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Identifying configurations of perceived teacher autonomy support and structure: Associations with self-regulated learning, motivation and problem behavior

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ABSTRACT

Grounded in self-determination theory, the aim of this study was (a) to examine naturally occurring configurations of perceived teacher autonomy support and clear expectations (i.e., a central aspect of teacher structure), and (b) to investigate associations with academic motivation, self-regulated learning, and problem behavior. Based on person-centered analyses in a sample of high school students ($N = 1036$), four different perceived teaching configurations emerged: high autonomy support – clear expectations, low autonomy support – vague expectations, high autonomy support, and clear expectations. The teaching configuration characterized by perceived autonomy support and clear expectations was related to the most positive pattern of outcomes, whereas the opposing teaching configuration related to the most negative pattern of outcomes. The two remaining groups fell in between. The discussion focuses on the compatibility of teacher autonomy support and teacher structure.

1. Introduction

Within self-determination theory (SDT; Deci & Ryan, 2000), learners' motivation and self-regulated learning are said to be facilitated by nurturing their basic psychological needs for autonomy (i.e., experiencing a sense of volition), competence (i.e., feeling effective and masterful), and relatedness (i.e., feeling close and connected). Although dozens of studies in the SDT literature have provided convincing evidence for the manifold learning benefits associated with teacher autonomy support versus control (Reeve, 2009; Vansteenkiste, Niemiec, & Soenens, 2010), far less attention has been paid to the role of teacher structure (e.g., Jang, Reeve, & Deci, 2010) and teacher involvement (e.g., Skinner & Belmont, 1993). Structure and involvement are said to generally feed into the needs for competence and relatedness, respectively.

A first aim was to add to this small body of work by investigating how autonomy support and clear expectations, one of the most central aspects of structure, relate to one another. We did so (a) by examining whether both teaching dimensions are positively related rather than being antagonistic and (b) by examining how both teaching dimensions naturally co-occur, thereby relying on a person-centered analytic approach. The second aim was to relate the retained perceived teaching constellations to students' motivation, learning strategies, and problem behavior.

1.1. Defining autonomy support and structure

"Do I really need to explain this homework in detail? When will you finally learn to take responsibility for your own learning process?" Teachers using statements such as these may think of themselves as being autonomy supportive because they expect their students to learn to manage their study work independently, that is, without the teacher being available to provide help or to monitor the learning process. Within this view, teacher autonomy support gets equated with the promotion of independent functioning, which involves granting students unlimited freedom and requiring that they resolve issues by themselves, that is, without help of the teacher. Although a definition of autonomy support as encouragement of independence is used only implicitly in the literature on self-regulated learning, this viewpoint is explicitly endorsed by some scholars in the teaching literature (e.g., Karagozoglu, 2009) and is quite common in the broader socialization literature (e.g., Silk, Morris, Kanaya, & Steinberg, 2003).

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From the SDT-perspective, teacher autonomy support has a different meaning. Autonomy-supportive teachers allow students to act upon their personal interests and values, such that their learning is accompanied with a sense of volition and psychological freedom (e.g., Reeve, 2009). To differentiate SDT's view on autonomy support from promotion of independence, Soenens et al. (2007) coined the term promotion of volitional functioning. Teachers can foster volitional functioning by providing students with the desired amount of choice, by giving a meaningful rationale when choice is constrained, by accepting rather than countering irritation and anger that arises during the learning process, and by using inviting language (e.g., "you can") rather than controlling language (e.g., "you should"). Numerous studies have shown that the benefits of fostering volitional functioning are manifold, including deep-level learning, positive affect, achievement and behavioral persistence (e.g., Buff, Reusser, Rakoczy, & Pauli, 2011; for an overview, see Reeve, 2009).

Note that the notion of volition as defined in SDT has a different meaning from how it is used in the social psychological literature (e.g., Dewitte & Lens, 1999) where volition refers to self-control, that is, "one's use of cognitive and attentional resources to override, inhibit or alter impulses in the service of attaining personal goals or satisfying motives" (Vohs & Heatherton, 2000, p. 214). When applied to the educational domain, students high in self-control would, for instance, be able to resist the temptation to get involved in leisure activities and instead give priority to their homework. Yet, from the SDT-perspective, this act of self-control is not necessarily engaged in willingly as students could give priority to their homework for pressuring reasons (e.g., to show they are model students). Previous SDT-based research (e.g., Moller, Deci, & Ryan, 2006) has shown that such a pressured engagement in self-control activities yields a more energy-draining effect relative to a volitional or willing engagement.

More important for the present study, these two views on teacher autonomy support (i.e., promotion of volitional functioning versus promotion of independence) imply a different relation with teacher structure. When teachers promote independence and 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 climate where students lack sufficient guidance. In contrast, when defined as the promotion of volitional functioning, autonomy support does not imply a lack of structure. On the contrary, if teachers want to provide guidance that is experienced as truly competence-supportive by the students, teachers may best adopt the students' frame of reference. Taking the students' perspective (i.e., a key element of the promotion of volitional functioning) then allows teachers to provide truly competence-supportive structure, that is, guidance that meets students' problems and wishes. Within SDT, the opposite of teacher autonomy support is not structure but the use of a controlling style, where teachers frustrate students' need for autonomy by directing their activities in an intrusive and pressuring fashion. Such pressure may involve internally controlling strategies, such as guilt-trips or conditional regard (e.g., Soenens, Sierens, Vansteenkiste, Goossens, & Dochy, 2012), or rather externally controlling strategies, such as threatening with tests or harsh sanctions (e.g., Grolnick & Ryan, 1987).

Given that high autonomy support is not equated with low structure in SDT, the question arises how exactly structure is defined. Reeve (2006; see also Grolnick, 2003) argued that structure has three components, 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, a lack of structure can be described along three subcomponents. These subcomponents are: (a) vagueness and confusion 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 of feedback. For instance, the provision of positive feedback has been found to promote intrinsic enjoyment (e.g., Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008) and engagement (e.g., Koka & Hein, 2003). Considerably less attention has been devoted to teachers' communication of expectations (but see Kunter, Baumert, & Koller, 2007). This is surprising because the communication of expectations, as it represents the starting point of the process of structuring students' learning process, is an essential feature of structure.

1.2. The interplay of perceived 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 mutually supportive way" (Reeve, 2002, p. 193; our italicizing). In line with this view, Sierens, Vansteenkiste, Goossens, Soenens, and Dochy (2009) found through confirmatory factor analysis that autonomy support (i.e., promoting volitional functioning) and structure are separate, yet positively related, teaching dimensions. Similarly, Jang et al. (2010), relying on observer ratings, found that autonomy support and structure co-varied positively. Similar findings have been obtained in the domain of parenting (e.g., Farkas & Grolnick, 2010).

Due to the recent call to consider autonomy support and structure as separate and compatible dimensions (e.g., Jang et al., 2010; Soenens & Vansteenkiste, 2010), researchers have paid more attention to the effects of combining teacher autonomy support and structure on 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 perceived competence when provided in an autonomy-supportive way. Using observational assessments, Jang et al. (2010) showed that both observed autonomy support and structure predicted engagement. Next, Sierens et al. (2009) demonstrated that perceived teacher structure only had a positive relation to self-regulated learning when it was combined with at least a moderate amount of perceived teacher autonomy support. Farkas and Grolnick (2010) found that these findings can be generalized to the parenting domain.

Finally, although not grounded in the SDT-perspective, a study by Patrick, Turner, Meyer, and Midgley (2003) is relevant. On the basis of observed teacher classroom practices, a group of supportive teachers was identified. Specifically, these teachers gave intrinsic reasons for learning, expressed confidence in the pupils' ability to master the material, provided clear expectations for desirable classroom behavior, and consistently followed up on these consensually agreed upon expectations. Interestingly, pupils in this supportive group, which combined autonomy supportive and well-structured teaching practices, reported using less self-handicapping, less avoidance of help-seeking, and less disruptive behavior compared to groups of pupils belonging to an ambiguous (characterized primarily by inconsistent

structure) and non-supportive (characterized by a controlling approach) classroom environment.

1.3. The present study

The first aim of this study was to advance our understanding of the association between teacher autonomy support and structure. In line with previous studies (e.g., Jang et al., 2010), we first adopted a variable-oriented approach to examine their association. Based on SDT, we expected that both perceived teaching dimensions would emerge as distinct, yet positively correlated, dimensions in factor analyses. Such a finding would be indicative of the compatibility of perceived teacher autonomy support and structure (Hypothesis 1a).

Further, we reasoned that if perceived teacher autonomy support and structure truly form different dimensions, they should co-occur in different ways in students' perceptions of teachers. Such distinct subgroups of perceived teaching configurations can best be modeled by a person-oriented approach, such as cluster analysis (von Eye & Bogat, 2006). In this study, we focused on clear expectations to operationalize structure. We hypothesized that 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 (Koestner, Ryan, Bernieri, & Holt, 1984). Accordingly, we expected to find two teaching constellations characterized by the provision of clear expectations: teachers who are perceived as offering clear expectations and scoring either high or low on autonomy support. Similarly, we reasoned that an absence of clear expectations may also go hand in hand with either low or high autonomy support. 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 cluster and a low autonomy support with clear expectations cluster (Hypothesis 1b).

The second aim was to examine the external validity of the retained teaching configurations by investigating whether students belonging to different clusters would display a different pattern of learning outcomes (i.e., time management, concentration, information processing, persistence, test anxiety) and motivation. Within SDT, a qualitative distinction is made between autonomous and controlled motivation. When autonomously motivated, pupils learn out of curiosity and interest or because they find the learning task personally meaningful. With controlled motivation, pupils learn to meet externally or internally imposed demands. Moreover, we broadened the range of outcomes by including measures of school-specific problem behavior (i.e., skipping classes) and more general externalizing problem behavior (e.g., stealing or drug use; see also Patrick et al., 2003). We did this because teachers do not only have the task of transmitting knowledge and learning material, but also face the challenge of disciplining their class such that students do not engage in problem behavior. The inclusion of these additional outcomes allowed us to examine whether the beneficial correlates of perceived teacher autonomy support and structure would radiate to the prevention of problem behavior.

Based on SDT, we expected that the cluster consisting of students scoring high on autonomy support and 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 teaching dimensions is hypothesized to relate to the most detrimental set of outcomes because both the needs for autonomy and competence are most likely to be frustrated (Hypothesis 2).

The two remaining clusters were hypothesized to score in between. We reasoned 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. We examined in a rather exploratory way whether these compensatory effects might be somehow outcome specific. First, we speculate that clear expectations might be associated with any kind of motivation (i.e., controlled and autonomous motivation) as students need to know what is expected from them 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 (Research Question 1). Second, abundant research in the parenting domain has shown that especially clear rules and expectations could prevent adolescents' problem behavior (e.g., Barber, Olsen, & Shagle, 1994). Extrapolating from this work, 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. This is because students who do not perceive clear teacher expectations experience a laissez-faire climate where any kind of behavior is permitted, including school-related problem behavior, like skipping classes (Research Question 2).

When examining these hypotheses we controlled for gender and grade level. This is necessary as girls typically score higher on autonomous motivation and various self-regulated learning strategies except test anxiety (e.g., De Blide, Vansteenkiste, & Lens, 2011), while boys score higher on problem behavior (e.g., LaCourse, Nagin, Tremblay, Vitaro, & Claes, 2003). As for grade level, students' intrinsic motivation (e.g., Lepper, Corpus, & Iyengar, 2005) and self-regulated learning (e.g., Vansteenkiste, Sierens, Soenens, Luyckx, & Lens, 2009) have been found to decline with increasing grade level, while externalizing problem behavior typically increase till the 9th and 10th grade (e.g., Warr, 1993).

2. Method

2.1. Participants and procedure

Participants were 1036 students in 7th through 12th grade and an additional (optional) year for specialization (13th grade). 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, 110 students (11%) followed a vocational track, while 926 students (89%) followed an academic track. All students filled out the questionnaire during a class period of 50 min. In terms of distribution across the different grades, 156 (15%), 156 (15%), 206 (20%), 161 (16%), 162 (16%), 184 (18%), and 18 (1.8%) were in their 7th, 8th, 9th, 10th, 11th, 12th and 13th grade, respectively. The study was approved by the ethical committee of the researchers' university. Passive consent was obtained from the parents and participation in the study was voluntary. Students could withdraw at any moment during the study, which took place in the computer lab. Participants filled out the questionnaires on a computer screen, which yielded the advantage that if a student would skip a question, a warning signal would appear. As a result, there were no missing values.

2.2. Measures

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

2.2.1. 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 measures students' perception of teachers' promotion of volitional functioning (e.g., "My teachers give me a lot of choices about how I do my schoolwork"; $\alpha = .77$). The Dutch version was translated following the guidelines of the International Test Commission (Hambleton, 1994) and has been used in previous studies (Sierens et al., 2009).

2.2.2. Clear expectations

Ten statements were formulated to rate teachers' provision of clear expectations (or lack thereof), thereby using the component 'clarity of expectations' of the Structure scale of the TASC (Belmont et al., 1988) as a source of inspiration. We elaborated this scale by formulating more items and by differentiating two aspects of teacher expectations, that is, (a) expectations regarding the learning material and tests (e.g., "My teachers clearly explain the rules and agreements regarding the learning material"; "My teachers clearly explain what will happen if someone breaks the rules (concerning tasks, tests,…)") and (b) expectations regarding desirable behavior in class [e.g., "My teachers clearly explain how to behave in class (e.g., not disturbing the class)"; "My teachers are very unclear with respect to what they expect regarding my behavior in class"]. Internal consistency was .83.

2.2.3. Self-regulation – academic

To measure quality of study motivation, students completed an adapted Dutch version of the Self-Regulation Questionnaire-Academic (SRQ-A; Ryan & Connell, 1989; Vansteenkiste et al., 2009). The scale assesses students' autonomous (e.g., "I'm studying because it is personally important to me"; 8 items; $\alpha = .85$) and controlled study motivation(e.g., "I'm studying because I would feel guilty if I wouldn't do so"; 8 items; $\alpha = .77$).

2.2.4. 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"; $\alpha = .80$). Time management assesses students' use of planning and efficient scheduling of their schoolwork (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); $\alpha = .74$]. 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"; $\alpha = .80$). 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; $\alpha = .76$).

2.2.5. Externalizing problem behavior and skipping classes

To assess externalizing problem behavior we tapped into (a) the frequency of substance use during the last year by means of the Deviant Behavior Scale (DBS; Weinmann, 1992; e.g., "I smoked soft drugs like marihuana and hash") and (b) students' engagement in 23 different offenses, such as vandalism, stealing, and unarmed fights, over the last year (Baerveldt, 1992). We dropped the two school skipping items from the latter scale and treated them as a separate variable because of their specific relevance in the school context ($r = .54$, $p < .001$). For both substance use and delinquency items, students rated items 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 ($\alpha = .88$).

3. Results

3.1. Descriptives and background characteristics

To examine the associations between gender and grade level and the outcomes, a MANOVA was performed (using PASW 18.0). The multivariate effects of gender [Pilai's Trace, $F(10, 1015) = 10.24$, $p < .001$; $\eta^2 = .09$] and grade level [Pilai's Trace, $F(50, 5095) = 7.16$, $p < .001$; $\eta^2 = .07$] were significant, while the gender by grade level interaction was not. At the univariate level, gender was significantly associated with autonomous motivation [$F(1, 1024) = 19.34$, $p < .001$; $\eta^2 = .02$], time and study management [$F(1, 1024) = 22.45$, $p < .001$; $\eta^2 = .02$], text anxiety [$F(1, 1024) = 22.75$, $p < .001$; $\eta^2 = .02$], externalizing problem behavior [$F(1, 1024) = 33.32$, $p < .001$; $\eta^2 = .03$], skipping classes [$F(1, 1024) = 5.21$, $p < .05$; $\eta^2 = .01$], perceived autonomy support [$F(1, 1024) = 5.00$, $p < .05$; $\eta^2 = .01$], and perceived expectations [$F(1, 1024) = 5.16$, $p < .05$; $\eta^2 = .01$]. Girls scored higher on autonomous motivation, time and study management, test anxiety, perceived autonomy support, and perceived expectations, while boys scored higher on externalizing problem behavior and skipping classes. Next, grade level was associated with autonomous motivation [$F(5, 1024) = 3.90$, $p < .01$; $\eta^2 = .02$], controlled motivation [$F(5, 1024) = 8.21$, $p < .001$; $\eta^2 = .04$], time and study management [$F(5, 1024) = 25.52$, $p < .001$; $\eta^2 = .11$], concentration [$F(5, 1024) = 3.45$, $p < .01$; $\eta^2 = .02$], deep-level learning [$F(5, 1024) = 4.87$, $p < .001$; $\eta^2 = .02$], test anxiety [$F(5, 1024) = 4.94$, $p < .001$; $\eta^2 = .02$], externalizing problem behavior [$F(5, 1024) = 17.26$, $p < .001$; $\eta^2 = .08$], skipping classes [$F(5, 1024) = 14.15$, $p < .001$; $\eta^2 = .07$], perceived autonomy support [$F(5, 1024) = 10.34$, $p < .001$; $\eta^2 = .05$], and perceived expectations [$F(5, 1024) = 16.99$, $p < .001$; $\eta^2 = .08$]. Given these associations, we controlled for these background variables when examining differences in learning, motivation, and problem behavior between the retained clusters.

3.2. Aim 1: examining the relation between perceived expectation and perceived autonomy support

3.2.1. Variable-centered approach: confirmatory factor analysis

To examine the construct validity of the teaching style scales (i.e., autonomy support and clear expectations), a confirmatory factor analysis was performed using Lisrel 8.50 with Maximum Likelihood Estimation (Jöreskog & Sörbom, 1996). 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. This fit was superior compared to a one-factor model, RMSEA = .11, CFI = .89, and SRMR = .08; $\Delta SBS\text{-}\chi^2$ (1) = 36.22, $p < .001$. As expected, autonomy support and clear expectations were positively related, $r = .54$, $p < .001$. Correlations among the study variables can be found in Table 1. Because of the large N and the resulting high power, we adopted a more conservative alpha level (i.e., $p < .01$) to preclude that small effects would be flagged as significant.

3.2.2. Person-centered approach: cluster analysis

Prior to running the cluster analysis, scores on autonomy support and clear expectations were standardized. In addition, because outliers can significantly affect the results of a cluster analysis (Garson, 1998), we removed univariate (3 SD above or below the mean) and multivariate outliers (as identified using the

Table 1
Possible range, means, standard deviation and intercorrelations among measured variables.

Variable	Possible range	*M*	SD	2	3	4	5	6	7	8	9	10	11
1. Perceived autonomy support	1–5	3.23	.62	.54**	.32**	.04	.33**	.34**	.28**	.37**	−.12*	−.25**	−.15**
2. Perceived clear expectations	1–5	3.49	.59	–	.23**	.12*	.23**	.27**	.22**	.36**	−.07	−.23**	−.12*
3. Autonomous motivation	1–5	2.87	.73		–	.27**	.36**	.33**	.41**	.46**	.00	−.18**	−.11*
4. Controlled motivation	1–5	2.89	.72			–	.07	−.06	.11*	.14**	.21**	−.02	.01
5. Time and study environment	1–5	2.90	.68				–	.55**	.27**	.65**	−.10*	−.39**	−.30**
6. Concentration	1–5	3.03	.73					–	.14**	.56**	−.54**	−.31**	−.20**
7. Information processing	1–5	3.23	.63						–	.40**	.14**	−.13**	−.10*
8. Persistence	1–5	3.33	.63							–	−.06	−.38**	−.29**
9. Test anxiety	1–5	2.88	.72								–	.05	−.04
10. Externalizing problem behavior	0–3	.36	.36									–	.55**
11. School skipping	0–3	.27	.59										–

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

Mahalanobis distance measure; Garson, 1998). In all, 11 participants were removed (final $N = 1025$).

Next, using PASW 18.0 a 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 a 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 considered for the second step of the cluster analysis. 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). In an iterative procedure, 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 interpretability and parsimony (von Eye & Bogat, 2006). Because the five-cluster solution was not interpretable, we retained the three- and four-cluster solutions for analyses of replicability.

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 .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 had a kappa of only .36. Therefore, only the four-solution was analyzed further. Fig. 1 presents the final cluster solution. The four-cluster solution accounted for 69% of the variance in autonomy support and 71% in clear expectations.

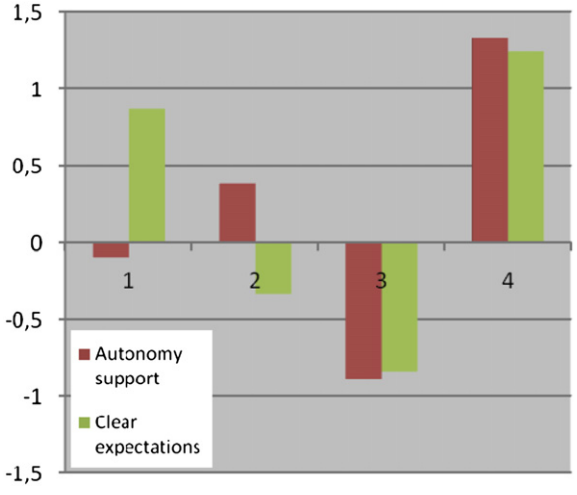

Fig. 1. *z*-Scores for perceived autonomy support and perceived clear expectations in the 4-cluster solution.

The *z*-scores and absolute scores of perceived autonomy support and perceived clear expectations are reported in Table 2. Cluster 1 ($n = 199$, 19.41%) was characterized by students who perceived their teacher, relative to students belonging to the other clusters, as average on autonomy support and as high on offering clear expectations and was labeled the 'Clear Expectations' cluster. This label is also justified by the fact that students in this group perceived their teachers to score higher on expectations compared to autonomy support in an absolute sense. Cluster 2 ($n = 294$, 28.68%) was characterized by students who perceived their teacher, relative to students belonging to the other clusters, as moderately high on autonomy support, but offering moderately clear expectations. It was labeled the 'Autonomy Support' cluster. This label can also be justified in light of the fact that students in this cluster perceived their teachers to score higher on autonomy support compared to expectations in an absolute sense. Cluster 3 ($n = 348$, 33.95%) was characterized by students who perceived their teacher as relatively low on autonomy support and offering relatively vague expectations and was labeled the 'Low Autonomy Support – Vague Expectations' cluster. 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 and was labeled the 'High Autonomy Support – Clear Expectations' cluster, as also confirmed by high absolute scores for the two clustering dimensions.[1]

[1] As recommended by an anonymous reviewer, we also used Latent Profile Analysis and the results of these analyses were similar to the ones obtained through cluster analyses: a four-class solution (BIC = 3403.62; entropy = .81) was preferred above a three- and five-class solution (BIC = 3452.90 and 3415.58; entropy = .72 and .77, respectively). These findings provide further confidence in the herein presented four-cluster solution.

Table 2
Univariate ANOVAs and post-hoc cluster comparisons based upon Tukey HSD tests for the four clusters ($N = 1025$).

Variable	Cluster				$F(3, 1021)$	η^2
	Clear expectations	Autonomy support	Low autonomy support – vague expectations	High autonomy support – clear expectations		
Cluster dimensions (*z*-scores)						
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
Cluster dimensions (raw scores)						
Perceived autonomy support	3.16[b]	3.47[c]	2.64[a]	4.10[d]	764.11***	.69
Perceived clear expectations	4.00[c]	3.29[b]	2.99[a]	4.21[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 problems	.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.
*$p < .05$. **$p < .01$. ***$p < .001$.

3.3. Aim 2: examining the relation 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 the independent variable and the outcome variables as the dependent variables. Based upon Pilai's Trace, statistically significant multivariate cluster differences were found, $F(33, 3039) = 61.07$, $p < .001$, $\eta^2 = .40$. This multivariate effect remained significant after introducing grade level and gender as covariates in a MANCOVA-analysis, $F(33, 3033) = 60.18$, $p < .001$, $\eta^2 = .40$. Moreover, each of the univariate effects of cluster membership on the separate outcomes was also significant after entering grade level and gender as covariates. Next, we tested differences between the four clusters by using pairwise comparisons based on Tukey's Honestly Significant Difference test (Table 2).

3.3.1. Motivation correlates

Although the four groups differed in terms of 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 characterized by varying levels of autonomy support and expectations which, in turn, reported higher autonomous motivation compared to those in the cluster characterized by the absence of teacher autonomy support and structure. Contrary to our expectations, students in the clusters with varying levels of autonomy support and structure did not significantly differ from each other on controlled motivation. If any differences for controlled motivation emerged, perceiving clear expectations was associated with greater controlled motivation, especially if teachers were not perceived as being autonomy supportive.

3.3.2. Learning correlates

As expected, 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 displayed a more maladaptive learning pattern in comparison with students in the clusters characterized by varying levels of autonomy support and expectations, although the three clusters did not differ for test anxiety. Further, the two clusters with varying levels of autonomy support and expectations did not differ from each other and scored in between the two other clusters for time management, concentration, deep-level learning, and persistence.

3.3.3. Problem behavior correlates

Concerning externalizing problem behaviors, students in the high autonomy support – clear expectations cluster scored lowest followed by students in the clusters with varying levels of autonomy support and clear expectations and, finally, students in the low autonomy support – vague expectations cluster. A similar pattern of results was found for skipping classes, although the results were less pronounced. Taken together, the absence of both autonomy support and structure is associated with the greatest engagement in problem behavior, whereas the presence of both is associated with the least engagement.

4. Discussion

The current state of the literature on the relationship between autonomy support and structure is one of confusion (Reeve, 2006). 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.

4.1. Aim 1: differentiating autonomy support and structure

In support of Hypothesis 1a that autonomy support and structure form two different teaching dimensions and replicating results

from previous research in the teaching (e.g., Sierens et al., 2009) and parenting domain (e.g., Farkas & Grolnick, 2010), confirmatory factor analysis indicated that the hypothesized two-factor model produced an acceptable fit. Further, both dimensions were positively related, which represents a first indication that autonomy support does not imply a lack of structure. Second, consistent with Hypothesis 1b, results of our person-centered analyses showed that perceived teacher autonomy support and structure do covary naturally. In one of the four retained groups, students perceived their teachers as providing both high autonomy support and clear expectations. Students in this cluster view their teachers as nurturing their inner motivational resources, relying on informational language, and acknowledging negative affects (Jang et al., 2010) while at the same time establishing clear rules and fair expectations.

The cluster-analytic results also revealed 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 those in the other clusters. For instance, a teacher may fail to provide clear expectations and wait to intervene in students' behavior until things go out of hand. Driven by irritation a teacher may then impulsively lash out, thereby using controlling language and pressuring students to behave differently.

Finally, two clusters were retained in which teachers are perceived as offering either autonomy support or clear expectations. Students in the former group perceive their teachers as giving opportunities to develop their own talents and interests, but potentially in a rather chaotic manner. For instance, teachers might be perceived as being enthusiastic about their course and as encouraging interest in the topic, yet at the same time as teaching in a rather ill-structured fashion. The latter group of students perceives their teachers as providing clear expectations, yet as being neutral in terms of autonomy support. The average score for autonomy support might mean that teachers use neither autonomy supportive nor controlling language. Alternatively, it is also possible that on some occasions teachers provide expectations in an autonomy-supportive fashion (e.g., showing empathy for difficulties in meeting some expectations), while being controlling on other moments (e.g., using 'should' statements and threats in case of failure to meet expectations). Future research, possibly using qualitative methodology (e.g., interviews) might provide insight in the dynamics involved in the cluster characterized by clear expectations only.

4.2. Aim 2: relationships with motivation, learning, and problem behavior

As for the relation between the clusters and outcomes, students in the cluster high on autonomy support and clear expectations displayed, as expected based on Hypothesis 2, the most adaptive outcomes, both in the academic and social domain. Those students reported most autonomous study motivation, reported making use of a variety of self-regulated learning strategies, and reported less behavioral problems, both within school (i.e., less skipping classes) and outside school (e.g., less drug use). Probably, teacher autonomy support and clear expectations work together to enhance adaptive school functioning and to deflect students from problem behaviors. This finding is in line with past work, such as the study by Jang et al. (2010) who showed that observed autonomy support and structure both uniquely and positively predicted high school students' behavioral engagement (see also Patrick et al., 2003; Skinner & Belmont, 1993). It is important to note that our study is the first, to our knowledge, to use person-oriented analyses to demonstrate the complementary nature of autonomy support and clear expectations (i.e., structure). Although obtained through a different approach, our findings enhance the validity of earlier findings.

Students perceiving their teachers as offering low autonomy support and vague expectations reported the lowest level of both autonomous and controlled motivation, reported engaging less frequently in a variety of self-regulation strategies, and generally speaking, were more likely to report engaging in aggressive and deviant behavior. 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., Grolnick, 2003).

Further, the current study offered empirical evidence concerning the effects of the perceived presence of one teaching dimension in the relative absence of the other (i.e., autonomy support or clear expectations). The present results showed that students perceiving such teaching configurations displayed less autonomous study motivation, scored lower on a variety of self-regulated learning outcomes, and reported more externalizing problem behavior in comparison to students in the high autonomy support and clear expectations cluster. Yet, 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.

In general, we did not find strong evidence for unique correlates of perceived autonomy support and structure. Yet, a number of exceptions deserve being discussed. First, in line with Research Question 1 that clear expectations (but not autonomy support) would relate to controlled motivation, the clear expectation cluster displayed the highest level of controlled motivation. This suggests that when teachers provide clear instructions, but fail to provide a meaningful rationale for the assigned tasks or do not actively solicit the students' opinion regarding the communicated expectations, these expectations might be experienced as relatively more pressuring. This is likely because the functional significance (Deci & Ryan, 1985) of the expectations differs. Rather than being perceived as informational and competence-supportive, the expectations might be experienced as pressuring and constraining by the students.

Second, the group characterized by the combination of autonomy support and structure displayed a lower level of test anxiety compared to the three other groups, which did not differ from each other. 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 suffices for stimulating other learning outcomes. Likely, when teachers set clear expectations in an autonomy-supportive way, children know how to handle a learning task and are willing to engage in it, which in conjunction help to minimize students' anxiety. Future research may further investigate the conditions under which test anxiety is reduced and the work by Pekrun and colleagues might serve as a source of inspiration herein (Pekrun, 2006).

Third, in contrary to Research Question 2, clear expectations did not have a unique association with students' problem behaviors as students in the two groups characterized by a varying combination of perceived autonomy support and clear expectations did not differ in terms of problem behaviors. This suggests that both perceived autonomy support and structure are associated with less problem behavior, a finding that deserves replication. Further, although one might expect the teaching dimensions to be especially related to school-related problem behavior, like skipping classes, the effect size for skipping classes was smaller than the effect size for more global, externalizing problem behavior. This might be a statistical artifact as the measure of the skipping class only contained two items and thus showed limited variance.

4.3. Limitations and further suggestions for future research

The current study has some limitations. First, the teaching dimensions were not course specific, but referred to students' entire group of teachers. Just as students' motivation (e.g., Bong, 2001) and academic emotional experiences (e.g., Goetz, Frenzel, Pekrun, Hall, & Ludtke, 2007) have been found to be rather subject-specific, it is likely that students' perception of the teaching dimensions varies by subject and, hence, by teacher. Future research could include teacher-specific or subject-specific assessment of teaching style to answer the question whether the retained pattern of teaching configurations and their correlates generalizes to specific teachers and to specific subjects.

Second, teacher structure was operationalized in a rather narrow way as it referred to clear expectations only. It seems important to examine whether other aspects of teacher structure (i.e., guidance during the learning activity Reeve, 2006) are also moderately positively correlated with teacher autonomy support and whether their perceived presence equally yields desirable motivation, learning, and behavior correlates. In addition, the third critical dimension of teaching style, that is, involvement, was not examined. It would be interesting for future research to examine whether the addition of this teaching dimension, which is said to play into the need for relatedness, would result in a refinement or extension of the observed teaching configurations. Along similar lines, the role of other contextual features, such as the role of peers and the family, could be examined. For instance, the observed differences for externalizing problem behavior might disappear and, hence, be spurious when controlling for the experienced need-thwarting at home or for students' affiliation with deviant friends (LaCourse et al., 2003). Alternatively, it is possible that quality of teaching style plays a critical role above and beyond these other contextual factors.

Further, the current assessment of student perceptions of teaching dimensions needs to be complemented with teacher perceptions and direct observations (e.g., Patrick et al., 2003; Turner et al., 2002). For instance, it could be examined to what extent the teaching profile assignment obtained through the students' self-reports converges with the assignment based on teacher or observer reports.

We were somewhat surprised by the fact that the clusters with varying levels of perceived autonomy support and structure did not differ very much. Apparently, autonomy support and clear expectations do not relate to outcomes in a very specific fashion. This lack of specificity is probably due to the fact that the two clusters characterized by varying levels of autonomy support and expectations were not so strongly differentiated on the two clustering variables. Therefore, we recommend future research to try replicating and extending the current findings, for instance by including other outcomes (e.g., student engagement) and by examining antecedents of these teaching configurations. For example, it is possible that the prevalence of constraints and inflexible structures in the school climate is associated with teachers providing low autonomy support, yet communicating clear expectations toward their students.

Finally, because of its cross-sectional design, no causal conclusions can be drawn from the present study. Although perceived teaching configurations might contribute to optimal motivation and learning, it is equally plausible that students characterized by a particular learning and motivational profile may perceive their teachers as more autonomy supportive and well-structuring. Thus, the bidirectional relations between the teaching dimension and the various outcomes need to be studied from a longitudinal perspective (e.g., Skinner & Belmont, 1993). In this context, it might be useful to examine whether teachers can be classified in one of these four groups based on their interactions with students during the first days of the school year (see Patrick et al., 2003). These initial interactions are likely of critical importance because teachers often establish norms and express their (lack of) enthusiasm about the learning content during these first school days. These initial experiences may impact on students' motivation, learning and problem behavior, which in turn may reinforce the students' interpretation of teachers' teaching approach during the rest of the school year.

4.4. Implications for practice

From an applied perspective, the present results suggest that teachers do well by providing clear instructions when introducing tasks and rules, such that students feel confident to engage in the learning activity and feel effective to meet the expectations. When introducing these expectations, teachers might best adopt an autonomy supportive rather than a controlling style. They could do so by building in choices whenever it is possible, providing meaningful rationales for the expectations they hold, actively soliciting the students' opinion, and accepting rather than suppressing the irritation that the assigned learning tasks might elicit. By giving voice to the wishes, concerns, and problems of students, students might feel respected and, hence, be more volitional in their learning.

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