



**The diversity of commitment  
in academic learning environments:  
a person-oriented approach**

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<p>Tiivistelmä – Abstrakt – Abstract</p> <p>Sisäänpääsy akateemisiin opintoihin ei johda automaattisesti sitoutumiseen opinnoissa. Opiskelijoiden sitoutumisessa saattaa olla eroja oppimisympäristöittäin. Tässä tutkimuksessa tutkittiin lääketieteen opiskelijoiden kokemien opiskeluongelmien yhdistelmiä luentoperustaisessa oppimisympäristössä (<math>n = 246</math>) ja ongelmalähtöisessä oppimisympäristössä (<math>n = 231</math>). Lisäksi tutkittiin näiden yhdistelmien välisiä eroja tehtävänvälttelyssä ja akateemisessa suoriutumisessa kussakin oppimisympäristössä. Lääketieteen opiskelijat luokiteltiin oppimisympäristöittäin henkilöittäin suoritettavan K-keskiarvoklusterianalyysin avulla ryhmiin seuraavien muuttujien perustalta: uupumus, itsesäätelyn puute, kiinnostuksen puute ja distressi. Luentoperustaisessa oppimisympäristössä lääketieteen opiskelijoiden keskuudesta löydettiin kolme sitoutumisen ryhmää: sitoutuneet, huolettomat ja huonosti sitoutuneet opiskelijat. Nämä profiilit olivat yhteydessä tehtävänvälttelyyn, mutta eivät opintomenestykseen. Sitoutuneet opiskelijat ilmaisivat vähemmän tehtävänvälttelyä kuin huolettomat opiskelijat ja huonosti sitoutuneet opiskelijat. Jälkimmäiset kaksi lääketieteen opiskelijoiden ryhmää eivät eronneet toisistaan tässä tapauksessa. Myös ongelmalähtöisessä oppimisympäristössä lääketieteen opiskelijoiden keskuudesta löydettiin kolme sitoutumisen ryhmää: sitoutuneet, sitoutuneet huolettomat ja huonosti sitoutuneet opiskelijat. Nämä profiilit olivat yhteydessä tehtävänvälttelyyn ja opintomenestykseen. Huonosti sitoutuneet opiskelijat ilmaisivat enemmän tehtävänvälttelyä kuin sitoutuneet huolettomat opiskelijat ja sitoutuneet opiskelijat. Jälkimmäiset kaksi lääketieteen opiskelijoiden ryhmää eivät eronneet toisistaan tässä tapauksessa. Sitoutuneet opiskelijat ja sitoutuneet huolettomat opiskelijat saivat parempia arvosanoja kuin huonosti sitoutuneet opiskelijat. Edeltävät kaksi lääketieteen opiskelijoiden ryhmää eivät kuitenkaan eronneet toisistaan tässä tapauksessa. Lopuksi käsitellään seuraamuksia tutkimukselle.</p>	
<p>Avainsanat – Nyckelord – Keywords</p> <p>lääketiede, oppimisympäristö, ongelmalähtöinen oppiminen, uupumus, itsesäätely, kiinnostus, stressi, sitoutuminen, motivaatio, opintomenestys, klusterianalyysi</p>	
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# **The diversity of commitment in academic learning environments: a person-oriented approach**

Entrance to academic studies does not automatically lead to commitment in one's studies. There may be differences in student commitment across different learning environments. In the present study, combinations of problems in studying medical students experience were investigated in a lecture-based learning environment ( $n = 246$ ) and in a problem-based learning environment ( $n = 231$ ). Also differences between the combinations in task avoidance and differences between the combinations in academic achievement were investigated in each learning environment. Medical students were classified in different learning environments by K-means cluster analysis by cases into groups based on the following variables: exhaustion, lack of self-regulation, lack of interest and distress. Three groups of commitment among medical students were identified in the lecture-based learning environment: committed, carefree and dysfunctional students. The profiles were related to task avoidance but not to study success. The committed students expressed less task avoidance than the carefree students and the dysfunctional students. The latter two groups of medical students did not differ from each other in this case. Also three groups of commitment among medical students were identified in the problem-based learning environment: committed, committed carefree and dysfunctional students. The profiles were related to task avoidance and study success. The dysfunctional students expressed more task avoidance than the committed carefree students and the committed students. The latter two groups of medical students did not differ from each other in this case. The committed students and the committed carefree students gained better grades than the dysfunctional students. However, the former two groups of medical students did not differ from each other in this case. The implications of the study for research are discussed.

## **Introduction**

Entrance to academic studies does not automatically lead to commitment in one's studies. University students experience their learning environment in a variety of ways. The learning environment in medicine play an important role in how students experience studying, and how they approach to it motivationally. Even well-motivated and successful students may experience higher levels of problems in studying (Heikkilä, Lonka, Nieminen & Niemivirta, 2012; Ketonen & Lonka, 2013; Litmanen, Loyens, Sjöblom & Lonka, 2014; cf. Ketonen et al., 2016).

In this research we focused on problems in studying in terms of four different research branches: exhaustion, lack of self-regulation, lack of interest and distress. Some of these branches have been recently applied in explaining well-being and motivation in medical education (Litmanen et al., 2014; see also Ketonen et al., 2016). However, not much is known about their relations in different medical learning environments. In this study we explored the relations between these branches among medical students in a lecture-based and in a problem-based medical learning environment (Albanese & Mitchell, 1993; Schmidt, 1983). Also relations with task avoidance and study success were looked at.

## **Problems in studying**

### *Exhaustion*

Exhaustion relates to depleted emotional resources and the experience of not being able to give of oneself at a psychological level (Maslach & Jackson, 1981). It is a condition in which emotional resources have been depleted as a result of stressful working conditions and individuals feel incapable of meeting study demands (Law, 2007). Emotional exhaustion is an experience of strain resulting from an overtaxing of study load (Schaufeli, Martinez, Pinto, Salanova & Bakker, 2002). It is conceived particular work-related adverse reactions to a pressing and demanding environment culminating in decreased effectiveness at studies such as poor performance (Dahlin & Runeson, 2007; Law, 2007; Maslach & Jackson, 1981; Schaufeli et al., 2002).

Emotional exhaustion is related but separate aspect of student burnout. It has been shown to be associated with mental problems, fostering of negative attitudes towards working and related to deterioration of interpersonal relationships in university (Law, 2007). Since burnout develops over time a burnout syndrome is not expected to be frequent among students, rather in the beginning of their professional path (Dahlin, 2007; Dahlin, Fjell & Runeson, 2010).

In examining exhaustion several studies (e.g. Dahlin, Joneborg & Runeson, 2007; Dahlin & Runeson, 2007; Guthrie et al., 1998) have mainly concentrated on the stages of

education instead of different learning environments. However, it has been tentatively found that a reasonable amount of experienced exhaustion may be a sign of commitment in the problem-based learning environment (Ketonen & Lonka, 2013; Litmanen et al., 2014; cf. Ketonen et al., 2016). It has been also found that the experience of high exhaustion may not be typical for all less committed groups of students (Heikkilä et al., 2012; Heikkilä, Niemivirta, Nieminen & Lonka, 2011; Räisänen, Postareff & Lindblom-Ylänne, 2016; cf. Ketonen et al., 2016).

### *Lack of self-regulation*

Self-regulated students are characterized as active self-aware learners regulating their own learning processes in several ways to direct the processing of subject matter (Hacker, Dunlosky & Graesser, 2009; Schunk & Zimmerman, 1994; Vermunt, 1998; Vermunt & Verloop, 1999). However, according to previous research (Heikkilä, 2011; Ketonen et al., 2016; Ketonen & Lonka, 2013; Olkinuora, Virtanen & Mikkilä-Erdmann, 2010; Räisänen et al., 2016) even highly selected university students are not all capable of self-regulating learning reflecting lower commitment.

There are three positions on the student's self-regulation continuum in general (Räisänen et al., 2016; Vermunt & Verloop, 1999). 1) Students with high degree of self-regulation master a learning activity well; they use it skillfully in the domain, on their own initiative. 2) Students with intermediate degree of self-regulation either master a learning activity with limitations or they master it well but do not use it skillfully in the subject domain, spontaneously or in the right situations. 3) Students with low degree of self-regulation do not master nor use specific learning activity.

Three main regulation strategies complementary to each other is consistently observed (Olkinuora et al., 2010; Räisänen et al., 2016; Vermunt & Vermetten, 2004): 1) self-regulated strategies, in which students perform regulation themselves, 2) an externally regulated strategy, in which students let learning be regulated by some other agent and 3) lack of self-regulation, in which students are unable to regulate themselves and experience insufficient hold from the agents of external regulation.

Lack of self-regulation may be related to lower grades (Heikkilä & Lonka, 2006) indicating problems of studying one can have with the regulation of the processing of subject matter. It means that a student is not able to set task-related goals, to set reasonable goals and to be responsible for studying (Vermunt & van Rijswijk, 1988). It means monitoring difficulties with the regulation of student's study processes (Vermunt & van Rijswijk, 1988; Vermunt, 1998; Vermunt & Vermetten, 2004; Vermunt, 2005): the students do not find it clear what they have to understand, they experience insufficient hold on the regulating elements and they find it difficult to evaluate whether they master the subject matter.

Previous research has shown growing interest in different learning environments in studying self-regulation (Roth, Ogrin & Schmitz, 2016). Average scores on lack of self-regulation may be related to lower or higher (Ketonen & Lonka, 2013) commitment depending on the learning environment.

#### *Lack of interest*

Several students whose meaning for studying is ambiguous gain access to university. These students have often difficulties in following the typical course of studying and, therefore, possess a risk of dropping out (Mäkinen, 2003a). This kind of experience does not develop only prior to studying but in the dynamic interaction between the student and the learning environment (Mäkinen, Olkinuora & Lonka, 2004; cf also Lonka, Olkinuora & Mäkinen, 2004).

Lack of interest refers to the general personal meaning given to the studies in university (Mäkinen et al., 2004). It refers to the lack of the most common way in experiencing the meaning of one's studies (Mäkinen, 2003b). Lack of interest is an indication of the missing basic meaning of studies. It refers to students' perceptions concerning the meaning of their studies and how students see the meaning of their studies when meaning is missing and there is no central interest. From the practical point of view students might ask themselves questions like "Is there any important aspects of studying to me?", "Is there any meaning

in my studies?”, and also “Is there any role of studying in my life?” (Mäkinen, Olkinuora & Lonka, 2002).

In measuring lack of interest the emphasis is on analyzing students’ underlying general motivational experience. It is measured by The Inventory of General Study Orientations (IGSO) that is mainly constructed to investigate general level and person-centered issues. It refers to the intention to analyze whether students see the meaning in their university studies as a whole: to a general motivational problem of subject-interest (Mäkinen et al., 2004) which can be related to lowest grades (Litmanen et al., 2014; Mäkinen, 2003a).

Committed students do not lack interest in studying (Ketonen et al., 2016; Ketonen & Lonka, 2013; Kusrkar, Croiset, Galindo-Garre´ & Ten Cate, 2013; Mäkinen et al., 2004; Olkinuora et al., 2010). These students do not have difficulties seeing meaning in studies or in clarifying the meaning of studying (Mäkinen, 2003b) like the less committed. Even though lack of interest may not differ between medical students in the lecture-based learning environment and medical students in the problem-based learning environment in general (Litmanen et al., 2014) a closer look to these learning environments can reveal something else. Somewhat low level of experienced lack of interest may be both, a sign of lower commitment (Heikkilä et al., 2012) in the lecture-based learning environment and a sign of higher commitment (Ketonen et al., 2016) in the problem-based learning environment.

### *Distress*

Psychological distress is an unpleasant emotional or mental experience which often impairs the experience to commit in studying (Mehta, Kaur, Girgla, Kaur & Kaur., 2015). It describes a range of experiences and symptoms of one’s internal life that are commonly held to be out of the ordinary, confusing or troubling. It is concerning if it diminishes studying.

The experience of distress stems from academic pressure which lies between the student and the learning environment. Distress is an imbalance between individual needs and



environmental supply and between individual motives and abilities and environmental demands (Elo, Leppänen & Jahkola, 2003). It is the result of a student's perception that one does not have the study resources to cope with a perceived study situation from the present, past or future of studies (Robotham, 2008; Robotham & Julian, 2006).

Stress is a multidimensional concept of study with different types of stress (Robotham, 2008; Robotham & Julian, 2006): negative experience of stress and positive experience of stress. The positive experience of stress can lead to distress, the negative experience of stress, having a negative impact on studying (Dahlin, Joneborg & Runeson, 2005).

Medical students' distress during their studies (e.g. Dahlin et al., 2005; Mehta et al., 2015; Niemi & Vainiomäki, 2006) has given rise to concern of whether distress is caused by the medical learning environment over the long period of education and how medical students' distress affects their studying (Firth-Cozens, 2001; Niemi & Vainiomäki, 2006). Both, lecture-based and problem-based learning environments may turn out to be stressful (Kiessling, Schubert, Scheffner & Burger, 2004; Moffat, McConnachie, Ross & Morrison, 2004; Niemi & Vainiomäki, 2006). The amount of experienced distress may also vary according to the learning environment (Mehta et al., 2015; Moffat et al., 2004). Students especially in the problem-based learning environment may feel uncertain what is expected of them by the faculty and experience the curriculum as unclear (Lewis et al., 2009).

Distress may also have a positive effect on studying enabling students to respond effectively into demanding learning conditions. Little or reasonable amount of distress is an essential part of studying and can serve as a motivator for some students (Adams, 2004; Mehta, et al., 2015; Moffat et al., 2004; Robotham, 2008). However, not all students find distress constructive. Distress associated with hindrances may have a negative relationship with the performance, whereas distress associated with challenging tasks may have a positive relationship with the performance (LePine, LePine & Jackson, 2004). Also, too much experienced distress may weaken the performance, and low levels of distress may be related to the best grades (Kember & Leung, 2006).

A reasonable amount of distress may be a sign of higher commitment (Kember & Leung, 2006; Litmanen, Hirsto & Lonka, 2010). Both, higher commitment and lower commitment

may reflect the experience of distress of the same kind (Ketonen & Lonka, 2013; Litmanen et al., 2010).

### **Task avoidance**

There are different ways university students approach to challenges in studying (Eronen, Nurmi & Salmela-Aro, 1998; Nurmi, Aunola, Salmela-Aro & Lindroos, 2003). Some university students seek to avoid challenges rather than make an effort to deal with them. Students use a task avoidant strategy when facing the prospect of failure (Nurmi et al., 2003). It provides students with an attributional cover. Other university students use more task-focused strategy when they are faced with challenges.

Task avoidance is a motivational thinking strategy of academic achievement situations. It relates to such task-irrelevant behavior which measures the extent to which a student tends to behave in a way that prevents him or her from carrying out the task to be done (Eronen et al., 1998). The task avoidance scale measures the extent to which a student tends to behave in rather preventive ways than helpful ways in carrying out the task (Nurmi, et al., 2003).

Task avoidance is a conceptual tool for describing different groups of students with different task avoidant and task focused orientations (Mäkinen & Olkinuora, 2004; Olkinuora & Mäkinen, 1999) and strategies (Nurmi et al., 2003). Task-oriented students use task-focused strategies when facing challenges (Mäkinen & Olkinuora, 2004). They experience tasks as positive challenges and are intrinsically motivated. Negative experiences do not seem to be a problem for them as long as they are not self-fulfilling prophecies (Nurmi et al., 2003).

Several group profiles have been found in which task avoidance plays a key role (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen & Lonka, 2013). It has been a core concept in defining commitment and well-motivated students.

## **The present study**

The main objective of the present study was to form combinations of problems in studying medical students experience in different learning environments following a person-oriented approach. Not much is known whether there are several group profiles of problems in studying among medical students in each of their learning environments and whether these group profiles contribute to task avoidance or grades the students have reported. For that purpose, this chapter specifies the goals and the research questions of the present study.

### *The goals of the study*

Our first goal was to indicate how various dimensions of problems in studying (exhaustion, lack of self-regulation, lack of interest and distress) are related to each other among medical students in a variable-centered way.

Our second goal was to investigate whether there are several differently functioning groups of medical students in terms of problems in studying using person-centered methods. Relations between the groups and task avoidance and reported grades were also looked at.

Both goals were applied in both learning environments separately (in the lecture-based learning environment and in the problem-based learning environment) and in order to take a closer look at the person-oriented approach in this study.

### *The research questions*

Consequently, the following research questions were investigated in both learning environments separately in the present study:

1. Are medical students' exhaustion, lack of self-regulation, lack of interest and distress related to each other?
2. What kinds of combinations of problems in studying medical students experience?

3. Are there differences in terms of task avoidance among groups of medical students with different profiles?
4. Are there differences in terms of reported grades among groups of medical students with different profiles?

We assumed that exhaustion, lack of self-regulation, lack of interest and distress would be related to each other in the lecture-based learning environment and in the problem-based learning environment (Lonka, et al., 2008; Ketonen et al., 2016; Ketonen & Lonka, 2013). Therefore, we expected to find groups of medical students who would experience all of these in a variety of ways including their relations to task avoidance and reported grades in each learning environment (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016; Ketonen & Lonka, 2013).

## **Methods**

### *Contexts of the study*

In Finland medical students constitute a highly selected group. Entry to the field is through an entrance examination, and about 10 – 15 % are admitted from those who participate in the examination. Education is six years in duration and it is carried out in altogether five lecture-based and problem-based learning environments. Our study was carried out in two of them: in one lecture-based and in one problem-based learning environment.

In lecture-based learning environments knowledge domains acquired through medical education are often studied in isolation from one another. Teaching medicine comes down to the transmission of knowledge from an external source to the student.

In problem-based learning environments problem-based learning is a pedagogical learner-centered approach. It is intended to empower students to conduct research and apply their knowledge and skills to construct or build a viable solution to a problem given by the teacher. In problem-based learning students learn through problem-solving that centers on a complex problem not having a single correct answer. They study in groups to identify what they are supposed to learn in order to solve a problem and apply new knowledge to

the problem (Hmelo-Silver, 2004). As many other student-centered methods (Loyens & Rikers, 2011; Struyven, Dochy & Janssens, 2010; Vermunt, 2007) problem-based learning requires active involvement of the students and is based on student's group work.

In the problem-based learning environment of our study the problem-based period was implemented for the pre-clinical phase of studies i.e. the first two years of medical studies. The active involvement and group work of students was supported by lectures during this period.

### *Participants*

The participants were students who studied medicine either in a lecture-based learning environment or in a problem-based learning environment. The number of participants was 247 students in the lecture-based learning environment and 231 students in the problem-based learning environment. The sample of this study was not randomly selected. Women were overrepresented in both learning environments. There were 71 % women and 29 % men in the lecture-based learning environment and 70 % women and 30 % men in the problem-based learning environment. The ages ranged from 20 to 43 years old (mean = 23, 84, SD = 3, 73) in the lecture-based learning environment and from 19 to 39 years (mean = 24, 74, SD = 2, 97) in the problem-based learning environment.

### *Procedures*

Data for this study was gathered with the MED NORD (Medical Education in Nordic Countries) (Lonka, et al., 2008) self-report questionnaire. MED NORD has been comprised of scales measuring different theoretical constructs that have previously shown good reliability and predictive value (Litmanen et al., 2014; Lonka, et al., 2008). The questionnaire was sent to the home addresses of medical students during the spring term 2006. The participants were informed that the present study focused on investigating students' views on learning and studying. The questionnaire included 133 items and a background information section taking about thirty minutes to complete. Participation to

the research was voluntary and responses were treated anonymously. According to a ratio of the frequency of the average starting year of the studies and university archives' information about the quota of yearly intake the response percentages were 61% (n = 247) of medical students in the lecture-based learning environment and 73% (n = 231) in the problem-based learning environment. The participants were informed that by returning the questionnaire they would receive a voucher for a movie ticket as a reward.

### *Materials*

The MED NORD (Lonka, et al., 2008) questionnaire was designed to measure aspects related to university students' well-being and motivation. The students had described their modes of well-being and motivation by answering Likert-type questions, presented to them in the MED NORD –questionnaire. Medical students rated several statements concerning exhaustion, lack of self-regulation, lack of interest and distress on a five point scale, and statements concerning task avoidance on a six point scale. Each of these Likert-type items asked the medical student how strongly one agreed or disagreed with a statement. Ten statements concerning problems of studying (Lonka, et al., 2008) consisted of four scales: exhaustion (Maslach & Jackson, 1981), lack of self-regulation (Vermunt & Van Rijswijk, 1988), lack of interest (Mäkinen et al., 2004) and distress (Elo et al., 2003). Five statements consisted of task avoidance (Nurmi, Salmela-Aro & Haavisto, 1995).

Altogether, the following six scales were used:

- *Exhaustion* that relates to depleted emotional resources and the experience of not being able to give of oneself at a psychological level. For example: “I feel like I’m at the end of my rope.”
- *Lack of self-regulation* that indicates problems of studying one can have with the regulation of the processing of subject matter. For example: “I notice that I have trouble processing a large amount of subject matter.”
- *Lack of interest* that refers to the general personal meaning given to the studies in university. For example: “The contents of my studies do not interest me.”

- *Distress* that is an imbalance between individual needs and environmental supply and between individual motives and abilities and environmental demands. For example: “Stress means a situation in which a 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?”
- *Task avoidance* that relates to such task-irrelevant behavior which measures the extent to which a student tends to behave in a way that prevents him or her from carrying out the task to be done. For example: “What often occurs is that I find something else to do when I have a difficult task in front of me.”
- *Reported grades* that measures how the student sees oneself progressing in studies. The students were asked to indicate whether their typical grade was “worse than the average”, “the same as the average” or “better than the average”. These options were coded to “1”, “2” and “3” correspondingly. In a previous study (Nieminen, 2011) the correlation between GPA and this variable was .63.

### *Scales and reliabilities*

Measurement reliability is a prerequisite for validity. Any values of coefficient alpha below .6 are regarded as poor by conventional psychometric criteria (Richardson, 2004).

Means and Cronbach alphas were calculated for different scales. Number of items, internal consistency (Cronbach’s Alpha), and scale means, standard deviations and minimum and maximum scores are presented in Table 1 and in Table 2.

The results showed that the reliability was good or satisfactory for each scale (Nunnally, 1978).

Table 1. The reliabilities of the scales: number of items, internal consistency (Cronbach alpha), scale means, standard deviations and minimum and maximum values per scale in the lecture-based learning environment ( $n = 246$ ).

Scales	<i>n</i> of items	Alpha	Mean values	SD	Min – Max
<i>Problems in studying</i>					
Exhaustion	4	0.83	2.59	0.84	1.00 – 5.00
Lack of regulation	3	0.67	2.84	0.86	
Lack of interest	2	0.70	1.76	0.80	
Distress	1	-	2.69	1.05	
<i>Strategy and attribution</i>					
Task avoidance	5	0.74	3.13	0.76	1.00 – 4.60

Note: Maximum score was 5 for problems in studying and 6 for task avoidance.

Table 2. The reliabilities of the scales: number of items, internal consistency (Cronbach alpha), scale means, standard deviations and minimum and maximum values per scale in the problem-based learning environment ( $n = 231$ ).

Scales	<i>n</i> of items	Alpha	Mean values	SD	Min – Max
<i>Problems in studying</i>					
Exhaustion	4	0.88	2.91	0.96	1.00 – 5.00
Lack of regulation	3	0.72	2.80	0.87	1.00 – 4.67
Lack of interest	2	0.73	1.79	0.83	1.00 – 5.00
Distress	1	-	3.01	1.08	
<i>Strategy and attribution</i>					
Task avoidance	5	0.74	2.60	0.76	1.20 – 5.00

Note: Maximum score was 5 for problems in studying and 6 for task avoidance.

### *Statistics and measures*

The aim of our present study was to apply a person-oriented approach in each of the learning environment of a discipline. For this purpose variable-centered and person-centered methods were used (Laursen & Hoff, 2006). Our intention was to form a research setting according to the original scale types (Lonka et al., 2008) and apply a method for identifying clusters by cases through similar scale types (Aldenderfer & Blashfield, 1984) instead of evaluating the best-fitting model.

Firstly, bivariate correlations were computed between problems of studying in two different medical learning environments. Correlations were computed in order to



investigate the interactions between exhaustion, lack of self-regulation, lack of interest and distress in both, lecture-based and problem-based learning environments. We found Pearson product-moment correlations a useful variable-centered method for examining relationships among the scales. However, it did not reveal what kind of groups of individuals existed in the population. Therefore, person-centered methods were applied in order to investigate what kinds of groups of medical students can be found in the lecture-based learning environment and in the problem-based learning environment.

Secondly, a hierarchical cluster analysis was carried out in order to decide the number of clusters. This analysis was carried out by selecting the squared Euclidian distance as a similarity measure and using Ward's method to form the initial clusters without restricting their number. This analysis provides a dendogram, a tree model based on the distance between the clusters. On theoretical grounds and on the basis of the tree model a three-cluster solution was selected in each learning environment.

Thirdly, a Quick Cluster Analysis was used to form the final groups once the number of the clusters was decided. Using a K-means algorithm the initial cluster centers i.e. group profiles were selected.

Fourthly, a significance testing of means of individual scales by clusters was performed by one-way analyses of variance (ANOVAs). Bonferroni's and Games-Howell's post hoc tests with their significant difference procedures were performed for pairwise comparisons among the cluster groups. In this case, significant differences between the individual groups were to be expected because K-means cluster analysis by cases maximizes mean differences.

Fifthly, the one-way analyses of variance (ANOVAs) were used to examine different student groups' task avoidance during their studies. Series of ANOVA-tests were used to investigate if there was a difference in task avoidance between the groups of medical students in the lecture-based learning environment and in the problem-based learning environment. After that the same analyses were used similarly to examine different student groups' reported grades. Bonferroni's post hoc test was performed for comparisons.

Effect sizes were also calculated. The eta-square values of .01, .06 and .14 were interpreted as small, medium and large as suggested by Cohen (1988).

SPSS for Windows was used in the statistical analyses.

## Results

### *Correlations between problems in studying in the lecture-based learning environment*

Our first research question concerned correlations between problems in studying among medical students in a lecture-based and in a problem-based learning environment: exhaustion, lack of self-regulation, lack of interest and distress. Firstly the correlations among medical students were calculated in the lecture-based learning environment in order to explore these relations (Table 3). Exhaustion, lack of self-regulation, lack of interest and distress correlated positively among medical students in the lecture-based learning environment. The highest correlation among medical students was between exhaustion and distress ( $p = .62$ ) and the lowest correlation between lack of interest and distress ( $p = .25$ ) in the lecture-based learning environment. All correlations were statistically significant.

Table 3. Pearson product-moment correlations between problems of studying in the lecture-based learning environment

	1	2	3
1 Exhaustion			
2 Lack of regulation	.53**		
3 Lack of interest	.39**	.43**	
4 Distress	.62**	.39**	.25**

Note \*\*  $p < .01$

### *Medical students' group profiles in the lecture-based learning environment*

Our second research question concerned group profiles. In order to examine the kinds of medical students' group profiles that could be found in the lecture-based learning environment, we classified participants in the lecture-based learning environment

according to their responses to exhaustion, lack of self-regulation, lack of interest and distress. Medical students in the lecture-based learning environment were distributed among three profiles in the following manner: 40, 24% of the medical students were in the first profile ( $n = 99$ ), 43, 50% in the second ( $n = 107$ ) and 16, 26% in the third ( $n = 40$ ). Medical students' group profiles in the lecture-based learning environment differed statistically very significantly on all clustering variables with effect sizes ( $\eta^2$ ) ranging from .38 to .62 (see Table 4). These eta-square values were interpreted as large as suggested by Cohen (1988). However, pairwise comparisons suggested variation in patterns of differences across the medical students' group profiles in the lecture-based learning environment. All medical students' group profiles in the lecture-based learning environment differed very significantly or significantly from each other in exhaustion, lack of self-regulation and distress, while pairwise differences were detected in lack of interest.

Table 4. Means, standard deviations and ANOVA results for profile differences on problems in studying in the lecture-based learning environment.

Variable	Committed		Carefree		Dysfunctional		$F(2,245)$	$p$	$\eta^2$
	$n = 99$		$n = 107$		$n = 40$				
Exhaustion	1.96	.51	2.75	.58	3.73	.66	143.92	.000	.54
Lack of regulation	2.22	.65	3.15	.66	3.56	.76	76.41	.000	.39
Lack of interest*	1.46 <sub>a</sub>	.54	1.61 <sub>a</sub>	.59	2.86	.91	74.43	.000	.38
Distress	1.77	.55	3.05	.72	4.00	.68	197.48	.000	.62

Note: Means within a row sharing the same subscript are not significantly different at the  $p < .05$  level. Owing to unequal variances the Games-Howell correction instead of Bonferroni was applied to the variables with an \*.

The first group of medical students in the lecture-based learning environment made the lowest scores on all the study problems. The second group of medical students in the lecture-based learning environment scored the second highest on all the study problems. The third group of medical students in the lecture-based learning environment scored the highest on all the study problems. The three medical students' group profiles in the lecture-based learning environment were labelled according to score means as (1.) *committed*, (2.) *carefree* and (3.) *dysfunctional students*. Figure 1, which shows the mean score profiles of medical students in the lecture-based learning environment, illustrates the relative differences among the three profiles.

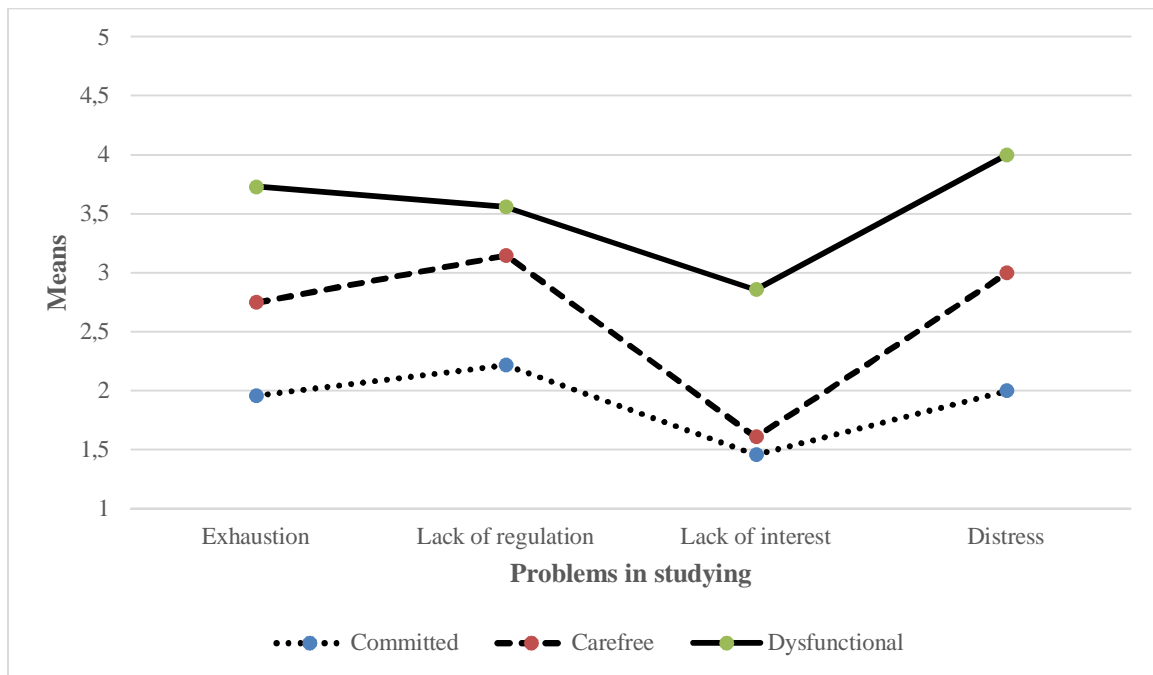


Figure 1. Profiles of commitment (means scores) of the three groups in the lecture-based learning environment

#### *Differences in task avoidance in the lecture-based learning environment*

Our third research question concerned whether there were differences between the groups of medical students in task avoidance in the lecture-based and in the problem-based learning environment. Firstly the differences in task avoidance among the groups of medical students were calculated in the lecture-based learning environment. The main effect was large for task avoidance,  $F(2, 245) = 23.54, p < .001, \eta^2 = .16$  among the groups of medical students in the lecture-based learning environment. Pairwise comparisons with Bonferroni's correction revealed that committed students expressed less task avoidance ( $M = 2.29, SD = .74$ ) than either carefree students ( $M = 2.84, SD = .64$ ) or dysfunctional students ( $M = 3.05, SD = .75$ ) in the lecture-based learning environment. The latter two groups of medical students did not differ from each other in task avoidance in this learning environment. However, all students scored low on task avoidance.

### *Differences in reported grades in the lecture-based learning environment*

Our fourth research question concerned whether there were differences between the groups of medical students in reported grades in the lecture-based and in the problem-based learning environment. Firstly the differences in reported grades among the groups of medical students were calculated in the lecture-based learning environment. The main effect was small for reported grades,  $F(2, 245) = .859, p = .425, \eta^2 = .01$  among the groups of medical students in the lecture-based learning environment. Dysfunctional students ( $M = 2.05, SD = .75$ ), carefree students ( $M = 2.10, SD = .60$ ) and committed students ( $M = 2.19, SD = .65$ ) did not differ from each other in reported grades in this learning environment.

### *Correlations between problems in studying in the problem-based learning environment*

Correlations among medical students were calculated in the problem-based learning environment in order to explore relationships between the problems in studying (Table 5). Exhaustion, lack of self-regulation, lack of interest and distress correlated positively among medical students in the problem-based learning environment. The highest correlation among medical students was between exhaustion and distress ( $p = .63$ ) and the lowest correlation between lack of interest and distress ( $p = .26$ ) in the problem-based learning environment. All correlations were statistically significant.

Table 5. Pearson product-moment correlations between problems of studying in the problem-based learning environment

	1	2	3
1 Exhaustion			
2 Lack of regulation	33.**		
3 Lack of interest	28.**	43.**	
4 Distress	63.**	29.**	26.**

Note \*\*  $p < .01$

*Medical students' group profiles in the problem-based learning environment*

In order to examine the kinds of medical students' group profiles that could be found in the problem-based learning environment, we classified participants in the problem-based learning environment according to their responses to exhaustion, lack of self-regulation, lack of interest and distress. Medical students in the problem-based learning environment were distributed among three profiles in the following manner: 41, 99% of the medical students were in the first profile ( $n = 97$ ), 37, 23% in the second ( $n = 86$ ) and 20, 78% in the third ( $n = 48$ ). Medical students' group profiles in the problem-based learning environment differed statistically very significantly on all clustering variables with effect sizes ( $\eta^2$ ) ranging from .37 to .64 (see Table 6). These eta-square values were interpreted as large as suggested by Cohen (1988). However, pairwise comparisons suggested variation in patterns of differences across the medical students' group profiles in the problem-based learning environment. All medical students' group profiles in the problem-based learning environment differed very significantly or significantly from each other in exhaustion, lack of self-regulation and distress, while pairwise differences were detected in lack of interest.

Table 6. Means, standard deviations and ANOVA results for profile differences on problems in studying in the problem-based learning environment.

Variable	Committed $n = 97$		Committed carefree $n = 86$		Dysfunctional $n = 48$		$F(2,230)$	$p$	$\eta^2$
	$M$	$SD$	$M$	$SD$	$M$	$SD$			
Exhaustion	2.18	.67	3.25	.76	3.76	.68	96.49	.000	.46
Lack of regulation	2.37	.74	2.72	.70	3.78	.61	66.14	.000	.37
Lack of interest*	1.46 <sub>a</sub>	.61	1.59 <sub>a</sub>	.46	2.78	.98	69.79	.000	.38
Distress*	2.01	.59	3.60	.69	3.98	.70	203.65	.000	.64

Note: Means within a row sharing the same subscript are not significantly different at the  $p < .05$  level. Owing to unequal variances the Games-Howell correction instead of Bonferroni was applied to the variables with an \*.

The first group of medical students in the problem-based learning environment made the lowest scores on all the study problems. The second group of medical students in the problem-based learning environment scored the second lowest on exhaustion, lack of self-regulation and lack of interest. However, these medical students in the problem-based learning environment scored high on distress like members of the third cluster. The third

group of medical students in the problem-based learning environment scored the highest on all the study problems. The three medical students' group profiles in the problem-based learning environment were labelled according to score means as (1.) *committed*, (2.) *committed carefree* and (3.) *dysfunctional students*. Figure 2, which shows the mean score profiles of medical students in the problem-based learning environment, illustrates the relative differences among the three profiles.

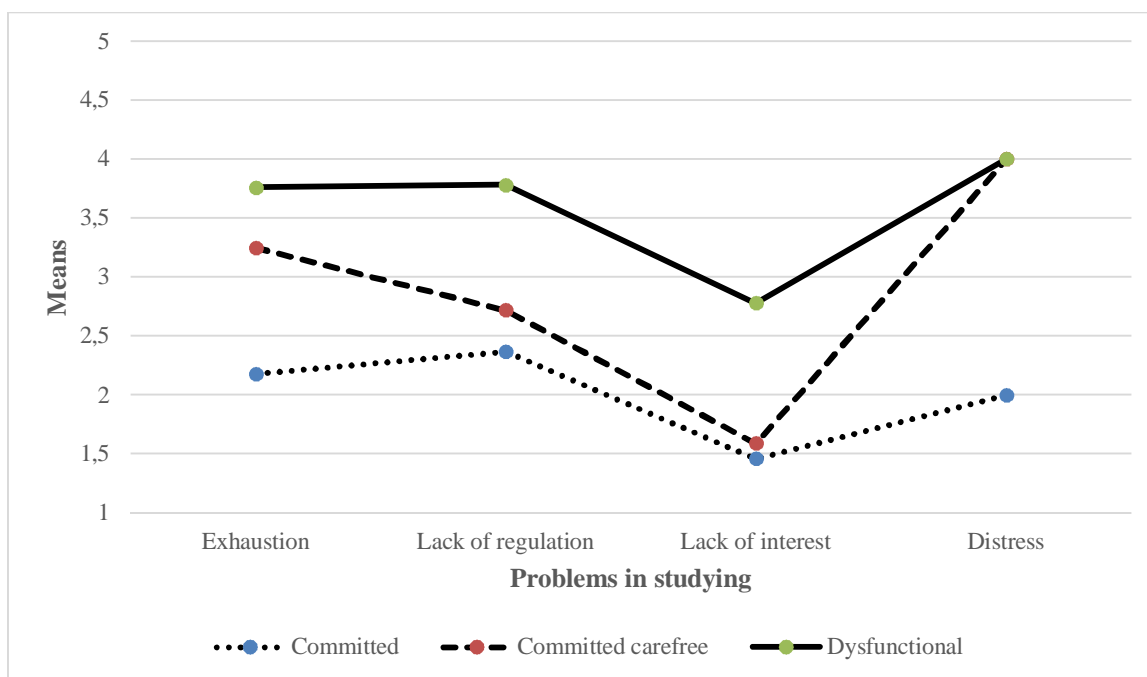


Figure 2. Profiles of commitment (means scores) of the three groups in the problem-based learning environment

#### *Differences in task avoidance in the problem-based learning environment*

Next the differences in task avoidance among the groups of medical students were calculated in the problem-based learning environment. The main effect was large for task avoidance,  $F(2, 230) = 23.95, p < .001, \eta^2 = .17$  among the groups of medical students in the problem-based learning environment. Pairwise comparisons with Bonferroni's correction revealed that dysfunctional students expressed more task avoidance ( $M = 3.21, SD = .81$ ) than either committed carefree students ( $M = 2.52, SD = .69$ ) or committed students ( $M = 2.37, SD = .65$ ) in the problem-based learning environment. The latter two groups of

medical students did not differ from each other in task avoidance in this learning environment. However, all students scored low on task avoidance.

#### *Differences in reported grades in the problem-based learning environment*

Finally the differences in reported grades among the groups of medical students were calculated in the problem-based learning environment. The main effect was small for reported grades  $F(2, 230) = 5.84, p = .003, \eta^2 = .05$  among the groups of medical students in the problem-based learning environment. Pairwise comparisons with Bonferroni's correction revealed that committed students ( $M = 2.28, SD = .61$ ) and committed carefree students ( $M = 2.22, SD = .66$ ) gained better grades than dysfunctional students ( $M = 1.90, SD = .72$ ). The former two groups of medical students did not differ from each other in reported grades in this learning environment.

## **Discussion**

The present study focused mainly on differences in medical student commitment across different learning environments in medicine. It was looked at what kinds of combinations of problems in studying medical students experienced in each learning environment. It was also looked at whether there were differences in terms of task avoidance among groups of medical students with different profiles and whether there were differences in terms of reported grades among groups of medical students with different profiles.

#### *Lecture-based learning environment*

Three groups of medical students were identified in the lecture-based learning environment: committed, carefree and dysfunctional students. The group profiles were in line with previous research (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016; Ketonen & Lonka, 2013; Mäkinen et al., 2004). The group profile of dysfunctional students (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016; Ketonen &



Lonka, 2013; see also Lonka et al., 2008) and the group profile of committed students (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016) were detected once again. In this study the dysfunctional and the carefree resembled lower commitment.

In previous studies (Kember & Leung, 2006; Litmanen et al., 2010) a reasonable amount of distress has been a sign of higher commitment. However, according to our results, a reasonable amount of experienced distress in the lecture-based learning environment turned out to be an integral part of studying free from care which however, did not serve higher commitment beside other experiences of problems in studying (cf Adams, 2004; Mehta et al., 2015; Moffat et al., 2004; Robotham, 2008). According to our results a reasonable amount of distress was not a sign of higher commitment (cf Kember & Leung, 2006; Ketonen & Lonka, 2013; Litmanen et al., 2010). Future research could find out whether this result can be confirmed in other academic fields among university students in lecture-based learning environments.

In the lecture-based learning environment committed students expressed less task avoidance than either carefree students or dysfunctional students. Despite the differences in expressed task avoidance all medical students could resemble the task-oriented students (Mäkinen & Olkinuora, 2004) at some level.

In the lecture-based learning environment the profiles were not related to study success. Like in the previous study by Ketonen and Lonka (2013) differences in grades were not found between higher and lower commitment. Even though dysfunctional students in the lecture-based learning environment scored highest on all the study problems and task avoidance their study success was quite similar with the committed and the carefree in this learning environment. Dysfunctional students in the lecture-based learning environment seemed to be more unable to meet the demands of their learning environment despite the study success. If possible in the research practices, future research could find out whether the results of study success are more accurate among university students in different academic learning environments using grade point average which measures long-term performance more specifically.

### *Problem-based learning environment*

Also three groups of medical students were identified in the problem-based learning environment: committed, committed carefree and dysfunctional students. The group profiles were in line with previous research (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016; Ketonen & Lonka, 2013; Mäkinen et al., 2004) apart from the group of committed carefree students (cf Heikkilä et al., 2012; Ketonen & Lonka, 2013). The group profile of dysfunctional students (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016; Ketonen & Lonka, 2013; see also Lonka et al., 2008) and the group profile of committed students (Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016) were detected once again. In this study the committed and the committed carefree resembled higher commitment.

Both, lower commitment of the dysfunctional and higher commitment of the committed carefree reflected the experience of higher distress in the problem-based learning environment (Litmanen et al., 2010). Even though the dysfunctional students and the committed carefree students in the problem-based learning environment were the most likely to experience uncertainty on what is expected of them by the faculty and experience the curriculum as unclear (Lewis et al., 2009) this experience kept the committed carefree going. Their experienced distress had a more positive effect on studying in demanding learning conditions. Even though the level of experienced distress was rather high, it seemed to be an essential part of committed carefree studying in the problem-based learning environment serving as a motivator for the students (cf Adams, 2004; Mehta et al., 2015; Moffat et al., 2004; Robotham, 2008). Future research could find out whether this result can be confirmed among university students in student-activating learning environments in different academic fields.

In the problem-based learning environment dysfunctional students expressed more task avoidance than either committed carefree students or committed students. Despite the differences in expressed task avoidance all medical students could resemble the task-oriented students (Mäkinen & Olkinuora, 2004) at some level also in this learning environment.

Like in previous studies (Heikkilä & Lonka, 2006; Heikkilä et al., 2012; Heikkilä et al., 2011; Ketonen et al., 2016) committed groups of students gained better grades than dysfunctional students in the problem-based learning environment.

### *Validity*

A measure is valid when it measures what it is supposed to measure. Consequently, any instrument should be validated in each context in which it is used (Richardson, 2004). Our study showed construct and content validity in the lecture-based learning environment and in the problem-based learning environment.

Construct validity refers to the degree to which the measure captures the construct (Elo et al., 2003). Correlations with variables that are assumed to measure the same concept is a traditional method for investigating validity (Elo et al., 2003). According to our results the correlations of measures of problems in studying showed construct validity in the lecture-based and in the problem-based learning environment. Exhaustion, lack of self-regulation, lack of interest and distress correlated positively among medical students in the lecture-based learning environment and in the problem-based learning environment. As expected the relations were in line with previous research (Ketonen et al., 2016; Ketonen & Lonka, 2013; Lonka et al., 2008) the associations being statistically significant and theoretically plausible in both learning environments.

The extent to which an instrument yields different scores on groups that would be expected to differ in the underlying experiences is related to construct validity (Elo et al., 2003; Richardson, 2004). According to our results task avoidance played a key role in differentiating between higher commitment and lower commitment in each learning environment. Medical students' scores on task avoidance discriminated coherently between the group profiles of commitment and showed reasonable levels of discriminating power in the lecture-based learning environment and in the problem-based learning environment.

Finally, content validity can be studied empirically through convergence with other measures (Elo et al., 2003). We found several profiles of commitment which differed

systematically from each other in task avoidance and reported grades in the lecture-based learning environment and in the problem-based learning environment. These results were in line with previous research (Heikkilä et al., 2011; Ketonen & Lonka, 2013; cf Heikkilä et al., 2012). We found also support for the idea that even well-motivated and successful students may experience higher levels problems in studying such as distress (Ketonen & Lonka, 2013; cf Heikkilä et al., 2012; see also Litmanen et al., 2014).

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