



THE RELATIONSHIPS BETWEEN DOCTORAL STUDENTS' PERCEPTIONS OF SUPERVISION AND BURNOUT

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ABSTRACT

Aim/Purpose	Both the quality and the quantity of doctoral supervision have been identified as central determinants of the doctoral journey. However, there is a gap in our understanding of how supervision activities are associated with lack of wellbeing, such as burnout, and also to completion of the studies among doctoral students.
Background	The study explored doctoral students' perceptions of different aspects of supervision including the primary sources, frequency, expressed satisfaction and their interrelation with experienced stress, exhaustion and cynicism.
Methodology	Altogether 248 doctoral students from three Finnish universities representing social sciences, arts and humanities, and natural and life sciences responded to an adapted version of a Doctoral Experience Survey. A combination of several measures was used to investigate the students' experiences of supervision and burnout.
Contribution	The results showed that students benefit from having several and different kinds of supervision activities. Various sources contribute not only to experiences of the doctoral journey and burnout, but also to the completion of the studies.
Findings	Experienced lack of satisfaction with supervision and equality within the researcher community and a low frequency of supervision were related to experiences of burnout. Experiences of burnout were connected to students' attrition intentions. Attrition intentions were related to source of supervision,

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	the form of thesis, and inadequate supervision frequency. Frequency was related to both experience of burnout and likelihood of attrition.
Recommendations for Practitioners	A recommendation developed from this research is to assist doctoral students with sufficient support, especially equality within the scholarly community and frequency of supervision. Further, greater emphasis could be put on group supervision and other collective forms of supervision. It is important that doctoral students develop networks both nationally and internationally.
Recommendation for Researchers	A recommendation emanating from this research is to put greater emphasis on further investigation of the role of other predictors in burnout in order to enhance doctoral students' well-being.
Impact on Society	A better understanding of factors that promote lower attrition rates and enhance well-being for doctoral students is likely to lead to more efficient use of financial and intellectual resources in academia and society more broadly.
Future Research	Given the results of this study, qualitative interviews might be helpful in mapping out the dynamics that lead to attrition and to identify the mechanisms in the researcher community that support the doctoral students and enhance well-being in their doctoral journey.
Keywords	doctoral education, supervision, supervisory activities, burnout

INTRODUCTION

Doctoral students face high and potentially strenuous demands (Hermann, Wichmann-Hansen & Jensen, 2014). A number of students have been found to suffer from stress and to experience loneliness (Hermann et al., 2014; Jacobsson & Gillström, 2006). These students may face an increased risk of burnout and even attrition if they are not given adequate support in complying with the demands placed on them (Jacobsson & Gillström, 2006; Pyhältö, Vekkaila, & Keskinen, 2015). There is evidence that a functional supervisory relationship, constructive feedback, and social support contribute not only to the timely completion of studies, but also to satisfaction with the doctoral program (Gardner, 2007; Golde, 2005; Ives & Rowley, 2005; Pyhältö, Vekkaila, & Keskinen, 2012; Stubb, Pyhältö & Lonka, 2011; Wao & Onwuegbuzie, 2011). It has been suggested that central for the functional supervisory interaction are mutual respect, flexible adjustment to the student's needs, clear communication between supervisor and student, and explicit strategies for progressing towards the doctoral degree (Halse & Malfroy, 2010). Furthermore, frequent supervision has been shown to reduce attrition risk among doctoral students (Pyhältö et al., 2015), whereas a lack of or inadequate supervision appears to increase the risk (Pyhältö et al., 2012). Thus, both the quality and the quantity of doctoral supervision have been identified as central regulators of the doctoral journey (Pyhältö et al., 2012). Altogether, previous research shows that there is a connection between supervision and experienced well-being. Yet, there is less research on how supervision is associated with lack of well-being, such as burnout. Furthermore, not enough is known about how experiences of well-being and a lack of it are manifested in different models of supervision, i.e., the dyadic model and collective model of supervision (cf. Dysthe, Samara, & Westrheim, 2006; Vekkaila, Pyhältö, & Lonka 2013; Wisker & Claesson, 2013). There is a gap in research on how the dyadic model and the collective model of supervision are associated with doctoral student burnout.

The aim in this study is to contribute to current knowledge with regard to how the quality and quantity of supervision relate to an increased or reduced risk of burnout during the doctoral journey. The focus is on the interrelation between the different elements of supervision and burnout, and on how the students' perceptions of the various supervisory activities are connected to experienced exhaustion and cynicism.

THEORY

THE SUPERVISORY RELATIONSHIP

It has been suggested that a functional supervisor-student relationship is one of the most important determinants of success on the doctoral journey (Zhao, Golde, & MacCormick, 2007). Seagram, Gould and Pyke (1998) found that doctoral students with fast completion times reported more involvement with their supervisors than those who took longer to complete their studies. Also, a good match between supervisors' and doctoral students' perceptions of supervision has been associated with a reduced risk of dropout and increased satisfaction (Pyhältö et al. 2015). Pyhältö et al. (2015) report that doctoral students consider personal supervisory interaction particularly important and benefit from the opportunity to use different resources, such as supervisory teams. Moreover, a constructive supervisory relationship, frequent meetings, a relaxed ambience during meetings, and a sympathetic and caring attitude towards the supervisee have been associated with good progress and satisfaction with doctoral studies (Cornér & Lindholm, 2013; Hermann et al., 2014; Ives & Rowley, 2005; Kam, 1997; Pyhältö et al., 2012., 2015; Zhao et al., 2007). On the other hand, communication problems, a lack of professional expertise, and power conflicts between supervisor and doctoral student have been shown to have a negative impact on the doctoral experience (Ismail, Majidb, & Ismail, 2013). Hence, the quality of the supervisory relationship influences the students' satisfaction with the doctoral process (Zhao et al., 2007).

Supervision includes both an intellectual dimension entailing providing knowledge, suggestions, and feedback, and affective aspects such as caring, support, and friendliness (Barnes & Austin, 2009; Halse & Malfroy, 2010). At its best, the supervision fosters both the advancement of the doctoral research and the doctoral student's overall development as a scholar (Gurr, 2001). According to Gurr (2001), this requires some sensitivity to students' needs combined with flexibility, or "a dynamic awareness of the state of the relationship and flexibility in responding to the inevitable changes" (p. 81). The supervisory relationship is also affected by student characteristics, the immediate researcher community including research groups, the infrastructures provided by the working environment, and institutional and national policies, structures, and procedures (Delany, 2012). Supervision plays a major role in the enculturation of the doctoral student to the practices of the scholarly community (Dysthe et al., 2006), much of which takes place within the supervisory relationship. Supervisors, for instance, often provide access to resources, professional networks, expertise, and learning opportunities, which are of critical importance for the student (Pearson & Brew, 2002).

Two basic models of supervisory practice have been distinguished in the literature, one based on the research group and the other on dyadic communication. Both models have their strengths and weaknesses. One of the strengths of the dyadic model is the highly individual supervision resulting in specific advice and personal attention (Dysthe et al., 2006). However, the model is vulnerable because it relies heavily on one-on-one interaction (Dysthe et al., 2006; Lee, 2007, 2008; Malfroy, 2005; Whisker & Claesson, 2013; Zhao et al., 2005). As a result, problems may not be exposed to other members of the scholarly community, thereby hindering the scrutiny of common practices and hiding possible underlying ethical problems (Löfström & Pyhältö, 2014). An advantage of collective forms of supervision, on the other hand, is that they enhance enculturation into the discipline and facilitate collective feedback (Dysthe et al., 2006) from several sources (Pyhältö, et al 2015). The collective model is also suggested to be less prone to problems than the dyadic model because the support comes from various sources (Pyhältö & Keskinen, 2012). A weakness in the group-based model, however, is that it typically involves orchestrating cooperation among supervisors, and finding a balance in the workload of individual students between their doctoral research and their group's research project can sometimes be problematic. It is possible that ambitious doctoral students become highly involved in several different projects, causing them to become overloaded with project work (Löfström & Pyhältö, 2015; Pyhältö & Keskinen, 2012). Consequently, there are risks that the supervisory support system fails to meet the doctoral student's needs of adequate support during the

doctoral journey. Furthermore, if there is a lack of support and the demands are too high, it may lead to psychological costs, which may emerge in the form of reduced wellbeing (Bakker & Demerouti, 2006) and even attrition (Lovitts, 2001; Pyhältö et al., 2015).

BURNOUT

The doctoral journey entails both intellectual and emotional challenges (Hermann, Wichmann-Hansen, & Jensen, 2014). If students do not receive sufficient support to help them overcome the challenges they are likely to be exposed to an increased risk of burnout, and, eventually, attrition (Jacobsson & Gillström, 2006; Lovitts, 2001; Pyhältö et al., 2015).

Burnout, which is a result of prolonged work-related stress (Freudenberger, 1974; Schaufeli, Martinez, Pinto, Salanova, & Bakker, 2002), has two distinctive symptoms: exhaustion and cynicism (Maslach & Jackson, 1981). *Exhaustion* is characterized by a lack of emotional energy, and feelings of strain and chronic fatigue (Maslach, Schaufeli, & Leiter, 2001), whereas *cynicism* is manifest in depersonalization and an excessively detached response to colleagues and other aspects of the job (Maslach, 2003). A strong relationship between exhaustion and cynicism has been identified across various organizational settings. In general, both tend to emerge from overload at work, heavy job demands, and social conflict (Maslach, 2003).

It has been shown in several studies that, among other negative symptoms, stress and exhaustion are relatively common among doctoral students (Hermann et al., 2014; Hyun, Quinn, Madon, & Lustig, 2006; Jacobsson & Gillström, 2006; Jairam & Kahl, 2012; Pyhältö et al., 2012; Stubb et al., 2011). It is suggested that up to one-third of them often or always feel exhausted. According to Hermann et al. (2014), approximately 25 percent of the doctoral students in their study reported that their work took so much time and energy that it negatively affected their private life and they suffered from loneliness. A comparative study on Finnish, Swedish, Irish, and Catalan doctoral students (Jacobsson & Gillström, 2006) showed that the study demands were often experienced to be excessive compared to the length of the studies, and consequently students experienced significant levels of stress. Moreover, doctoral students who had considered interrupting their studies were more stressed and suffered more from negative feelings such as anxiety and exhaustion than their peers who had not considered such a course of action (Pyhältö et al., 2012). On the other hand, it appears that social support from supervisors helped to ease emotional exhaustion (Rigg, Day, & Adler, 2013). Likewise, it has been found that a high degree of integration into the researcher community increases the likelihood of timely completion of the doctoral degree (Hermann et al., 2014; Jairam & Kahl, 2012; Wao & Onwuegbuzie, 2011). Reduced support in the social structure both within academia and outside, and a competitive feeling among academic colleagues may also weaken the engagement of doctoral students in their research (Jairam & Kahl, 2012).

The aim of this study was to enhance understanding of the interrelation between supervision and experienced burnout among doctoral students. The students' experiences of various supervisory aspects including sources, frequency and quality, and the associations of these experiences with burnout were analyzed. The following research questions were addressed:

- 1) How do doctoral students experience aspects of supervision including the sources, the frequency and the quality?
- 2) How do doctoral students' experiences of and satisfaction with supervision relate to their experiences of burnout?

METHOD

CONTEXT

The study was conducted in three Finnish universities. Doctoral students in Finland are involved in conducting doctoral research from the very beginning of their studies. In parallel to writing their

doctoral thesis they do the required coursework and take part in courses, seminars and conferences (from 40 to 60 units in the European Credit Transfer and Accumulation System, ECTS), depending on the discipline. Applicants for doctoral programs are required to have a Master's degree and a comprehensive and systematic research plan. Hence, acceptance is based on the grade of the Master's thesis and the quality of the research plan. The doctoral thesis comprises either a monograph (book format) or a series of 3-5 articles and a summary (Finland's Council of State, 2014). The article-based dissertation has become the dominant format, although field-specific differences exist (Pyhältö, Stubb & Tuomainen, 2011). The articles are typically co-authored with supervisors and other senior researchers. Doctoral students have at least one supervisor (the minimum qualification being an associate professorship) in the relevant field, and also have a second supervisor. In fact, the policy for doctoral education in many universities stipulates at least two supervisors. The education is publicly funded and there are no tuition fees. University studies in Finland are, for the most part, conducted in Finnish, Swedish, or English. The language of the supervision process depends on the native language of the doctoral student and the language of the doctoral program. Although the number of doctoral positions funded by the doctoral schools within the universities is growing, the most typical sources of funding include grants from foundations, project funding, university posts for doctoral students, and work outside of the university (Cornér & Lindholm, 2013; Pyhältö et al., 2011).

PARTICIPANTS

In total (N), 248 Swedish-speaking doctoral students (147 women, 59%; 101 men, 41%; mode 30-34 years) from the Faculties of Humanities and Theology (75/30%), Natural Sciences and Engineering (52/26%), Social Sciences and Law (40/16%), Behavioral Sciences (35/14%), Economics (30/13%), and Medicine (16/6%) responded to the survey. The response rate was 36 percent. The distribution of gender and age was representative of the whole student population (Cornér & Lindholm, 2013). About half (51%) of the participants were full-time students and the rest (49%) were completing their doctoral studies part-time. Over half of them (55%) were compiling an article-based dissertation, and 39 per cent were writing a monograph. Six percent were undecided about the form of their dissertation. The participants were in different phases of their doctoral studies. A half (52%) of the students had completed more than two-thirds of their thesis and 48 percent of the students were in the first-third of their thesis process. Thus, the majority of the informants already had extensive experience studying on the doctoral level. The participants obtained funding for their doctoral education from different sources. Most of them (66%) were funded through personal grants at least for one of the study periods. There were differences in funding between the various fields. Eighty percent of those in humanities and theology obtained grants for their doctoral education, whereas those majoring in science and technology generally obtained project funding (56%). A third (33%) of the students worked outside of the university to finance their studies.

DOCTORAL EXPERIENCE SURVEY

The data were collected via an online survey based on an adapted version of the Doctoral Experience Survey (Pyhältö et al., 2011; Pyhältö et al., 2015), which consists of 27 statements rated on a Likert-type response scale (1=fully disagree, 5=fully agree), and five open-ended questions. The Doctoral Experience Survey (Pyhältö et al., 2011; Pyhältö et al., 2015) has been validated in earlier studies. The adapted version included items and open-ended questions on the following themes: the main challenges doctoral students face, the resources available to them, the supervision process, the availability of courses in Swedish, the students' wellbeing, and their views on their prospective careers. The survey also includes 14 background questions. The survey was piloted before the data-collection. This study utilizes questions concerning the doctoral students' perceptions of the supervision process and of burnout.

The participants were asked to identify the primary actors in the supervision process ("Who is your supervisor in the thesis process?") as well as whether there had been any changes of supervisor and the frequency of supervision. They were also asked to assess the significance of the different actors

in the process. The students' overall satisfaction with their supervision and, in particular, with the supervisory support, was explored via the item: "Are you satisfied with the supervision you receive"? Scales for measuring the quality of supervision (e.g., the supervisory and researcher community experiences) were measured with three scales comprising 20 items. A principal component analysis with promax rotation revealed the factor structure, based on which three sum variables were compiled for further analysis. The Cronbach's Alphas measuring the internal consistency of the subscales were good (Table 1), and the data fitted the principal component analyses well (KMO = .908, Bartlett's test = .000). Communalities were between .504 and .958 (Table 2), and the three sum variables explained 55 percent of the variance. The participants' experience of the *supervisory support* was measured on a five-item sub-scale, the *researcher community support* with a four item scale, and *the equality in the researcher community* were measured on two four-item sub-scales. The subscales followed the empirical structure identified in Pyhältö et al. (2011). Most of the items included in the first and second subscales were the same and, further, the three items in the third subscale matched the former empirical structure (Pyhältö et al., 2011), but the subscale was named "Satisfaction with working conditions".

Table 1. Items included in the supervisory-support scale, researcher-community support and equality in the researcher community.
Cronbach's Alpha (α), Mean and Standard Deviations (SD). 1=fully disagree, 5=fully agree

The scale	Items included	α	Mean (SD)
Supervisory support	"I receive encouragement and personal attention from my supervisors" "I feel that my supervisors are interested in my opinions" "I feel appreciated by my supervisors" "I can openly discuss any problems related to my doctoral education with my supervisors" "I often receive constructive criticism of my skills and expertise"	.884	3.79 (0.9)
Researcher-community support	"I feel accepted by the research community" "I feel that the other members of the research community appreciate my work" "My expertise is put to use in the research community" "I receive encouragement and support from the other doctoral students"	.758	3.59 (0.8)
Equality in the researcher community	"Rights and responsibilities between me and the other doctoral students in my immediate surroundings are equally distributed" "My research community addresses problems in a constructive way" "I am treated equally in my research community" "There is a good sense of collegiality between researchers"	.801	3.51 (0.8)

Table 2. Factor loadings for supervisory-support scale, researcher-community support and equality in the researcher community

Sum variables		1	2	3
Supervisory support	“I receive encouragement and personal attention from my supervisors”	.958		
	“I feel that my supervisors are interested in my opinions”	.854		
	“I feel appreciated by my supervisors”	.750		
	“I can openly discuss any problems related to my doctoral education with my supervisors”	.624		
	“I often receive constructive criticism of my skills and expertise”	.655		
Researcher-community support	“I feel accepted by the research community”		.708	
	“I feel that the other members of the research community appreciate my work”		.812	
	“My expertise is put to use in the research community”		.650	
	“I receive encouragement and support from the other doctoral students”		.504	
Equality in the researcher community	“Rights and responsibilities between me and the other doctoral students in my immediate surroundings are equally distributed”			.755
	“My research community addresses problems in a constructive way”			.734
	“I am treated equally in my research community”			.563
	“There is a good sense of collegiality between researchers”			.517

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

A combination of several measures was used to investigate the students' experiences of burnout on the doctoral journey: the one-item Stress scale (“Have you recently been stressed?”) (Elo, Leppänen, & Jahkola, 2003) and Exhaustion (4 items) and Cynicism scales (3 items) (Pyhältö et al., 2011). A principal components analysis with varimax rotation resulted in the expected factor structure, based on which two sum variables were compiled for further analysis. The Cronbach's Alphas measuring the internal consistency for each scale were good (Table 3). The two factors explained 53 percent of the total variance. The communalities were between .563 and .921 (Table 4).

A single dependent sum variable for burnout was created for the multiple regression analysis. The objective was to interpret the relation between statistically significantly different predictors and study-related burnout. It was not possible to exclude other possibly related directions and variables, however.

Table 3. The items included in the questionnaire. Cronbach's Alpha (α), Mean and Standard Deviations (SD). 1=fully disagree, 5=fully agree.

The Scale	Items included	α	Mean (SD)
Stress	“Stress means a situation in which a person feels tense, restless, nervous or anxious, or is unable to sleep because his/her mind is troubled all the time.”		3.55 (1.10)
	“Do you feel this kind of stress these days?”		
Exhaustion	“I am stressed out by the workload, deadlines and competition in doctoral studies.”	.791	2.78 (0.89)
	“Doctoral studies are too stressful for me.”		
	“I worry about my thesis in my free time.”		
	“My workload is often too high.”		
Cynicism	“It is difficult for me to find meaning in my doctoral studies.”	.743	2.28 (0.94)
	“I am not motivated by the content of my studies.”		
	“I have to force myself to work on my		

Table 4. Factor loadings for exhaustion and cynicism

Sum variables		1	2
Exhaustion	“I am stressed out by the workload, deadlines and competition in doctoral studies.”	.740	
	“Doctoral studies are too stressful for me.”	.690	
	“I worry about my thesis in my free time.”	.645	
	“My workload is often too high.”	.636	
Cynicism	“It is difficult for me to find meaning in my doctoral studies.”		.921
	“Doctoral studies are too stressful for me.”		.609
	“I often have to force myself to work on my thesis.”		.563

Extraction Method: Maximum Likelihood.

Rotation Method: Varimax with Kaiser Normalization

RESULTS

PRIMARY SOURCES OF SUPERVISION AND THEIR SIGNIFICANCE

The majority of the doctoral students (59%) had one supervisor, although over a third (39%) reported having more than one or a group of supervisors. Very few of the participants (2%) reported that they did not have a supervisor or did not know who it was. One fifth of them (21%) had changed supervisor and 13 percent had considered changing. Typical reasons for changes in the supervisory arrangements included retirement and a change of job among the supervisors, student dissatisfaction with the supervisor's competence, and a dysfunctional “chemistry” between student and supervisor. Few doctoral students (4%) initiated changes in the supervisory relationships.

Further analyses showed variation in student perceptions of the significance of the different supervisory sources (Table 5). The students emphasized the role of the main supervisor, and were more satisfied with the supervision they receive from the first supervisor than from other sources ($t(240) = -4.11, p < .01$). However, the second supervisor and the other postgraduate students were also perceived as important sources of supervisory support.

Table 5. Doctoral students' perceptions of the significance of different actors in the supervision process: means and standard deviations (1=fully disagree, 5=fully agree)

Central actors in supervision	Mean	(SD)
First supervisor	4.17	1.106
Second supervisor	3.51	1.341
Other Ph.D. students	3.46	1.184
Other members in the research group	3.37	1.292
Other members in the supervision group	2.74	1.361
Support/assessment group	2.19	1.253

In general, the female students emphasized the significance of different supervisory sources more than their male counterparts. They evaluated the role of the second supervisor ($t(149) = 2.02, p < .05$), other postdoctoral students ($t(179.311) = 2.51, p < .05$), and the other members in the research group ($t(138,279) = 2.32, p < .05$) to be more significant than the men did. Students whose studies were not prolonged (lasting less than seven years) emphasized the role of other members of the research group as a supervisory source more than those whose doctoral studies have been prolonged ($t(161) = 2.38, p < .05$). Moreover, those who were writing article-based theses perceived the other members in their supervision group ($t(101.287) = 2.32, p < .05$) and their research group ($t(86,379) = 2.36, p < .05$) more significant, than those who were writing monographs.

FREQUENCY OF SUPERVISION

The supervision varied in frequency from meeting daily to less than once in sixth months. The majority of the students (70%) received supervisory input at least once every second month, and typically either once in two months (30%) or every month (26%), but for almost a third of them it was once in six months or more seldom (30%) (Table 6).

Table 6. The doctoral students' perceptions of supervision frequency (%)

Frequency of supervision	F	(%)
Daily	7	2.8
Weekly	27	10.9
Monthly	65	26.2
Once every other month	74	29.8
Once in six months	42	16.9
More seldom	33	13.3
Total	248	100

It was further shown that students whose studies were prolonged (lasting over 7 years) received supervisory input less frequently than those aiming to complete within seven years ($\chi^2(5) = 36.23, p = .000$). Moreover, full-time students and those writing an article-based dissertation had more frequent supervision than those writing a monograph ($\chi^2(5) = 22.55, p = .028$) or working part-time on their dissertation ($\chi^2(5) = 12.53, p = .028$).

SATISFACTION WITH THE SUPERVISION AND THE SUPERVISORY SUPPORT, RESEARCHER-COMMUNITY SUPPORT AND EQUALITY IN THE RESEARCH COMMUNITY SUPPORT

The majority of the students (71%) reported that they were satisfied with their supervision. In terms of frequency, those reporting supervision on a monthly basis or more often were more satisfied than those who referred to once every second month or more seldom ($\chi^2 (1) = 16.18, p = .000$). As many as 85 percent of the students in the former group were satisfied with the supervision they received.

The students had varying experiences of the quality of the supervisory support. On average, they reported receiving constructive support such as encouragement and positive feedback. They also acknowledged the support they received from the researcher community, indicative of acceptance, appreciation, and collegial support, and felt they were treated equally in the research community, experiencing justice and fair play among Ph.D. student colleagues.

Students who reported high levels of support from the researcher community, received high levels of supervisory support, and felt equally treated were more satisfied with their supervision than their peers who received less support from the above-mentioned sources (Table 7).

Table 7. Means and standard deviations for Supervisory support, Researcher-community support and Equality in the research community among students who reported being satisfied with the supervision they received and those who were not satisfied. Effect sizes measured with Cohen's *d*.

Scale	Satisfied	Not satisfied	<i>t</i> (df)	<i>p</i>	effect (<i>d</i>)
Supervisory support	3.74 (0.708)	3.33 (0.727)	4.066(139,246)	.000	medium (.569)
Researcher-community support	3.72 (0.766)	3.28 (0.746)	4.212(139,246)	.000	medium (.582)
Equality in the research community	3.71 (0.777)	3.03 (0.781)	-6.273 (134,202)	.000	large (.875)

EXPERIENCED EXHAUSTION AND CYNICISM AND SUPERVISION

The students reported experiencing average levels of stress ($M = 3.55$), although some variation occurred (Table 8). Those who had considered interrupting their studies compared to those who had not considered interrupting doctoral studies reported higher stress levels in the recent past ($t (245) = 3.18, p = .002$). There were associations between reduced levels of satisfaction with supervision and experienced stress, exhaustion, and cynicism (Table 8). Those who reported being dissatisfied felt more stressed than those who were satisfied with the supervisory support. Moreover, the dissatisfied students experienced more exhaustion, including experiencing a heavier workload, and worried more about their thesis, than those who were satisfied, and also tended to score more highly on cynical perceptions.

Table 8. Means and standard deviations for stress, exhaustion and cynicism among students', who were satisfied with their supervisory support and those who were not. Effect sizes measured with Cohen's *d*.

Items	Satisfied	Not satisfied	<i>t</i> (df)	<i>p</i>	Effect
Stress (single item)	3.46 (1.034)	3.77 (1.118)	2.033(246)	.043	small (.288)
Exhaustion	2.66 (0.915)	3.05 (0.755)	3.447(161.947)	.001	small – medium (.461)
Cynicism	2.15 (0.897)	2.60 (0.954)	3.524(127.671)	.001	small – medium (.497)

The analysis showed significant negative correlations between experienced exhaustion and cynicism and experiences of supervisory support, researcher community support, and equality in research community support. The results show an association between high levels of supervisory support and reduced levels of experienced exhaustion ($r=-0.140, p<.005$): students who obtained support from the researcher community felt less cynical ($r=-0.206, p<.001$). Also, a sense of equal treatment within the researcher community was associated with reduced levels of both experienced exhaustion ($r=-0.219, p<.001$) and cynicism ($r=-0.189, p<.001$).

Further investigation showed that lack of satisfaction with supervision, lack of equality within the researcher community and low frequency of supervision were related to experiences of burnout (Table 9).

Table 9. A summary of the multiple regression analyses with burnout as the dependent variable ($R^2=.140, R^2_{adj}=.108, n= 248$)

Variables	B	SE(B)	<i>t</i>	Sig. (<i>p</i>)
Frequency of supervision	-.205	.049	-2.744	.007**
Satisfaction with supervision	-.199	.130	-2.750	.006**
Equality in the research community	-.172	.065	-2.521	.012**

Note: $R^2=.140$

* $p < .05$, ** $p < .01$, *** $p < .001$

Students who received more supervision and were more satisfied with it and those who felt they were equally treated within the researcher community had a reduced risk for experiencing burnout. Experiences of burnout, in turn, were connected to students' attrition intentions.

Table 10. A summary of the multiple regression analyses with consideration of interruption as the dependent variable ($R^2=.216, R^2_{adj}=.187, n= 248$)

Variables	B	SE(B)	<i>t</i>	Sig. (<i>p</i>)
Source of supervision	-.218	.063	-3.451	.001**
Frequency of supervision	.150	.029	2.073	.039**
Thesis form	.244	.064	3.767	.000***
Burnout	.376	.039	5.863	.000***

Note: $R^2=.216$

* $p < .05$, ** $p < .01$, *** $p < .001$

The results indicated that the likelihood of dropout increased among those students with experiences of burnout. The form of the thesis was related to attrition with those writing an article-based thesis being less at risk compared to writers of monographs. Doctoral students who receive supervision from several supervisors harbor less attrition intentions. Frequency of supervision is related to both experiences of burnout and attrition intentions (Table 10). Attrition intentions, in turn, were related to experiences of burnout, the form of thesis, the source of supervision, and by inadequate supervision frequency. Frequency is, in addition, related to both experience of burnout and likelihood of attrition.

DISCUSSION

The aim of the study was to enhance understanding of the way in which doctoral students' experiences of supervision relate to their experiences of burnout. The findings imply that supervision activities contribute not only to experiences of the doctoral journey and burnout, but also to the completion of the journey. The results showed that the doctoral students had diverse perceptions concerning the actors involved in supervision. The main supervisor was emphasized, but the second supervisor, other postgraduate students and other members in the research group were likewise perceived as important sources of supervisory support. This suggests that students benefit from having the opportunity to use several and varying sources of doctoral supervision. This conclusion is sup-

ported in previous research (Dysthe et al., 2006, Pyhältö et al., 2015) showing that different actors in the supervisory process enable collective feedback, and that students gain from receiving feedback from several sources.

The students' experiences of supervision frequency varied. Doctoral students typically receive supervision once a month, or every month, although some received it on a daily basis whereas others reported being given supervisory support less than once in six months. Full-time students and those who were writing an article-based dissertation received more frequent supervision than those who were studying part-time and those who were writing a monograph. This implies that being a full-time student and writing an article-based dissertation provides more opportunities to engage with members of the researcher community and to benefit from several sources of feedback than writing a monograph and studying part-time. Moreover, frequency of supervision was related to both the experience of burnout and the consideration of interrupting doctoral studies. Our results confirmed that frequency of supervision is a central determinant of students' satisfaction with their supervision, which is in line with previous research suggesting that frequent supervision reduces the risk of dropout (Pyhältö et al., 2015).

Our findings also emphasize the importance of the quality of supervision. The students receiving emotional and informational support from the supervisors and from the researcher community and those experiencing equal treatment in the community were overall satisfied with their supervision. It has been shown in earlier research that the quality of the supervisory relationship influences student satisfaction with the doctoral process (Zhao et al., 2007), and that more collaborative knowledge-sharing environments are needed (Malfroy, 2005; Pyhältö, Stubb, & Lonka, 2009; Vekkaila, Pyhältö, Hakkarainen, Keskinen, & Lonka, 2012). Our results highlight in particular the importance of being able to use different supervisory sources, the significance of frequent contact, and quality in terms of the students' experience of supervision, and researcher community support of doctoral training as ingredients of high-quality supervision.

The results further indicate that experiences of various supervisory activities were related to perceived symptoms of stress, exhaustion, and cynicism among the students, and that collective forms of supervision and a high degree of integration into the research community were associated with a reduced risk of burnout. From the doctoral student perspective, this indicates that co-supervision can be seen as an advantage. The students' acknowledged and valued the support they received from the researcher community. These findings highlight the importance of doctoral students developing networks in their field, institution, and both nationally and internationally. Different kinds of networks may provide the doctoral students support, strengthen their well-being and reduce the risk for experiences of burnout during the doctoral journey. These findings are in line with those of previous studies indicating that a constructive relationship is one of the key elements of a successful doctoral journey (Gardner, 2007; Golde, 2005; Ives & Rowley, 2005; Pyhältö et al., 2012; Stubb, Pyhältö, & Lonka, 2011; Wao & Onwuegbuzie, 2011). Our results complement the earlier finding by showing that a sense of equal treatment within the researcher community was related to reduced levels of experienced exhaustion and cynicism. This implies that experiencing equal treatment in the research community helps to prevent burnout. This finding corroborates evidence from earlier studies showing that doctoral students are sensitive to problems involving experiences of inequality (Löfström & Pyhältö, 2014). The students in our sample who were dissatisfied with the supervision also experienced more exhaustion and cynicism than those who reported high levels of supervisory support.

Finally the analyses revealed that experiences of burnout are connected with attrition intentions. In addition, attrition intentions are related to form of thesis, the source of supervision, and frequency in supervision. Doctoral students who receive supervision from several supervisors have less attrition intentions. Students who were writing an article-based dissertation were less likely to consider interrupting their studies. One explanation for this finding could be that those writing an article-based dissertation are still pursuing their own personal study projects that may be unrelated to organized research projects (Hakkarainen et al., 2013) and, therefore, may have a weaker sense of belonging to

the scholarly research community. A feeling of isolation is shown to be associated with loneliness and increased stress levels (Pyhältö et al., 2009; Stubb et al., 2011; Vekkaila et al., 2013). This implies that meetings on a regular basis and constructive support from the supervisor are likely to reduce the risk of attrition.

The sample in our study is representative of the population in terms of gender and field distribution. Our aim in collecting data from three universities was to avoid some of the challenges of single-institution studies (e.g., the results being the consequence of a particular institutional context). A doctoral education is undergoing change, a better understanding of what constitutes high quality supervision that contributes to both doctoral student learning and well-being is needed in order to develop good supervisory practices. Given the results of this study, we believe there is a need to further identify and investigate the role of other predictors in burnout. Qualitative interviews might be helpful in mapping out the dynamics that lead to attrition.

CONCLUSION

This study examined aspects of supervision including the sources, the frequency, and the quality and how these are associated with burnout. The results suggest that students' benefit from having several and varying sources of doctoral supervision. Experienced lack of satisfaction with supervision and equality within the researcher community, and a low frequency of supervision were related to experiences of burnout. Experiences of burnout, in turn, were connected to students' attrition intentions. Attrition intentions were related to source of supervision, the form of thesis, and inadequate supervision frequency. Frequency is, in addition, related to both experience of burnout and likelihood of attrition. Consequently, the collective model of supervision is related with reduced risks of students experiencing burnout. These findings offer a substantial base for future development in researcher education suggesting greater emphasis on group supervision and other collective forms of supervision.

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