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Interrelations among university students' approaches to learning, regulation of learning, and cognitive and attributional strategies: a person oriented approach

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Abstract This study investigated the relationships among approaches to learning, regulation of learning, cognitive and attributional strategies, stress, exhaustion, and study success. University students ($N = 437$) from three faculties filled in a questionnaire concerning their self-reported study behaviour, cognitive strategies, and well-being. Their interrelations were examined in a variable- and a person-oriented way. Latent class clustering was used for clustering students into homogeneous groups. Three groups of students were identified: non-academic, self-directed, and helpless students. Helpless students reported higher levels of stress and exhaustion than non-academic or self-directed students. Self-directed students had the highest GPA. Our findings demonstrate the usefulness of combining cognitive and emotional aspects for investigations of students' learning.

Keywords Approaches to learning · Regulation of learning · Cognitive and attributional strategies · Latent class clustering · Study success

Introduction

Recent research has shown that classic concepts of educational psychology—such as motivation, approaches to learning, or regulation of learning—by themselves explain only limited amounts of variance in learning outcomes. Traditionally those concepts, theories, and frameworks have been studied separately. It is important to explore, whether,

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by combining traditions, we could build a more comprehensive picture of university student learning.

There are three main theoretical frameworks to be integrated. Firstly, the "Student approaches to learning" tradition (SAL) has its roots in qualitative, phenomenographic research, which originated in Marton's work in the 1970s (Marton 1975, 1976; Marton and Säljö 1976; Lonka et al. 2004). Secondly, research on self-regulation (SRL) relies on a modern version of the information processing paradigm, including not only cognitive, but also motivational, affective, and contextual factors (Pintrich 2000, 2004). Thirdly, the "cognitive and attributional strategies framework" is based on the cognitive theories of personality and attribution (Nurmi 1989; Bandura 1997).

There exists a profound discussion in previous literature about the relationships between the traditions of student approaches to learning (SAL) and self-regulated learning (SRL) (Richardson 2007; Pintrich 2004; Lonka et al. 2004). There is, however, less research on how cognitive and attributional strategies relate to learning and self-regulation in higher education.

Approaches to learning

The distinction between the deep and surface approaches to learning has been made in most conceptualizations of student learning. Marton and Säljö (1976) started the tradition by investigating linkages between students' intentions and levels of processing, and demonstrated the impact these had on learning outcomes. Students who applied a deep approach to learning paid attention to the fundamental idea or message in the materials they were studying. Their intention was to understand. In order to understand, they processed the material actively. Quite to the contrary, students applying a surface approach minimized the use of their intellectual capacity and sought to remember the text word by word. In other words, student's intention was to reproduce content and the learning process was characterized by syllabus-boundness and rote learning. Thus, the term 'approach to learning' originally referred to how intentions and processes were combined in student learning.

Around the same time, Pask (1976) identified the holist and the serialist learning strategies. Like Marton and Säljö (1976), Pask devised learning tasks, which required understanding of written materials. Students were asked to explain their understanding to the researcher. Pask identified a dichotomy of strategies: One group of students saw a task in a broad context and in personal terms, and showed a tendency to be impulsive in reaching conclusions (holistic strategy), whereas another group applied a step-by-step, impersonal strategy, focusing on one particular task at a time, processing material step by step (serialistic strategy). Pasks' strategies can be seen as differing ways of constructing understanding (Entwistle and McCune 2004), but aspects of the serialist strategy have also been found to be linked with memorization, external regulation of learning, and seeing learning as the intake of knowledge (Vermunt 1998).

A large amount of quantitative research has later confirmed the important distinction between the two main approaches in a variety of contexts and populations (e.g., Entwistle and Ramsden 1983; Vermunt and van Rijswijk 1988; Lonka and Lindblom-Ylänne 1996; Biggs 1987, 1993; Watkins 2001; Richardson 1997). Self-report surveys and questionnaires have been used extensively to assess students' approaches to learning. Although the general conceptualization is widely accepted, criticism has also been presented. For example, the exact nature of the deep and the surface approaches has been reassessed (Richardson 1997). The early studies, applying interview designs, indicated that deep and

surface approaches were either different categories or forms of understanding (Marton 1975), or a single bipolar dimension along which individuals may vary (Marton 1976). Questionnaire-based research takes a somewhat broader scope, focussing on students' dispositions to adopt meaning and reproducing orientations to studying (Pintrich 2004). Richardson (1997) concluded that "it could be argued that the continuous measurements generated by questionnaires on approaches to studying reflect the result of aggregating a large series of bare dichotomies across a wide variety of learning situations (p. 302)."

Regulation of learning

Learning is hardly ever pure information-processing. Most students recognize that affect and context influence their learning. The focus of educational research has been shifting from investigations of mainly cognitive processes to studying cognition in interaction with motivation (Rozendaal et al. 2001). Motivational and self-regulative components have recently been embedded in models of student learning, and finer and finer theoretical conceptualizations of self-regulation have been explicated (e.g., Heikkilä and Lonka 2006; Pintrich 2000; Boekaerts 1997; Boekaerts and Niemivirta 2000; Vermunt and Verloop 1999; Pintrich and De Groot 1990).

Self-regulated learning is metacognitively guided, at least partially intrinsically motivated, and to some extent strategic (Zimmerman 2000). A self-regulating university student is aware of his or her general strengths and weaknesses as a learner, able to modify her or his actions when demands change (Butler and Winne 1995; Zimmerman 2000), and able to set goals and evaluate his or her own learning processes. Vermunt (Vermunt and van Rijswijk 1988; Vermunt and Verloop 1999) distinguished self-regulation from external regulation by teachers, by study materials, or by other aspects of the learning environment. Self-regulation seems to be an especially relevant issue in higher education, where external support is limited (Vermunt and Verloop 1999).

Cognitive and attributional strategies among university students

In order to cope with a demanding situation, students need to use a variety of cognitive and behavioral strategies. Students perform a variety of maneuvers to avoid failure or to alter its personal meaning. Self-handicapping and defensive-pessimism are two of the most well-known strategies used to protect self-worth in academic environment (Jones and Berglas 1978; Cantor 1990).

Self-handicappers are afraid of failure and—in order to create excuses for a potential failure—concentrate on task-irrelevant behavior. Such maneuvers provide an attributional cover for the student but, simultaneously, decrease the likelihood of success. The anticipatory self-protective motive differentiates self-handicapping from other kinds of task-irrelevant behaviour (Martin et al. 2003). The consequences of self-handicapping can be seen as either negative or positive—depending on how the consequences are defined. From the perspective of self-worth, self-handicapping is a functional strategy. In university settings, self-handicapping has, however, been shown to be associated with poor study success and a low level of well-being (Jones and Berglas 1978; Eronen et al. 1998; Nurmi et al. 2003).

Students using a defensive-pessimistic strategy have defensively low expectations and they feel very anxious before a performance situation. Unlike self-handicapping students, those who are defensive-pessimistic succeed in harnessing anxiety into action: negative feelings seem to serve as a motivator before a performance situation. Further, when

evaluating outcomes, negative feelings may serve as an attributional cover. However, interesting findings exist about the functionality of the strategy in the university environment: Eronen et al. (1998) showed that at the beginning of studies, a defensive-pessimistic strategy proved to be even more productive than an optimistic strategy. Although a defensive-pessimistic strategy appears to be rather efficient in the university environment, it may have negative consequences for well-being. Eronen et al. (1998) showed that defensive-pessimistic students were less satisfied with their studies than optimistic students.

Users of the optimistic strategy are striving for success. Based on their previous successes, they have high outcome expectations and a desire to enhance an already strong image of competence (Cantor 1990; Norem 1989). These students apply active, task-focused strategies to meet their goals, and attribute their successes positively. Eronen et al. (1998) showed that, in the long run, an optimistic strategy turned out to be the most successful strategy, in terms of both academic achievement and well-being, in the university environment.

What do the three research traditions have in common?

Motivation is a pervasive determinant of behaviour for students of all educational levels. It is assumed that the motivational ground is the factor that separates students from each other. Concepts used in all of the traditions of SAL, SRL, and cognitive and attribution strategies share common basic assumptions, which derive from cognitive psychology. Further, motives are—or motivation is—included in all of the three frameworks. The notion of an approach to learning describes both *what* students do and *why* they do it. In deep approach, the intention is to understand, while in a surface approach, the motive is more instrumental in nature. In a similar fashion, the regulation of learning—or more broadly, metacognition—includes the idea of 'the will and the skill' (Pintrich and De Groot 1990). Case and Gunstone (2002) argue that it is natural that metacognition and approaches to learning should be strongly related to each other. In high quality learning, self-regulatory processes are harnessed to serve students' learning motives, goals, and intentions. Students capable of self-regulation are able to use a variety of strategies regardless of their own motivational ground or task demands (Butler and Winne 1995; Zimmerman 2000). This means, for example, that self-regulating students are able to use their strategies even when they are not intrinsically motivated or when there are distractions in the environment. Students who have regulatory problems, on the other hand, may not have sufficient skills to serve their learning motives. Furthermore, their regulatory strategies may be serving other motives, such as protecting self-worth. Task-irrelevant behaviour as a part of a self-handicapping strategy is a good example of this kind of protective motive (Jones and Berglas 1978).

Similarities and differences between approaches to learning, regulation of learning, and cognitive and attributional strategies, both in terms of constructs and research methodologies, were analyzed in detail in a previous article by Heikkilä and Lonka (2006). They showed that an optimistic strategy was positively related to a deep approach to learning and the self-regulation of learning, and negatively related to a surface approach, external regulation, and problems with regulation. The associations between self-handicapping, approaches, and regulation were the opposite: self-handicapping was positively related to a surface approach, external regulation, and lack of regulation, and negatively to a deep approach and to self-regulation.

The present study

Most of the previous studies have applied a variable-oriented approach, analysing relationships between concepts at the level of variables. We applied a person-oriented approach (see Bergman et al. 2003; Niemivirta 2002) in order to explore what kinds of cognitive-motivational profiles of approaches to learning, regulation of learning, and cognitive and attributional strategies occur naturally among university students. This means that we did not specify a priori criteria for grouping students. However, this does not imply a lack of theoretical support for the grouping. Because of the similarities in the background theories and their constructs, we hypothesized that approaches to learning, regulation of learning, and cognitive and attributional strategies would be interrelated.

Dispositions, approaches, and strategies are presumably associated, not only with each other and with learning outcomes, but also with the general well-being of university students. There has been growing interest in the stress experienced by students in higher education (Robotham and Julian 2006; Law 2007; Schaufeli et al. 2002; Lonka et al. 2008). Lazarus and Folkman (1984) define stress as an imbalance between demands and resources. Not all stress, however, is negative: at its best, stress can have a positive effect, enabling individuals to respond effectively to demanding situations. Unlike stress, exhaustion results in negative outcomes only: it has been shown to be related to physical or mental problems, deterioration of interpersonal relationships, and to the fostering of negative attitudes towards work and others (Law 2007).

Research questions

This study examined the following research questions:

1. What kinds of correlational relations exist between approaches to learning, regulation of learning, and cognitive and attributional strategies?
2. What kinds of cognitive-motivational profiles can be identified among university students?
3. Are there differences in terms of exhaustion and stress among students with differing profiles?
4. Are there differences in study success among students with differing profiles?

Method

Context of the study

Our participants were highly selected university students. In Finland, students are selected through demanding entrance examinations, which are subject-specific. The number of applicants is multiple of the intake. Our participants studied in three differing Faculties. The degree program of the Faculty of Law consists of a single major subject, while there are several major subjects at the faculties of Arts and Agriculture. Even within one faculty, programs differ greatly from each other. Due to the heterogeneity of the environments, we used a general level inventory for all students.

Participants and procedure

Self-report questionnaires were mailed to first-year students in three faculties at the University of Helsinki. First year students were selected in order to examine what kinds of cognitive-motivational profiles students have in the beginning of their studies. The data were collected at the end of the first study year in order to allow the students enough experience of university-level studying, on which to base their responses. Questionnaires were mailed to 890 students and a fully completed questionnaires were received from 437 students (Faculty of Arts $n = 141$, Faculty of Agriculture $n = 141$, Faculty of Law $n = 97$, the response rate 50%). In the Faculty of Agriculture and the Faculty of Law, whole cohorts of first-year students were included in the sample. Due to the large number of students in the faculty of Arts a random sample of students was taken. The age of the students varied from 19 to 49 (Mean 23,00, SD. 4,7), 333 were female, 103 male, 1 did not report gender.

The questionnaires were sent to students about 8 weeks before the end of first study year, together with a covering letter and a post-paid return envelope. Four weeks later a reminder was sent to those who had not returned the questionnaire. It was voluntary to participate and the students were not rewarded for their cooperation.

Measures

Approaches to learning

Students' approaches to learning were assessed with 12 items, based on previous inventories such as ASI (Entwistle and Ramsden 1983) and ILS (Vermunt 1998), but formulated so as to describe what kinds of practices students valued in studying. The items were hypothesized to reflect two types of approaches to studying, a deep approach (e.g., "It is important to try to relate details to a bigger whole"), and a surface approach (e.g., "It is important to memorize new definitions and scientific concepts as literally as possible"). All statements were rated using a Likert-scale ranging from 1 (totally disagree) to 6 (totally agree). A principal axis factor analysis with promax oblique rotation, as implemented in the SPSS v. 15 statistical package, suggested that after removing three items with low communality, three factors (explaining 58% of the total variance) would describe the data better than a two-factor solution (the eigenvalues for these factors were 2.58, 2.04, and 1.21, respectively). Accordingly, items reflecting the importance of understanding loaded on the first factor, items tapping surface approach on the second, and items referring to critical evaluation loaded on the third factor. Based on the obtained structure, we constructed composite scores and labeled them as Deep Understanding, Surface Approach, and Critical Evaluation, respectively. Corresponding reliabilities (Cronbach's alphas) were .74, .65, and .64.

Regulation of learning

Items concerning regulation of learning were adopted from the Inventory of Learning Styles (Vermunt and van Rijswijk 1988). These scales have been widely used and validated in earlier studies in Finland (Lonka and Lindblom-Ylänne 1996; Heikkilä and Lonka 2006). The two-five-item scales intended to assess student's ability to regulate and diagnose their own learning process (self-regulation; e.g., "When I am studying, I also pursue learning goals that have not been set by the teacher but by myself") as well as the problems

that a student may have with regulating learning (problems with self-regulation; e.g., "I notice that I have trouble processing a large amount of subject matter"). Likert-scales ranging from 1 (I seldom or never do this) to 6 (I almost always do this) were used for rating each item. Factor analysis (see above) replicated the hypothesized structure (with two factors explaining 50% of the total variance) and resulted in two clear factors (eigenvalues for these factors were 2.82 and 1.68): the first one included items reflecting active engagement and effective self-regulation, whereas the second one included items referring to study-related difficulties. Based on this, we constructed two composite scales labeled as Self-Regulation and Lack of Regulation. Reliabilities for these scales were .69 and .72, respectively.

Cognitive and attributional strategies

Students' cognitive and attributional strategies were assessed using a Finnish version of the Strategy and Attribution Questionnaire (SAQ; Nurmi et al. 1995). The inventory included 40 items reflecting five different scales: Success Expectations (e.g., "When I go into new situations, I usually expect I will manage."), Task-Irrelevant Behavior (e.g., "If something begins to go wrong with my school work, I quickly disappear to the cafeteria or to some other place."), Social Support (e.g., "I know people who I can get support from."), Reflective Thinking (e.g., "If difficulties arise, it usually helps to think them over."), and Mastery Orientation (e.g., "Careful preparations for an exam leads to good results."). All items are rated with a four-point Likert-scale ranging from 1 (completely disagree) to 4 (completely agree). Principal axis factor analysis with promax oblique rotation was again used for evaluating the structural validity of scales. Based on an iterative procedure, nine items were excluded due to having very low communality (below .20). For the rest of the items, a six-factor solution described the data best explaining 56% of the total variance (eigenvalues for the first six factors were 5.52, 3.94, 2.38, 1.85, 1.74, and 1.37, respectively). Although the hypothesized dimensions of the inventory were not entirely replicated, the current solution referred to constructs similar to the original work. Six composite scales were thus constructed using all items loading .40 or above. Based on the contents, these scales were labeled as Worrying Beforehand (e.g., "I spend a lot of my time thinking about things, especially if there are difficulties."), Seeking Social Support (e.g., "If there are some difficulties, it helps to talk them over with another person."), Success Expectations (e.g., "When I get ready to start a task, I am usually certain that I will succeed in it."), Reflective Thinking (e.g., "If things do not go right, it is best to stop and think."), Task-Irrelevant Behavior (e.g., "What often occurs is that I find something else to do when I have a difficult task in front of me."), and Mastery Orientation (e.g., "How I succeed in my studies depends on chance.", scored in reversed direction). The reliabilities for the resulting scales were .83, .84, .73, .81, .76, and .64, respectively.

Exhaustion

A modified version of the exhaustion scale (Maslach and Jackson 1981) was used for assessing exhaustion. This version has also been applied in MED NORD instrument which is a tool for measuring medical students' study orientations and well-being (Lonka et al. 2008). This six items scale measures Exhaustion in Studying (e.g., "I feel totally exhausted"). The frequency of these symptoms were rated on a five-point Likert-scale ranging from 1 (never) 5 (all the time). The reliability (alpha) for the scale was .80.

Stress

The experience of stress was measured with a single-item measure of stress symptoms (Elo et al. 2003). This measure has first a definition of stress following a question and a rating scale: "Stress means a situation in which person feels tense, restless, nervous or anxious or is unable to sleep at night because his/her mind is troubled all the time. Do you feel this kind of stress these days?" The frequency of stress experiences was rated on a 5-point Likert-scale ranging from 1 (not at all) to 5 (very much).

Data analysis

The structural validity of the scales included was tested by means of a series of factor analyses. Correlations were computed in order to study relations among the scales. Latent class clustering was used for clustering students into homogeneous groups. The configuration of these groups in relation to gender and study track/major/faculty was examined by means of configural frequency analysis. Finally, a series of ANOVAs was conducted to examine between-group differences across the criterion variables.

Results

Correlative relationships

Our first question concerned the relationship between approaches to learning, regulation of learning, and cognitive and attributional strategies. In order to explore the relationships, Pearson correlation coefficients were calculated (Table 1).

Deep Understanding correlated positively with Critical Evaluation and Self-Regulation. Critical Evaluation had positive correlations with Self-Regulation and Success Expectation, indicating an optimistic strategy. Self-Regulation correlated positively with Success Expectations and negatively with both Task-Irrelevant Behavior and Lack of Regulation, while Lack of Regulation correlated negatively with Success Expectations and positively with Task-Irrelevant Behavior. There was a strong negative correlation between Task-Irrelevant Behavior and Success Expectations.

Profiles

Students with similar patterns of approaches to learning, regulation of learning and cognitive and attributional strategies were identified through latent class cluster analysis (LCCA; Vermunt and Magidson 2002). LCCA is a probabilistic or model-based variant of a traditional cluster analysis (Vermunt and Magidson 2002), and aims to identify the smallest number of latent classes or groups that adequately describe the associations among observed continuous variables. Classes are added stepwise until the model optimally fit the data, and statistical criteria such as Bayesian Information Criterion (BIC) are used to evaluate the best-fitting model. Compared to traditional cluster analysis, the advantages of this procedure include a less arbitrary choice of the cluster criterion, a possibility to operate with mixed measurement levels (i.e., different scale types), and a possibility to impose restrictions to the parameters. Note, that although recent simulation and method comparison studies provide evidence supporting the use of LCCA instead of the more traditional clustering methods (Bacher et al. 2004; Magidson and Vermunt 2002),

Table 1 Pearson product moment correlations between approaches to learning, regulation of learning, and cognitive and attributional strategies

	1	2	3	4	5	6	7	8	9	10
1 Deep understanding										
2 Critical evaluation	.37**									
3 Surface approach	.10*	-.07								
4 Self-regulation	.17**	.33**	.01							
5 Lack of regulation	−.05	−.08	.08	−.25**						
6 Success expectations	.07	.12*	.00	.29**	−.40**					
7 Task-irrelevant behavior	.03	−.06	−.02	−.28**	.36**	−.42**				
8 Worrying beforehand	.01	−.03	.16**	−.06	.38**	−.33**	.37**			
9 Mastery orientation	.08	.05	−.02	.09	−.28**	.29**	−.13**	−.13**		
10 Reflective thinking	.23**	.21**	.00	.15*	−.09	.09	−.05	.05	.16**	
11 Seeking social support	.05	.09	−.12**	−.06	−.02	.04	.08	.02	.05	.26**

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

justified criticism directed at the practical value of some of the above advantages and the robustness of LCCA in general have also been presented (Bartholomew et al. 2008; Marsh et al. 2009).

Variables reflecting similar adaptive and maladaptive components of learning activity within each framework were used for the LCCA. That is, Deep Understanding, Critical Evaluation, and Surface Approach from the approaches to learning framework, Self-Regulation and Lack of Regulation from the regulation of learning framework, and Success Expectations and Task-Irrelevant Behaviour from the cognitive strategies framework were included as clustering variables in the analysis. The purpose of this was to examine the extent to which these variables contributed to qualitatively different types of cognitive-motivational student profiles.

The results from a series of LCCAs using Latent Gold statistical software suggested that a three-group solution described the data best. The BIC values (smaller value implying better fit) for one- to four-group solutions were 9362.55, 9186.32, 9167.84, and 9183.43, respectively. The results from ANOVAs on clustering variables show the extent to which each variable differentiated the groups (see Table 2). Figure 1, displaying standardized score mean profiles, illustrates the relative differences between the three groups. The students were relatively equally distributed into the three groups, with 33.9% of the students in the first group ($N = 146$), 34.6% in the second ($N = 151$), and 31.5% in the third group ($N = 138$).

Of all variables, only Surface Approach did not discriminate between the groups ($p = .133$, $\eta_p^2 = .01$). Regarding the other variables, the explained variance was quite substantial, ranging from 16% (Deep Understanding) to 46% (Task-Irrelevant Behavior).

Table 2 Means, standard deviations, and ANOVA results for group differences on approaches to learning, regulation of learning, and cognitive and attributional strategies

Variable	Non-academic $N = 148$		Self-directed $N = 151$		Helpless students $N = 138$		$F(2,434)$	p	η^2
	M	SD	M	SD	M	SD			
Deep understanding	5.50	.57	5.91	.28	5.80	.31	40.49	<.0.001	.16
Critical evaluation	4.73	.66	5.67	.40	5.41	.60	109.67	<.0.001	.34
Surface approach	3.40[a]	.83	3.51[a]	.99	3.61[a]	.84	2.03	NS	.01
Self-regulation	2.92[a]	.61	3.97	.75	3.03[a]	.77	95.96	<.0.001	.31
Lack of regulation	2.76	.68	2.33	.64	3.47	.79	96.75	<.0.001	.31
Success expectations	3.12	.41	3.44	.37	2.66	.50	118.32	<.0.001	.35
Task-irrelevant behavior	1.97	.53	1.71	.42	2.75	.47	186.52	<.0.001	.46
Worrying beforehand	1.95	.57	1.78	.61	2.33	.64	30.77	<.0.001	.12
Mastery orientation	3.70[a]	.32	3.78[a]	.35	3.56	.41	14.73	<.0.001	.06
Reflective thinking	3.32	.54	3.62[a]	.48	3.45[a]	.46	13.90	<.0.001	.06
Seeking social support	3.30[a]	.53	3.38[a]	.63	3.35[a]	.57	.734	NS	.00

Based on the Levene's test, the equality of error variance could only be assumed in Task-irrelevant behaviour, due to which the Games-Howell correction was applied for pairwise comparisons for all other variables. For Task-Irrelevant Behaviour, Bonferroni's correction was used. Means within a row sharing the same subscripts are not significantly different at the $p < 0.05$ level

Pairwise comparisons, however, suggest variation in the patterns of differences across the groups. All groups differed significantly from each other on Critical Evaluation, Lack of Regulation, Success Expectations, and, Task-Irrelevant Behavior, but not on Self-Regulation, in relation to which group 1 did not differ from group 3. Interestingly, group 3 displayed low scores on Critical Evaluation, Deep Understanding, and Self-Regulation, but not so on Success Expectations. Then again, students in group 3 scored high on Lack of Regulation and Task-Irrelevant Behavior and low on Self-Regulation, yet, their scores on Critical Evaluation and Deep Understanding were average. While group 2 had a very adaptive profile altogether, it would seem that groups 1 and 3 represented two different types of maladaptive profiles. The three groups were labeled, according to the score mean profiles, as (1) non-academic students, consisting of 148 students (34% of the sample) (2) self-directed students ($n = 151$, 35% of the sample), and (3) helpless students ($n = 138$ students, 32% of the sample) (see Fig. 1).

Next, we looked at the group configuration in relation to gender and faculty membership. This was done using Configural Frequency Analysis, which is a robust method for examining the patterning of frequencies by cell-wise comparison of observed frequencies against the expected ones (von Eye 1990). An observed frequency significantly larger than expected is flagged as a "type", and an observed frequency significantly smaller than expected is flagged as an "antitype". The chi-square for group configuration by gender was 10.88, which is statistically significant ($p = .004$). However, only one cell was flagged as an "antitype". The number of males in helpless students was somewhat lower ($p = .008$) than expected by chance alone. Regarding the relationship between faculty membership and cognitive-motivational profile, the overall chi-square was significant (χ^2 [4, 437] = 20.05, $p = .001$), which was mostly explained by one statistically significant deviation from the expected frequency; In the non-academic group, there were less students from the Faculty of Arts than expected by chance alone ($p = .005$).

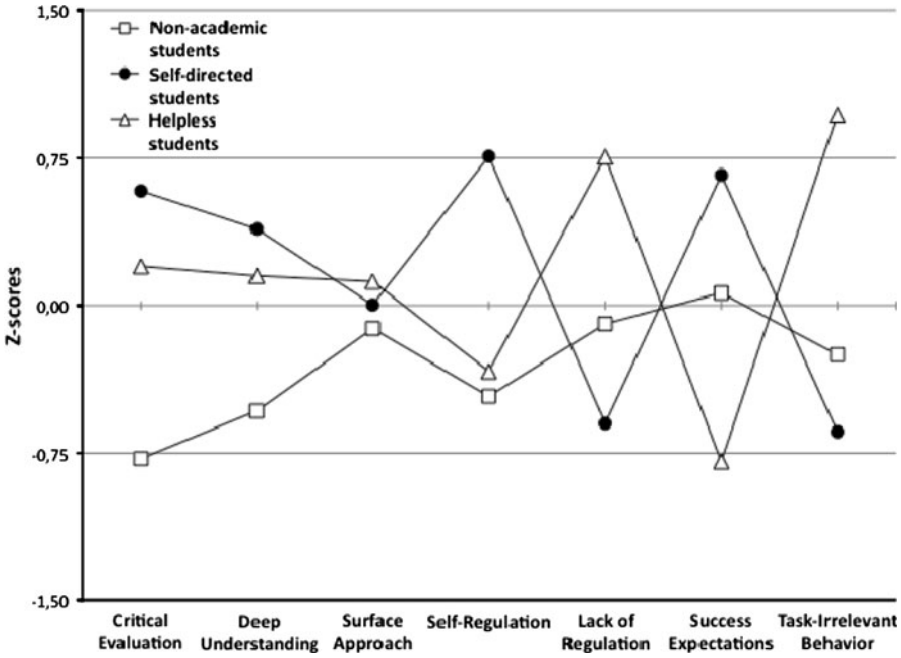

Fig. 1 Cognitive-motivational profiles (standardized mean scores) of the three groups

Finally, we performed a series on ANOVAs with cognitive-motivational profiles as an independent factor and all the other variables of interest as dependent variables. First, for validation purposes, we looked at group differences in relation to the cognitive-motivational variables that were not included in the clustering procedure. Accordingly, we found significant overall effects for Worrying beforehand, Mastery Orientation, and Reflective Thinking, but not for Seeking Social Support (see Table 2). The pairwise comparison revealed that regarding Worrying beforehand, all groups differed from each other so that the helpless students scored highest, followed by non-academic and self-directed students, respectively. In relation to Reflective Thinking, self-directed group had higher scores than the helpless and non-academic groups, which did not differ from each other. Finally, with respect to Mastery Orientation, self-directed and non-academic students did not differ from each other, but they both reported higher levels of control than the helpless students did.

Next, we examined group differences in relation to stress and exhaustion. The main effects were significant both for stress [$F(2, 436) = 14.70$, $p < 0.001$] $\eta^2 = 0.06$ and exhaustion [$F(2, 436) = 33.6\, p < 0.001$] $\eta^2 = 0.13$. Pairwise comparisons showed that the helpless students reported higher levels of stress and exhaustion than either non-academic or self-directed students, which, in turn, did not differ from each other.

Our fourth aim was to examine whether there were differences between the groups in study success. Study success was assessed with grade point average (GPA) and accumulation of credits. The main effect was significant for GPA [$F(2, 325) = 9{,}5$, $p = 0.001$] $\eta^2 = .06$, and only marginally significant for the accumulation of credits [$F(2, 333) = 3{,}0$ $p = 0.051$] $\eta^2 = .02$. Compared to non-academic and helpless students, the self-directed students had significantly higher GPA, but regarding the accumulation of credits, the self-

Table 3 Means, standard deviations and ANOVA results on stress, exhaustion and academic performance

	Non-academic students		Self-directed students		Helpless students		$F(2,434)$	p	η^2
	M	SD	*M*	SD	*M*	SD			
Stress	2.64[a]	.94	2.62[a]	1.02	3.18	1.02	14.70	<.0.001	.06
Exhaustion	2.45	.61	2.32	.65	2.94	.72	33.64	<.0.001	.13
GPA	2.11[a]	.35	2.29	.32	2.14[a]	.33	9.52	<.0.001	.06
Accumulation of credits	29.23[a]	11.74	32.28[a]	13.45	28.95[a]	12.12	3.01	NS	.02

Based on the Levene's test, the equality of error variance could be assumed in GPA, Accumulation of credits due to which the Games-Howell correction was applied for pairwise comparisons for Exhaustion, For GPA and Accumulation of credits Bonferroni's correction was used. Means within a row sharing the same subscripts are not significantly different at the $p < 0.05$ level

directed students differed (marginally, $p = .069$) only from the non-academic students. All above findings are summarized in Table 3.

Discussion

The aims of this study were, firstly, to explore how approaches to learning, regulation of learning, and cognitive strategies are related to each other, and, secondly, to examine what kinds cognitive-motivational profiles can be identified among university students. The results supported our assumptions and previous findings (Heikkilä and Lonka 2006): Critical Evaluation and Deep Understanding were related to the Self-Regulation of Learning and to Success Expectations. In the person-oriented analysis, three groups of students with differing cognitive-motivational profiles were indentified: non-academic, self-directed, and helpless students. These groups differed from each other in well-being and in study success.

The profile '*Non-academic students*' (34%) was the most surprising of the three. Students in this group had the lowest scores on Deep Understanding, Critical Evaluation, Surface Approach and Self-Regulation of Learning, while showing average scores on Success Expectations and Task-Irrelevant Behavior. The profile was somewhat difficult to name, unlike the other two which were quite easy to interpret. We named the profile *non-academic*, since these students demonstrated hardly any critical evaluation or deep understanding, and also showed low levels of self-regulation. These students did not seem to be distressed, either: non-academic students did not differ from self-directed students in stress and exhaustion. Even though there were no statistically significant differences between the groups in the measures of well-being, there was an interesting difference in exhaustion: non-academic students had equal ratings with self-directed students' on stress, but their scores on exhaustion were higher than those of self-directed students'. It may be that these students did not suffer from negative stress but did not benefit from positive stress either, while still experiencing some negative effects of exhaustion.

Non-academic students' study success, in terms of GPA and accumulation of credits, did not differ from the other groups. This is an intriguing finding: even though these students did not express elements that are usually associated with academic success—such as deep understanding, critical evaluation, and self-regulation—their study success was similar to that of the other groups. Mäkinen et al. (2004) showed that work-life oriented

studying was related with a fast progress of studies, but not necessarily with good grades. One possible explanation for our findings could be that the motivational ground of these students is instrumental. We did not, however, measure this form of motivation in the present study.

The profile of *'Self-directed students'* (35%) was characterized by high levels of Self-Regulation of learning, Success Expectations, Deep Understanding, Critical Evaluation, and low levels of Lack of Regulation and Task-Irrelevant Behaviour. Self-directed students were the most successful in terms of GPA, and they reported the lowest levels of exhaustion and stress. Our findings were in line with some earlier ones: self-directed students' profile resembles the optimistic strategy, which has shown to be related with general well-being and study success (Eronen et al. 1998; Nurmi et al. 2003). Earlier studies have demonstrated the relationship between deep approach and the tendency to self-regulate (Heikkilä & Lonka 2006; Vermunt 1998; Lonka and Lindblom-Ylänne 1996; Vermetten et al. 1999). In a meta-analysis, Watkins (2001) showed a positive correlation (average .30) between deep approach and self-esteem. Pintrich and colleagues (Pintrich and De Groot 1990) results showed that self-efficacy for learning was the strongest predictor of final grades. Bandura (1997) has argued that in demanding situations, students with strong self-efficacy beliefs set high goals, exert effort, and persist with academic tasks. Findings from research on achievement goal orientation indicate that students' goals are linked, not only with emotions and cognitions contributing to effective learning, but also with those related to well-being (Kaplan and Maehr 1999). Finally, Tuominen-Soini et al. (2008) showed that mastery-oriented students had relatively high levels of both academic achievement and subjective well-being. Our results support all of those findings, despite the variation in the conceptualizations of differing lines of research.

Recently, the concept of study engagement has been introduced, defined as vigor, dedication, and absorption (Schaufeli et al. 2002). It is possible that self-directed students experience such a positive, fulfilling state of mind, and do not suffer from the opposite end of the continuum, study burnout, which has been shown to correlate negatively with study engagement (Salmela-Aro et al. 2009).

'Helpless students' (32%) expressed high levels of Lack of Regulation and Task-Irrelevant Behavior, moderate levels of Surface Approach, and low levels of Success Expectations and Self-Regulation of learning. Students belonging to this group reported the highest levels of exhaustion and stress. They had the lowest GPA and had achieved the smallest amount of credits. Helpless students' profile resembles the self-handicapping strategy (Eronen et al. 1998) coupled with problems in the regulation of learning. Previous studies have shown a relationship between self-handicapping, poor study success, and poor study satisfaction (Eronen et al. 1998; Nurmi et al. 1995; Norem and Cantor 1986). Our findings support those results. There are several possible explanations for the emergence of this group. One such factor might be a poor fit between the demands of the academic environment and students' expectancies or capabilities, such as study skills.

Volet (2001) and Boekaerts (2001) pointed out that the context of studying and the subject domain are closely related to motivational and affective factors. Our results, however, showed that students from three different faculties, namely humanities, law, and agriculture and forestry, were distributed equally to the three cognitive motivational groups. This may imply that that there are no systematic differences along faculty lines—at least not at the kind of general cognitive-motivational level, which was examined in the present study.

Our results showed that two-thirds of the participants expressed some kind of maladaptive cognitive-motivational profile. Despite of that quite unfortunate finding, we believe that our results are fairly generalizable to Finnish university students. Earlier

studies concerning motivational orientations have shown that a typical Finnish secondary school student "does acknowledge the goal of mastering school subjects and the importance of grades, but is somewhat reluctant to invest in the attainment of those goals" (Tuominen-Soini et al. 2008, p. 260). Such students do not seem to undergo serious psychological distress either (Tuominen-Soini et al. 2008). Such an attitude resembles the 'Non-academic students' profile. However, these results may tell more about our educational system than about individual students in our study. Since much of the teaching at the beginning of university studies is provided in the form of mass-lectures, students are not required to engage themselves personally in learning and may thus miss positive feelings of study engagement. In line with our findings, there are problems with flow-through in Finnish higher education (Statistics Finland 2007). As our first year students' cognitive-motivational profiles are far from optimal, it is understandable that far too many students do not graduate in time.

Conclusions

The present study contributes both to current research on student learning in higher education and to a conceptual discussion in the field of educational psychology. We believe, in line with Richardsson (2007), that "the relationship between students' motives and attitudes, conceptualised from the SRL perspective, and their study behaviour, conceptualised from the SAL perspective, is an empirical matter, not a conceptual one" (p. 386). Researchers have argued (i.e., Pintrich 2004; Heikkilä and Lonka 2006) that elements of students' strategies of monitoring and regulating their cognitions and motivation, should be included in conceptual models, and measurement instruments, of student learning. Entwistle and McCune (2004) point out a surprising lack of emphasis on emotions in inventories of student learning. Our findings indicate that cognitive-emotional aspects should not be ignored when investigating students' learning.

We applied a person-oriented approach in order to study individual profiles, instead of relationships among variables. This approach allowed us to identify the number of individuals characterized by different cognitive-motivational profiles. In our analyses we did not specify a priori criteria for grouping students. We did, however, have theoretical support for the grouping: the classification provides support for the theory. We were able both to validly extract groups of students sharing similar tendencies, and to demonstrate some important differences in these students' well-being and study success.

The study was a traditional one in the sense that it was individually oriented and focussed on the participants' beliefs and other discursive entities rather than their actual practices. When using self-report questionnaires we measure aptitudes: items require the respondents to generalize their actions across multiple situations rather than referencing singular and specific learning situations. However, the general believes and conceptions were shown to be related to students' actual academic achievement. Future research should, however, employ designs which would enable us to understand the relationships between predispositions and actual study practices.

The present study was correlative in nature, and we cannot draw conclusions about causality between the measured elements. In order to understand the developmental trends and causal relations, we need to engage in longitudinal studies. One promising line of research might be to study these phenomena in action by using the Contextual Activity Sampling System (CASS, Muukkonen et al. 2007), which provides tools for the analysis and modeling of within-person changes across time.

Perhaps the most important educational implication of the present study is that it reminds educators about the variation that exists among students in higher education. Even in a highly selected population of university students, there are those whose cognitive-motivational mindset is not optimal. Obstacles in tertiary studies may result from a number of issues: concerns with one's own competence, insufficient study skills, lack of appropriate goals, and emotional exhaustion.

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