Motivational Profiles From a Self-Determination Perspective: The Quality of Motivation Matters

Article *in* Journal of Educational Psychology · August 2009

DOI: 10.1037/a0015083

CITATIONS
584

READS
8,972

5 authors, including:

Maarten Vansteenkiste
Ghent University
354 PUBLICATIONS **26,903** CITATIONS
SEE PROFILE

Bart Soenens
Ghent University
292 PUBLICATIONS **19,096** CITATIONS
SEE PROFILE

Koen Luyckx
KU Leuven
350 PUBLICATIONS **11,343** CITATIONS
SEE PROFILE

Willy Lens
KU Leuven
108 PUBLICATIONS **10,618** CITATIONS
SEE PROFILE

Journal of Educational Psychology
2009, Vol. 101, No. 3, 671–688

0022-0663/09/$12.00 DOI: 10.1037/a0015083

Motivational Profiles From a Self-Determination Perspective: The Quality of Motivation Matters

Maarten Vansteenkiste
Ghent University

Eline Sierens
University of Leuven

Bart Soenens
Ghent University

Koen Luyckx and Willy Lens
University of Leuven

The present research complements extant variable-centered research that focused on the dimensions of autonomous and controlled motivation through adoption of a person-centered approach for identifying motivational profiles. Both in high school students (Study 1) and college students (Study 2), a cluster analysis revealed 4 motivational profiles: a good quality motivation group (i.e., high autonomous, low controlled); a poor quality motivation group (i.e., low autonomous, high controlled); a low quantity motivation group (i.e., low autonomous, low controlled); and a high quantity motivation group (i.e., high autonomous, high controlled). To compare the 4 groups, the authors derived predictions from qualitative and quantitative perspectives on motivation. Findings generally favored the qualitative perspective; compared with the other groups, the good quality motivation group displayed the most optimal learning pattern and scored highest on perceived need-supportive teaching. Theoretical and practical implications of the findings are discussed.

Keywords: motivational profiles, autonomous motivation, controlled motivation, self-determination theory, quality of motivation

Most motivation psychologists, teachers, and parents would agree that students' study behavior is multidetermined. Multiple reasons might drive study behavior, such as a spontaneous interest in the learning material, a desire to prove oneself by getting high grades, external expectations, or future professional goals. Nevertheless, some motives might be more dominant for some students, whereas different motives might be of greater importance to others. Also, some students might combine some motives in a relatively unique manner, so that they, for instance, study both because they need to meet external demands and because they find learning enjoyable as such. Thus, different groups or types of students might exist that are characterized by different motivational profiles.

To identify motivational profiles, one must adopt a person-centered approach (Magnusson, 1998). Such an approach complements the dimensional or variable-centered approach that is typically used in motivational research (but see Csizér & Dörnyei, 2005; Pintrich, 2000; Ratelle, Guay, Vallerand, Larose, & Senécal, in press; Wang & Biddle, 2001). Whereas the primary aim in person-centered analyses (e.g., cluster analysis; Gore, 2000) is to categorize individuals into groups whose members have similar motivational profiles, the focus of the variable-centered approach is on the effects of motivational dimensions on students' learning and performance. The two approaches are likely to yield complementary information (Fortunato & Goldblatt, 2006), but little prior attention has been devoted to the person-centered approach by motivational researchers. Our aims in the present research were (a) to map out the motivational profiles of students on the basis of their scores for autonomous and controlled study motivation, as distinguished within self-determination theory (SDT; Deci & Ryan, 2000; Vansteenkiste, Lens, & Deci, 2006), and (b) to investigate how these different groups of students differed on a variety of learning outcomes, such as students' use of cognitive and meta-cognitive strategies, determination, cheating behavior, and grade point average (GPA), as well as several important perceived teaching variables (e.g., teacher autonomy support, structure, and involvement).

Autonomous and Controlled Motivation

SDT is based on a multidimensional view of the concept of motivation that distinguishes the quantity, amount, or intensity of motivation from the quality or type of motivation. This differentiated conceptualization is a quite exceptional feature of the theory, as most currently popular motivation theories, including self-efficacy theory (Bandura, 1989) and expectancy-value theory (e.g., Eccles & Wigfield, 2002), hold motivation to be a unitary, quantitative construct and suggest that a higher amount of motivation should yield more optimal outcomes. SDT, in contrast, suggests that higher levels of motivation do not necessarily yield more desirable outcomes if the motivation is of a poor quality (e.g., if the

Maarten Vansteenkiste and Bart Soenens, Department of Psychology, Ghent University, Ghent, Belgium; Eline Sierens, Koen Luyckx, and Willy Lens, Department of Psychology, University of Leuven, Leuven, Belgium.

Correspondence concerning this article can be addressed to Maarten Vansteenkiste, Department of Psychology, Ghent University, Henri Dunantlaan 2, Ghent 9000, Belgium. E-mail: maarten.vansteenkiste@ugent.be

motivation is controlled rather than autonomous in nature; Ryan & Deci, 2000; Vansteenkiste et al., 2006).

Within SDT, autonomous or volitional motivation is said to consist of two subcomponents: intrinsic motivation and well-internalized extrinsic motivation. Intrinsic motivation refers to the enactment of the activity for its own sake (i.e., for excitement, enjoyment, and interest that is inherent to the learning itself). When students study out of curiosity and personal interest in the learning material, their learning is characterized by a sense of psychological freedom and an internal perceived locus of causality (deCharms, 1968). Intrinsic motivation represents the most optimal type of motivation, because it is fully autonomous or self-determined.

When students are not spontaneously attracted to their studies, they still can study in a relatively autonomous manner, given that they foresee the personal relevance of the learning. Students may identify with the personal importance of the learning activity, as the learning serves a personally endorsed goal. Although not intrinsically motivated, such students still experience a sense of psychological freedom when they study, so that their study behavior is characterized by an internal perceived locus of causality. As both identified motivation and intrinsic motivation are characterized by a sense of volition and choicefulness, these subcomponents often have been combined to form a composite score of autonomous motivation in empirical research (e.g., Vansteenkiste, Lens, Dewitte, De Witte, & Deci, 2004). Autonomous motivation has been found to be associated with (a) higher psychological well-being (e.g., Levesque, Zuehlke, Stanek, & Ryan, 2004); (b) greater use of adaptive meta-cognitive strategies, such as planning and time management (e.g., Vansteenkiste, Zhou, Lens, & Soenens, 2005); (c) more determination and will, as indexed by greater effort-expenditure (e.g., Ryan & Connell, 1989), greater intention to persist (e.g., Hardre & Reeve, 2003; Noels, Pelletier, Clément, & Vallerand, 2000), greater effective perseverance (e.g., Pelletier, Fortier, Vallerand, & Brière, 2001; Vallerand & Bissonnette, 1992; Vallerand, Fortier, & Guay, 1997), and less procrastination (e.g., Senécal, Julien, & Guay, 2003); (d) better cognitive processing, as indexed by more deep-level learning (e.g., Grolnick & Ryan, 1987; Vansteenkiste, Simons, Lens, Soenens, & Matos, 2005); and (e) higher grades (e.g., Soenens & Vansteenkiste, 2005).

Within SDT, it is maintained that teachers and parents foster autonomous motivation when they create an environment that facilitates the satisfaction of students' needs for autonomy (i.e., experiencing a sense of volition and psychological freedom in one's studying), competence (i.e., feeling effective in one's studying), and relatedness (i.e., experiencing a sense of closeness and friendship with one's student peers). Such a need-supportive environment is characterized by the provision of autonomy support, structure, and involvement. Teacher autonomy support involves the offering of choice, the minimization of controlling language, and the provision of a meaningful rationale (Deci, Eghrari, Patrick, & Leone, 1994; Reeve & Jang, 2006). Teacher structure involves the provision of optimal challenging tasks, praise, encouragement after failure, and adequate help, as well as the communication of clear guidelines and expectations with respect to the task that needs to be accomplished (Reeve, 2002; Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009). Teacher involvement refers to the demonstration of sincere concern and the provision of warmth and unconditional regard (Connell & Wellborn, 1991). Various studies have shown that autonomy-supportive teaching is critical for students' autonomous motivation (e.g., Soenens & Vansteenkiste, 2005), but fewer studies have focused on the effects of teacher structure and involvement on students' autonomous motivation.

With respect to controlled motivation, two subcomponents have been equally distinguished. External regulation represents the most pressured and controlled type of motivation. When externally regulated, students study to avoid punishments, to obtain rewards, or to meet external expectations. Students feel that they have no choice but to study and that externally pressuring contingencies are pushing them to put effort in their studies. Because of its controlled nature, external regulation is characterized by an external perceived locus of causality.

However, pressure does not necessarily originate from external sources, as students can pressure themselves into action, for instance, by buttressing their learning with negative feelings of guilt, shame, and anxiety or positive feelings of pride and ego enhancement. This type of regulation has been labeled introjected regulation. When students have introjected reasons for studying, they have swallowed the reason for performing the activity, so that it is now internal rather than external (as in external regulation). Yet, students with an introjected regulation have not yet fully accepted the reason for studying as their own, so that their behavior comes with feelings of inner compulsion and conflict. Because of its pressuring experience, introjected regulation is said to be represented by an external perceived locus of causality (Ryan & Deci, 2000).

Various studies have combined external and introjected regulation to form a controlled motivation composite (e.g., Vansteenkiste, Lens, et al., 2004). These studies have found that controlled motivation predicts a broad variety of undesirable outcomes that include (a) the use of maladaptive coping strategies (Ryan & Connell, 1989); (b) less engagement in adaptive meta-cognitive strategies, such as concentration and time management (e.g., Vansteenkiste, Zhou, et al., 2005), and more engagement in maladaptive meta-cognitive strategies, such as test anxiety (Vansteenkiste, Zhou, et al., 2005); (c) superficial cognitive processing (Vansteenkiste, Simons, et al., 2005); (d) less determination, as indexed by more procrastination (Senécal, Julien, & Guay, 2003) and more dropout (Vallerand et al., 1997); and (e) lower achievement (Soenens & Vansteenkiste, 2005).

A controlled motivation is said to arise in a need-thwarting environment (i.e., a chaotic, neglectful, and controlling environment). A controlling environment can be created by pressuring students from the outside, for instance, through the use of rewards, punishments, deadlines, or controlling language (Deci, Koestner, & Ryan, 1999), or by pressuring students from the inside, for instance, through the use of more subtle and insidious tactics, such as shaming, guilt induction, or love withdrawal (Assor, Roth, & Deci, 2004; Soenens, Vansteenkiste, Luyten, Duriez, & Goossens, 2005).

Motivational Profiles

Extant SDT-based research on autonomous and controlled motivation typically has adopted a dimensional approach and has examined the unique effects of both types of motivation through statistical techniques such as regression analysis and path analysis

(but see Ratelle et al., 2007). In this study, we adopted a person-centered approach, which yields a number of advantages, both at the practical level and the theoretical level.

First, from an applied perspective, it is instructive to gain insight on the percentages of students characterized by an optimal or a suboptimal motivational profile. Such information might be useful both from a diagnostic viewpoint and from an intervention viewpoint. Students' cluster assignment reflects a particular combination of motivation scores, which is likely to yield more diagnostic information relative to students' scores on the separate motivational dimensions. Gaining insight on students' motivational profiles also is instructive because motivational interventions can then be better tailored to each particular group. For instance, whereas some groups might particularly benefit from a more autonomy-supportive teaching climate, other groups might need more structure.

Second, from a more theoretical viewpoint, person-centered analyses might provide further evidence for the internal validity of SDT. If SDT's claim that the qualitative difference between autonomous and controlled motivation is of critical importance for describing students' motivation holds any truth (Reeve, 2002; Vansteenkiste, Lens, et al., 2006), it would be important to show that at least two groups of students exist that are characterized by an opposing motivational profile. That is, we would need to find a good quality motivation group, characterized by high autonomous and low controlled motivation, as well as a poor quality motivation group, characterized by low autonomous and high controlled motivation. Furthermore, if it is true that people differ not only in the quality of their motivation but also in the quantity of their motivation (Deci & Ryan, 2000), it would be important to find that some students endorsed both autonomous and controlled study motives, whereas others scored low on both types of motives. Thus, we expected to find four different clusters, each with a unique pattern of scores on autonomous motivation and controlled motivation (i.e., high–high, high–low, low–high, and low–low).

We are aware of only one study to date in which a person-centered analysis of SDT's motivational constructs was conducted (Ratelle et al., in press), although a few other studies have used SDT variables in conjunction with achievement goals (e.g., Murcia, Gimeno, & Coll, 2007). Notably, the four anticipated clusters described in the preceding paragraph did not consistently emerge in the study by Ratelle et al.. Instead, three different clusters emerged in three different studies. In two studies among high school students, the first two clusters were labeled "high autonomous–high controlled" and "moderate autonomous–moderate controlled," as these clusters were respectively characterized by high and moderate scores on both autonomous and controlled motivation. The third cluster, which was labeled "controlled," was characterized by high controlled motivation scores and high amotivation (i.e., lack of motivation) scores; it constituted only a small percentage of the total group (5.9% and 7.3% in Studies 1 and 2, respectively). A somewhat different set of clusters emerged in the third study among college students. In addition to a "high autonomous–high controlled" cluster and a "low autonomous–low controlled" cluster, there was a "good quality" motivation group that was characterized by high autonomous (i.e., intrinsic and identified) and low controlled (i.e., introjected and external) motivation scores. Given that the Ratelle et al. study represents the first study examining autonomous and controlled motivation from a person-oriented perspective, additional research evidence is needed.

Motivational Profiles and Learning Outcomes

The number and types of motivational profiles that emerge from a person-centered analysis may provide evidence for the internal validity of motivational frameworks. In addition, a comparison of the empirically derived motivational profiles, in terms of learning outcomes and social–contextual variables, may speak to the external validity of motivational theories. An advantage of a person-centered, relative to a dimensional, approach is that it allows for a more detailed examination of the additive or interactive effect of autonomous and controlled motivation on optimal learning. Although the interactive effects of autonomous and controlled motivation have been examined in a few studies (e.g., Vansteenkiste, Zhou, et al., 2005), a dimensional approach was used to create interaction terms. Thus, the studies failed to examine naturally occurring interactions, as can be achieved through a person-centered analysis.

Furthermore, the comparison of clusters with different motivational profiles allows one to directly test and compare predictions that follow from quantitative and qualitative perspectives on motivation. In particular, we aimed to examine whether, as argued within quantitative theories on motivation, the student groups that are characterized by a stronger amount of motivation, regardless of its quality or type (i.e., autonomous or controlled), would display more optimal learning than would less strongly motivated student groups. In contrast, on the basis of motivational theories, such as SDT, that emphasize the importance of the quality of motivation, it can be hypothesized that the presence of more motivation is not necessarily beneficial. This is so because, when the additional amount of motivation is of a poor quality (i.e., controlled), optimal learning likely will be hampered rather than facilitated. To examine these issues, we performed six different cluster comparisons. The quantitative and qualitative motivational perspectives yielded converging predictions for two of these comparisons, whereas conflicting predictions were formulated for four of them. These comparisons and their associated predictions are summarized in Table 1.

First, we compared the good quality motivation group (i.e., high autonomous, low controlled) with the low quantity motivation group (i.e., low autonomous, low controlled). On the basis of both perspectives, it can be predicted that in comparison with the low quantity motivation group, the good quality motivation group should display better learning, as it is characterized both by a higher amount of motivation, which is important from the quantitative perspective, and by a better (i.e., autonomous) type of motivation, which is important from the qualitative perspective.

Second, we compared the high quantity motivation group (i.e., high autonomous, high controlled) with the poor quality motivation group (i.e., low autonomous, high controlled). Again, both perspectives would converge on the prediction that the former group should display better learning, albeit for different reasons: In comparison with the poor quality motivation group, the high quantity motivation group is characterized both by a higher amount of motivation and a by more beneficial (i.e., autonomous) type of motivation.

Table 1
Overview of Theory-Driven Cluster Comparisons

Prediction	Quantitative motivational perspective	Qualitative motivational perspective
Converging predictions		
Comparison 1: high quantity vs. poor quality motivation	High quantity > poor quality	High quantity > poor quality
Comparison 2: good quality vs. low quantity motivation	Good quality > low quantity	Good quality > low quantity
Conflicting predictions		
Comparison 3: poor quality vs. low quantity motivation	Poor quality > low quantity	Poor quality ≤ low quantity
Comparison 4: good quality vs. high quantity motivation	Good quality < high quantity	Good quality ≥ high quantity
Comparison 5: good quality vs. poor quality motivation	Good quality = poor quality	Good quality > poor quality
Comparison 6: high quantity vs. low quantity motivation	High quantity > low quantity	High quantity = low quantity

A third contrast involved the comparison of the poor quality motivation group with the low quantity motivation group. On the basis of the quantitative perspective, it can be predicted that the poor quality motivation group should display more optimal learning than should the low quantity motivation group, as the former group is characterized by a higher amount of motivation. In contrast, on the basis of the qualitative perspective, the poor quality motivation group might fare no better or even worse than the low quantity motivation group, as, compared with being unmotivated, the feelings of pressure that are present in the poor quality group would undermine or have a null effect on students' optimal learning.

Fourth, we compared the good quality group with the high quantity group. Within the quantitative view it can be hypothesized that the latter group would display more optimal learning compared with the former. In contrast, within the qualitative view, it can be expected that the high quantity motivation group would score no better or even worse than the good quality motivation group, as the additional presence of controlled motivation would not contribute to and might even detract from optimal learning.

Fifth, we compared the good and poor quality motivation groups. The qualitative perspective would clearly suggest that the presence of high autonomous and low controlled motivation should be more conducive to one's learning than should the presence of low autonomous and high controlled motivation. In contrast, on the basis of the additive perspective, it can be hypothesized that, if the total amount of motivation in both groups is of a similar magnitude, no differences should be expected.

A final comparison involved the contrast between the high quantity and low quantity motivation groups. Whereas the quantitative perspective would predict that the former should display less optimal learning than the latter, the qualitative perspective would instead predict a lack of difference between the groups. This would be the case because, although the high quantity motivation group would display a higher autonomous motivation, the possible positive effects associated with this beneficial type of motivation might be counteracted by additional presence of controlled motivation. This increase would increase feelings of pressure and stress in students and therefore adversely affect students' learning.

Present Research

The present research consisted of two studies, one among high school students (Study 1) and one among college students (Study 2). We aimed to examine the number and types of clusters of students that need to be retained to explain the variation in students' motivation scores in the most parsimonious manner. Further, we examined how the retained groups would differ with respect to (a) a broad range of learning outcomes, including self-regulated learning, cheating, and GPA (Studies 1 and 2), and (b) teaching style dimensions (i.e., autonomy support, structure, and involvement; Study 2). Self-regulated learning has been generally defined as the generation of thoughts, emotions, and actions that are oriented toward accomplishment of student goals (Schunk & Zimmerman, 1994). Although researchers have introduced somewhat different taxonomies of self-regulated learning (e.g., Boekaerts, 1997; Pintrich, 1999; Schunk & Zimmerman, 1994; Winne, 1995), most of these models emphasize the importance of three components. These are (a) use of cognitive strategies to process, learn, and understand the study material (e.g., elaboration, organization, and critical thinking); (b) meta-cognitive strategies, which refers to the cognitive monitoring and supervision of the learning activity (e.g., time and environment use, test anxiety); and (c) determination or will, which is reflected in the capacity of students to persist in times of difficulties (i.e., effort-regulation) and to enact their learning intention (i.e., lack of procrastination).

Study 1

To examine students' motivational profiles, we performed a series of cluster analyses using students' autonomous and controlled motivation as the constituting dimensions. We expected four clusters to emerge: a high quantity motivation group (i.e., high autonomous, high controlled), a low quantity motivation group (i.e., low autonomous, low controlled), a good quality motivation group (i.e., high autonomous, low controlled), and a poor quality motivation group (i.e., low autonomous, high controlled).

To examine the external validity of the obtained cluster solution (Aldenderfer & Blashfield, 1984), we compared the retained groups with respect to all of the measured outcomes. That is, we performed the six comparisons summarized in Table 1, with a particular focus on the last four comparisons, because these comparisons allowed us to directly pit the conflicting hypotheses from quantitative and qualitative views on motivation against one another.

Method

Participants and Procedure

Participants were 291 (33%) male and 590 (66%) female 7th- to 12th-grade students who came from two secondary schools in

Flanders (Belgium) and provided informed consent for their participation. Six persons failed to disclose their gender. The distribution of students ($N = 887$) across the different school years was as follows: 7th-grade students ($n = 237$, 27%), 8th-grade students ($n = 253$, 29%), 9th-grade students ($n = 110$, 12%), 10th-grade students ($n = 113$, 13%), 11th-grade students ($n = 100$, 11%), and 12th-grade students ($n = 74$, 8%). Questionnaires were administered to the students during a class period. At least one researcher was present during data collection. The students had approximately 45 min to complete the surveys. Participation was voluntary, and anonymity was guaranteed.

Measures

Academic self-regulation. Students' reasons for studying were assessed with an adapted version of the Academic Self-Regulation Scale (Ryan & Connell, 1989), which has been successfully used in previous work (e.g., Vansteenkiste, Zhou, et al., 2005). The 16-item scale, which contains 4 items per regulation, can be found in the Appendix. Internal consistencies, as indexed by Cronbach's alpha, were satisfactory: intrinsic motivation, $\alpha = .89$; identified regulation, $\alpha = .79$; introjected regulation, $\alpha = .69$; and external regulation, $\alpha = .77$. Like previous researchers (e.g., Pelletier et al., 2001; Vansteenkiste, Lens, et al., 2004), we created composite scores for autonomous ($\alpha = .87$) and controlled ($\alpha = .72$) motivation by averaging the subscales of intrinsic and identified and introjected and external regulation, respectively. This approach was justified, as a principal-components analysis indicated a clear drop in eigenvalues (i.e., 4.96, 2.79, 1.35, 1.27) between the second and third retained factor. Together, the first two components explained 48% of the variance in the motivation items. After oblique rotation (PROMAX), all autonomous motivation items had loadings of at least .40 on the first component, whereas all controlled motivation items had loadings of at least .40 on the second factor. No cross-loadings were found. Autonomous and controlled motivation were unrelated, $r(876) = .02$, *ns*.

Cognitive processing. Four different aspects of cognitive processing (i.e., elaboration, critical thinking, organization, and rehearsal) were assessed with the Motivated Strategies for Learning Questionnaire (MSLQ; Pintrich, Smith, Garcia, & McKeachie, 1991). All items were answered on a 5-point Likert scale ranging from 1 (*not at all true of me*) to 5 (*very true of me*). Rehearsal (four items) refers to learning by heart. Elaboration (six items) refers to building internal connections between items to be learned. Organization (four items) refers to the selection of appropriate information and the construction of meaningful connections among the information that needs to be learned. Critical thinking (five items) refers to the degree to which students link new knowledge to existing knowledge, which allows them to reach better decision and to solve problems more efficiently. The internal consistency of the rehearsal scale was weak ($\alpha = .39$) and, as a result, rehearsal was dropped from further analyses. Because the three other aspects of cognitive processing were quite strongly correlated (average $r = .53$, $p < .001$), they were averaged into a combined score of cognitive processing ($\alpha = .84$).

Meta-cognitive self-regulation. Three different aspects of meta-cognitive self-regulation were assessed: test anxiety, time and environment use, and meta-cognitive strategy use. All these aspects were assessed with the MSLQ (Pintrich et al., 1991). All items were answered on a 5-point Likert scale ranging from 1 (*not at all true of me*) to 5 (*very true of me*). Test anxiety refers to worries and negative thoughts students have when taking exams (cognitive component) as well as to the affective and physiological arousal aspects of anxiety (affective component). Internal consistency of this 5-item scale as indexed by Cronbach's alpha was .74. Meta-cognitive strategy use refers to continually checking and correcting one's learning behavior while executing a task through strategies such as goal setting, analyzing the task at hand, self-testing, or giving self-feedback. Internal consistency of this 12-item scale was .72. Finally, time and environment use involves the efficient and effective management of one's study time (e.g., scheduling) and environment (e.g., choosing a quiet place, free of visual and auditory distractions). Internal consistency of this 8-item scale was .71.

Determination. Determination generally refers to the capacity to be persistent in one' studying and has sometimes been referred to as meta-motivation (Boekaerts, 1997). Determination was assessed with two scales: effort regulation and procrastination. Effort regulation includes the ability to set up a learning intention and to control one's effort and attention in the face of distractions, difficulties, or uninteresting activities. The 4-item scale, taken from the MSLQ, yielded an acceptable internal consistency as indexed by a Cronbach's alpha of .77. Procrastination, which was assessed with the Questionnaire Concerning Study Management Abilities (Depreeuw & Lens, 1998), refers to the tendency to postpone one's studying and failure to act upon one's intention to study. Internal consistency of this 10-item scale was .89.

Cheating. The cheating measures were taken from Anderman, Griesinger, and Westerfield (1998). Two different aspects of cheating were assessed: (a) the extent to which students were effectively cheating during tests (five items; e.g., "I copy answers from other students on tests"; $\alpha = .86$) and (b) students' beliefs about the acceptability of cheating (three items; e.g., "It is okay to cheat during tests"; $\alpha = .78$). All items were answered on a 5-point Likert scale ranging from 1 (*Completely not true*) to 5 (*Completely true*).

Academic performance. Academic performance was measured with self-reported results on the previous semester's exams. Evidence exists that self-reported school grades are accurate reflections of the school grades actually obtained. For instance, Dornbusch, Ritter, Leiderman, Roberts, and Fraleigh (1987) reported a correlation of .76 between self-reported and actually obtained grades.

Results

Plan of Analysis

We used cluster analysis to generate motivational profiles. Cluster analysis groups motivational scores on the basis of multiple characteristics so as to maximize between-group heterogeneity and within-group homogeneity and thereby capture the multivariate interactions of the motivational dimensions. In doing so, we proceeded in two steps and used a combination of hierarchical and nonhierarchical clustering methods, as recommended by Gore (2000); Hair, Anderson, Tatham, and Black (1998); and Tan, Steinbach, and Kumar (2006).

In the first step, we used Ward's method to carry out a hierarchical cluster analysis based on squared Euclidian distances. In a

hierarchical cluster analysis, each person starts out as his or her own cluster and the closest persons are combined into a new aggregate cluster in subsequent steps. This process continues till a single homogeneous cluster is formed. However, hierarchical cluster analyses are sensitive to outliers in the data that can lead to undesirable combinations of clusters that persist throughout the analysis. To reduce the impact of outliers, we began our analyses by removing multivariate outliers (i.e., individuals with high Mahalanobis distance values; Garson, 1998) and univariate outliers (i.e., values more than 3 *SD* below or above the mean) and used the hierarchical method only as a preliminary step in identifying and comparing several possible cluster solutions; these clusters provide the necessary input for subsequent nonhierarchical or iterative procedures (Hair et al., 1998). The total number of retained clusters is based on a priori theorizing, parsimony of the cluster solution, and explanatory power (i.e., the cluster solution had to explain approximately 50% of the variance in each of the constituting motivational dimensions; Milligan & Cooper, 1985).

In the second step, the initial cluster centers extracted according to Ward's hierarchical method were used as nonrandom starting points in an iterative, nonhierarchical *k*-means clustering procedure. The solution in this case is derived from the a priori determined number of clusters. During this process, a cluster seed is selected as the initial cluster center, and all persons with a specific threshold distance are included in the resulting cluster. Then, another seed is selected and the assignment continues until all persons are assigned (Fortunato & Goldblatt, 2006). With this procedure, unlike cluster assignment in the hierarchical cluster analysis, individuals might be reassigned. Thus, whereas hierarchical cluster analysis represents a means of obtaining the optimal number of clusters, nonhierarchical *k*-means cluster analysis is a way of further fine-tuning the preliminary cluster solution through an iterative process (Gore, 2000).

We used a double-split cross-validation procedure to examine the stability of the cluster solutions (Breckenridge, 2000; Tinsley & Brown, 2000). The sample is randomly split into halves (Subsamples A and B). The full two-step procedure (Ward, followed by *k* means) is then applied to each half, and the two solutions are compared for agreement as follows. The participants of each half of the sample are assigned to new clusters on the basis of their Euclidean distances to the cluster centers of the other half of the sample (SPSS procedure QUICK CLUSTER, option CLASSIFY). These new clusters are then compared for agreement with the original cluster by means of Cohen's kappa (κ). The two resulting kappas are averaged. An agreement of at least 0.60 is considered acceptable (Asendorpf, Borkenau, Ostendorf, & van Aken, 2001). The cluster solution with the highest kappa is preferred, because this solution is more stable and replicable.

Finally, to explore the external validity of the retained cluster solution, we examined whether the retained groups yield different scores on self-regulated learning, cheating, and GPA. This was done through multivariate analyses of variance and post hoc comparisons of the different clusters. *F* values and effect sizes were reported. The number of persons involved in each of these analyses varied, as some of the outcomes were not filled out by all participants. Before reporting the results of the primary analyses, we briefly discuss correlations among the observed variables and independent *t* tests examining gender effects.

Correlations and Gender Effects

Correlations between the study variables can be found in Table 2. Autonomous motivation and controlled motivation were differentially related to most outcomes. Autonomous motivation was positively correlated with time and environment use, effort regulation, meta-cognitive strategy use, and GPA and was negatively correlated with procrastination, cheating attitude, and cheating behavior. Controlled motivation showed the opposite pattern of correlates. Furthermore, autonomous motivation was positively correlated with cognitive processing and controlled motivation was positively correlated with test anxiety. The difference in strength of associations between autonomous and controlled motivation and the outcome variables was significant for all outcomes (all *p*s $<.001$; average *z* value = 10.18).

Table 2
Means and Standard Deviations for Male and Female Participants Together With T Tests and Intercorrelations Between Measured Variables (Study 1)

Variable	F	M	*t* test	1	2	3	4	5	6	7	8	9	10
1. Autonomous motivation	2.64 (0.74)	2.45 (0.76)	3.58***	—									
2. Controlled motivation	2.86 (0.70)	2.99 (0.73)	ns	.02	—								
3. Cognitive processing	2.96 (0.60)	2.92 (0.67)	ns	.41***	.06	—							
4. Test anxiety	3.10 (0.84)	3.03 (0.92)	ns	.05	.35***	.06	—						
5. Procrastination	3.00 (0.87)	3.15 (0.92)	−2.23*	−.42***	.24***	−.14***	.23***	—					
6. Time and environment use	3.36 (0.65)	3.26 (0.70)	2.16*	.43***	−.12***	.30***	−.13***	−.71***	—				
7. Effort regulation	3.60 (0.82)	3.48 (0.88)	1.97*	.48***	−.11***	.20***	−.10***	−.67***	.64***	—			
8. Meta-cognitive strategy use	3.29 (0.50)	3.25 (0.61)	ns	.51***	.01	.57***	−.05	−.41***	.53***	.50***	—		
9. Cheating behavior	2.19 (0.94)	2.52 (1.08)	−3.64***	−.35***	.13***	−.22***	.06	.43***	−.44***	−.42***	−.34***	—	
10. Cheating attitude	2.81 (0.99)	3.16 (1.13)	−3.71***	−.45***	.14***	−.26***	.05	.45**	−.48***	−.49***	−.44***	.74***	—
11. GPA	74.46 (7.80)	71.40 (7.81)	5.39***	.30***	−.12***	.17***	−.17***	−.36***	.34***	.37***	.32***	−.38***	−.41***

Note. Values in parentheses are standard deviations. F = female participants; M = male participants; ns = nonsignificant; GPA = grade point average.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Next, grade was found to be correlated with various outcomes. It was negatively correlated with autonomous motivation, $r(876) = -.21$, $p < .001$, cognitive processing, $r(876) = -.20$, $p < .001$, time and environment use, $r(876) = -.31$, $p < .001$, meta-cognitive strategy use, $r(876) = -.21$, $p < .001$, effort regulation, $r(876) = -.28$, $p < .001$, and academic achievement, $r(860) = -.55$, $p < .001$, whereas it was positively correlated with controlled motivation, $r(876) = .12$, $p < .001$, cheating attitude, $r(591) = .55$, $p < .001$, and cheating behavior, $r(591) = .59$, $p < .001$. Independent t tests further indicated that male and female participants differed on various outcomes. The means, standard deviations, and t statistics of these gender differences can be found in Table 2. Female participants displayed a more adaptive academic pattern of functioning: They were more autonomously motivated, were less likely to procrastinate, were more efficient in using their time and environment, put more effort into their studies, were more critical about cheating, reported they cheated less, and obtained higher grades than did male participants. These results were consistent with previous research (e.g., Vallerand et al., 1997).

Cluster Analysis

Internal validity. Prior to conducting cluster analysis, we removed 4 univariate and 6 multivariate outliers. This resulted in a total sample of 876 participants. Four clusters were retained using Ward's cluster method; they explained 61% and 65% of the variance in the constituting dimensions and thereby surpassed the 50% threshold. A three-cluster solution explained only 23% of the variance in controlled motivation, and a five-cluster solution appeared theoretically less interpretable and less parsimonious. These initial cluster centers were then used as nonrandom starting points in an iterative hierarchical k-means clustering procedure. Figure 1 (upper panel) presents the final cluster solution. The y-axis in the figure represents z scores. The distances between the cluster means and the total sample standardized mean, in standard deviation units, were interpreted as effect sizes (Scholte, van Lieshout, de Wit, & van Aken, 2005). Analogous to Cohen's (1988) d, 0.2 *SD* is a small effect, 0.5 *SD* is a medium or moderate effect, and 0.8 *SD* is a large effect.

The z scores of autonomous and controlled motivation are reported in Table 3 (top part). As can be noted, all four retained groups were characterized by z scores that reflected a moderate-to-strong deviation from the mean; this suggests that the four retained groups differed considerably in terms of their autonomous and controlled motivational profile. In particular, the four a priori theorized groups emerged: (a) the good quality motivation cluster ($n = 157$, 18%), with relatively high scores on autonomous motivation but relatively low scores on controlled motivation; (b) the high quantity motivation cluster ($n = 237$, 27%), with high scores on both autonomous and controlled motivation; (c) the poor quality motivation cluster ($n = 238$, 27%), with high scores on controlled motivation but low scores on autonomous motivation; and (d) the low quantity motivation cluster ($n = 244$, 28%), with low scores on both motivational dimensions.

In addition to tabulating the z scores for autonomous and controlled motivation, we created two other scores: (a) a quantity of motivation index (i.e., the total amount of motivation), which was created by summing the z scores for both types of motivation, and

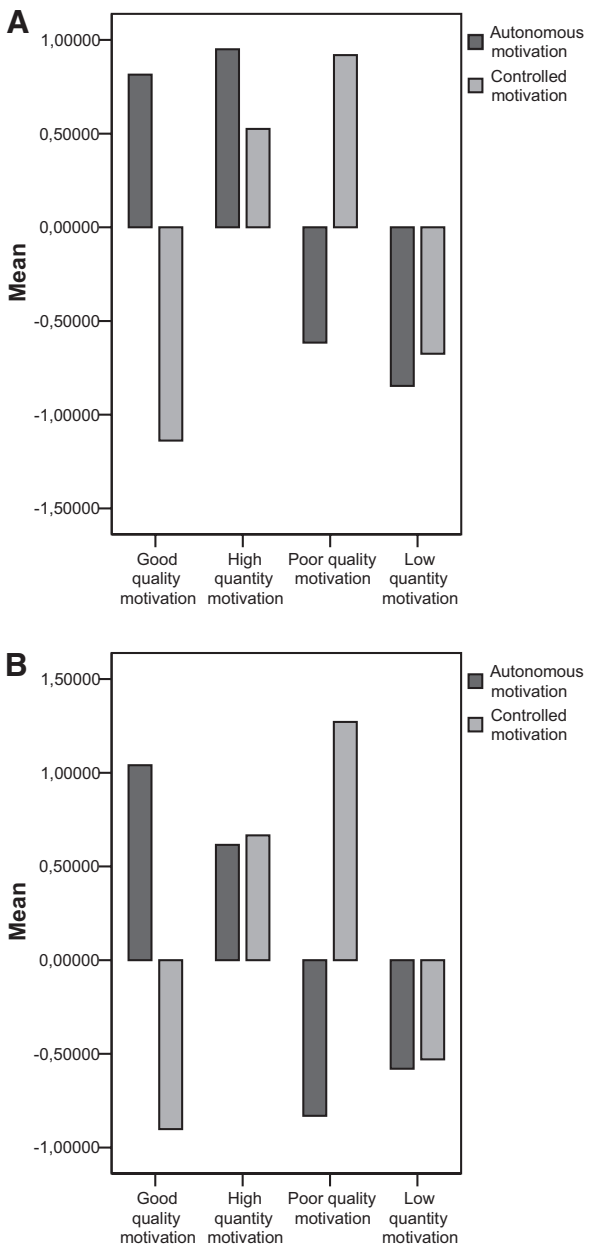

Figure 1. Top panel: Z scores of autonomous and controlled motivation of four-cluster Solution, Study 1 ($n = 876$). Bottom panel: Z scores of autonomous and controlled motivation of four-cluster solution, Study 2 ($n = 473$).

(b) a quality of motivation index, which was created by subtracting the z score for controlled motivation from the z score for autonomous motivation (Sheldon & Kasser, 1995). These scores were deemed useful, as they would allow for a direct examination of whether the retained clusters differed with respect to the amount and quality of motivation. In line with the assigned group labels, it was found that the high and low quantity motivation groups scored highest and lowest on the quantity of motivation index, respectively. The good and poor quality motivation groups fell in between, with the good quality motivation group being characterized

Table 3
Z Scores of the Constituting Dimensions and Means of Validity and Dependent Variables for the Four Extracted Clusters Together With F Values and Effect Sizes (Study 1)

Dimension and variable	Good quality motivation $n = 157$ (18%)	High quantity motivation $n = 237$ (27%)	Poor quality motivation $n = 238$ (27%)	Low quantity motivation $n = 244$ (28%)	F	η^2
Constituting dimension					$F(3, 872)$	
Autonomous motivation	0.81_a	0.95_a	-0.62_b	-0.85_c	580.76^{***}	.66
Controlled motivation	-1.14_a	0.53_b	0.92_c	-0.67_d	574.09^{***}	.66
Total amount of motivation[a]	-0.33_a	1.48_b	0.30_c	-1.52_d	492.90^{**}	.63
Quality of motivation[b]	1.95_a	0.42_b	-1.33_c	-0.17_d	696.38^{**}	.70
Outcome variable					$F(3, 845)$	
Cognitive processing	3.12_a	3.21_a	2.84_b	2.69_b	34.53^{***}	.11
Meta-cognitive regulation						
Test anxiety	2.81_a	3.25_b	3.36_b	2.79_a	26.50^{***}	.09
Time and environment use	3.64_a	3.56_a	3.03_b	3.16_b	38.80^{***}	.12
Meta-cognitive strategy use	3.51_a	3.48_a	3.09_b	3.03_b	51.35^{***}	.15
Determination						
Effort regulation	4.00_a	3.86_a	3.17_b	3.31_b	47.54^{***}	.15
Procrastination	2.49_a	2.80_b	3.52_c	3.19_d	49.49^{***}	.15
GPA	$77.0\%_a$	$74.9\%_b$	$71.2\%_c$	$71.8\%_c$	13.59^{***}	.05
Cheating					$F(3, 580)$	
Cheating behavior	1.83_a	2.07_a	2.70_b	2.53_b	14.37^{***}	.07
Cheating attitude	2.32_a	2.65_b	3.39_c	3.24_c	26.23^{***}	.12

Note. Cluster means are significantly different if they have different subscripts.
[a] Sum of autonomous and controlled motivation. [b] Autonomous motivation minus controlled motivation.
$^{**}p < .01$. $^{***}p < .001$.

by a lower amount of motivation than the poor quality motivation group. As for the quality of motivation index, consistent with the assigned group labels, the good and poor quality motivation groups yielded the most extreme scores. The two quantity motivation groups fell in between, with the high quantity motivation group being characterized by a better quality of motivation than the low quantity motivation group.

The stability or replicability of this four-cluster solution was examined by means of the double-split cross-validation procedure described earlier. The average kappa value across the subsamples (.78) provided substantial evidence for the stability of this four-cluster solution. Then, we evaluated whether male and female participants would be equally distributed across the four retained clusters. Consistent with the observed mean differences in autonomous motivation and external regulation and consistent with the findings of Ratelle et al. (2007), chi-square testing revealed a significant Cluster Assignment × Group effect, $\chi^2(3, N = 870) = 16.71$, $p < .001$. Closer inspection of the percentages revealed that, compared with female participants, male participants were underrepresented in the good quality motivation group and overrepresented in the poor quality motivation group. Finally, we examined whether students from different grades would be equally distributed across the four retained clusters. In line with previous work (e.g., Gottfried, Fleming, & Gottfried, 2001), a significant effect, $\chi^2(15, N = 876) = 58.79$, $p < .001$, indicated that the 7th- and 8th-grade students were overrepresented and underrepresented in the good quality and poor quality motivation group, respectively, compared with the 9th- to 12th-grade students. Given these results and given the effects of gender and grade on the learning outcomes, we decided to control for both gender and grade when we compared the clusters in terms of outcome variables in subsequent analyses.[1]

External validity. A multivariate analysis of covariance (MANCOVA) was conducted with cluster membership as independent variable, learning outcomes as dependent variables, and gender and grade as covariates. Because the cheating variables were not filled out by all participants, we performed a separate MANCOVA on the two cheating outcomes. As for the learning variables, the Wilks's lambda was significant, $F(21, 2523) = 16.70$, $p < .001$, $\eta^2 = .12$, which indicated that significant multivariate cluster differences were found; in addition, a multivariate effect was found for both gender, $F(7, 839) = 2.78$, $p < .001$, $\eta^2 = .02$, and grade, $F(7, 839) = 56.13$, $p < .001$, $\eta^2 = .32$. As for cheating, the Wilks's lambdas of cluster membership, $F(6, 1160) = 12.81$, $p < .001$, $\eta^2 = .06$, and of grade, $F(2, 279) = 144.84$, $p < .001$, $\eta^2 = .33$, were significant. Cluster membership and the two covariates jointly explained between 9% and 39% of the variance in the learning outcomes (*ps* <.001). Follow-up univariate F values, η^2, and pairwise comparisons (using Tukey's honestly significant difference test) are shown in Table 3 (bottom part).

As expected on the basis of the qualitative and quantitative perspective, the good quality motivation group displayed a more optimal profile of learning outcomes than did the low quantity motivation group (Comparison 1) and the high quantity motivation

[1] As one might wonder whether gender plays a role in the emergence and meaning of the clusters themselves, we examined whether the same motivational profiles show up in the male and female data by performing an additional series of cluster analyses separately for male and female participants. The four-cluster solution showed up in both subsamples and was found to be quite convergent across gender ($\kappa = .61$). These findings justify our approach in performing cluster analysis on the full sample.

group yielded better learning outcomes than did the poor quality motivation group (Comparison 2). Furthermore, and contrary to the quantitative perspective, the poor quality motivation group did not display better academic functioning relative to the low quantity motivation group (Comparison 3). The poor quality motivation group even displayed higher scores on test anxiety and procrastination. Similarly, it was found that the high quantity motivation cluster displayed no better academic functioning relative to the good quality motivation group (Comparison 4). This finding goes against the quantitative perspective, because the high quantity motivation group was more strongly motivated than the good quality motivation group. Compared with the good quality motivation group, the high quantity motivation group showed higher levels of test anxiety and procrastination, adopted a more positive attitude toward cheating, and obtained lower achievement scores. Further, in line with the qualitative perspective, the high and poor quality motivation groups displayed the most optimal and least optimal profile of learning outcomes, respectively (Comparison 5). Finally, the high quantity and low quantity motivation groups also differed on all outcomes, and the most optimal scores were achieved in the high quantity group (Comparison 6). The significant difference between the two quantity motivation groups might, however, be attributed not only to the higher amount of motivation that characterizes the high quantity group but also to the better quality of motivation in the high quantity group.

Brief Discussion

This first study indicates that a four-cluster solution most parsimoniously describes the variance in students' autonomous and controlled motivation scores. The four clusters were quite heterogeneous in terms of their motivational profiles, as one cluster scored high on both dimensions (i.e., high quantity motivation group), one scored low on both dimensions (i.e., low quantity motivation group), one scored high on autonomous motivation but low on controlled motivation (i.e., good quality motivation group), and one scored low on autonomous motivation and high on controlled motivation (i.e., poor quality motivation group). Thus, the retained clusters were perfectly in line with our expectations. Moreover, the generated four-cluster solution was found to be highly replicable and internally valid.

With respect to the external validity of the cluster solution, it was found that the set of learning outcomes that characterized each of the four clusters fell in line with a qualitative view on motivation, as defended within SDT. In particular, the fact that the poor quality motivation group did not do better than the low quantity motivation group and even scored higher for test anxiety and procrastination suggests that the additional presence of a poor type of motivation (i.e., controlled) does not yield any benefits compared with being unmotivated. In contrast, being autonomously motivated for one's studies is associated with various learning benefits compared with being unmotivated, as the good quality and low quantity motivation group differed on all measured variables. The good quality motivation group also scored systematically higher on all outcomes than did the poor quality motivation group, as would be predicted by the qualitative perspective. Note that these effects emerged even though the poor quality motivation group was characterized by a higher amount of total motivation. Thus, these findings are in direct opposition to what would be predicted by the quantitative perspective. Further contradicting the quantitative perspective, the good quality motivation group did not score lower on the learning outcomes than did the high quantity motivation group, although the latter group was equally characterized by a higher amount of motivation. In contrast, if any differences emerged between the good quality and high quantity motivation groups, they were in favor of the good quality group. These findings suggest that, in line with the qualitative perspective, the additional presence of controlled motivation next to autonomous motivation detracts rather than contributes to optimal learning. Finally, although the high quantity motivation group scored systematically higher on all learning outcomes than did the low quantity motivation group, as would be predicted by the quantitative perspective, it remains unclear whether these differences can be solely attributed to the amount of motivation that differs between both groups, as both groups also differed in terms of the quality of their motivation. Thus, quality and quantity of motivation were confounded in this comparison of clusters.

Study 2

Study 2 was intended to replicate and extend the findings of Study 1 in three important ways. First, we aimed to examine the generalizability of the findings of Study 1. In doing so, we sampled college instead of high school students and assessed students' academic motivation at the situational level (i.e., with respect to a specific course) rather than at the domain level (Vallerand, 1997). The assessment of students' course-specific motivation was deemed important, because this might result in a different number and type of clusters to be extracted in the cluster analysis. Whereas students' global academic motivation is likely to be more personality driven, students' course-specific motivation might be more strongly affected by situational circumstances, such as the perceived teaching climate (Vallerand, 1997). Ratelle et al. (in press) have argued that this stronger susceptibility to contextual influences may in turn affect the obtained cluster solution. For instance, due to a stronger impact of the teaching environment, the variation in students' autonomous and controlled motivation scores at the situational level might be restricted, so that a smaller number and/or a different type of clusters would need to be retained. It is also possible that different levels of assessing motivation primarily result in different frequency distributions across clusters rather than in a different number and type of clusters. Thus, whereas the number and type of the retained groups might be quite stable across the level of assessed motivation, the size of the retained groups might vary. Given that the impact of the type of assessment (i.e., domain vs. situational) has not been explicitly addressed in previous research, we considered this issue in an explorative fashion.

Study 2 also built on Study 1 by examining how perceived teaching climate varies by students' motivational profile. Within SDT it is argued that good quality motivation will be fostered when teachers provide a need-supportive climate, that is, (a) when they act in an autonomy-supportive rather than a controlling fashion, which is likely to satisfy students' need for autonomy; (b) when they provide sufficient structure and guidelines, which is likely to be conducive to students' competence satisfaction; and (c) when they display an involved and caring attitude, so that students experience a sense of connectedness. We examined whether the

motivational clusters differed in terms of the general degree of perceived need support and with respect to the support of the three separate needs. We performed the same series of comparisons as in Study 1. On the basis of the qualitative perspective echoed within SDT, we predicted that students in the good quality motivation group would display the most optimal learning outcomes and would experience their teachers as high on all three facets of need-supportive teaching. This prediction was based on because the fact that the combined nurturance of the three basic psychological needs is most likely to foster good quality motivation (Deci & Ryan, 2000).

Method

Participants and Procedure

Participants were 484 first-year students from four Belgian teacher training institutes. Of those participating, 39% ($n = 189$) were male and 61% ($n = 295$) were female. Their average age was 19.04 years ($SD = 1.68$). The questionnaires were distributed and filled out during classes. Participants were assured of confidentiality and anonymity.

Measures

Academic self-regulation. The same scale used to assess academic motivation in Study 1 was used in this study. However, the scale was adjusted slightly, as we now assessed students' motivation for one particular course (i.e., educational sciences) rather than students' overall study motivation. Internal consistencies of the four subscales as indexed by Cronbach's alpha ranged between .72 and .89. As in Study 1, we created an autonomous ($\alpha = .88$) and controlled ($\alpha = .84$) motivation composite score by averaging the intrinsic and identified and the external and introjected motivation subscales, respectively. A principal-components analysis on the motivation items revealed a clear drop in eigenvalues in the transition from the second to the third component (i.e., 5.18, 3.32, 1.22, and 1.09). Accordingly, two components were retained that explained a total of 53% of the variance in motivation items. After oblique rotation (PROMAX), all autonomous items had loadings of at least .40 on the first component, whereas all controlled motivation items had loadings of at least .40 on the second component. No cross-loadings were found.

Learning outcomes. The learning outcomes assessed were the same as in Study 1. However, these outcomes also were assessed specifically with reference to the course of educational sciences. Cronbach's alpha coefficients were acceptable in all cases: cognitive processing ($\alpha = .77$), procrastination ($\alpha = .89$), test anxiety ($\alpha = .74$), effort regulation ($\alpha = .68$), time and environment use ($\alpha = .63$), and meta-cognitive strategy use ($\alpha = .71$).

Perceived teaching style. We used the subscales Autonomy Support (eight items), Structure (eight items), and Involvement (eight items) of the shortened version of the Teacher as Social Context Questionnaire (Belmont, Skinner, Wellborn, & Connell, 1988). All items were answered according to a 5-point answer format, which ranged from 1 (*Competely Disagree*) to 5 (*Completely Agree*) and referred to one single teacher (i.e., students' teacher in educational sciences). After reversing negatively worded items, we calculated scale scores by averaging the items of each scale (αs = .75, .83, .70). In addition, we created a general need-supportive teaching scale by summing scores for structure, involvement, and autonomy support ($\alpha = .89$). Such an approach was justified by the pattern of positive correlations among the three dimensions (see Table 4).

Table 4
Means and Standard Deviations for Male and Female Participants Together With T Tests and Intercorrelations Between Measured Variables (Study 2)

	F	M	*t* test	1	2	3	4	5	6	7	8	9	10	11
1. Autonomous motivation	3.20 (0.75)	2.83 (0.66)	5.47***	—										
2. Controlled motivation	2.34 (0.87)	2.36 (0.72)	ns	−.19***	—									
3. Cognitive processing	3.27 (0.48)	3.20 (0.50)	ns	.43***	−.09	—								
4. Test anxiety	3.43 (0.80)	3.23 (0.79)	2.69**	−.14**	.32***	−.14**	—							
5. Procrastination	2.76 (0.83)	3.13 (0.69)	−4.85***	−.41***	.25***	−.26***	.26***	—						
6. Time and environment use	3.56 (0.56)	3.26 (0.50)	5.93***	.48***	−.13**	.34***	−.13**	−.54***	—					
7. Effort regulation	3.60 (0.71)	3.32 (0.65)	4.43***	.45***	−.26***	.33***	−.24***	−.61***	.53***	—				
8. Meta-cognitive strategy use	3.46 (0.47)	3.26 (0.50)	4.56***	.46***	−.13**	.58***	−.11*	−.37***	.53***	.45***	—			
9. Teacher need support	2.98 (0.66)	2.70 (0.57)	−4.58***	.47***	−.24***	.19***	−.20***	−.35***	.31***	.41***	.31***	—		
10. Teacher autonomy support	3.86 (0.57)	3.60 (0.58)	4.91***	.39***	−.21***	.22***	−.14**	−.31***	.28***	.36***	.29***	.83***	—	
11. Teacher structure	3.52 (0.62)	3.33 (0.51)	3.56***	.44***	−.15***	.17***	−.17***	−.29***	.33***	.30***	.32***	.82***	.59***	—
12. Teacher involvement	3.31 (0.65)	3.14 (0.60)	2.82***	.47***	−.15***	.26***	−.15***	−.28***	.29***	.33***	.25***	.80***	.57***	.63***

Note. Values in parentheses are standard deviations. F = female participants; M = male participants; ns = nonsignificant; GPA = grade point average.
** $p < .01$. *** $p < .001$.

Results

Correlations and Gender Effects

Correlations can be found in Table 4. The pattern of correlates was similar to that of the correlations obtained in Study 1. Autonomous motivation and controlled motivation were differentially correlated with all learning outcomes ($ps < .001$, average z value = 9.26). The composite score of perceived need-supportive teaching as well as all three separate teaching dimensions were positively correlated with autonomous motivation and negatively correlated with controlled motivation.

Descriptive statistics (means and standard deviations) can be found in Table 4. Independent t testing indicated that female and male participants differed on all variables, except for controlled motivation and cognitive processing. As in Study 1, female participants were more autonomously motivated and scored higher on all learning outcomes and perceived teaching dimensions.

Cluster Analyses

Internal validity. The cluster analyses were conducted in the same way as in Study 1. Prior to running the analyses, we removed 2 univariate outliers (i.e., values more than 3 *SD* below or above the mean) and 7 multivariate outliers (i.e., individuals with high Mahalanobis distance values; Garson, 1998). This resulted in a total sample of 475 participants. As in Study 1, four clusters were retained using Ward's cluster method; they explained 66% and 64% of the variance in the constituting dimensions. Figure 1 (bottom panel) displays the final four-cluster solution obtained after the iterative *k*-means cluster analysis. The z scores of autonomous and controlled motivation are reported in Table 5 (top half). As can be noted, the z scores on both motivational dimensions reflected a moderate-to-strong deviation from the mean for all four retained groups. The four clusters that emerged were the same as in Study 1: the good quality motivation cluster ($n = 111$, 23%), with high scores on autonomous motivation and low scores on controlled motivation; the high quantity motivation cluster ($n = 107$, 22%), with high scores on both autonomous and controlled motivation; the poor quality motivation cluster ($n = 89$, 19%), with high scores on controlled motivation and low scores on autonomous motivation; and the low quantity motivation cluster ($n = 166$, 35%), with low scores on both motivational dimensions.

As in Study 1, we created a quantity of motivation index by summing the z scores of autonomous and controlled motivation and a quality of motivation index by subtracting the z score of controlled motivation from the z score of autonomous motivation. The four retained groups differed from one another significantly on the quantity of motivation index. The high quantity motivation group again yielded the highest score, followed by the poor quality group, the good quality group, and the low quantity group. As for the composite score of quality of motivation, the good quality motivation group scored higher than the poor quality motivation group, whereas the two quantity of motivation groups fell in between and did not differ from one another. Thus, unlike in Study 1, the comparison of the two quantity motivation groups was not confounded by a different level of quality of motivation. This provided an opportunity to more accurately examine the predictions derived from quantitative perspectives.

Furthermore, we again used the double-split procedure to examine the replicability of this four-cluster solution. As in Study 1, the solution appeared quite stable, as indexed by a kappa of .75. We examined the replicability of this four-cluster solution in yet

Table 5
Z Scores of the Constituting Dimensions and Means of Validity and Dependent Variables for the Four Extracted Clusters Together With F Values and Effect Sizes (Study 2)

Dimension and variable	Good quality motivation $n = 111$ (23%)	High quantity motivation $n = 104$ (22%)	Poor quality motivation $n = 89$ (19%)	Low quantity motivation $n = 166$ (35%)	F	η^2
Constituting dimension						
Autonomous motivation	1.04_a	0.62_b	-0.83_c	-0.58_d	277.76***	.64
Controlled motivation	-0.90_a	0.67_c	1.27_c	-0.53_d	365.11***	.70
Total amount of motivation[a]	0.14_a	1.29_b	0.44_c	-1.11_d	188.62***	.55
Quality of motivation[b]	1.94_a	-0.05_b	-2.10_c	-0.05_b	483.61***	.76
Learning outcome						
Cognitive processing	3.46_a	3.41_a	3.06_b	3.10_b	22.39***	.13
Meta-cognitive regulation						
Test anxiety	3.08_a	3.39_b	3.81_c	$3.26_{a,b}$	17.95***	.11
Time and environment use	3.70_a	3.60_a	3.18_b	3.33_b	17.26***	.10
Meta-cognitive strategy use	3.66_a	3.51_a	3.23_b	3.16_b	23.71***	.14
Determination						
Effort regulation	3.83_a	$3.61_{a,b}$	3.07_c	3.41_b	19.98***	.12
Procrastination	2.55_a	$2.76_{a,b}$	3.42_c	2.97_b	19.78***	.12
Teacher need support	3.26_a	2.99_b	2.47_c	2.77_d	29.07***	.16
Teacher autonomy support	4.09_a	3.86_b	3.44_c	3.67_b	22.12***	.13
Teacher structure	3.74_a	3.56_a	3.14_c	3.35_b	19.81***	.12
Teacher involvement	3.56_a	3.43_a	2.89_c	3.11_b	24.30***	.14

Note. Cluster means are significantly different if they have different subscripts.
[a] Sum of autonomous and controlled motivation. [b] Autonomous motivation minus controlled motivation.
*** $p < .001$.

another way by examining cluster-assignment agreement with the sample of Study 1. The average kappa was .93. Finally, as in Study 1, there was a significant association between gender and cluster membership, $\chi^2(3, N = 472) = 22.34$, $p < .001$. Compared with female participants, male participants were underrepresented in the good quality motivation group and overrepresented in the low motivation and poor quality motivation groups. Given these results and the observed mean-level differences in several learning outcomes between the genders, we controlled for gender when comparing the different clusters in terms of learning outcomes and teaching variables.[2]

External validity. Next, we examined how the four clusters differed in terms of learning outcomes and teaching dimensions. A MANCOVA was conducted with cluster membership as an independent variable, learning outcomes and teaching dimensions as dependent variables, and gender as a covariate. The Wilks's lambda for cluster membership was significant, $F(27, 1335) = 6.94$, $p < .001$, $\eta^2 = .12$, and this indicated that significant multivariate cluster differences were found. In addition, gender yielded a multivariate effect, $F(9, 443) = 6.47$, $p < .001$, $\eta^2 = .12$. Gender and cluster membership explained between 12% and 18% of the variance in the outcomes (ps $<.001$). Follow-up univariate F values, η^2, and pairwise comparisons (using Tukey's honestly significant difference test) are shown in Table 5 (bottom half).

Results were generally consistent with the results from Study 1. With respect to the first two comparisons, it was found that the high quantity motivation group differed from the poor quality motivation group on all outcomes (Comparison 2) and that the good quality motivation group differed significantly from the low quantity motivation group on all outcomes, except for test anxiety (Comparison 2). More important, Comparison 3 again showed that adding controlled motivation to a total lack of motivation does not yield benefits. Compared with participants in the low quantity motivation group, participants in the poor quality motivation group did not display improved learning: On the contrary, in spite of their higher quantity of motivation, individuals in the poor quality group scored significantly higher on procrastination and text anxiety and significantly lower on effort regulation and all three teaching dimensions than did individuals in the low quantity group. Similarly, and again contrary to the quantitative perspective, the high quantity motivation cluster did not display better academic functioning relative to the good quality motivation group (Comparison 4) and even displayed higher levels of test anxiety and lower perceived teacher need support in general and autonomy support in particular. Further, the good quality motivation group differed on all assessed outcomes from the poor quality motivation group (Comparison 5). Note that these findings emerged in spite of the fact that the poor, relative to the good, quality motivation group displayed a higher amount of motivation, as indexed by the higher scores of its members on the composite measure of quantity of motivation. Finally, with respect to the comparison of the two quantitative groups (Comparison 6), the high quantity motivation group was found to display a somewhat more adaptive pattern of functioning than did the low quantity motivation group, as would be predicted by the quantitative perspective. The quantitative groups differed in terms of cognitive processing, meta-cognitive strategy use, time and environment use, and experienced teacher involvement and structure, but they had equal scores on effort regulation, test anxiety, procrastination, and perceived teacher autonomy support.

Brief Discussion

The results of Study 2 replicate the findings of Study 1 and simultaneously extend them. First, there emerged a stable four-cluster solution, distinguishing between a good quality motivation group, a high quantity motivation group, a poor quality motivation group, and a low quantity motivation group, that closely resembled the solution obtained in Study 1. Second, the relationships with external variables were generally consistent with predictions derived from the qualitative perspective and with results from Study 1. In particular, the good quality motivation group displayed the most optimal pattern of educational outcomes, followed by the high quantity motivation group, the low quantity motivation group, and the poor quality motivation group. Students in the good quality motivation group experienced the highest levels of need-supportive teaching, as expressed in the provision of autonomy support, structure, and involvement.

General Discussion

The present research was meant to extend the limited amount of work that has addressed students' motivational profiles from a SDT perspective. Although a few previous studies used a person-centered approach in addressing motivational dynamics, some of these studies used both SDT-based concepts and non-SDT-based concepts as clustering dimensions (e.g., Wang & Biddle, 2001), whereas others, which relied exclusively on SDT-based constructs, found inconclusive evidence with respect to the type of clusters that needed to be retained across different age groups and educational environments (Ratelle et al., 2007). Therefore, as suggested by Ratelle et al., the present study further addressed this issue in two samples of high school and college students. In doing so, we extended the number of studied outcomes by including various learning outcomes and teaching dimensions. There emerged a number of intriguing results, which are related to (a) the number, type, size, and replicability of the motivational profiles; (b) their relation with a variety of learning outcomes; and (c) their relation to perceived teaching style dimensions.

Number and Type of Retained Motivational Profiles

When the autonomous and controlled motivation scales were used as constituent clustering variables, consistent evidence was found for a highly stable and replicable four-cluster solution within each sample and across the assessment level of motivation (i.e., domain-related or situational). The four clusters obtained matched perfectly with our SDT-based predictions: Two clusters were characterized by simultaneously low and high levels of autonomous and controlled motivation, respectively, and were consequently labeled the low quantity motivation and high quantity

[2] As in Study 1, we performed a series of cluster analyses separately for male and female participants to examine whether gender plays a role in the obtained cluster solution. In each case, a four-cluster solution needed to be retained and was found to be quite convergent across gender ($\kappa = .62$).

motivation groups. The motivational profiles of the two other clusters stood in a diametric relation to one another; one cluster, labeled the good quality motivation group, scored high on autonomous but low on controlled motivation, whereas the other cluster, labeled the poor quality motivation group, scored low on autonomous and high on controlled motivation. Thus, whereas autonomous and controlled motivation systematically covaried in two of the retained clusters (i.e., low and high quantity motivation groups), they were differentially endorsed in two other clusters (i.e., low and good quality motivation groups). The emergence of these four clusters, which represented the most parsimonious and interpretable cluster solution, is consistent with previous SDT-based research showing that autonomous and controlled motivation are relatively orthogonal constructs. Considering the distribution of students across the four groups, we note that each group was represented by a substantial percentage of students, which varied from 18% to 35%. Across the two studies, most students appeared to be classified in the low motivation group, and only a smaller percentage of the students belonged to the good quality motivation group.

Consistent with gender differences in the motivational dimensions (e.g., Ratelle et al., 2007; Vansteenkiste, Zhou, et al., 2005), male and female students were unequally distributed across the clusters. Compared with males, females were more likely to belong to the good quality motivation group and less likely to be part of the poor quality motivation group. Also, consistent with previous research showing a gradual deterioration of intrinsic motivation across the school years (Gottfried et al., 2001), it was found that first- and second-year high school students were overrepresented in the good quality motivation group and underrepresented in the poor quality motivation group, whereas the opposite pattern of findings appeared for older high school students.

Notably, the four-cluster solution obtained in the present set of studies differs somewhat from the three-cluster solution obtained by Ratelle et al. (2007). In two samples among high school students, Ratelle et al. found consistent evidence for what they labeled a high autonomous–high controlled group, a moderate autonomous–moderate controlled group, and a controlled motivation group. The high quantity motivation and poor quality motivation clusters obtained in this study map well onto the clusters obtained by Ratelle et al. Contrary to Ratelle et al., however, we found evidence for the existence of two clusters—the good quality group and the poor quality group—in which students' autonomous and controlled motivational scores do not covary but instead stand in diametric relation to one another. Markedly, a similar good quality motivation group also emerged in Ratelle et al.'s third study among college students.

Ratelle et al. (in press) suggested that the emergence of such a good quality motivation cluster among college students (but not among high school students) would be due to the more controlling environment to which Canadian high school students are exposed. Thus, at least implicitly, they were suggesting that the types of clusters that emerge through cluster analysis vary as a function of the social environment to which students are exposed. The consistent replication of the four motivational groups across the two levels of assessed motivation (domain bounded and specific) in the present study seems inconsistent with such an explanation; given the explanation that the type of social environment affects the type of retained clusters, it might be expected that a less heterogeneous set of clusters would emerge when students' motivation is assessed at the situational level because students' situational motivation is likely to be more strongly affected by the perceived teaching style.

Herein, we provide an additional explanation. We suggest that the heterogeneity of a cluster solution depends on the strength of the association between the constituting motivational dimensions. Thus, one would be less likely to find clusters characterized by opposite scores on the motivational dimensions if the two clustering dimensions are strongly correlated. Consistent with this reasoning, in Ratelle et al. (2007) the correlation between autonomous and controlled motivation was quite high in the two college samples but less pronounced in the study among high school students. In the present set of studies, similarly, the autonomous and controlled motivation scales were relatively orthogonal, and this suggests that autonomous and controlled motivation can be combined in at least four different ways (i.e., high–high, high–low, low–high, and low–low). These four possible motivational profiles indeed consistently showed up in our two-step cluster analysis.

More research is clearly needed on the number and types of motivational subgroups that should be retained for describing the variance in students' autonomous and controlled motivations. Future research might examine whether the subgroups required depend on the average correlation of the constituting clustering variables in the total sample, the extent to which the social environment induces one type of motivation more than another, or both. In this respect, it would be especially instructive to assess students' situational motivation for two different courses that vary in the extent to which teachers are perceived as need supportive. If situational circumstances are a critical determinant of the number and type of retained clusters, the number and type of clusters should differ for these two courses. Although we believe that the distribution of students across the retained clusters might vary as a function of the experienced need support, we speculate that the type and number of retained clusters should be relatively stable, as this requirement might primarily depend on the strength of the correlation between autonomous and controlled motivation.

Learning Outcomes

Previous research within the SDT tradition has shown convincingly that an autonomous, relative to a controlled, regulation of study activities is associated with various positive learning outcomes and has thereby provided evidence for the claim that the quality of students' motivation matters (see Reeve, Deci, & Ryan, 2004, for an overview). However, a notable disadvantage of the dimensional approach is that the differential predictions that can be derived from qualitative and quantitative theories of motivation can not be directly tested against one another. The person-centered analyses we used in the present set of studies provided an ideal opportunity to examine these issues in greater detail. For this aim, we performed six comparisons, the results of which are summarized in Table 6. The findings provide solid support for SDT's claim that the quality of motivation matters.

As can be noticed, across both studies, the good quality motivation group, characterized by the presence of autonomous motivation and the absence of controlled motivation, differed on all outcomes (except one) relative to the low quantity motivation group, which was characterized by the lack of any type of motivation. These findings suggest that in comparison with not being

Table 6
Overview of Findings

Prediction	Quantitative perspective	Study 1	Study 2	Qualitative perspective	Study 1	Study 2
Converging predictions						
Comparison 1: high quantity vs. poor quality motivation	High quantity > poor quality	8/9	10/10	High quantity > poor quality	8/9	10/10
Comparison 2: good quality vs. low quantity motivation	Good quality > low quantity	8/9	9/10	Good quality > low quantity	8/9	9/10
Conflicting predictions						
Comparison 3: poor quality vs. low quantity motivation	Poor quality > low quantity	0/9	0/10	Poor quality ≤ low quantity	9/9	10/10
Comparison 4: good quality vs. high quantity motivation	Good quality < high quantity	0/9	0/10	Good quality ≥ high quantity	9/9	10/10
Comparison 5: good quality vs. poor quality motivation	Good quality = poor quality	0/09	0/10	Good quality > poor quality	9/9	10/10
Comparison 6: high quantity vs. low quantity motivation	High quantity > low quantity	Confound	6/10	High quantity = low quantity	Confound	4/10

motivated at all, being autonomously motivated yields various learning benefits. Similarly, combining autonomous and controlled motivation, as was the case in the high quantity motivation group, was systematically associated with more optimal learning across the two studies relative to being solely motivated because of controlled reasons, as is the case in the poor quality motivation group. Again, the additional presence of autonomous motivation seems to facilitate more optimal learning. The findings of these two comparisons do, however, fail to provide definite evidence for the importance of the quality of students' motivation, as similar predictions can be derived from quantitative theories of motivation, such as self-efficacy theory and expectancy-valence models. Indeed, because the amount of motivation is higher in the good quality cluster relative to the low quantity cluster and in the high quality cluster relative to the poor quality cluster, more optimal learning should occur according to a quantitative view as well.

To ascertain whether any additional amount of motivation yields similar learning benefits, one must examine whether the presence of controlled motivation relative to a lack of motivation would equally result in more optimal learning, as would be predicted by a quantitative perspective on motivation. As shown in Table 6, the poor quality motivation group did not display a more adaptive pattern of academic functioning than did the low quantity motivation group. If any significant differences emerged, they were in favor of the low quantity motivation group: Compared with the group of students with primarily controlled motives, the unmotivated students reported less test anxiety (Studies 1 and 2), were less likely to procrastinate (Studies 1 and 2), and put more effort into their studies (Study 2). Thus, whereas adding autonomous motivation to no motivation at all seems to promote optimal learning, adding controlled motivation to no motivation at all seems to forestall optimal learning.

The critical importance of the quality of motivation was evidenced by yet another comparison of clusters, that between the good quality motivation group and the high quantity motivation group. This comparison yields quite a conservative test of SDT's claim that the quality of motivation matters, because these two clusters differ only in their endorsement of controlled study motives. On the basis of quantitative theories of motivation, it would be suggested that students who are more strongly motivated, such as the high quantity motivation group, should display more optimal learning than students who are less strongly motivated, such as the good quality motivation group (Vansteenkiste, Lens, De Witte, & Feather, 2005). The pattern of results did not confirm such predictions. On the contrary, if any significant differences between the groups emerged, it was that the high quantity motivation group appeared to display poorer academic functioning than did the good quality motivation group. To illustrate, the high motivation group scored higher on test anxiety (Studies 1 and 2) and procrastination (Study 1), adopted a more positive attitude toward cheating (Study 1), and obtained lower academic grades (Study 1), even though its overall amount of motivation was higher than that of the good quality motivation group.

Taken together, the results suggest that the presence of controlled motivation, next to either a high amount of autonomous motivation or a low amount of autonomous motivation, yields no benefits at all. Instead, the pressure and stress associated with controlled motivation seem to lead students to procrastinate more. Perhaps as a result of their procrastination and the pressure to do well on tests, controlled students are more anxious when taking tests, are more likely to cheat, and obtain lower grades. The additional presence of controlled motivation did not detract from cognitive processing per se, but it seemed to make students more vulnerable to a poor regulation of their study activities and their approach to exams. This pattern of results is in line with the findings of Ratelle et al. (2007; Study 3) that the high autonomous motivation group was more persistent relative to a high motivation group.

Further, across both studies, the good quality motivation group was found to display better cognitive processing, more determination, more meta-cognitive self-regulation, and higher achievement than did the poor quality motivation group. Indeed, the good quality motivation group and poor quality motivation group yielded the two most extreme scores for all learning outcomes. This pattern of results clearly suggests that endorsing controlled motives at the expense of autonomous motives undermines various learning strategies and outcomes relative to endorsing autonomous motives without feeling controlled. Note that these results were

obtained even though the poor quality motivation group yielded a higher total amount of motivation score, which, from a quantitative perspective, should yield a more optimal pattern of learning outcomes.

A final set of comparisons concerns the comparison of the two quantity of motivation groups. The results from Study 1 cannot be used to examine whether amount of motivation really matters, as would be predicted by quantitative perspectives, as the two quantity motivation groups differed not only in terms of their quantity but also in terms of their quality of motivation. However, in Study 2, quantity and quality of motivation were not confounded in the comparison of these two groups. Comparisons in this study showed that, if any significant effects emerged, they were in favor of the high quantity motivation group. In particular, the motivated students used a greater variety of strategies (e.g., elaboration, organization) when cognitively processing the learning material and organized their study time more efficiently. Thus, quantity of motivation does matter, although an inspection of Table 6 suggests that strict quantitative theories of motivation would be improved by incorporation of a distinction between different types of motivation as to better account for the observed differences in optimal learning between motivational profiles.

Perceived Teaching Environment

According to SDT, a good quality motivation is fostered within social environments that satisfy students' needs for autonomy, competence, and relatedness. A teaching climate characterized by high autonomy support, structure, and involvement is said to contribute to this process of need satisfaction (Grolnick, Kurowski, & Gurland, 1999). The findings of Study 2 confirm these predictions. Whereas the highly motivated students and good quality motivated students experienced their teachers as being equally structuring and involved, the former group felt teachers were less autonomy supportive. This finding confirms SDT's claim that, although providing a sense of competence (through structure) and a sense of connection and concern (through involvement) might increase students' motivation, students will be highly motivated and will display good quality motivation only when teachers are autonomy supportive. Furthermore, the low quantity motivation students experienced their teachers not only as being more autonomy supportive relative to the poor quality motivated students but also as being more structuring and more involved. Thus, it seems that the lack of need support makes students especially vulnerable for a lack of quality motivation rather than a lack of overall motivation.

Limitations and Future Research Directions

The present research has a number of limitations, including the self-report assessment, which might artificially boost the observed strength of the relationships between variables through shared method variance. Such problems could be circumvented by including teacher reports of students' grades and learning strategies as well as of their own teaching style. Furthermore, the research was cross-sectional in nature, and such a design precludes the inference of causal relationships. Longitudinal research in conjunction with cross-lagged analyses is needed to sort out whether, for instance, teacher autonomy support predicts good quality motivation or whether autonomously motivated students provoke a more autonomy-supportive teaching style among their teachers. Furthermore, longitudinal analyses would allow investigation of whether the retained student groups would display different motivational trajectories over time and whether some students might change to a different cluster as a result of being exposed to a particular teaching environment.

In future, researchers might build on the present research by including assessments of *a*-motivation (Legault, Pelletier, & Pelletier, 2006) as an additional cluster variable. In this regard, they could examine whether the low motivation group pairs a lack of autonomous and controlled motivation with a greater amount of *a*-motivation. This might be the case, but it is equally possible that the poor quality motivation group might be characterized by a high sore on *a*-motivation or that a fifth cluster would emerge, with high scores on *a*-motivation but low scores on autonomous and controlled motivation. Moreover, the inclusion of *a*-motivation would help determine whether the quality and quantity of motivation are critical for understanding the differences between the motivational profiles.

A further issue that might be addressed is whether using the four motivational variables (i.e., external, introjected, identified, and intrinsic) discerned within SDT instead of the composite scores of autonomous and controlled motivation as the constituting clustering variables results in a more refined picture. It is possible that more clusters would emerge if more clustering variables were used (Milligan & Cooper, 1985), so that, for instance, some student groups are characterized by strong external pressure (i.e., external regulation), whereas others are more characterized by strong internal pressure (i.e., introjection). Also, there might exist a group of students who do not experience studying as particularly fun and challenging (i.e., intrinsic motivation) but who do understand the personal relevance of their studies (i.e., identification). If these more subtle differences in motivational profiles emerged, this would provide additional empirical evidence for the theoretical differentiation between two types of controlled motivation and two types of autonomous motivation. Such a more refined cluster analysis would help us understand whether the more maladaptive learning pattern that was observed in motivational groups high in controlled motivation is due to elevated external pressure, internal pressure, or both. This issue was not addressed in the present research, due to our use of a composite score of controlled motivation.

Conclusion

Most often, motivational theories—and SDT in particular—have been tested by examining the correlates of motivational dimensions distinguished in these theories. This dimensional approach differs from the way laymen (e.g., teachers, school principals, parents) reflect on motivational constructs and dynamics, which is typology based rather than dimension based. The accessibility and understanding of motivational theories can be advanced by adoption of a person-centered approach. In the present research, in which we took such an approach, four types of motivational profiles consistently emerged: a good quality motivation group, a high quantity motivation group, a low quantity motivation group, and a poor quality motivation group. Students in the good quality motivation group displayed the most optimal pattern of educational outcomes relative to all other groups of students, even those whose total amount of motivation exceeded the amount of motivation of the good quality motivation group. Students

in the good quality motivation group also experienced their teachers as autonomy supportive, well structured, and emotionally involved. It seems therefore that, to foster good quality motivation, teachers and school principals need to create a school and class environment that allows students to satisfy their basic needs for autonomy, competence, and relatedness.

References

Aldenderfer, M. S., & Blashfield, R. K. (1984). *Cluster analysis.* Beverly Hills, CA: Sage.

Anderman, E. M., Griesinger, T., & Westerfield, G. (1998). Motivation and cheating during early adolescence. *Journal of Educational Psychology, 90,* 84–93.

Asendorpf, J. B., Borkenau, P., Ostendorf, F., & van Aken, M. A. G. (2001). Carving personality at its joints: Confirmation of three replicable personality prototypes for both children and adults. *European Journal of Personality, 15,* 169–198.

Assor, A., Roth, G., & Deci, E. L. (2004). The emotional costs of parents' conditional regard: A self-determination theory analysis. *Journal of Personality, 72,* 47–88.

Bandura, A. (1989). Human agency in social cognitive theory. *American Psychologist, 44,* 1175–1184.

Belmont, M., Skinner, E., Wellborn, J., & Connell, J. (1988). *Teacher as social context: A measure of student perceptions of teacher provision of involvement, structure, and autonomy support* (Tech. Rep. No. 102). Rochester, NY: University of Rochester.

Boekaerts, M. (1997). Self-regulated learning: A new concept embraced by researchers, policy makers, educators, teachers, and students. *Learning and Instruction, 7,* 161–186.

Breckenridge, J. N. (2000). Validating cluster analysis: Consistent replication and symmetry. *Multivariate Behavioral Research, 35,* 261–285.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Erlbaum.

Connell, J. P., & Wellborn, J. G. (1991). Competence, autonomy and relatedness: A motivational analysis of self-system processes. In M. R. Gunnar & L. A. Sroufe (Eds.), *Self processes and development* (Vol. 23, pp. 43–77). Hillsdale, NJ: Erlbaum.

Csizér, K., & Dörnyei, Z. (2005). Language learners' motivational profiles and their motivated learning behaviour. *Language Learning, 55,* 613–659.

deCharms, R. (1968). *Personal causation: The internal affective determinants of behavior.* New York: Academic Press.

Deci, E. L., Eghrari, H., Patrick, B. C., & Leone, D. R. (1994). Facilitating internalization: The self-determination perspective. *Journal of Personality, 62,* 119–142.

Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 25,* 627–668.

Deci, E. L., & Ryan, R. M. (2000). The "what" and the "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry, 11,* 227–268.

Depreeuw, E., & Lens, W. (1998). *Vragenlijst aangaande Sudie-Organisatie Vaardigheden* [Questionnaire concerning study management abilities]. Louvain, Belgium: Katholieke Universiteit Leuven, Centre for Motivational Psychology.

Dornbusch, S. M., Ritter, P. L., Leiderman, H. P., Roberts, D. F., & Fraleigh, M. J. (1987). The relation of parenting style to adolescent school performance. *Child Development, 58,* 1244–1257.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology, 53,* 109–132.

Fortunato, V. J., & Goldblatt, A. M. (2006). An examination of goal orientation profiles using cluster analysis and their relationships with dispositional characteristics and motivational response patterns. *Journal of Applied Social Psychology, 36,* 2150–2183.

Garson, D. G. (1998). Cluster analysis. In *Statnotes: Topics in multivariate analysis.* Retrieved April 20, 2006, from http://www2.chass.ncsu.edu/garson/PA765/cluster.htm

Gore, P. A., Jr. (2000). Cluster analysis. In H. E. A. Tinsley & S. D. Brown (Eds.), *Handbook of applied multivariate statistics and mathematical modeling* (pp. 297–321). San Diego, CA: Academic Press.

Gottfried, A. E., Fleming, J. S., & Gottfried, A. W. (2001). Continuity of academic intrinsic motivation form childhood through late adolescence: A longitudinal study. *Journal of Educational Psychology, 93,* 3–13.

Grolnick, W. S., Kurowski, C. O., & Gurland, S. T. (1999). Family processes and the development of children's self-regulation. *Educational Psychologist, 34,* 3–14.

Grolnick, W. S., & Ryan, R. M. (1987). Autonomy in children's learning: An experimental and individual difference investigation. *Journal of Personality and Social Psychology, 52,* 890–898.

Hair, J. R., Anderson, R. E., Tatham, R. L., & Black, W. C. (1998). *Multivariate data analysis.* Upper Saddle River, NJ: Prentice-Hall.

Hardre, P. L., & Reeve, J. (2003). A motivational model of rural students' intentions to persist in, versus drop out of, high school. *Journal of Educational Psychology, 95,* 347–356.

Legault, L., Green-Demers, I., & Pelletier, L. (2006). Why do high school students lack motivation in the classroom? Toward an understanding of academic amotivation and the role of social support. *Journal of Educational Psychology, 98,* 567–582.

Levesque, C., Zuehlke, A. N., Stanek, L. R., & Ryan, R. M. (2004). Autonomy and competence in German and American university students: A comparative study based on self-determination theory. *Journal of Educational Psychology, 96,* 69–84.

Magnusson, D. (1998). The logic and implications of a person-centered approach. In R. B. Cairns, L. R. Bergman, & J. Kagan (Eds.), *Methods and models for studying the individual* (pp. 33–64). Thousand Oaks, CA: Sage.

Milligan, G. W., & Cooper, M. C. (1985). An examination of procedures for determining the number of clusters in a data set. *Psychometrika, 50,* 159–179.

Murcia, J. A. M., Gimeno, E. C., & Coll, D. G.-Z. (2007). Young athletes' motivational profiles. *Journal of Sport Science and Medicine, 6,* 172–179.

Pelletier, L. G., Fortier, M. S., Vallerand, R. J., & Brière, N. M. (2001). Associations among perceived autonomy support, forms of self-regulation, and persistence: A prospective study. *Motivation and Emotion, 25,* 279–306.

Pintrich, P. R. (1999). The role of motivation in promoting and sustaining self-regulated learning. *International Journal of Educational Research, 31,* 459–470.

Pintrich, P. R. (2000). Multiple goal, multiple pathways: The role of goal orientation in learning and achievement. *Journal of Educational Psychology, 92,* 544–555.

Pintrich, P. R., Smith, D., Garcia, T., & McKeachie, W. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire* (Tech. Rep. No. 91-B-004). Ann Arbor: Regents of the University of Michigan.

Ratelle, C. F., Guay, F., Vallerand, R. J., Larose, S., & Senécal, C. (2007). Autonomous, controlled, and amotivated types of academic motivation: A person-motivated analysis. *Journal of Educational Psychology, 99,* 734–746.

Reeve, J. (2002). Self-determination theory applied to educational settings. In E. L. Deci & R. M. Ryan (Eds.), *Handbook of self-determination* (pp. 183–203). Rochester, NY: University of Rochester Press.

Reeve, J., Deci, E. L., & Ryan, R. M. (2004). Self-determination theory: A dialectical framework for understanding socio-cultural influences on

student motivation. In S. Van Etten & M. Pressley (Eds.), *Big theories revisited* (pp. 31–60). Greenwich, CT: Information Age Press.

Reeve, J., & Jang, H. (2006). What teachers say and do to support students' autonomy during a learning activity. *Journal of Educational Psychology, 98,* 209–218.

Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57,* 749–761.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. *American Psychologist, 55,* 68–78.

Scholte, R. H. J., van Lieshout, C. F. M., de Wit, C. A. M., & van Aken, M. A. G. (2005). Adolescent personality types and subtypes and their psychosocial development. *Merrill-Palmer Quarterly, 51,* 258–286.

Schunk, D. H., & Zimmerman, B. J. (1994). *Self-regulation of learning and performance: Issues and educational applications.* Hillsdale, NJ: Erlbaum.

Senécal, C., Julien, E., & Guay, F. (2003). Role conflict and academic procrastination: A self-determination perspective. *European Journal of Social Psychology, 33,* 135–145.

Sheldon, K. M., & Kasser, T. (1995). Coherence and congruence: Two aspects of personality integration. *Journal of Personality and Social Psychology, 68,* 531–543.

Sierens, E., Vansteenkiste, M., Goossens, L., Soenens, B., & Dochy, F. (2009). The interactive effect of perceived teacher autonomy–support and structure in the prediction of self-regulated learning. *British Journal of Educational Psychology, 79,* 57–68.

Soenens, B., & Vansteenkiste, M. (2005). Antecedents and outcomes of self-determination in three life domains: The role of parents' and teachers' autonomy support. *Journal of Youth and Adolescence, 34,* 589–604.

Soenens, B., Vansteenkiste, M., Luyten, P., Duriez, B., & Goossens, L. (2005). Maladaptive perfectionistic self-representations: The mediational link between psychological control and adjustment. *Personality and Individual Differences, 38,* 487–498.

Tan, P.-N., Steinbach, M., & Kumar, V. (2006). *Introduction to data mining.* Boston: Addison-Wesley.

Tinsley, H. E. A., & Brown, S. D. (2000). Multivariate statistics and mathematical modeling. In H. E. A. Tinsley & S. D. Brown (Eds.), *Handbook of applied multivariate statistics and mathematical modeling* (pp. 3–36). San Diego, CA: Academic Press.

Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), *Advances in experimental social psychology* (Vol. 29, pp. 271–360). San Diego: Academic Press.

Vallerand, R. J., & Bissonnette, R. (1992). Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A prospective study. *Journal of Personality, 60,* 599–620.

Vallerand, R. J., Fortier, M. S., & Guay, F. (1997). Self-determination and persistence in a real-life setting: Toward a motivational model of high-school drop out. *Journal of Personality and Social Psychology, 72,* 1161–1176.

Vansteenkiste, M., Lens, W., & Deci, E. L. (2006). Intrinsic versus extrinsic goal-contents in self-determination theory: Another look at the quality of academic motivation. *Educational Psychologist, 41,* 19–31.

Vansteenkiste, M., Lens, W., De Witte, H., & Feather, N. T. (2005). Understanding unemployed people's job search behaviour, unemployment experience and well-being: A comparison of expectancy-value theory and self-determination theory. *British Journal of Social Psychology, 44,* 269–287.

Vansteenkiste, M., Lens, W., Dewitte, S., De Witte, H., & Deci, E. L. (2004). The "why" and "why not" of job search behavior: Their relation to searching, unemployment experience and well-being. *European Journal of Social Psychology, 34,* 345–363.

Vansteenkiste, M., Simons, J., Lens, W., Soenens, B., & Matos, L. (2005). Examining the impact of extrinsic versus intrinsic goal framing and internally controlling versus autonomy supportive communication style upon early adolescents' academic achievement. *Child Development, 76,* 483–501.

Vansteenkiste, M., Zhou, M., Lens, W., & Soenens, B. (2005). Experiences of autonomy and control among Chinese learners: Vitalizing or immobilizing? *Journal of Educational Psychology, 97,* 468–483.

Wang, C. K. J., & Biddle, S. J. H. (2001). Young people's motivational profiles in physical activity: A cluster analysis. *Journal of Sport and Exercise Psychology, 23,* 1–22.

Winne, P. (1995). Inherent details in self-regulated learning. *Educational Psychologist, 4,* 173–187.

(*Appendix follows*)

Appendix

The Academic Self-Regulation Scale

The following questionnaire measures your motivation for studying. Please indicate how important each of the listed motives is for you to study by encircling a number between 1 (*Completely Not Important*) and 5 (*Very Important*).

Why are you studying in general? I'm studying . . .

Ext1	1. Because I'm supposed to do so.	1	2	3	4	5
Ext2	2. Because that's something others (parents, friends, etc.) force me to do.	1	2	3	4	5
Ext3	3. Because others (parents, friends, etc.) oblige me to do so.	1	2	3	4	5
Ext4	4. Because that's what others (e.g., parents, friends) expect me to do.	1	2	3	4	5
Introj1	5. Because I want others to think I'm smart.	1	2	3	4	5
Introj2	6. Because I would feel guilty if I didn't study.	1	2	3	4	5
Introj3	7. Because I would feel ashamed if I didn't study.	1	2	3	4	5
Introj4	8. Because I want others to think I'm a good student.	1	2	3	4	5
Ident1	9. Because I want to learn new things	1	2	3	4	5
Ident2	10. Because it is personally important to me.	1	2	3	4	5
Ident3	11. Because this represents a meaningful choice to me.	1	2	3	4	5
Ident4	12. Because this is an important life goal to me.	1	2	3	4	5
Intr1	13. Because I am highly interested in doing this.	1	2	3	4	5
Intr2	14. Because I enjoy doing it.	1	2	3	4	5
Intr3	15. Because it's fun.	1	2	3	4	5
Intr4	16. Because it's an exciting thing to do.	1	2	3	4	5

Note. ext = external regulation; introj = introjected regulation; ident = identified regulation; itr = intrinsic motivation.

Received July 12, 2007
Revision received December 5, 2008
Accepted January 5, 2009 ■