regulation) or internal (e.g., feelings of guilt; introjected regulation) pressures (Ryan, Connell, & Grolnick, 1992). Several studies already demonstrated that an autonomous, relative to a controlled, study motivation is positively associated with students' use of SRL strategies (e.g., Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009) and grades (Black

& Deci, 2000). In line with previous work (e.g., Vansteenkiste, Simons et al., 2005), we expected that students who perceive their teachers as psychologically controlling would report less autonomous relative to controlled motives for studying, which, in turn would be associated with lower SRL. Our hypothesized model is graphically represented in Figure 1.

Method

Participants and Procedure

The sample comprised 533 adolescents (11^{th} and 12^{th} grade; 41.2% male) from nine secondary schools from the academic track in Flanders (Belgium). Participants' mean age was 16.9 years (*SD* = 0.7 years). The questionnaires were administered during a class period of 50 minutes, with the first author being present to answer questions. One or two teachers were also present during the administration of the surveys. Students' permission to participate in the study and to scrutinise their exam scores was obtained through a procedure of passive informed consent. Specifically, the researcher orally explained the purpose of the study and the necessity to use students' exam scores. Confidential treatment of the data was guaranteed. All students were told they could refuse participation and deny permission to use their exam scores by filling out a form. None of the students chose to do so. A total of 511 exam scores were provided by the school board one month later (see below).

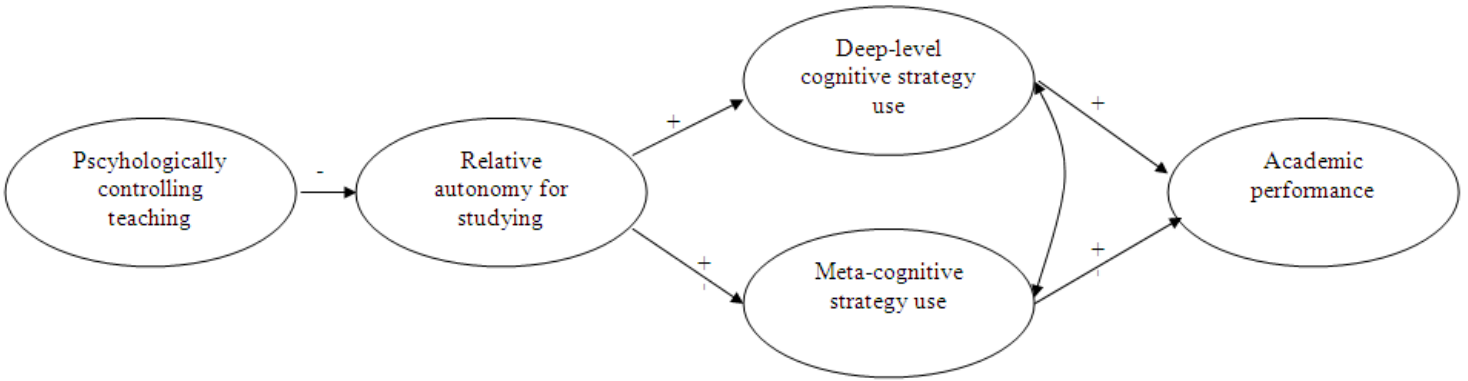

Figure 1. Hypothesized model: Outcomes of PCT.

Measures

All questionnaires in Study 1 and Study 2 were translated from English to Dutch, the participants' mother tongue, using the guidelines of the International Test Commission (Hambleton, 1994). All scales used a 5-point Likert-type scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*), unless otherwise indicated. Scale scores were computed as the means of items. Means and standard deviations for all study variables are provided in Table 1.

Psychologically controlling teaching. A committee approach (Hambleton, 1994) was adopted. A group of scholars experienced with research on psychological control (i.e., the first three authors) selected seven items. These items were taken from two frequently used and validated scales, that is the Psychological Control Scale-Youth Self-Report (PCS-YSR; Barber, 1996) and the Psychological Control Scale of the Child's Report of Parental Behavior Inventory (CRPBI; Schaefer, 1965). Five items were almost literally taken over but the socialization figure referred to was changed from parents to teachers (e.g., "My teachers often interrupt me"). Two items were slightly adjusted to tap PCT (e.g., "My teachers clearly show that I have hurt their feelings when I have failed to live up to their expectations"). The resulting scale and its descriptive statistics can be found in Table 2. Information about the psychometric characteristics of this scale is provided in the Results section.

Table 1

Correlations Among, and Means, Standard Deviations and Gender Differences for Study Variables – Study 1 (N = 503)

Variable	2	3	4	5	6	7	8	Total *M*	*SD*	Male *M*	*SD*	Female *M*	*SD*	*F*[a]
1. Psychologically controlling teaching	.22**	-.05	-.08	.08	-.15**	-.27**	-.14**	2.28	0.71	2.50	0.73	2.13	0.66	37.25
2. Relative autonomy for studying		.26**	.06	.24**	.30**	.39**	.22**	-1.80	3.36	-2.26	3.16	-1.48	3.47	6.90
3. Elaboration			.52**	.53**	.50**	.28**	.07	3.18	0.60	3.12	0.62	3.22	0.58	3.77
4. Organization				.16**	.33**	.20**	-.04	3.08	0.84	2.90	0.87	3.20	0.80	16.51
5. Critical thinking					.35**	.13**	.01	2.78	0.74	2.94	0.78	2.66	0.69	18.85
6. Meta-cognitive self-regulation						.48**	.23**	3.19	0.49	3.14	0.49	3.23	0.49	4.68
7. Time and study environment							.26**	3.10	0.66	3.00	0.65	3.17	0.65	8.56
8. Academic achievement								66.47	7.16	65.15	7.13	67.40	7.06	12.55

Note. [a] df = (1, 524) for the SRL variables; df = (1, 526) for Psychologically controlling teaching; df = (1, 528) for Relative autonomy for studying; df = (1, 509) for Academic achievement.

** $p < .01$.

Table 2

Descriptive Statistics of the Psychologically Controlling Teaching Items

Item		Student responses (Study 1)			Teacher responses (Study 2)		
My teachers... (Student report)		Mean	Skewness	Kurtosis	Mean	Skewness	Kurtosis
1.	are always trying to change me.	2.09	.89	.34	2.08	.59	-.35
2.	clearly show that I have hurt their feelings when I have failed to live up to their expectations.	2.03	.76	.03	2.35	.34	-.94
3.	are less friendly with me, if I do not see things their way.	2.78	.24	-.85	1.77	1.15	1.15
4.	react harshly if I have disappointed them.	2.54	.37	-.41	2.67	-.01	-.82
5.	make me feel guilty when I dissatisfied them.	2.42	.42	-.67	1.98	-.66	-.58
6.	avoid talking with me when I have disappointed them.	1.78	1.33	1.61	1.23	3.40	13.28
7.	often interrupt me.	2.30	.60	-.37	1.74	.87	.29

Note: The teacher report of the Psychologically Controlling Teaching questionnaire is analogous to the student report. For example: *"I always try to change my students"*.

Autonomy support, structure, and involvement. These teaching dimensions were measured using the short form of the Teacher as Social Context Questionnaire (TASC; Belmont, Skinner, Wellborn, & Connell, 1988). The TASC comprises the subscales of Autonomy support (8 items; e.g., "My teachers give me a lot of choices about how I do my schoolwork"; α = .71), Structure (8 items; e.g., "If I can't solve a problem, my teachers show me different ways to try to"; α = .70), and Involvement (8 items; e.g., "My teachers really care about me"; α = .83).

Relative autonomy for studying. To assess students' academic motivation, we used an adapted, Dutch version (16 items; Vansteenkiste et al., 2009) of the Self-Regulation Quesionnaire - Academic initially introduced by Ryan and Connell (1989). The measure consists of four subscales, representing four different types of motivation for studying, that is, external regulation (4 items, e.g., "Studying is what I'm supposed to do"; α = .82), introjected regulation (4 items, e.g., "I will feel bad about myself if I do not study"; α = .72), identified regulation (4 items, e.g., "It is personally important to me"; α = .79), and intrinsic motivation (4 items, e.g., "I enjoy studying"; α = .90). Similar to previous research (e.g., Soenens & Vansteenkiste, 2005), after assigning a weight to the four types of motivation according to their degree of autonomy, that is, external regulation -2; introjected regulation -1; and identified regulation +1; and intrinsic motivation +2, these weighted scores were summed to create an index of relative autonomy for studying (α = .78; see e.g., Niemiec et al., 2006, for this procedure).

Deep-level cognitive strategy use. Participants were presented with three scales from the Motivated Strategies for Learning Questionnaire

(MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991), namely Elaboration (6 items, e.g., "When reading for classes, I try to relate the material to what I already know"; α = .56), Organization (4 items, e.g., "I make simple charts, diagrams, or tables to help me organize course material"; α = .67), and Critical thinking (5 items, e.g., "I treat the course material as a starting point and try to develop my own ideas about it"; α = .75). Rather than tapping into participants' use of deep-level cognitive learning strategies for a specific course, as is commonly done, we assessed participants' deep-level learning in general.

Meta-cognitive strategy use. We measured students' use of meta-cognitive strategies using the subscales Meta-cognitive self-regulation (12 items; e.g., "Before I study new course material thoroughly, I often skim it to see how it is organized") and Time and study environment (8 items; e.g., "I usually study in a place where I can concentrate on my course work") of the MSLQ. These items also pertained to participants' use of meta-cognitive strategy use in general rather than with respect to a specific course. The subscales had a Cronbach's alpha of .65 (Meta-cognitive self-regulation) and .70 (Time and study environment).

Academic performance. Academic performance was measured by students' overall grades at the end of the first semester (December), which were obtained through the school board. Grades ranged between 41% and 88% with a mean of 66.47% (*SD* = 7.17)

Plan of Analysis

We examined the proposed model in which PCT relates to SRL and, eventually, achievement by Structural Equation Modeling procedures (LISREL 8.7; Jöreskog & Sörbom, 1996) based on the analysis of

covariance structures. In line with Holmbeck's recommendations (1997), we tested the following models with latent constructs: (a) direct effects models, (b) full mediation models, and (c) partial mediation models. Full mediation is demonstrated when the addition of a direct path in the third model does not improve fit compared to the second model. This three-step approach was used to test different portions of our hypothesized model (see Figure 1).

Assessment of model fit was based on multiple criteria: the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), and the Standardized Root Mean Square Residual (SRMR). A RMSEA of .08 or below (Hu & Bentler, 1999), a CFI value > .90 (Byrne, 1994), and a small SRMR value (e.g., .06; Quintana & Maxwell, 1999), which imply that the model explains the data with a small degree of error, indicate a psychometrically acceptable fit to the data.

Results

Preliminary Analyses

Reliability and validity of the PCT Scale – Student Report. To ensure the adequacy of the PCT Scale as an adaptation of two parental psychological control scales, we investigated (a) the factorial validity and the internal consistency and (b) the external validity of the scale by calculating zero-order correlations with more adaptive teaching dimensions, that is perceived autonomy support, structure, and involvement.

To examine the factorial validity of the PCT Scale, items were subjected to a principal component analysis. This analysis revealed one clear factor, accounting for 46% of the variance, with all item loadings above .58 (eigenvalue of 3.20). Cronbach's alpha was .80. PCT was significantly negatively related to the adaptive teaching dimensions

autonomy support (r = -.44, p < .01), structure (r = -.38, p < .01), and involvement (r = -.29, p < .01) while these teaching dimensions were significantly positively interrelated (.53 < r < .58; all ps < .01). As expected, PCT and autonomy support were more strongly negatively related than PCT and involvement (Fisher z = -3.92, p < .001) and PCT and autonomy support were somewhat more strongly related than PCT and structure (Fisher z = -1.67, p = .09).

Correlational analyses and descriptive statistics. Pearson correlation coefficients among the study variables are presented in Table 1. PCT was significantly negatively related to students' relative autonomy for studying, to the two meta-cognitive strategy use subscales, and to academic achievement. However, contrary to the hypothesis, PCT was unrelated to the use of deep-level cognitive strategies. Furthermore, students' relative autonomy for studying was significantly positively related to all SRL strategies, except for elaboration, and to academic achievement. Finally, the two meta-cognitive strategy use subscales, but not the deep-level cognitive strategy use subscales were significantly positively related to students' academic performance.

Next, we examined gender differences because males and females have been found to differ in various study variables, such as motivation (e.g. Vallerand & Bissonnette, 1992) and meta-cognitive strategy use (e.g., Vrugt & Oort, 2008). The MANOVA analysis using gender as between-subjects variable and the self-regulated learning scales as dependent variables was significant (Wilks' λ = .89; F(5, 519) = 12.52; p < .001, η^2 = .11). Follow-up univariate analyses revealed that female, relative to male, students scored higher on organization, elaboration, time and study environment, and meta-

cognitive self-regulation and lower on critical thinking. Univariate ANOVAs on the remaining variables indicated that females scored lower on perceived PCT (F (1, 526) = 37.25; $p < .001$) and higher on relative autonomy for studying (F (1, 528) = 6.90; $p < .01$) and academic achievement (F (1, 509) = 12.55; $p < .001$). The results are shown in Table 1. Because of these gender differences, we included gender as a control variable in all subsequent analyses.

Primary Analyses

Measurement model. We estimated a confirmatory factor analytic model to assess whether the indicators represented the latent constructs properly. We used parcels as indicators of the latent constructs PCT (three parcels) and relative autonomy for studying (four parcels) by randomly assigning their respective items to one of the parcel groupings (Little, Cunningham, Shahar, & Widaman, 2002). The subscales critical thinking, elaboration, and organization were used as indicators of the latent construct deep-level cognitive strategy use, whereas meta-cognitive self-regulation and time and study environment were used as indicators of the latent construct meta-cognitive strategy use. In addition, gender and academic performance were each represented as a latent variable with a single indicator, the error variance of which was set to 0. The measurement model with six latent variables represented by 14 indicators approached the criteria for acceptable fit, RMSEA = .09, CFI = .93, SRMR = .07. After adding a cross-loading of meta-cognitive self-regulation on deep-level cognitive strategy use, the fit of the revised model (RMSEA = .08, CFI = .94, SRMR = .06) considerably improved, ΔSBS-χ^2 (1) = 13.40, $p < .001$. Adding this cross-loading seemed logical because meta-cognitive self-regulation and

deep-level cognitive strategy use share a cognitive focus. Moreover, the modification did not substantially change the correlations among the latent factors, as indicated by the non-significant chi-square test (ΔSBS-χ^2 (15) = 20.31, p = ns). Factor loadings ranged from .47 to 1 (mean lambda = .74) and were all significant ($p < .001$).

Structural model. To examine the association between PCT on academic achievement, we tested a direct effect model. The direct path from PCT to achievement was significant (β = -.12, $p < .05$) and the model fitted the data well, RMSEA = .03, CFI = 1.00, SRMR = .02. Adding deep-level cognitive and meta-cognitive strategy use as mediators in the relation between PCT and achievement yielded an acceptable model fit, RMSEA = .09, CFI = .93, SRMR = .06, with PCT being positively related to meta-cognitive strategy use (β = -.38***, $p < .001$), but unrelated to deep-level cognitive strategies (ß = -.03, p = n.s.). Further, whereas meta-cognition was significantly related to achievement (β = .35***, $p < .001$), deep-level cognitive strategies was not (ß = -.07, p = n.s.). To examine whether PCT captures a unique portion of variance in achievement or whether the relation to achievement is completely mediated by meta-cognitive strategy use, we added a direct path from PCT to achievement. The direct path was not significant (ß = .02, p = n.s.), suggesting that the relation between PCT and achievement was completely mediated by students' use of meta-cognitive strategies. The Sobel test (Sobel, 1982) indicated that the indirect effect of PCT over meta-cognitive strategy use to achievement was significant, z = -4.01, $p < .001$.

Furthermore, we examined whether students' relative autonomy for studying would mediate the negative path from PCT to meta-cognitive

strategy use, whereas PCT would be indirectly related to deep-level cognitive strategy use through students' relative autonomy for studying. Including relative autonomy for studying as an intervening variable yielded a good model fit, RMSEA = .08, CFI = .94, SRMR = .07. All hypothesized paths were significant. To examine whether the association between PCT and meta-cognitive strategy use was completely or partially mediated by students' relative autonomy for studying, we examined the strength of the remaining direct path from PCT to meta-cognitive strategy use. There was no need to examine whether there was a remaining direct pathway to deep-level cognitive strategy use because PCT was unrelated to deep-level cognitive strategy use in the direct effects model. The fit of the model was as follows: RMSEA = .08, CFI = .94, SRMR = .06. The direct path was significant (β = -.26, p < .001) and adding this path increased model fit compared to the full mediation model, ΔSBS-χ^2 (1) = 11.42, p < .001. Accordingly, the association between PCT and meta-cognitive strategy use is partially mediated by students' relative autonomy for studying. The Sobel testing indicated that the indirect effects of PCT over relative autonomy for studying to deep-level cognitive and meta-cognitive strategy use were significant (z = -3.47, p < .001, and z = -4.28, p < .001, respectively). Finally, the direct path from students' relative autonomy for studying to achievement was not significant (β = .09, p = ns).

Figure 2 graphically displays all structural paths in our final model. For the sake of clarity, paths from gender to each of the latent constructs were not included. Gender (dummy coded with 0 = male and 1 = female) was significantly related to PCT (β = -.36, p < .001) and academic achievement (β = .14, p < .01).

Summary Study 1

Study 1 yielded three important findings. First, the PCT scale proved to be a reliable and valid instrument. Principal component analysis on the PCT items yielded one clear factor, Cronbach's alpha of the PCT scale was high, and the scale was significantly negatively related to adaptive teaching dimensions, and in particular to autonomy support. Second, as expected, higher PCT was associated with lower SRL and achievement outcomes. Third, mediating mechanisms underlying the relation between PCT and SRL and achievement were revealed. PCT was negatively related to relative autonomy for studying, which in turn was positively related to students' use of deep-level cognitive and meta-cognitive strategies. Meta-cognitive strategy use, in turn, was significantly positively related to academic performance. In addition, PCT continued to be significantly related to meta-cognitive strategy use above and beyond its indirect relation through students' relative autonomy for studying.

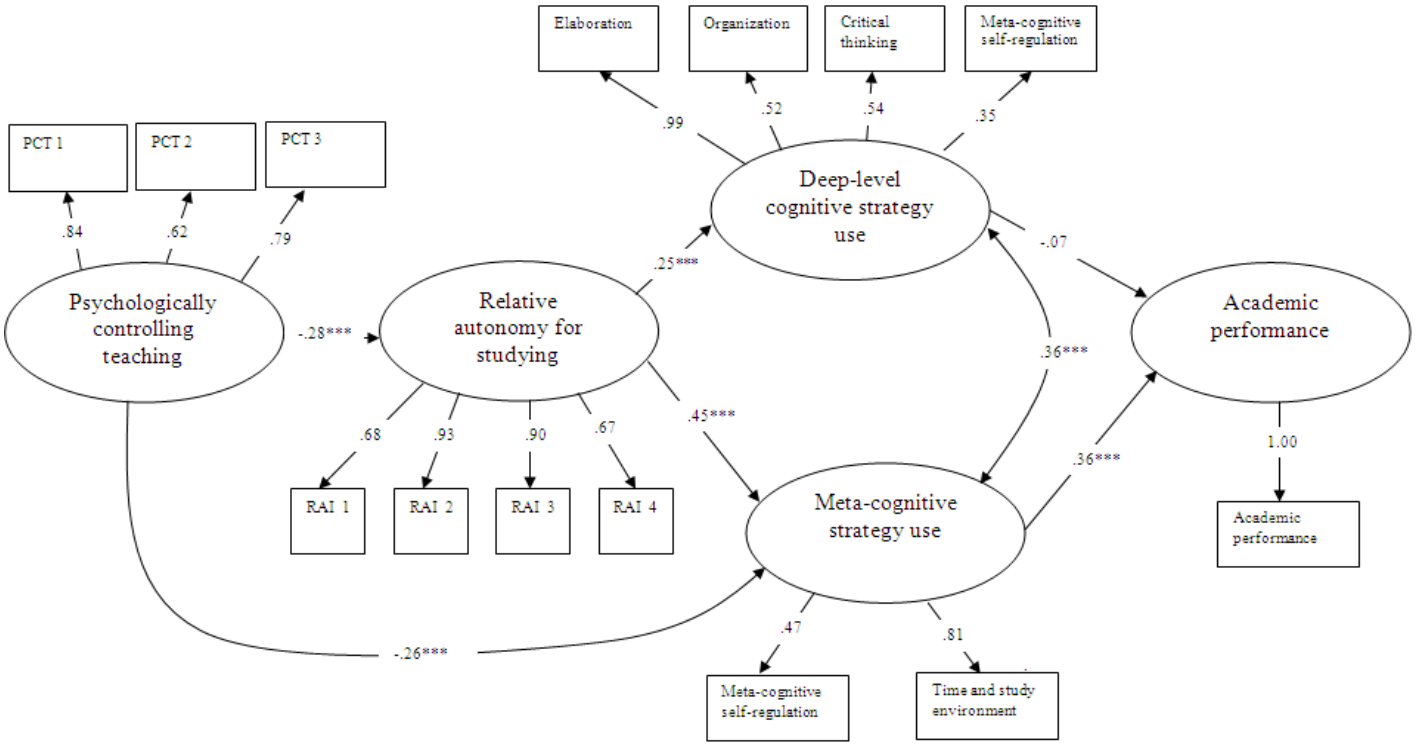

Figure 2. Final model of outcomes of PCT. Gender is left out for clarity reasons.

*** $p < .001$.

Study 2

Antecedents of PCT

Because of the maladaptive pattern of correlates of PCT it becomes imperative to explore its antecedents. Therefore, Study 2 aimed to examine the role of environmental and dispositional sources of pressure in the prediction of PCT and the potential explanatory role of teacher burnout in these associations.

We distinguish three sources of pressure similar to the sources discerned in the parenting and SDT literature: pressure from "above", from "within", and from "below" (Grolnick, 2003). Within the teaching context, pressure from above refers to pressure from the environment, in particular from parents, colleagues, and principals. Such pressure can be characterized, for example, by frequent evaluations and forced conforming to colleagues' teaching methods (Pelletier, Séguin-Lévesque, & Legault, 2002). Pressure from within and from below refers to stressful conditions in the functioning of teachers themselves and of their students, respectively. To operationalize these two pressures, we relied, similar to Study 1, on the concept of quality of motivation (Deci & Ryan, 2000), as indexed by teachers' autonomous, relative to their controlled, motivation to teach and students' autonomous, relative to their controlled, study motivation (i.e., low pressures).

Various earlier studies focused on one source of pressure. For example, Roth, Assor, Kanat-Maymon, and Kaplan (2007) demonstrated, using multilevel modeling, that teachers' self-reported autonomous, relative to their controlled, reasons for teaching was positively associated with child-reported perceptions of autonomy-supportive teaching. Few studies,

however, examined the combined effects of the three forms of pressure, with the exception of Taylor, Ntoumanis, and Standage (2008). These authors found that perceived job pressure (pressure from above), teacher autonomous causality orientation (low pressure from within), and perceptions of students' relative autonomy (low pressure from below) were all related to teachers' use of adaptive motivational strategies. In this study, we further examine whether the three levels of perceived pressure would yield a significant relation with the maladaptive teaching dimension PCT. It is expected that the exposure to any of these pressuring sources prompts teachers to act in a psychologically controlling way because the experienced pressure would increase the likelihood of teacher burnout.

Burnout is defined as a state characterized by frustration as a result of a perceived discrepancy between what teachers are doing and their expected effects on their students (Friedman, 1995). The key aspects of burnout represent feelings of *emotional exhaustion*, which refers to being overextended, and *depersonalization*, which refers to the adoption of a cynical and deindividuating attitude toward others (Maslach, Schaufeli, & Leiter, 2001). Herein, we hypothesized that the encounter of pressuring sources would drain teachers' energy and, as a result, would be associated with emotional exhaustion. Additionally, teachers who are exposed to pressuring sources might adopt a depersonalizing attitude toward their students, colleagues, and parents to cope with the pressuring atmosphere of their working situation. These predictions are consistent with previous research which showed that organizational pressure (pressure from above; e.g., Levesque, Zuehlke, Stanek, & Ryan, 2004), teacher characteristics, such as maladaptive perfectionism (pressure from within; e.g., Stoeber &

Rennert, 2008) and teachers' relative autonomy for teaching (Roth et al., 2007), and negative student behavior, such as disrespect (e.g., Friedman, 1995), are associated with the burnout components.

Thus, when teachers feel emotionally drained, they would have less energy available to stay attuned to their students' wishes. Moreover, the adoption of a depersonalizing attitude would lower teachers' threshold to act in a controlling way vis-à-vis their students. Therefore, we hypothesized that greater emotional exhaustion and depersonalization would be related to higher levels of PCT and would thus mediate the relationships between perceived pressures and PCT.

Method

Participants and Procedure

Teachers voluntarily participated in this study during a faculty meeting or in the staff rooms of six secondary schools offering the academic track. They were informed that participation involved filling out a survey on their job conditions and interactions with students. The teachers were asked to send this questionnaire to the principal researcher of this study by regular mail. Three weeks after the initial invitation to participation, a reminder together with the survey were mailed to the non-respondents. Out of the sample consisting of 488 Dutch-speaking Belgian teachers, 317 (65%) completed the questionnaire. The age ranged from 21 to 61 years with a mean of 40 years (*SD* = 10.4 years) and 62.8% were female. The mean number of years of teaching experience was 16.8 (*SD* = 10.6 years); 40.4% of the teachers obtained a college degree whereas 59.6% had an university degree.

Measures

Means and standard deviations for all study variables are provided in Table 3.

Psychologically controlling teaching. Teachers assessed their own perceptions of their PCT with the PCT Scale – Teacher Self-Report. The 7 items used in Study 1 were slightly reworded to assess PCT from teachers' own perspective (e.g., "I avoid looking at my students if they have disappointed me"). Cronbach's alpha was .74. A principal component analysis indicated that all items loaded on a single factor with a minimum loading of .46, explaining 40.1% of the variance.

Pressure from above. We used an abbreviated version of the Constraints at Work scale (Pelletier et al., 2002) to measure pressure exerted by colleagues, parents, and school principals. Specifically, we selected the items that most directly tapped into pressure versus sense of choice. The resulting subscale consisted of 7 items. Cronbach alpha was .62. A sample item reads: "In this school, I have to conform to my colleagues' teaching methods". Ratings were made on a 7-point Likert scale, ranging from 1 (*not at all true*) to 7 (*completely true*).

Pressure from within – Relative autonomy for teaching. The same items that were used in Study 1 to assess students' motivation were used to assess teachers' motivation for teaching. However, the stem of this scale was reworded to: "I am motivated to teach well because...". The reliabilities of the different motivational subtypes (i.e., external, introjected, identified, and intrinsic motivation) were satisfactory, ranging between .70 and .90. An index of relative autonomy for teaching was constructed in the same way as in Study 1. Cronbach's alpha was .83.

Pressure from below – Relative autonomy for studying. To tap into teachers' perceived motivation for studying of their students, the same items were used as in Study 1, although the stem of this scale was reworded into: "My students are motivated to learn because...". The reliabilities of the motivation subtypes were satisfactory, ranging between .73 and .88. The teacher perceived relative autonomy index for studying had an alpha of .77.

Burnout. Participants completed the subscales Emotional exhaustion and Depersonalization of the widely used and empirically validated Maslach Burnout Inventory-Educators Survey (MBI-ES; Kokkinos, 2006; Maslach & Jackson, 1986). Emotional exhaustion assesses participants' feelings of tiredness (9 items; e.g., "I feel emotionally drained from my work"; α = .91), whereas Depersonalization assesses the development of an impersonal attitude towards the teaching job and students (5 items; e.g., "I feel I treat some students as if they were impersonal objects"; α = .66).

Table 3

Correlations Among, and Means, Standard Deviations and Gender Differences for Study Variables – Study 2 (N = 317)

Variable	2	3	4	5	4	Total *M*	*SD*	Male *M*	*SD*	Female *M*	*SD*	*F*[a]
1. Constraints at work (pressure from above)	-.22**	-.10	.24**	.24**	.21**	3.06	0.87	2.90	0.93	3.16	0.83	6.64
2. Relative autonomy teacher (low pressure from within)		.08	-.37**	-.33**	-.28**	6.98	3.12	6.62	3.19	7.15	3.10	2.10
3. Relative autonomy students (low pressure from below)			-.14*	-.13*	-.09	-1.76	2.76	-1.57	2.67	-1.91	2.80	1.14
4. Emotional exhaustion				.38**	.28**	1.92	0.81	1.91	0.86	1.93	0.79	0.09
5. Depersonalization					.39**	1.41	0.50	1.51	0.57	1.34	0.45	8.84
6. Psychologically controlling teaching						1.97	0.58	2.06	0.59	1.92	0.57	4.21

Note. [a] df = (1, 308) for Constraints at work, Relative autonomy teacher, and Relative autonomy students; df = (1, 316) for Emotional exhaustion and Depersonalization; df = (1, 314) for Psychologically controlling teaching.

* $p < .05$. ** $p < .01$.

Plan of Analysis

Similar to Study 1, we relied on SEM analyses to examine the model in which the three sources of pressure relate to PCT through the burnout components. In doing so, we followed the same approach as in Study 1.

Results

Preliminary Analyses

Correlations among the study variables can be found in Table 3. We included years of teaching experience in the correlational analyses because past research has shown differences related to teaching experience in our study variables, such as relationships with students (e.g., Pianta, Hamre, & Stuhlman, 2003). Constraints at work and teachers' relative autonomous motivation were significantly negatively related. No other correlations among the hypothesized antecedent variables were significant. Constraints at work and teachers' (but not students') relative autonomous motivation were significantly related to PCT. The three variables reflecting hypothesized antecedents were significantly related to both emotional exhaustion and depersonalization, while both of them were positively interrelated and positively associated with PCT. Years of teaching experience was negatively correlated with constraints at work, but positively related to teachers' perceived relative autonomous motivation in students.

Because past research has shown gender differences for several variables under study, such as burnout (e.g., Grayson & Alvarez, 2008), we examined mean differences. Similar to Study 1, we inspected gender differences using a MANOVA analysis treating gender as between-subjects variable and the sources of pressure as outcome variables. An overall significant effect was found (Wilks' $\lambda = .96$; $F(3, 305) = 3.97$; $p < .01$, $\eta^2 =$

.04). Follow-up univariate analyses revealed that female teachers scored higher on perceived constraints at work than males. A MANOVA analyis with the burnout components as dependent variables also yielded an overall significant effect (Wilks' $\lambda = .97$; $F(2, 314) = 3.97$; $p < .01$, $\eta^2 = .04$). Follow-up univariate analyses revealed that female teachers scored lower on depersonalization than males. A univariate ANOVA on PCT indicated that females scored lower than males (F (1, 314) = 4.21; $p < .05$). The results are shown in Table 3. Because of the effects of gender and teaching experience, we included them as control variables in the primary analyses.

Primary Analyses

Measurement model. We evaluated a measurement model including six latent constructs, that is, constraints at work, teachers' relative autonomous motivation, teacher perceived relative autonomous study motivation in students, emotional exhaustion, depersonalization, and PCT. Three to four parcels were used as indicators of each of these constructs. Gender and years of teaching experience were each represented as a latent variable with a single indicator. The measurement model provided an excellent fit to the data, RMSEA = .04, CFI = .98, SRMR = .05. Examination of factor loadings, ranging from .39 to 1.00 (mean lambda = .82), indicated that they were all significant.

Structural model. To verify the relative contribution of each hypothesized antecedent of PCT, we tested the direct effects model. This model contained a significant direct relation from both constraints at work and teachers' relative autonomous motivation with PCT ($ß = .27$, $p < .001$ and $ß = -.28$, $p < .001$, respectively) and fitted the data well, RMSEA = .05, CFI = .98, SRMR = .05. In line with the correlations, the path from teacher

perceived relative autonomous study motivation in students to PCT was found to be non-significant (ß = -.10, *p* = n.s.).

Next, the burnout components were included in the model as intervening variables in the relations between perceived pressures and PCT. This model fitted the data well, RMSEA = .04, CFI = .98, and SRMR = .05. Depersonalization functioned as a mediator in the relationships between constraints at work and PCT and between teachers' relative autonomous motivation and PCT. Contrary to our hypotheses, emotional exhaustion was not significantly related with PCT. Teachers' relative autonomous motivation was the only significant antecedent of emotional exhaustion.

To examine whether depersonalization could fully account for the link between both constraints at work and teachers' relative autonomous motivation and PCT, we allowed direct paths from both of them to PCT. The direct paths were not significant (β = .17, *p* = n.s.; β = -.11, *p* = n.s., respectively), suggesting full mediation by depersonalization. The Sobel tests (Sobel, 1982) indicated that the indirect effects of constraints at work and teachers' relative autonomous motivation over depersonalization to PCT were significant (*z* = -3.14, $p < .01$ and *z* = -4.39, $p < .001$, respectively).

Figure 3 graphically displays all structural paths in the final model. For the sake of clarity, paths from gender and years of teaching experience to each of the latent constructs were not included. Gender (dummy coded with 0 = male and 1 = female) was significantly related to constraints at work (β = .18, $p < .05$) and depersonalization (β = -.28, $p < .01$). Years of teaching experience was significantly related to constraints at work (β = -.20, $p < .01$).

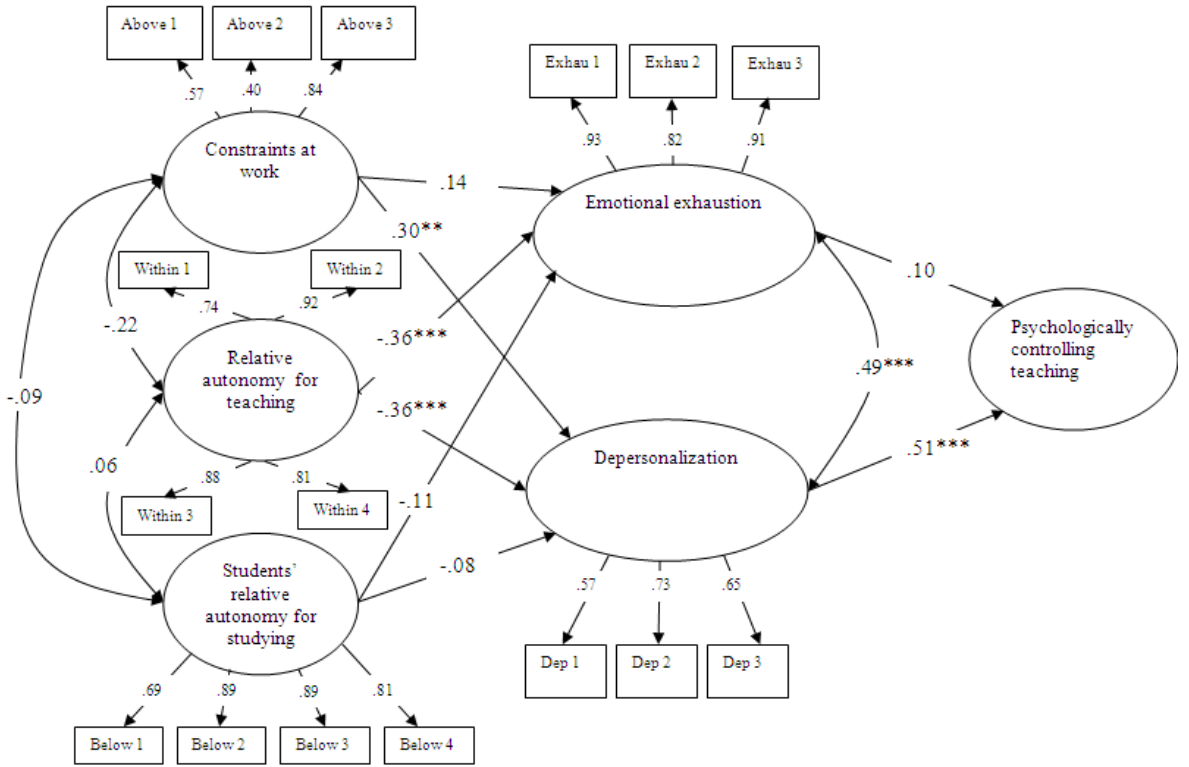

Figure 3. Final model of antecedents of PCT. Gender and years of teaching experiences are left out for clarity reasons. Notice that perceived pressure from within and from below are indicated by low scores on relative autonomy for teaching and studying, respectively. * p <.05. ** p < .01.

Summary Study 2

The relations between perceived pressure from above and pressure from within, as indexed by teachers' low relative autonomy for teaching, to PCT were fully mediated by the burnout component depersonalization. Pressure from below, as indexed by students' low relative autonomy for learning, was not related to PCT. Furthermore, pressure from within was the only source of pressure that was significantly related to emotional exhaustion. Moreover, emotional exhaustion was not related to PCT, indicating that emotional exhaustion did not function as an intervening variable in the relationships between different sources of perceived pressures and PCT.

General Discussion

The present studies applied the construct of psychological control, which involves the communication of a conditionally approving attitude through intrusive and manipulative practices (e.g., shaming and expression of disappointment), to the teaching context. Specifically, we examined associations between PCT and a number of hypothesized antecedents, mediators, and outcomes. Validity and reliability analyses show that PCT can be assessed –both in students' and in teachers' perceptions– as a reliable, unidimensional factor that correlates negatively with adaptive teaching dimensions, that is, autonomy support, structure, and involvement.

The remaining part of the discussion is organized around two important sets of findings, that is, (a) the hypothesized outcomes and (b) the hypothesized antecedents of PCT. Across the two studies we aimed to test the SDT-based notion that controlling teaching and PCT in particular relates

to a controlled and rigid orientation in the functioning of both teachers and students.

Outcomes of Psychologically Controlling Teaching

Through structural equation modeling, our first study demonstrated negative associations between PCT and (a) important components of SRL, that is, deep-level cognitive and meta-cognitive strategy use, through students' relative autonomy for learning, and (b) academic achievement. Our findings further indicated that the association between PCT and meta-cognitive strategy use was partially mediated by students' low relative autonomy for studying. Low use of meta-cognitive strategies was, in turn, related to lower academic performance. Together, these findings are consistent with the idea that PCT undermines students' autonomous motivation to learn and instead fosters a controlled regulation of study activities (Vansteenkiste, Simons et al., 2005). This low-quality type of motivation would in turn deplete students' energy and vitality that are needed to adequately self-regulate their learning process (Vansteenkiste, Zhou et al., 2005). The direct relationship between PCT and meta-cognitive strategy use possibly indicates that PCT is a strong and direct source of stress reducing the energy needed for meta-cognitive strategy use.

With regard to the self-regulatory learning strategies, it is interesting to note that meta-cognitive strategy use (e.g., time management) was significantly related to academic achievement, whereas deep-level cognitive strategy use was not. These findings are in line with the results of previous research showing stronger relations between meta-cognitive strategy use and performance than between cognitive strategy use and performance (e.g., VanderStoep, Pintrich, & Fagerlin, 1996; Wolters & Pintrich, 1998).

Furthermore, the positive association found between meta-cognitive strategy use and academic performance is consistent with investigations showing that the promotion of self-regulated learning increases academic performance (e.g., Lane et al., 2008).

Antecedents of Psychologically Controlling Teaching

Our last aim was to identify factors which are associated with teachers' PCT. In doing so, we examined the role of three sources of pressure in relation to PCT. Results indicated that perceived pressure from above, as indexed by teacher perceived constraints at work, and perceived pressure from within, as measured by teachers' controlled relative to their autonomous motivation for teaching, but not perceived pressure from below, as measured by students' controlled relative to their autonomous motivation for studying, were associated with PCT. These findings are consistent with research reporting relations between perceived pressure from authorities and teachers' own use of pressure (e.g., Deci, Spiegel, Ryan, Koestner, & Kauffman , 1982) and between personal characteristics and motivation in teachers and their behavior toward students (e.g., Boggiano, Barrett, Weiher, McClelland, & Lusk, 1987; Roth et al., 2007).

Furthermore, we found that depersonalization played a mediating role in the relations between pressures from above and within and PCT. So, it seems that pressure from above and pressure from within distract teachers from students' personal wants and desires, presumably because they foster an "objectifying" stance (Kasser, 2002; Vansteenkiste, Mouratidis, & Lens, 2010) towards students. This attitude of depersonalization might lower teachers' threshold for adopting a controlling attitude towards students as they are reduced to objects that can be pushed around. Although emotional

exhaustion was positively correlated with PCT, it did not play a unique mediating role in the relation between the sources of pressures and PCT. Possibly, emotional exhaustion is the predominant burnout component in relation to intrapsychic problems (e.g., psychopathology and somatic complaints; e.g., Jackson, Schwab, & Schuler, 1986; Leung & Lee, 2006), whereas depersonalization yields more relational costs. In light of this reasoning, it seems logical that especially depersonalization, as a cynical attitude towards students and the teaching job more globally, is associated with psychologically controlling actions.

Some results were not in line with our predictions. First, pressure from below, defined as teachers' beliefs about students' quality of motivation, was not uniquely related to the use of PCT, nor was it related to burnout. These findings were not in line with SDT's claim that pressure is always pernicious, nor was it with most previous research measuring pressure from below (e.g., Pettit, Laird, Dodge, Bates, & Criss, 2001; Taylor & Ntoumanis, 2007). A possible explanation for the apparent contrast in results between our study and most prior research is that teachers do not really suffer from a controlled motivation in their students because student motivation itself is not easily observed. In contrast, one may expect that students who display rebellious reactions, show apathy or achieve poorly, for example, do induce PCT (see for example, Barrow, 1976). Another explanation is that, contrary to previous research, this study measures more levels of pressure simultaneously in relation to controlling teaching. Consequently, it is possible that, when controlling for pressure from above and pressure from within, pressure from below has no unique effect on

controlling teaching. These explanations are rather speculative and should be tested in future research.

Second, there was no significant path from pressure from above to emotional exhaustion whereas there was a significantly positive path from pressure from within to emotional exhaustion. It is possible that pressure from above, which refers to an interpersonal experience, is especially important in developing interpersonal attitudes, like depersonalization, whereas experiences of pressure in one's own functioning is detrimental to both intrapersonal and interpersonal functioning.

Limitations and Suggestions for Future Research

The current research has some limitations. First, our focus is limited by primarily relying on self-report data. To avoid possible response bias and, as such, to validate our results, multiple informants, such as external observers, and behavioral measures, are needed. In developing an observational coding scheme, future research could rely on Barber (1996) who assessed parental psychological control in video-taped family problem-solving tasks. Second, the cross-sectional nature of our studies does not allow us to examine reciprocal relations between the studied concepts. For that objective, longitudinal research is recommended. Further, to make causality statements, experimental research is recommended (see Vansteenkiste, Simons et al., 2005, for an example).

As a final limitation, three issues on generalizability could be raised. First, students' frame of reference in Study 1 for responding to the measures was devoid of context. Therefore, to internally validate our findings, future research should ask students to respond to the instruments with reference to a particular course. Considering different courses (e.g., math, chemistry, and

language learning), one could examine if the structural relationships among the study variables are similar across courses or rather course specific. Second, although the return rate of 65% in Study 2 was rather high, it leaves open the question as to how representative of secondary school teachers the sample is. Third, the involvement of only secondary school students and teachers from the academic track limits the generalizability of our findings to the educational system as a whole. Given the obvious work and organizational differences between educational levels, it may be important to replicate the present findings with kindergarten, elementary, and/ or college school students and teachers. Moreover, we encourage future researchers to replicate the findings in other than European countries, such as the United States. Such external validation seems necessary due to the contextual differences between countries, such as the system of high-stakes testing in the U.S. which clearly represents pressure from above and is absent in the European context.

Finally, we propose two important additional avenues of study. First, due to the partial mediating role of students' relative autonomy for studying (Study 1), future research could focus on other possible mediators, such as need satisfaction in students. Second, our study is a first step toward elucidating the dynamics involved in PCT. It would be instructive for future research to more thoroughly explore the relation between PCT and other teaching dimensions, such as autonomy support, structure, and external control, and to look for unique effects of these teaching dimensions on students' learning, well-being, and performance. Possibly, PCT is primarily related to maladaptive learning outcomes, such as procrastination and drop-out. It is also interesting to look for the differences in antecedents of

externally and psychologically controlling teaching. Probably, for example, externally controlling teaching is more likely to occur in circumstances where the teacher feels externally controlled, whereas PCT is more likely to occur in an environment where more subtle and hidden, but intrusive pressures are experienced.

Conclusions and Practical Implications

Given the harmful correlates of PCT, from an applied perspective, it is important for teachers to refrain from PCT. To modify psychologically controlling teacher behavior, teachers can be provided with information about what behaviors constitute PCT and their effects on adolescent learning and achievement. To the extent that teachers wish to positively influence their students' learning, they can be advised to teach in an autonomy-supportive fashion, for instance, by explaining the relevance of learning strategies (Reeve, 2009).

It is equally important that pressure on and control of teachers is reduced, as indicated by the results of Study 2. To avoid the development of an objectifying attitude towards students, which seems to catalyze the use of PCT, it is desirable that the entire educational community and the general public recognize the complexity, responsibilities, and stresses that are inherent in the teaching profession so that the pressure from above on teachers gets reduced. To achieve this aim, principals could create an autonomy-supportive climate where teachers have a say in various decisions, in which a rationale is provided when staff involvement in decisions is limited, and where teachers are offered opportunities for self-direction and self-initiative.

At the intra-individual level, increasing teachers' pleasure and importance of their teaching might be important because teachers' motivation relates significantly to the use of a psychologically controlling stance. Perhaps, it is better for teachers who primarily teach for controlled reasons to reorient themselves in their professional career and to choose a job that lies more in line with their values and interests.

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7

General Discussion

In this concluding chapter, we look back on the different studies in our Ph.D. thesis. First, we provide a summary of the main findings of our work. Second, we discuss the limitations of our studies and we provide suggestions for future research that might remedy these shortcomings. Finally, we spell out some practical implications of our findings for educators, teachers, and policy makers.

Main Findings

This Ph.D. thesis enhances current knowledge on the link between teaching dimensions and student academic adjustment (outcomes; i.e., primarily self-regulated learning; SRL) and between sources of pressures (antecedents) and the teaching dimension psychologically controlling teaching.

Teaching Dimensions and Students' School Functioning

Based on the parenting literature, SDT, and previous research, this Ph.D. thesis investigated how students' functioning, and principally students' SRL, can be promoted or hindered. In doing so, we asked three related questions. First, we explored whether teacher autonomy support and structure are both necessary for SRL to flourish. Second, we explored whether psychologically controlling teaching would be devastating for students' use of SRL strategies. Third, we explored whether students' quality of motivation plays a mediating role in the relationships between the teaching dimensions and students' SRL and could thus explain why teaching dimensions are related to students' SRL.

In Chapter 3, we found in a sample of secondary school and teacher education students that structure was associated with higher SRL only when it was combined with at least a moderate amount of autonomy support.

Furthermore, person-oriented analyses in a sample of secondary school students in Chapter 4 revealed that a teaching style characterized by high autonomy support and high structure is most beneficial for students' school functioning. Finally, in Chapter 5, changes in perceived teacher autonomy support and structure were found to be positively related to changes in students' SRL through changes in secondary school students' autonomous study motivation during one school year. Hence, teacher autonomy support and structure have consistently been shown both to be necessary for students' optimal school functioning (i.e., students' SRL), presumably because autonomy support primarily satisfies students' need for autonomy whereas structure primarily satisfies students' need for competence (Connell & Wellborn, 1991). Focusing on one of these teaching dimensions is not sufficient to explain students' functioning, especially students' SRL. Our findings are in line with experimental research concerning the importance of offering structuring elements, such as limits, in an autonomy-supportive way for maintaining students' intrinsic interest and personal control (Burgess, Enzle, & Schmaltz, 2004; Koestner, Ryan, Bernieri, & Holt, 1984). Similarly, Jang, Reeve, and Deci (in press) found that observed autonomy support and structure both predicted student's behavioral engagement. Also, Buyse, Verschueren, and Doumen (2007) found that teacher self-report of autonomy support and structure were both negatively related to kindergarten children's externalizing behavior.

Moreover, in all our studies, autonomy support and structure positively co-varied, replicating results from observational (Jang et al., in press) and teacher self-report research (Buyse et al., 2007) and indicating that teacher autonomy support and structure are separate, but compatible

aspects of a student-centered teaching style. This general finding runs counter to the prevailing misconception in practice that more autonomy support automatically involves less structure and more permissiveness (Reeve, 2009). Many teachers inappropriately associate autonomy support with laissez-faire. According to this view, then, autonomy support and structure are antagonistic and opposites of each other. Nevertheless, as our data show, structuring information can be provided by teachers in either an autonomy-supportive or a controlling way (Deci & Ryan, 1985). For example, positive feedback, as an element of structure, is given in a controlling way when a teacher says: "You just did the exercise like I wanted you to do". Conversely, positive feedback is given in an autonomy-supportive way, when the teacher says: "You did the exercise very well and made a lot of progress." So, defined within SDT, autonomy support and structure are compatible constructs which develop in tandem over time. There is no trade-off relationship between autonomy support and structure. On the contrary, the opposite of autonomy support is controlling teaching; the opposite of structure is chaos.

In Chapter 6 (Study 1), in a study among secondary school students, we showed that controlling teaching and, more specifically, psychologically controlling teaching seems to hinder SRL and eventually academic performance (partially) through its negative relationship with students' autonomous relative to controlled study motivation. The negative outcomes of psychologically controlling teaching complement research on the detrimental effects of a controlling teaching communication style on deep-level learning (Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005),

teacher rated student engagement (Assor, Kaplan, Kanat-Mayman, & Roth, 2005), and academic achievement (Aunola & Nurmi, 2004).

As noted, with regard to the mediational role of students' motivation in the relationship between teaching dimensions and students' SRL, we found in Chapter 6 (Study 1) that psychologically controlling teaching was negatively related to students' SRL (partially) through students' relative autonomy for studying. Moreover, in our longitudinal study, reported in Chapter 5, we demonstrated that the extent to which teachers are perceived to increase their use of autonomy-supportive and structuring behaviors is associated with a corresponding increase in students' autonomous motivation. The increase in autonomous motivation, in turn, relates to an increase in students' use of SRL strategies. Our mediation analyses show that there were both direct and indirect paths, through students' quality of motivation, between the perceived teaching dimensions and students' SRL. The indirect effects show that the perceived teaching dimensions as well as students' quality of motivation explained the use of SRL strategies. The results of the mediation analyses of Chapters 5 and 6 are generally in line with previous cross-sectional and longitudinal research on the mediating role of students' autonomous motives in the relationship between teacher autonomy support and student learning outcomes (e.g., Guay, Boggiano, & Vallerand, 2001; Pelletier, Fortier, Vallerand, & Brière, 2001).

Our studies and all previous research are clearly conclusive in this matter: (a) autonomy support and structure are conceptually distinct, yet compatible teaching dimensions that are both necessary for students' school functioning, and specifically students' SRL, whereas psychologically controlling teaching hinders students' SRL; and (b) students' quality of

motivation is an important intervening variable in the relationships between the teaching dimensions and SRL, both cross-sectionally and longitudinally.

Sources of Pressure and Psychologically Controlling Teaching

Articulating the antecedents of teaching dimensions, leads to three categories of variables, that is, teacher characteristics ("from within", such as teachers' personality), student characteristics ("from below", such as students' personality), and elements of the broader environment ("from above", such as school climate). In Study 2 of Chapter 6, we focused on the conditions that constitute risk factors for psychologically controlling teaching. In line with previous research (e.g., Deci, Spiegel, Ryan, Koestner, & Kauffman, 1982; Pelletier, Séguin-Lévesque, & Legault, 2002), we found support for the notion that pressure from above, operationalized as perceived constraints at work, and pressure from within, operationalized as low relative autonomy for teaching, are positively related to psychologically controlling teaching. The positive relationships between both pressures and psychologically controlling teaching were fully mediated by the depersonalization component of burnout. However, in contrast to previous research (e.g., Taylor & Ntoumanis, 2007), pressure from below, operationalized as teachers' perceptions of students' low relative autonomy for studying, did not show any relationship with psychologically controlling teaching. We wonder if the relationship between pressure from below and psychologically controlling teaching would be significantly positive if we would expand the concept of pressure from below to include other aspects, such as externalizing misbehavior.

Limitations and Related Suggestions for Future Research

We believe our studies contribute to educational and developmental theorizing and research (a) by highlighting the relationship between perceived teacher autonomy support and structure, (b) by showing how perceived autonomy support and structure can promote late-adolescents' school functioning, (c) by showing how perceived psychologically controlling teaching can be detrimental to late-adolescents' school functioning, and (d) by showing how perceived pressures are related to teacher functioning (i.e., burnout and psychologically controlling teaching). However, we also identified important limitations within our questionnaire-based studies which could point to a number of potentially fruitful areas for future research.

First, we did not take the nested structure of school data into account: students are nested within classes, which in turn are nested within schools. We focused on how perceived teaching dimensions (i.e., class level variables) affected students' school functioning and so examined within-class effects. Future researchers could direct their attention toward multi-level models, such as hierarchical linear modeling techniques (Goldstein, 1995), to disentangle between-school, between-teacher or between-class, and within-classroom (i.e., between-student) effects on motivation and learning measures (Raudenbush, Bryk, Gheong, & Congdon, 2004). For example, Jang et al. (in press) examined between-schools, between-class, and within-class effects of teachers' instructional styles (i.e., teacher autonomy support and structure) on students' engagement through multi-level modeling, using hierarchical linear modeling. For students' self-report engagement, they found that within-class effects constituted 86% of

variance whereas between-class effects constituted only 14% of the variance and between-school effects constituted less than 1% of the variance.

Second, although the current results are consistent with studies in which actual teacher behavior was assessed (e.g., Jang et al., in press), our research largely unaddressed the temporal order of the associations between teachers' motivating style and students' functioning. The relationship between the teaching dimensions and students' school functioning is likely to be bidirectional (e.g., Skinner & Belmont, 1993). For example, offering autonomy support and structure could enhance students' SRL, but it is equally possible that students' active engagement in SRL elicits teachers' provision of autonomy support and structure. To answer this directional influence question, cross-lagged analyses together with experimental designs, in which teacher autonomy support and structure or students' SRL are manipulated, are needed. For example, Reeve, Jang, Carrell, Jeon, and Barch (2004) experimentally demonstrated in a high school sample that teachers' autonomy support influenced students' engagement. Students responded with greater engagement when their teachers showed an increase in autonomy-supportive behaviors. Similarly, Jang (2008) demonstrated that an externally provided rationale that is personally meaningful for students fosters students' engagement and, eventually, conceptual learning in the context of an uninteresting learning activity. To date, however, there is a dearth of experimental research examining how students' learning behavior affects teaching style.

Third, there is a growing consensus that students' perceptions of the teaching style rather than the teaching style as such influence students' learning (Entwistle, 1991; Shuell, 1996; Struyven, Dochy, Janssens,

Schelfhout, & Gielen, 2006). Moreover, Assor and colleagues found that children as well as adolescents can differentiate among various types of autonomy-affecting teaching behaviors (Assor & Kaplan, 2001; Assor, Kaplan, & Roth, 2002). Consequently, we relied on self-report measures. We recognize that our predominant use of self-report measures might have inflated the magnitude of the correlations obtained, a phenomenon known as shared method variance. To eliminate this potential problem, a multiple informant approach, integrating reports by teachers and students with direct in-class observations of teacher-student interactions, is recommended.

Fourth, there is general consensus about the subcomponents of autonomy support. There are high intercorrelations among the instructional autonomy-supportive behaviors confirming that teachers use these behaviors simultaneously (see, e.g., Assor et al., 2002; Reeve, 2009; Reeve et al., 2004; see Table 1 in Chapter 1). However, with respect to structure, which also spans an array of skills, there is no clarity about its subcomponents. Based on Reeve's (2002, 2006) reasonings, we defined structure as consisting of (a) clear expectations before a learning activity, (b) individualized help during a learning activity, and (c) informational, constructive feedback during and after a learning activity. Despite the availability of this theoretical model, empirical research calculating the subcomponents of structure through correlational and factor analysis is lacking.

Fifth, in order to increase the external validity and generalizability of our findings, samples that include students and teachers in kindergarten or elementary schools, at the university level, or in settings for higher education, are desirable. For example, it might be the case that the

associations between perceived teacher autonomy support and structure and students' use of deep-level cognitive and meta-cognitive strategies become stronger with age because of increasing cognitive maturity in regulating one's own learning process.

Finally, in an attempt to unravel outcomes and antecedents of teaching dimensions, we focused in this Ph.D. thesis on the outcomes of perceived autonomy support, structure, and psychologically controlling teaching and on the antecedents of psychologically controlling teaching. Obviously, more research is needed on outcomes and antecedents of teaching dimensions. In particular, it would be interesting to explore (a) the outcomes of perceived chaos and neglect, the opposites of structure and involvement, respectively, and (b) how the three sources of pressure are related to the three adaptive teaching dimensions or how supportive conditions from above, from within, and from below are related to autonomy support, structure, and involvement. Such an exploration might assist researchers in achieving additional insight in the outcomes of teaching style and in the circumstances under which teaching style dimensions develop.

Practical Implications

Many of our standard educational structures and practices, on average, tend to be experienced as controlling (Deci, Vallerand, Pelletier, & Ryan, 1991; Reeve et al., 2004). In light of our research findings along with previous research inspired by SDT, which show that autonomy support and structure are positively associated with adaptive learning outcomes whereas controlling teaching is negatively associated with these outcomes, this state of affairs is alarming. Consequently, teachers are clearly advised to refrain

from controlling teaching and to search for an appropriate balance between high autonomy support and structure.

Clarifying and discussing the reasons (i.e., antecedents) that often pull teachers toward a controlling style and describing a controlling teaching style and its inimical consequences for students can make teachers more mindful of their daily functioning (Reeve, 2009). Greater mindfulness of one's motivating style and its antecedents and outcomes for students is a fundamental, first step toward becoming more student-centered, that is, more autonomy-supportive and structuring. A second step includes the appreciation of the benefits of autonomy support and structure. When teachers are confronted with the numerous benefits of autonomy support and structure for students and for their own functioning, they might want to become more autonomy-supportive and structuring (Reeve, 2009). The third and last step is to become aware of and to develop autonomy-supportive and structuring skills (Reeve, 2009). Combining both high autonomy support and high structure is certainly a demanding and difficult task. Yet, previous research demonstrates that preservice as well as experienced teachers can acquire an autonomy-supportive style (Reeve, 1998; Reeve et al., 2004). Hence, we expect that practicing teachers can incorporate autonomy-supportive and structuring behaviors when exposed to information on how to combine autonomy support with structure. Specifically, teacher training based on instructional booklets, intensive workshops on a core and concrete set of autonomy-supportive and structuring behaviors, and an interactive website on how to provide autonomy support and structure, along with school intervention programs seem particularly appropriate. Furthermore, describing "best practices" of how teachers can combine high autonomy

support with a lot of structure and providing possibilities for group discussions are realistic options to create a conceptual change in teachers' beliefs about motivating students and, subsequently, actualizations thereof in their teaching behaviors. Examples of specific instructional behaviors for teachers keen to increase the autonomy-supportive as well as structuring component of their instructional style are: setting flexible deadlines, co-opting deadlines with students, encouraging students to set subdeadlines for complex, multi-component tasks (Burgess et al., 2004) and setting rules by offering a rationale to explain why following the rules is truly worth the students' effort (Reeve, 2009).

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