Students' experiences of study-related exhaustion, regulation of learning, peer learning and peer support during university studies

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Abstract

The present mixed-method longitudinal study examines students' experiences of study-related exhaustion, regulation of learning, peer learning and peer support during university studies. At the first measurement point, 188 first-year students completed the questionnaire. At the second measurement point, 91 of the 188 students participated in the follow-up study at their fourth study year and completed the same questionnaire again. Of these, twelve students were interviewed. The results showed that experienced study-related exhaustion and self-regulation of content increased during studies. However, the results also showed a large individual variation in experienced study-related exhaustion. The students whose exhaustion decreased described experiences of peer support that helped them to develop their self-regulation skills. Students whose study-related exhaustion remained low evaluated their self-regulation skills as good. They experienced that they did not need other students' support in the regulation of learning. The students whose study-related exhaustion increased or remained high described more problems in self-regulation. Most students relied on peer support because of self-regulation problems. However, not all students used other students' support despite of problems in studying. It can be concluded that regulation skills have a key role in experienced study-related exhaustion during studies.

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Introduction

University students experience significant levels of study-related exhaustion (Kunttu et al. 2016), and it has been shown to increase during studies (Salmela-Aro and Read 2017; Dahlin and Runeson 2007). Research shows that problems in self-regulation of learning, which refer to problems in planning, monitoring and reflecting on one's own learning, are related to students' experiences of exhaustion at the beginning of their university studies (Heikkilä et al. 2011; Heikkilä et al. 2012). There is an increasing body of research on how the development of self-regulation skills may be supported by peers (Hadwin et al. 2011; Hadwin and Oshige 2011; Panadero et al. 2019). There is also evidence that peer support is related to lower levels of study-related exhaustion (Väisänen et al. 2017). In recent years, collaborative learning practices have become essential to university teaching and learning. Group working skills are increasingly emphasized. In a working life, self-regulation and peer learning skills are important because experts need to take responsibility for their own learning as part of their everyday work and be able to reflect on their performance and learning and work collaboratively (Van de Wiel et al. 2011; Cuyvers et al. 2020). In recent years, there has been a growing interest in how these skills develop during university education (Coertjens et al. 2013; Donche et al. 2010). However, longitudinal research regarding a variation in self-regulation of learning, peer learning and peer support and study-related exhaustion during university studies is still scarce. Most studies apply quantitative methods and focus on group-level analysis. In addition, little is known about how these elements are inter-related during studies. Therefore, research that examines the variation and the relationship between these aspects at both the group and individual level and combines quantitative and qualitative methods is needed. The aim of this mixed-method longitudinal study is to explore the variation in students' experienced self-regulation of learning, peer learning, peer support and study-related exhaustion during studies and how these are related to each other.

Self-regulation of learning, peer learning and peer support

Self-regulation of learning refers to the ability to regulate one's own learning by planning, monitoring and reflecting upon one's own learning (Zimmerman 2000; Pintrich 2004; Schunk and Zimmerman 2012; Vermunt and Donche 2017). Self-regulation of learning consists of three distinct phases: (1) goal setting and planning studying before studying; (2) using different strategies, monitoring and controlling learning during studying; and (3) reflecting on learning after studying (Zimmerman 2000; Schunk and Zimmerman 2012). In addition to the regulation of the learning process, the learning content may also be regulated. The regulation of the learning content refers to consulting literature and sources outside the syllabus (Vermunt and Donche 2017). Learning may also be externally regulated by external sources, such as a teacher (Vermunt and Donche 2017). Lack of regulation refers to monitoring difficulties when regulating one's own learning processes (Vermunt 2005; Vermunt and Donche 2017). Self-regulation of learning is particularly important in challenging situations in studying when combining study, work and free time. In addition, self-regulation of learning is related to students' academic success and the ability to persist in their studies (Vanthournout et al. 2012). Students' experiences of study-related exhaustion should be taken seriously because

there is evidence that experienced study-related exhaustion during studies is later related to experiences of exhaustion in working life (Dahlin et al. 2010).

Research shows contradictory results regarding the development of self-regulation of learning during university studies. On the one hand, there is evidence that self-regulation of learning may be difficult particularly at the beginning of university studies (Donche et al. 2010; Donche and Van Petegem 2009; Lindblom-Ylänne et al. 2015a). However, there is a large variation in students' self-regulation skills (Lindblom-Ylänne et al. 2017). Some studies show that students' self-regulation skills develop during their studies (Donche et al. 2010; Donche and Van Petegem 2009). On the other hand, the development has not been found in all studies (Van der Veken et al. 2009).

Peer learning refers to reciprocal learning in which students learn in interaction with each other during informal or formal learning situations (Boud 2014). Peer learning provides students with a way to develop their own self-regulation skills. Research shows that peer learning may promote first-year students' self-regulation skills by enhancing students' ability to monitor and reflect on their own learning (De Backer et al. 2015). However, research indicates that there is a variation in how students engage in peer learning activities (Räisänen et al. 2016; Räisänen et al. 2020).

Peer support plays a significant role in peer learning. Peer support refers to the identification and active use of social resources in studying (Boud 2014). During peer learning, a more advanced student may support, for example, in clarifying and establishing goals and in monitoring learning process (Panadero et al. 2019). Many students experience also emotional support as important during studies (Boud 2014), but they may also need informational support, which means asking for advice from peers in study-related matters and for coping with stressful situations. Peer support may be particularly important at the beginning of university studies when students may experience challenges in self-regulation.

The relationship between study-related exhaustion, self-regulation of learning, peer learning and peer support

Study-related exhaustion refers to emotional tiredness and fatigue related to studying (Salmela-Aro et al. 2009). It develops because of long-term stress when a student does not have enough resources to respond to study demands (Salmela-Aro et al. 2009; Lin and Huang 2014). Exhaustion may appear as a feeling of being overwhelmed by study-related matters, worrying about study matters in free time and having problems in sleeping (Salmela-Aro et al. 2009). Research has shown that students who set high demands on themselves particularly experience study-related exhaustion (Dickinson and Dickinson 2015) which is a core component of study-related burnout (Schaufeli et al. 2002; Salmela-Aro et al. 2009; Salmela-Aro and Read 2017).

Students who have good self-regulation skills experience less study-related exhaustion, whereas students who have problems in self-regulation experience higher levels of study-related exhaustion (Heikkilä et al. 2011, 2012). Therefore, problems in self-regulation may increase the risk for study-related exhaustion. Litmanen et al. (2014) found that first-year medical students experienced a heavy workload and elevated levels of exhaustion. They argued that at the beginning of their studies, students may not yet have the required self-regulation skills that could help them to manage workload. There is evidence that students with good self-regulation skills can better cope with challenges in studying (Martin and Marsh 2006). Thus, self-regulation is positively related to academic resilience.

Research shows that receiving peer support is related to low levels of exhaustion and lack of peer support or inadequate support is negatively related to well-being (Väisänen et al. 2017;

Wilcox et al. 2005; Jou and Fukada 2002; Jacobs and Dodd 2003; Lin and Huang 2012). Thus, the match between needed and received support is important (Wolff et al. 2013). Research shows that being able to seek peer support is one key element related to resilience and coping with challenges in studying (Turner et al. 2017). There is evidence that students who can seek support from others to cope with challenges during studies later experience lower levels of burnout in working life (Salmela-Aro et al. 2011).

Although there is some research on the variation in self-regulation of learning and study-related exhaustion during university studies, these have been examined separately, and little is known about the relationship between self-regulation of learning and study-related exhaustion during studies. In addition, research on the relationship between peer learning, peer support and study-related exhaustion during studies is still scarce. Therefore, a comprehensive picture of the interrelationships among all these aspects during studies is lacking. To explore the complex interrelations, a mixed-method approach combining quantitative and qualitative methods and research combining a variable- and a person-oriented approach is needed.

The aims of the study

This mixed-method longitudinal study aims to examine university students' experiences of self-regulation of learning, peer learning, peer support and study-related exhaustion during studies. The first aim is to explore the variation in students' experiences of self-regulation of learning, peer learning, peer support and study-related exhaustion during studies at the group-level. The second aim is to examine the variation in study-related exhaustion in more detail at the individual level. The third aim is to investigate how these are inter-related at the individual level. The specific research questions are as follows:

(1) What variations do students experience in self-regulation of learning (self-regulation, external regulation and lack of regulation), peer learning, peer support and study-related exhaustion at the group level from the first to the fourth study year (quantitative)?
(2) What variations do students experience in study-related exhaustion at the individual level from the first to the fourth study year (quantitative)?
(3) How is the variation in experienced self-regulation of learning, peer learning and peer support related to the variation in experienced study-related exhaustion (quantitative and qualitative)?

The first aim is examined through the first research question. In the first research question, quantitative methods are used to achieve an overview of a variation at the group level in experiences of self-regulation (self-regulation, external regulation and lack of regulation), peer learning, peer support and study-related exhaustion during studies. It is hypothesized that experienced study-related exhaustion will increase during studies (Salmela-Aro and Read 2017; Dahlin and Runeson 2007). The second aim is examined through the second research question. Students' experienced study-related exhaustion is explored in more detail at the individual level using quantitative research methods. It is hypothesized that there will be a variation in changes at the individual level because there is evidence that group-level average changes hide changes at the individual level (Lindblom-Ylänne et al. 2013, 2015b).

The third aim is examined through the third research question using quantitative and qualitative methods. Quantitative methods are used to achieve an overview of the relationship

between experiences of self-regulation of learning, peer learning, peer support and study-related exhaustion during studies. Qualitative methods focus on investigating the relationship between experienced self-regulation of learning, peer learning, peer support and study-related exhaustion during studies more deeply. First, it is hypothesized that the increase in experienced self-regulation of learning is related to decreased study-related exhaustion and that the increase in problems in self-regulation of learning is related to increased study-related exhaustion (Heikkilä et al. 2011, 2012). Second, it is hypothesized that students who report problems in self-regulation of learning will perceive peer learning and peer support as more important during studies than students who report good self-regulation skills (Räisänen et al. 2016).

Methods

Participants and procedure

This longitudinal study was conducted at one Finnish research-intensive university. At the first measurement point in spring 2013, altogether 188 first-year students completed the questionnaire; they came from three different disciplines and six different degree programmes: biosciences including biology ($n = 40$); aquatic sciences ($n = 6$) and environmental sciences ($n = 10$); dentistry and medicine ($n = 108$); and mathematics ($n = 24$). Data collection was conducted in collaboration with the participating degree programmes. The students were informed about the longitudinal study at one lecture which was part of the compulsory course of each degree programme in March 2013. The students were told that the participation in the study was voluntary. In the questionnaire, the students were asked to give their contact information if they were willing to participate in the follow-up study at their fourth study year.

The mean age of the participants was 23 years (SD = 4.43; Mo = 21; min–max = 17–45 years). Altogether, 104 of the students were female (55.3%) and 83 were male (44.4%). One student did not report gender. Students in Finland graduate from upper-secondary school at the age of 19, and because of demanding entrance examinations, they enter the university on average at an older age than in many other European countries. In terms of age, the sample well represented the Finnish student population. The response rate among the students at the degree programme of biology was 100% because all 40 first-year students completed the questionnaire as part of their personal study plan and gave permission to use their responses in the study. Regarding the other degree programmes, only those students who participated in one lecture of the compulsory course could be reached. Therefore, it is difficult to estimate the actual response rate from these degree programmes.

At the second measurement point in spring 2016, altogether 91 (48%) of the 188 students participated in the follow-up study at their fourth study year and completed the same questionnaire: biology ($n = 15$); aquatic sciences ($n = 4$); environmental sciences ($n = 5$); dentistry and medicine ($n = 55$) and mathematics ($n = 19$). The electronic follow-up questionnaire was sent by email to 159 students who had given their contact information at the first measurement point. Altogether, 57.2% of these students participated in the follow-up study. The participants received three reminders by email. The mean age of the participants was 25 years (SD = 3.79; Mo = 23; min–max = 22–48 years). Altogether, 52 of the students were female (57.1%) and 36 were male (39.6%). Three students did not report gender. Of the students, one student had changed the major subject from biology to veterinary medicine and one student from biology to Latin language.

The student group that participated in both measurements was compared with the students who participated only in the first measurement. No differences were found between these groups in their experiences of self-regulation of learning, peer learning, peer support and study-related exhaustion at the first measurement point. In addition, we found a variation in students' experiences in self-regulation, peer learning, peer support and study-related exhaustion among those who participated in the follow-up study. Therefore, we can conclude that the attrition was not found to be selective.

The follow-up questionnaire included an interview invitation. Students were able to submit their contact information if they wished to participate in the interviews. They were then contacted by e-mail and interviewed in spring 2016. Altogether, 30 students submitted their contact information and 12 of them finally volunteered to participate in an interview. Of the students, seven were medical students, four were bioscience students, and one was a mathematics student. The interviewed students represented well the students who participated in the study at the first measurement point because there was a variation in students' experiences of study-related exhaustion and regulation skills.

The study followed the ethical guidelines of the Finnish Advisory Board on Research Integrity (2012). The anonymity of the participants was ensured during all stages of the study. The students gave their informed consent for participating in the study. The students were advised that they could withdraw from the study at any time. They were also informed that the teacher could not access their responses and that participation would not affect their grades in any way. The students were not given any incentives for participating in the study.

Context

The disciplines were chosen because they all represent the natural sciences but the nature of each curricula is different. In biosciences and mathematics, the duration of studies is 5 years. Studies include bachelor's studies (3 years) and Master's studies (2 years), and students receive the degree of Master of Science. In the degree programmes in biosciences, the studies mainly include lectures during the first study year along with laboratory work and field courses, while seminars take place in later years. In mathematics, the studies include lectures and exercises. In dentistry and medicine, the duration of studies is 6 years. The first 2 years include a preclinical phase, and then from the third to sixth years, there is a clinical phase. Students studying dentistry receive the degree of Licentiate of Dentistry, and students studying medicine acquire a degree of Licentiate of Medicine. The studies are based on problem-based learning (PBL).

Measures

Survey

Self-regulation of learning was measured using four regulation scales (self-regulation of process, self-regulation of content, external regulation and lack of regulation) from the Inventory of Learning Styles (ILS, Vermunt 1994). Four items measured the self-regulation of process, which refers to students' ability to regulate their own learning process (e.g. "When I have difficulty grasping particular subject matter, I try to analyse why it is difficult for me"). Three items measured the self-regulation of content (e.g. "In addition to the course requirements, I study other literature related to the content of the

course"). Four items measured external regulation of learning, the extent to which a teacher regulates a student's learning. The option stated: "I experience the instructions and assignments given by the teacher as indispensable guidelines for my studies". Four items measured lack of regulation such as "I notice that I have trouble processing a large amount of subject matter". EFA supported the use of the same four factors at the second measurement point than at the first measurement point including self-regulation of process ($\alpha = .64$), self-regulation of content ($\alpha = .66$), external regulation ($\alpha = .78$) and lack of regulation ($\alpha = .62$).

Engaging in peer learning and perceived value of peer support were measured using items that were modified from the Proactive Strategy Scale and based on the previous research in school and working life contexts (Pyhältö et al. 2015; Pietarinen et al. 2013). Engaging in peer learning was measured using two items ("I often do study tasks together with peers"). The perceived value of peer support was measured using three items ("Peer support is important in studying"). EFA supported the use of the same two factors at the second measurement point as at the first measurement point including engaging in peer learning ($\alpha = .88$) and the value of peer support in studying ($\alpha = .90$).

The study-related exhaustion subscale from the Finnish version of the Study-Burnout Inventory was used to measure university students' experiences of study-related exhaustion (SBI-9, Salmela-Aro 2009). The Study-Burnout Inventory includes three factors: study-related exhaustion, feelings of cynicism related to studying and feelings of inadequacy as a student. In the present study, a study-related exhaustion subscale that included three items was used: "I feel overwhelmed by my study work". The students responded to all the items in this study on a 7-point Likert scale ranging from 1 = totally disagree to 7 = totally agree.

The same quantitative measures were used at both measurement points. The questionnaire is presented in Appendix A. Exploratory factor analysis (EFA) with principal axis factoring and direct oblimin rotation using SPSS Statistics, version 23, was used to verify that all the factor structures of the scales in this study were the same at both measurement points. Exploratory factor analyses at the first measurement point are presented in detail in the previous study (Räisänen et al. 2020). The EFA at the second measurement point showed that the three items clearly loaded on a single factor ($\alpha = .79$).

Semi-structured interviews

First, the students were asked about their studying during university studies and how it has changed during their studies. They were not specifically asked about self-regulation of learning. The aim was that they would freely describe the aspects they considered to be important in their own studying. If the students did not describe self-regulation of learning, they were asked further questions about their study practices and strategies. Second, they were asked whether they study independently or with their peers, what kind of role peer learning has in their studying and how studying with peers has supported their studying. Third, they were asked to explain their questionnaire answers related to study-related exhaustion. Clarifying questions were asked to ensure that the students' responses were correctly interpreted. The interview questions are presented in Appendix B. The interviews lasted 56 min on average and were recorded and transcribed verbatim. The transcribed interview data included 292 pages (1.5 line spacing).

Data analyses

First, a paired samples *t*-test was used to examine a group-level variation in experienced self-regulation of learning including self-regulation of process, self-regulation of content, external regulation and lack of regulation, peer learning, perceived value of peer support and study-related exhaustion during the studies. Second, a detected variation in experienced study-related exhaustion was investigated in more detail at the individual level by creating a change variable by subtracting the students' scale scores at the first study year from the students' scale scores at the fourth study year. Since it was shown that there was a large individual variation in experienced study-related exhaustion, three change groups were created: decrease, no or slight change and increase in study-related exhaustion. The change groups were created based on Likert-scale changes of greater or less than a half of a Likert-scale point (Table 1) (see also, Lindblom-Ylänne et al. 2006). The group "no or slight" change was created to allow slight changes in study-related exhaustion to be reported.

Finally, a paired samples *t*-test was used to examine a variation in experienced self-regulation of learning, external regulation, lack of regulation, peer learning and perceived value of peer support in more detail within the change groups.

The interview data were qualitatively content analysed (Elo and Kyngäs 2007). The analysis included four phases. In the first phase, the interviews were transcribed by the first author, and the interviews were read through several times to gain a comprehensive picture.

The second phase focused on analysing students' descriptions regarding self-regulation of learning using deductive content analysis. The analysis was based on the theory of the phases of self-regulation (Zimmerman 2000). First, in the data reduction, all text segments in which the students described self-regulation were coded into the same category. The data included 232 descriptions of self-regulation of learning. Secondly, descriptions related to the same phases of self-regulation and how these had changed during studies were grouped together, conceptualized and coded as follows: (1) planning studying, (2) using different strategies, monitoring and controlling during studying; and (3) reflecting on studying.

The third phase concentrated on analysing students' descriptions regarding peer learning and peer support using inductive content analysis. First, in the data reduction, all text segments in which students described studying with other students during studies were identified as peer learning and coded into the same category. Second, descriptions in which the students described how other students have supported their studying during peer learning were identified. The data included 116 descriptions of peer learning and peer support. Third, descriptions related to peer support related to different phases of regulation were grouped together, conceptualized and coded as follows: (1) peer support in planning studying, (2) peer support in using different strategies, monitoring and controlling studying; and (3) peer support in reflecting on studying.

Table 1 The change groups of study-related exhaustion

Group	Change
Decrease in exhaustion	Decrease > 0.5 in Likert scale
No or slight change in exhaustion	Decrease or increase 0.5 or < 0.5 in Likert scale
Increase in exhaustion	Increase > 0.5 in Likert scale

The fourth phase focused on examining students' descriptions of study-related exhaustion. First, these descriptions were analysed using deductive content analysis (Elo and Kyngäs 2007) based on the theory of the different components of study-related burnout (Salmela-Aro et al. 2009). Second, in the data reduction, all text segments in which the students described study-related exhaustion, such as experiences of being overwhelmed by study-related matters, worrying about study matters in free time and having problems sleeping and changes in these experiences during studies, were coded into the same category. The data included 82 descriptions of study-related exhaustion.

These phases were first conducted by the first author. The results were discussed in-depth among all authors after each phase. Although agreement among authors was high, the final results were obtained only after several discussions.

Results

Variation at the group-level in experienced study-related exhaustion, self-regulation of learning, peer learning and perceived value of peer support during studies

The results showed a statistically significant increase in experienced study-related exhaustion ($t = -5.237$, $p < .000$) and self-regulation of content from the first to the fourth study year ($t = -2.864$, $p < .05$) (Table 2). The results also showed an increase in self-regulation of process, lack of regulation, peer learning and perceived value of peer support and a decrease in external regulation of learning. However, these changes were not statistically significant.

Individual variation in experienced study-related exhaustion during studies

The individual-level analysis showed a large individual variation in experienced study-related exhaustion. Therefore, three change groups were created: decrease, no or slight change and increase in study-related exhaustion. A total of 13 students reported a decrease in study-related exhaustion during their studies. From these students, seven students reported a decrease in exhaustion from high to average, four students reported a decrease from average to low, and two students reported a decrease from low to lower. A total of 27 students reported no or slight change in experienced study-related exhaustion during their studies. From these students, 11 students reported that exhaustion remained low, 10 students' reported exhaustion remained average, and six students reported that exhaustion remained high. A total of 51 students

Table 2 Results of the paired samples t-tests

	1st year	4th year	t	d
Self-regulation of process	4.84 (1.05)	5.05 (1.05)	-1.499	
Self-regulation of content	2.94 (1.15)	3.43 (1.40)	-2.864^*	0.39
External regulation	4.55 (1.07)	4.53 (1.27)	0.200	
Lack of regulation	3.41 (1.07)	3.58 (1.08)	-1.493	
Perceived value of peer support	5.12 (1.27)	5.29 (1.53)	-1.138	
Engagement in peer learning	3.61 (1.78)	3.79 (2.06)	-1.153	
Study-related exhaustion	3.12 (1.40)	3.89 (1.55)	-5.237^{**}	0.53

Significance level: $p < .001^{**}$; $p < .05 = ^*$; $- =$ not significant. $d < 0.50$ small, > 0.50 medium

reported that study-related exhaustion increased during their studies. From these students, 14 students reported an increase from low to average, six students reported an increase from low to high, 29 students an increase from average to high, and two students reported an increase from high to higher.

The interrelation between variation in self-regulation of learning, peer learning, peer support and study-related exhaustion during studies

Individual-level changes in the regulation of learning, peer learning and perceived value of peer support were examined in more detail among the change groups. The results based on quantitative data are presented in Table 3, and the results based on qualitative data are presented in Table 4.

Students whose experienced study-related exhaustion decreased during studies

The quantitative results showed a statistically significant decrease in experienced lack of regulation ($t = 2.327$, $p < .05$) and an increase in perceived value of peer support during studies ($t = -2.369$, $p < .05$).

In line with the quantitative results, in the interviews, the students also described decreased feelings of study-related exhaustion and emphasized that the importance of peer support had increased during studies. The students reported that they had experienced long-term stress, worry about study matters in free time and sleeping problems. They described that they had had difficulties particularly in planning studying and time management. In line with the quantitative results, the students described that their problems in studying had decreased and they had been able to develop self-regulation skills during their studies that had decreased their feelings of exhaustion. One student whose exhaustion decreased from average to low described study-related exhaustion and studying in the following way:

> I have been close to burnout a few times during my studies. I slept badly, I couldn't get sleep and I woke up in the middle of the night and started to think about the things related to studying and I couldn't stop it. [...] I tried to do everything at the same time but I didn't know where to start. I have learned to plan and schedule my studying and it has helped me.

Table 3 Change groups of study-related exhaustion and their means, standard deviations and changes in the scales

Change groups of study-related exhaustion	Decrease (n = 13)		No or slight change (n = 27)		Increase (n = 51)	
	1st year M (SD)	4th year M (SD)	1st year M (SD)	4th year M (SD)	1st year M (SD)	4th year M (SD)
Self-regulation of learning process	4.7 (1.0)	5.0 (1.0)	5.1 (1.1)	5.1 (1.1)	4.7 (1.0)	5.1 (1.1)
Self-regulation of learning content	2.4 (1.1)	2.5 (1.1)	3.0 (1.1)	3.6 (1.4)	3.0 (1.1)	3.6* (1.4) ↑
External regulation	4.9 (0.9)	4.4 (1.4)	4.6 (1.2)	4.3 (1.5)	4.4 (1.1)	4.6 (1.1)
Lack of regulation	3.7 (1.4)	3.1* (1.1) ↓	3.4 (0.9)	3.4 (1.1)	3.3 (1.1)	3.8** (1.0) ↑
Perceived value of peer support	5.1 (1.2)	5.8* (1.5) ↑	5.2 (1.2)	4.8 (1.7)	5.1 (1.3)	5.4 (1.4)
Engaging in peer learning	3.0 (1.6)	3.8 (2.4)	3.9 (1.7)	3.3 (2.0)	3.6 (1.9)	4.0 (2.0)

Note. Significance level: $p < .001$**; $p < .05 = $ *

The students emphasized that studying with other students had helped them to develop planning, monitoring and reflecting on learning. They experienced that peers had helped them in challenging learning situations and enhanced their well-being.

> My own studying has not always been so systematic. Other students have helped me to be more systematic and plan my studying. Through studying with other students, I have also learned to reflect on learning. I have been able to ask for help from other students when I have had problems in studying and stress and it has helped me.

One student reported having challenges in self-regulation from the beginning of studies. The student noted that other students' support would have been necessary but the student did not have peers with whom to study or from whom to ask support after the first study year. Experiences of study-related exhaustion had decreased only after the student decided to drop university studies.

Students whose experienced study-related exhaustion remained relatively unchanged during studies

Among these students, in the quantitative analysis, statistically significant changes during studies were not found in self-regulation, peer learning and the importance of peer support.

In the interviews, the students also described their feelings of study-related exhaustion as relatively stable during their studies (either low, average or high). The students' descriptions revealed a variation in experienced self-regulation of learning and peer support during peer learning that was not shown in the quantitative results. The students whose experienced study-related exhaustion remained low positively described their well-being during their studies. They described good self-regulation skills. They carefully planned their studying, set their own goals and had good time management skills; they also monitored and reflected on their own studying. One student described these in the following way:

> I usually don't stress about things related to studying. I have my own systematic way to study. I study regularly and I have a principle that I do everything that is related to study and work on weekdays between seven and five o'clock. I trust that it's enough. Free time and rest are also important.

Although they reported that they sometimes studied with their peers, the students stated that they did not need other students' support in the regulation of learning.

The students whose experienced study-related exhaustion remained either average or high described higher levels of exhaustion that were shown as long-term stress, problems in sleeping and worry about study matters during free time. One student whose exhaustion remained high during studies said that problems in well-being had also affected physical health. Many students also described feelings of inadequacy as a student. The students reported many challenges in self-regulation, particularly in planning their own studying and in time management. The student whose exhaustion remained high described study-related exhaustion, inadequacy as a student and studying in the following way:

> I always have the feeling that I should read and that I don't do enough. Sometimes I have studied 12 hours a day and it hasn't been enough. At the weekends I think that I should read but I'm so exhausted from the week that I just can't. I have had difficulties

in planning and scheduling my studying. I usually don't set my own goals for studying because it's difficult to set goals that I could reach.

The student whose exhaustion remained average admitted needing more studying with peers and support from them because of self-regulation problems.

I have a few peers with whom I have studied. We have gone through the most important topics of study. Through studying together, I have learned to recognise what I already know and to reflect on my own learning. They have helped me learn how to study. I would like to study more with them but everyone is so exhausted that they don't have energy to study with others in addition to independent studying.

The student whose exhaustion remained high reported studying independently. The student experienced that other students could not support in self-regulation problems.

Students whose experienced study-related exhaustion increased during studies

Among these students, the quantitative results showed a statistically significant increase in experienced self-regulation of content ($t = -2.27$, $p < .05$) and lack of self-regulation ($t = -3.744$, $p < 0.001$) during studies. The results also showed an increase in all other scales, but the changes were not statistically significant.

In the interviews, the students also reported increased feelings of study-related exhaustion and problems in self-regulation. The students emphasized the importance of peer support in studying. The students reported that increased study-related exhaustion was shown as increased tiredness, worry about study-matters in free time, problems in sleeping and difficulty in recovering from studying. The students also described increased experiences of inadequacy as a student. The students' descriptions showed low self-efficacy beliefs; they were worried about their own competences related to future working life and such concerns were related to feelings of stress.

The students described increased workload and challenges in self-regulation of learning, particularly in planning studying, setting reasonable goals, time management, monitoring and reflecting on their learning. They reported that they had difficulties in learning how to study. One student whose exhaustion increased from low to high described well-being and studying in the following way:

Studying is much more strenuous than at the beginning of my studies and the amount of studying has dramatically increased. I feel that I don't have time to recover from studies. I have had many problems in time management. I try to plan to study but it's often difficult to stick to that plan and that's why I have often studied during the night, which also contributes to stress due to lack of sleep. I continually wonder if I have enough competence for future working life and that worry causes more stress.

The students highlighted that other students' support was essential in studying because of challenges in self-regulation. They described the support that they received from peers in planning, monitoring and reflecting on their own learning. However, some students did not have an opportunity for peer support because of a lack of peers with whom they could study. The summary of the qualitative results is presented in Table 4.

Table 4 Students' descriptions of their self-regulation of learning, peer support and study-related exhaustion

	Decrease in study-related exhaustion			No or slight change in study-related exhaustion			Increase in study-related exhaustion		
	From high to average ($n=1$)	From average to low ($n=1$)	From average to low ($n=1$)	Remained low ($n=2$)	Remained average ($n=2$)	Remained high ($n=1$)	From low to high ($n=2$)	From average to high ($n=1$)	From high to higher ($n=1$)
Study-related exhaustion	Descriptions of a decrease in exhaustion			Positive descriptions of well-being	Descriptions of high study-related exhaustion and inadequacy as a student during studies		Descriptions of an increase in study-related exhaustion and inadequacy as a student during studies		
Self-regulation of learning	Descriptions of developing own self-regulation skills during studies	Descriptions of problems in self-regulation		Descriptions of good self-regulation skills		Descriptions of problems in self-regulation	Descriptions of increased problems in self-regulation		
Peer support	Descriptions of being able to develop self-regulation skills through peer support	Descriptions of needing more peer support because of self-regulation problems		Descriptions of not needing other students' support in the regulation of learning	Descriptions of needing more peer support because of self-regulation problems	Descriptions of not utilizing peer support despite self-regulation problems	Descriptions of emphasizing the importance of peer support because of self-regulation problems. All the students did not have an opportunity for peer support		

Discussion

This mixed-method longitudinal study examined a variation in university students' experienced self-regulation of learning, peer learning, peer support and study-related exhaustion during studies and how these were inter-related. As expected, the quantitative results were in line with previous studies showing that study-related exhaustion increased at the group-level during university studies (Salmela-Aro and Read 2017; Dahlin and Runeson 2007). Moreover, as in previous studies, it was found that self-regulation of learning increased during studies (Donche and Van Petegem 2009; Donche et al. 2010). The regulation of the learning content is needed when a student does not understand something that should be learned. Through the regulation of the learning content, a student may independently search for more knowledge outside the syllabus. In addition, a student may regulate how much effort to put into studying and to manage the workload.

As expected, a closer examination of the variation in experienced study-related exhaustion at the individual-level showed a large individual variation during studies. These changes were not shown at the group level because changes went to different directions; therefore, the variation in the changes was neutralized as has also been shown in previous research (Lindblom-Ylänne et al. 2013, 2015b). Based on the variation, three student groups were identified: students whose experienced study-related exhaustion (1) decreased, (2) remained relatively stable and (3) increased during studies. More than half of the students experienced that study-related exhaustion increased during studies. It was worrying because students who experience exhaustion may be at risk for dropping out from university (Rogers et al. 2015). Experiences of exhaustion may also affect students' well-being (Salmela-Aro et al. 2009). There is also evidence that exhaustion during studies is related to exhaustion later in working life (Dahlin et al. 2010).

Although the quantitative results did not show statistically significant changes in experienced self-regulation of process, lack of regulation and external regulation of learning, peer learning and peer support, the qualitative results did reveal a variation in these aspects. As expected regarding the relationship between experiences of self-regulation, peer learning, peer support and study-related exhaustion, the students whose experienced study-related exhaustion decreased during studies reported that problems in self-regulation decreased during studies. Most students reported that being able to develop their regulation skills decreased their experiences of exhaustion. The results were in line with previous research showing that students experienced elevated levels of exhaustion at the beginning of studies (Litmanen et al. 2014). As Litmanen et al. (2014) argue, one reason for experiences of exhaustion at the beginning of studies may be undeveloped self-regulation skills. As hypothesized, the students who experienced problems in self-regulation emphasized the role of peer support in self-regulation during studies. They reported that they had been able to develop their planning, monitoring and reflection skills through peer support. This is in line with research showing that peers supported students to develop their monitoring and reflection skills during the first study year (De Backer et al. 2015).

Among the students whose experienced study-related exhaustion remained relatively unchanged during their studies (low, average or high) or increased during studies, there was a variation in their experienced self-regulation skills, which was clearly related to their experiences of study-related exhaustion. The students whose exhaustion remained low

reported good self-regulation skills, whereas the students whose exhaustion remained high or increased during studies reported more challenges in self-regulation. These results are in line with previous studies showing that students who had good self-regulation skills experienced lower levels of exhaustion than students who had problems in self-regulation at the first study year (Heikkilä et al. 2011, 2012). It was worrying that many students experienced problems in self-regulation because these problems are related to a risk for not graduating on time or dropping out from university (Vanthournout et al. 2012).

The students whose study-related exhaustion remained high or increased during studies also reported experiences of inadequacy as a student. It was worrying because experiences of inadequacy as a student is one dimension of study-related burnout (Salmela-Aro et al. 2009). The students whose study-related exhaustion increased also described an increased workload. As in previous studies, the students experienced that the workload was negatively related to their well-being (Litmanen et al. 2014; Dahlin et al. 2010). These students also reported difficulties in recovering from studying. One reason for these feelings of workload and difficulties in recovering from studying may be due to difficulties in planning studying and in time management.

As expected, the students who reported good self-regulation skills said that they did not need other students' support in learning. Most students who experienced problems in self-regulation experienced that other students' support in learning was essential for them because of problems in self-regulation. However, it may be that these students had such severe difficulties in self-regulation that even peer support did not help them to decrease study-related exhaustion. Not all students utilized peer support despite problems in studying, and all students did not have an opportunity for peer support although they experienced that they would have needed it. It may be that these students tried to manage their studying alone. It was worrying because a lack of peer support may lead to loneliness which is negatively related to well-being (Lin and Huang 2012). Therefore, the match between needed and received support is important (Wolff et al. 2013).

There are some methodological limitations that should be considered when interpreting the results of this study. First, this longitudinal study included only two measurement points. However, the strength of the study was that the students were followed for 4 years during their studies during which time changes could have occurred in experienced study-related exhaustion and studying. Second, the sample size of the study was limited, and some students were not part of the follow-up study. However, half of the students were reached after 3 years. In addition, only 12 students were interviewed at the second measurement point. However, the in-depth interviews allowed the students to describe their experiences from the beginning of their university studies. Because of the limited sample size, the findings should not be generalized to the entire population. More research is needed to increase an understanding of the changes of university students' self-regulation of learning, peer learning, peer support and study-related exhaustion during studies. Third, the results of the present study are completely based on students' self-reports regarding self-regulation of learning, peer learning, peer support and study-related exhaustion rather than measuring their actual behaviour. Fourth, the scales measuring self-regulation and study-related exhaustion have been validated in a university context. However, the scales measuring peer learning and peer support have been previously used in the university context in only one previous study. Further development of the scales is still needed in the university context to capture peer learning and peer support more profoundly. Finally, the study was based only on four disciplines

and six degree programmes at one research-intensive university in one country. In addition, there was a variation in the number of students representing different disciplines. Therefore, the differences between individual disciplines could not be explored. In the forthcoming studies, it would be interesting to explore changes in self-regulation of learning, peer learning, peer support and study-related exhaustion in different disciplines.

Conclusion

First, the present study adds new knowledge on the variation in university students' experiences of self-regulation of learning, peer learning, peer support and experienced study-related exhaustion during studies. The results showed that experienced study-related exhaustion and self-regulation of content increased during studies. However, the results at an individual level showed a large variation in experienced study-related exhaustion, regulation of learning, peer learning and peer support. These results could not have been detected only through a group-level analysis. Second, the study provides evidence on the relationship between these aspects during studies. It can be concluded that regulation skills have a key role in experienced study-related exhaustion during studies. The results showed that the students whose experienced study-related exhaustion decreased during studies reported being able to develop their regulation skills during studies. The students whose experienced study-related exhaustion remained average or high during studies reported more problems in regulation of learning. The students whose experienced study-related exhaustion increased during studies experienced increased problems in regulation of learning during studies. Peer support and peer learning may have a key role for those students who are at risk for study-related exhaustion. The results also showed that peer support was important for many students because of problems in self-regulation. Many students were able to develop their self-regulation skills through other students' support. However, the results showed that not all students used other students' support despite problems in studying and some did not have peers with whom to study and from whom they could ask for support.

In terms of practical implications, it is important to pay attention to students' self-regulation and peer learning skills, peer support as well as well-being from the beginning of university studies. In order to increase their own self-regulation and peer learning skills and peer support and to decrease experiences of study-related exhaustion, students may practise planning their own studying by setting their own goals for learning and studying and by creating a concrete plan on when to study, work and have free time. It is also important for them to allow time to recover from studying. It is important that students also monitor their own study progress and reflect on their own studying and learning. To enhance peer learning and peer support skills, the students can organize studying with peers outside lectures. It would be important that students could discuss problems related to studying with their peers.

Teachers can support the development of students' self-regulation skills by setting clear goals for learning, encouraging students to set their own goals and helping students to divide goals into sub-goals. Students can be given tasks that require reflection on their own studying and learning. It is important that teachers also provide students opportunities for peer learning in such a way that all students would have an opportunity to study with and receive support from peers. Peer learning skills could also be enhanced by giving students such challenging tasks that require working collaboratively. Peer learning could also be considered in

assessment so that students would understand its importance in learning. Formative assessment supports students to reflect on their own studying during the study process. In addition, the use of self- and peer assessment helps students to become aware of their own self-regulation and peer learning skills.

Finally, study counselling can support students by arranging courses that focus solely on study skills and where students are able to practise these skills through guidance in developing planning and time management skills. Students' well-being could be supported through courses that focus on well-being.

Appendix A. Variables and scales of the questionnaire

Self-regulation of learning

1. When I am studying, I also pursue learning goals that have not been set by the teacher, the course or degree but by myself.
2. When I have difficulty understanding particular subject matter, I try to analyse why it is difficult for me.
3. I study according to the instructions given in the study material or provided by the teacher.
4. To test whether I have mastered the subject matter, I try to think of examples and problems besides the ones given in the study material or by the teacher.
5. I have noticed that I have trouble processing a large amount of subject matter.
6. To test my learning progress, I try to formulate the main points in my own words.
7. In addition to the course requirements, I study other literature related to the content of the course.
8. I experience the instructions and assignments given by the teacher as indispensable guidelines for my studies.
9. It is difficult for me to determine whether I have mastered the subject matter sufficiently.
10. I study all the subject matter in the same order that it has been handled in the course.
11. If I do not understand the subject matter, I search for more material related to the subject concerned.
12. I realize that the objectives of the course are too general for me to offer any support.
13. I do more than I am expected to do in a course.
14. The instructions and the course objectives given by the teacher are important to me in order to know exactly what to do.
15. I realize that I miss someone to fall back on in case of difficulties in studying.

Scale: 1–7, 1 = totally disagree, 7 = totally agree

Engaging in peer learning

1. I often do study tasks together with peers.
2. I often prepare for the exam together with peers.

Perceived value of peer support
1. Peer support is important in studying.
2. Conversations with peers support me in my studying.
3. I ask for help from my peers concerning questions related to studying.

Scale: 1–7, 1 = totally disagree, 7 = totally agree

Study-related exhaustion
1. I feel overwhelmed by my study work.
2. I often sleep badly because of matters related to my study work.
3. I often brood during my free time over matters related to my study work.
Scale: 1–7, 1 = totally disagree, 7 = totally agree

Appendix B. Interview questions

Introduction to the interview In this interview, we will discuss your experiences related to studying at university and your well-being while doing so. First, I will ask you for some background information. Then, I will ask you about your studying at the university and whether your studying has changed during your studies. At the end, I would like to ask you about your experiences related to well-being during your studies; we can go through your responses to the questionnaire related to well-being at the first and fourth study year.

The discussion will be confidential. The interview data will be treated confidentially. The anonymity of the participants will be ensured during all stages of the study. You can also withdraw from the study at any time.

I Phase and progression of studies
1. In which phase are you in your studies?
2. How have your studies progressed?
3. Have you worked during your studies? How have you succeeded in combining studies and work?

II Studying during university studies
Next, I would like to ask you about your experiences of studying at university.

4. Could you freely describe how you usually study? Please describe the process. What do you concretely do?
5. What are your goals in studying?
6. Do you set your own goals for learning and studying?
7. Do you think that you have usually been able to reach the goals? If not, why?
8. How do you plan your studying? Do you do make schedules? How are you able to follow your plans? What do you do to follow your plans? What do you do if you notice that you are not able to follow them?
9. How do you usually prepare for exams?
10. Do you reflect on your own studying and learning after studying?
11. What role does a teacher have in your studying and learning?

12. Have you had problems related to studying during university studies? Could you give an example? What have you done if you have had problems?
13. Have you considered dropping from the university or changing your major subject?

III Studying with peers and peer support

Next, I would like to ask you about your experiences of studying with peers and peer support.

14. Do you usually study independently or with your peers? What works the best for you?
15. What benefits are there in studying with peers?
16. If you study with peers, how do you concretely study together? Could you please give an example?
17. If there is collaborative learning in a course, what do you think about it?
18. Do you have peers from whom you have been able to seek support in problems related to studying? If so, how have your peers supported you in problems related to studying? Has peer support been essential for you to manage studying? If not, have you wished that there would have been such peers?
19. Have you helped your peers in studying or helped with problems related to studying?

IV Changes in studying during university studies

Next, we can discuss your experiences of changes in studying during your university studies.

20. Has your studying changed during your university studies? If so, how has your studying changed?
21. Have you tried to develop your own study practices? If so, which practices have you developed?

V Well-being and study-related exhaustion

Next, I would like to ask you about your experiences of well-being related to studying. Do you feel fine? You can say if there are questions to which you do not want to respond. First, we can go through your responses to the questionnaire regarding your experiences related to well-being at the first and fourth study year. The questionnaire included items:

22. "I often sleep badly because of matters related to my studies". If yes, how is it shown? Have there been any changes during your studies? If yes, which changes?
23. "I feel overwhelmed by my study work". If yes, how is it shown? Have there been changes during your studies? If yes, which changes?
24. "During my free time, I often brood over matters related to my study work". Which study-related matters do you brood over in your free time? Have there been changes during your studies? What changes?
25. If a student has not experienced study-related exhaustion, how have you been able to avoid having these kinds of problems?
26. What ways have you used to recovering from study-related exhaustion?
27. How do you think that you are going to manage the rest of your studies?
28. Is there anything else that you would like to add or clarify?

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Current themes of research:

Milla Räisänen focuses on her research on university students' self- and co-regulation of learning, peer learning, peer support and well-being.

Most relevant publications in the field of Psychology of Education:

Räisänen, M., Postareff, L., Mattsson, M., & Lindblom-Ylänne, S. (2020). Study-related exhaustion: First-year students' use of self-regulation of learning and peer learning and perceived value of peer support. *Active Learning in Higher Education, 21*(3), 173–188.

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Most relevant publications in the field of Psychology of Education:

Postareff, L., & Lindblom-Ylänne, S. (2011). Emotions and confidence within teaching in highereducation. *Studies in Higher Education, 36*(7), 799–813. https://doi.org/10.1080/03075079.2010.483279

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Sari Lindblom

Current themes of research:

Sari Lindblom focuses on her research on student learning and teaching at university, for example, on approaches to learning and teaching, self-regulation, self-efficacy beliefs, motivation to studying, assessment practices and quality enhancement in higher education. Her default publishing name is Lindblom-Ylänne.

Most relevant publications in the field of Psychology of Education:

Lindblom-Ylänne, S., Haarala-Muhonen, A., Postareff, L. & Hailikari, T. (2017). Exploration of individual study paths of successful first-year students: an interview study. *European Journal of Psychology of Education, 32*, 687–701. https://doi.org/10.1007/s10212-016-0315-8.

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