



DOCTORAL STUDENTS' SOCIAL SUPPORT PROFILES AND THEIR RELATIONSHIP TO BURNOUT, DROP-OUT INTENTIONS, AND TIME TO CANDIDACY

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ABSTRACT

Aim/Purpose	The primary aim of this study was to better understand the individual variations in supervisory and researcher community support among doctoral students by analyzing the social support profiles of Finnish doctoral students. The differences among the profiles, in terms of satisfaction with supervision, experienced burnout, time to candidacy and disciplinary background were also examined.
Background	This study explores social support profiles and their association with the experienced burnout, satisfaction with supervision, drop-out intentions, disciplinary background, and form of dissertation among doctoral students by employing a person-oriented approach.
Methodology	In total, 402 doctoral students from a Finnish university completed a Doctoral Experience survey. Latent Profile Analysis (LPA) was used to group doctoral students according to social support from supervisors and the researcher community.
Contribution	The present study is among the first quantitative studies to explore doctoral student social support profiles and their association with burnout, drop-out intentions, and time to candidacy. It brings into focus the importance of supervisory and researcher community support as one of the most crucial assets of doctoral education in researcher communities.
Findings	Two social support profiles, a) sufficient support from supervisor and researched community, and b) insufficient support from both of these, were identified. Further investigation suggested that the doctoral students who received sufficient

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support were less likely to suffer from burnout and were less likely to develop drop-out intentions than students who received insufficient support from their supervisor and the researcher community.

Recommendations for Practitioners A recommendation deriving from this research is to identify students at risk as early as possible and assist them with sufficient support.

Keywords doctoral education, supervision, burnout, satisfaction, drop-out intentions

INTRODUCTION

High-quality social support from the supervisor and researcher community has been identified as one of the main determinants for the successful completion of doctoral studies (Basturkmen, East, & Bitchener, 2012; Can & Walker, 2011). For example, constructive feedback, emotional support (Vekkaila, Pyhältö, Virtanen, & Taina, 2016), including an open, honest, and ongoing discussion between doctoral students and their supervisors concerning student experiences, expectations and goals are reported to have a positive influence on students' perseverance (Ives & Rowley, 2005). Frequent, good-quality supervision has been associated with progress in and the timely completion of doctoral studies (Jairam & Kahl, 2012; Martinsuo & Turkulainen, 2011; Wao & Onwuegbuzie, 2011), satisfaction with supervision, and the overall doctoral experience (Pyhältö, Vekkaila, & Keskinen, 2015). Moreover, positive relationships with faculty and peers and between the candidate's goals and aspirations with the doctoral program have been shown to contribute to student resilience (Hoskins & Goldberg, 2005). Extensive prior research on doctoral supervision and the researcher community has identified social support as a central antecedent for a successful doctoral journey (Ali & Kohun, 2007; Gardner, 2007, 2008; Jairam & Kahl, 2012; Martinsuo & Turkulainen, 2011; Weidman & Stein, 2003; Zhao, Golde, & McCormick, 2007).

However, surprisingly little is known about individual variation in the support experienced among doctoral students (e.g., Jairam & Kahl, 2012). Doctoral students' support experiences may differ from each other even within the same research group, doctoral program, or across different disciplines (Barnes & Randall, 2012; Kim & Otts, 2010). Accordingly, doctoral students' social resources for coping with the challenges provided by the doctoral journey are likely to vary among students, resulting in an increased or reduced risk of a negative doctoral experience. To be able to develop a more functional support system for students and identify the students at risk as early as possible, we need to gain a better understanding of the kinds of experience profiles that are associated with an increased risk of a negative doctoral experience and dropping-out. Yet, knowledge about the association between doctoral students' social support profiles and increased or reduced risk of completing doctoral studies is scarce.

This study aims to further investigate the individual variations in supervisory and researcher community support among doctoral students by analyzing the social support profiles of Finnish doctoral students at a research-intensive university. The differences among the profiles, in terms of satisfaction with supervision, experienced burnout, time to candidacy, and disciplinary background were also examined. Our investigation was guided by four hypotheses:

H1: The doctoral students are satisfied with their supervision, experience a fair amount of supervisory and researcher community support, experience a moderate amount of burnout, and the majority of them have no drop-out intentions. We also expect to find some gender differences in supervisory and researcher community support and experienced burnout.

H2: Different kinds of social support profiles in terms of researcher community and supervisory support can be detected among doctoral students.

H3: The social support profiles differ from each other in terms of discipline, research group status, type of student, gender, and the form of the dissertation.

H4: The social support profiles differ from each other in terms of satisfaction with supervision, experienced burnout, time to candidacy, and drop-out intentions.

LITERATURE REVIEW

SUPERVISORY AND RESEARCHER COMMUNITY SUPPORT

Social support refers to the social resources perceived to be available and provided to doctoral students by their social environment. This includes both formal and informal relationships within the researcher community, with peers, supervisors and other staff members. Supervisor(s) and other members of the doctoral student's immediate researcher community typically provide the primary source of social support in the doctoral journey (e.g., Vekkaila et al., 2016). However, potential sources of social support are not limited to the researcher community but are often extended to close friends and family (Hopwood, 2010; McAlpine, Jazvac-Martek, & Hopwood, 2009).

Within the literature, social support is perceived as a meta-construct comprising emotional, informational, and instrumental forms of social support (see Cobb, 1976; House, 1981). Emotional support is characterized by empathy, trust, listening, caring, esteem, and belonging to a network of researcher communities with mutual obligations, whereas informational support is characterized by information, such as advice, feedback, affirmation, and suggestions that enable doctoral students to cope with the problems faced during their studies. Providing instrumental support, such as writing recommendations to foundations, allocating sufficient time to doctoral research, or dividing labor fairly within a research group, directly helps a doctoral student cope with the challenges of research work (Löfström & Pyhältö, 2015).

Doctoral students often expect their supervisor to provide a primary source of informational and emotional support. Instrumental support is, however, less often emphasized by students, although it has been suggested that supervisors recognize this issue to a great extent (Pyhältö, Vekkaila, & Keskinen, 2012, 2015). Doctoral students have, for instance, been found to value feedback that enables them to solve problems related to their research projects, (Jairam & Kahl, 2012; Pyhältö et al., 2015; Woolderink, Putnik, van der Boom, & Klabbers, 2015), personal attention in the form of regular interaction with (Wao & Onwuegbuzie, 2011) and interest (Lovitts, 2001) from their supervisor, as well as encouragement (Jairam & Kahl, 2012; Weidman & Stein, 2003). Students have also been found to value the basic prerequisites of supervision, such as the supervisor being available, responding to the students' e-mails within a reasonable time and showing a commitment to supervisory relationships (Pyhältö et al., 2015).

In addition to providing support, supervisors also mediate doctoral student-researcher community interaction, for instance, by providing access to community and research network practices (e.g., Lee, 2008; Wisker, Robinson, & Shacham, 2007). Moreover, close relationships and support from other members of the researcher community, particularly in terms of a sense of belonging, have been found to promote a positive doctoral experience, whereas the lack of such support has been found to increase the drop-out risk among doctoral students (e.g., Gardner, 2010). The findings indicate that both adequate social support in terms of encouragement and constructive feedback received both from the supervisor and other members of the researcher community are likely to increase doctoral students' satisfaction and resilience in their studies (Gardner, 2007; Ives & Rowley, 2005). However, primary sources and necessary forms of support can vary depending on the phase of the doctoral journey and the task at hand. There are some indicators that suggest that peers may provide a key source of emotional support (Hadjiioannou, Shelton, Fu, & Dhanarattigannon, 2007; Maher et al., 2008; Noonan, Ballinger, & Black, 2007), while the role of supervisors and other senior members of the researcher community is emphasized as a primary source of professional or informational and instrumental support (Jairam & Kahl, 2012; Vekkaila et al., 2016).

The availability of social support is a crucial, but not in itself a sufficient determinant of a positive doctoral experience. The perceived fit between the required and provided support also plays a central

role in the doctoral experience (Pyhältö et al., 2015). To be functional, the support provided should promote the ability to cope with a particular problem (Cohen & McKay, 1984; Helgeson & Gottlieb 2000, p. 235) during a student's doctoral studies. Accordingly, the support offered should match the type of problem being faced in order to be effective. Moreover, the appropriateness of the social support, the reciprocity of interaction and the roles of the giver and receiver of the support are important determinants for supportive behavior (Cohen & Syme, 1985, p. 10). Receiving social support has been associated with an engaging doctoral experience, whereas a lack of support and diminishing feedback have been associated with an increased risk of experiencing burnout and, in particular, cynicism (Vekkaila et al., 2016). However, reciprocal support and providing support for others especially, were rarely reported by early career researchers. To summarize, different sources and elements of social support are likely to play a central role in the doctoral experience, yet variation among doctoral students in their experience of social support provided by their supervisor and researcher community is likely to occur, resulting in differences in students' ability to cope with the stressors of the doctoral journey.

BURNOUT, RESEARCHER COMMUNITY, AND SUPERVISORY SUPPORT

Burnout syndrome develops gradually from prolonged and extensive work-related stress (Maslach, Schaufeli, & Leiter, 2001) often resulting from a discrepancy between work demands and the doctoral student's resources to cope with them (Baker & Pifer, 2015; Pyhältö et al., 2012). Burnout has two distinctive symptoms: exhaustion and cynicism (Bakker, Schaufeli, Leiter, & Taris, 2008; Maslach & Leiter, 2005). Exhaustion is characterized by a lack of emotional energy and feeling strained and tired at work, whereas cynicism is characterized by losing interest in one's work and feeling that one's research has lost its meaning; distancing oneself from the work often results in reduced involvement (Maslach & Leiter, 2008) and even dropping out of doctoral studies (Vekkaila et al., 2016). However, exhaustion is not sufficient to develop burnout; cynicism is necessary (Leiter, 1993; Maslach, 2003; Maslach & Leiter, 2008). An association between exhaustion, cynicism and turnover has also been detected among doctoral students (Virtanen, Taina, & Pyhältö, 2016).

It has been suggested that social support buffers the negative effects of prolonged stress (Chan, 2002) and, consequently, reduces the risk of experiencing burnout, for instance, by decreasing the exhaustion and cynicism experienced by doctoral students (Vekkaila et al., 2016). There is evidence that both the quality and the quantity of social support received from the supervisor(s) and other members of the researcher community play a central role in the success of doctoral students in their studies. It has been found, for instance, that doctoral students who perceived themselves as members of their researcher community and experienced these relationships as empowering suffered less from stress and lack of interest in their studies than their less fortunate counterparts (Pyhältö, Stubb, & Lonka, 2009; Stubb, Pyhältö, & Lonka, 2011). They are also less likely to consider dropping out of their studies. The researcher community, including supervisor(s), is not, however, always able to provide optimal support for doctoral students. Accordingly, a lack of supervisory support together with destructive friction within the researcher community have been identified as central sources of cynicism among doctoral students (Virtanen et al., 2016). For example, doctoral students who reported less frequent supervision than their peers were less satisfied with their doctoral studies and supervision and were more likely to consider dropping out of their studies (Pyhältö et al., 2015).

Lack of social support has also been associated with increased levels of distress among doctoral students (Pyhältö et al., 2009). Findings imply that social support is likely to be one of the key resources for promoting not only doctoral student progress and intellectual growth, but also for buffering the risk of experiencing burnout and drop-out. Therefore, not only should doctoral education be able to provide functional forms and sources of social support, but doctoral students should also learn to seek, use, and provide social support in order to utilize this resource in their doctoral studies. This, however, depends on there being a sufficient understanding of the social support profiles of doctoral students and the various positive and negative indicators associated with the profiles. As most of the

studies mentioned above mainly use a variable-oriented approach, they succeed in detecting and describing overall tendencies but may not disclose differently functioning subgroups of individuals and the complex relationships between variables associated with these subgroups (see Bergman & Andersson, 2010; Ketonen et al., 2016). Therefore, the person-centered approach (Bergman & Andersson, 2010; Bergman & Magnusson, 1997) applied in this study could contribute to doctoral education literature by revealing group differences not detected in previous studies.

METHODS

DESIGN AND RESPONDENTS

The goal of this study was to detect different kinds of social support profiles among doctoral students and examine the differences between profiles in variables such as experienced burnout, time to candidacy, and research group status. We, therefore, used a quantitative approach and a cross-sectional design, which enabled us to identify the profiles across different doctoral training programs and departments at the same university.

We used Total Population Sampling in which the entire population that met the criteria (registered doctoral students at university who permitted us to conduct the study) were included. The sample comprised 402 doctoral students (62.4% female, 37.6% male) from 10 faculties of a research-intensive Finnish university. The departments included were Architecture, Biochemistry and Molecular Medicine, Humanities, Mining, Education, Natural Science (including Mathematics), Medicine, Business, Technology and Information Technology, and Electrical Engineering. As the university had 1,580 registered doctoral students at the time of the study the response rate was 25.4%. Respondents ranged in age from under 25 to over 50 years of age; the majority (53.5%) of them were under 35 years of age. The majority of the doctoral students (56.0%) studied full time. In terms of age distribution and the doctoral training committees, the sample was a good representation of the entire population. However, females were slightly overrepresented.

At the time of the study, the university in question had three doctoral training programs and corresponding doctoral training committees. The majority (38.3%) of respondents studied on the Technology and Natural Sciences (STEM disciplines) program, almost one third (32.2%) on the Human Sciences program and the remainder (28.4) on the Health and Biosciences program. This distribution and the departmental distribution were a good representation of the entire population.

The purpose of the study was explained to all respondents. It was emphasized that participation was voluntary. The study was initiated and implemented in close co-operation with the graduate school administration of the university in question. This co-operation included, for example, several reviews of the research protocol by the university administration. For this reason, an additional IRB review was unnecessary.

DOCTORAL EXPERIENCE SURVEY

The data required to test our hypotheses was collected via e-mail through an online survey in the spring of 2015. The Doctoral Experience survey (previous versions Pyhältö et al., 2009, 2015) included Likert-type statements and open-ended questions concerning six topics: (1) interest in doctoral studies, (2) doctoral students' positive and negative key experiences, (3) the research environment, supervision and collaboration (Pyhältö et al., 2015), (4) academic writing (Lonka et al., 2014), (5) burnout (Stubb et al, 2012), and 6) engagement and drop-out intentions, as well as background questions. The survey was available in Finnish and English. The survey was sent to all registered doctoral students ($N = 1580$) at the university. Before data collection, the survey was validated by a pilot study comprising 100 doctoral students from the Department of Behavioral Sciences of another Finnish university. In this study, data was utilized from various scales of burnout and supervisory and researcher community support (total 37 items, see Appendix A). These entailed a supervisory support scale (13 items), a researcher community support scale (9 items), destructive friction (5 items), drop-

out intentions (one item), experienced burnout scale (total 11 items) including cynicism (5 items), and exhaustion (6 items), doctoral student overall satisfaction with supervision (one item, 1–7) and time to candidacy. All the scales were measured using a 7-point scale (1 = dissatisfied/strongly disagree, 7 = completely satisfied/fully agree). Drop-out intentions were measured with a single item: Have you considered dropping out of your doctoral studies? (Yes/No.)

ANALYSES

To create the compound variables needed to test our first hypothesis, Exploratory (EFA) and Confirmatory Factor Analysis (CFA) were performed to investigate the factorial structure of the measures of supervisory and researcher community support and burnout experienced by students. First, a series of EFAs were carried out with Maximum Likelihood extraction and both orthogonal and oblique rotations. The decision about the number of factors to retain was based on both the eigenvalues of the factors and the theoretical salience of the rotated factors. The three-factor solution for the supervisory and researcher community support scale and the two-factor solution for the experienced burnout scale suggested by the results of EFAs were further tested with CFAs conducted using IBM SPSS Amos Version 22. Both maximum likelihood and asymptotically distribution-free estimation methods were used. The fit indexes used were the Comparative Fit Index (CFI), the Goodness of Fit Index (GFI) and the Tucker Lewis Index (TLI) (good fit was considered to be values over .95 and acceptable was over .90). For the Root Mean Square Error of Approximation, RMSEA index, values under .05 were good, between .05 and .08 were acceptable and values over .10 indicated questionable fit (Byrne, 2010; Kline, 2005; Steiger, 2007).

Latent Profile Analysis (LPA) was used to extract latent classes of doctoral students in order to test our second hypothesis. The three continuous supervisory and researcher community support scale scores based on EFAs and CFAs were used as indicators in the LPA. All LPAs were conducted using Mplus (version 7.3; Muthén, & Muthén, 1998–2012). To estimate the LPA models, Robust Maximum Likelihood (MLR) estimation was used as it produces robust standard errors and chi-square statistics to handle non-normally distributed data. The class-specific covariance matrices were assumed to be diagonal, assuming zero covariance between indicator variables within each class.

The first phase of the LPA involved identifying the most appropriate number of classes. The plausibility of 1-, 2-, 3-, 4-, and 5-class solutions was investigated. Classes were added iteratively to determine the best model fit for the data according to statistical and interpretive criteria and also according to the limitations imposed by the sample size (see Bauer, & Curran, 2003; Muthén, 2003; Nylund, Asparouhov, & Muthén, 2007). Akaike (AIC), Bayesian (BIC) and adjusted Bayesian (aBIC) information criteria were used to test the goodness of fit of the model with the data, with the lower values indicating a better fit. The entropy value and the p-values of the Lo-Mendell-Rubin adjusted likelihood ratio (aLRT), Vuong-Lo-Mendell-Rubin likelihood ratio (VLMR) and bootstrapped likelihood ratio (BLRT) tests were also referred to. After identifying the best fitting mixture solution, the most likely latent class membership was saved as a nominal variable to be used in further analyses.

RESULTS

SATISFACTION WITH SUPERVISION, SUPERVISION AND COMMUNITY, BURNOUT, AND DROP-OUT INTENTIONS

Our first hypothesis predicted that the doctoral students are satisfied with their supervision, experience a fair amount of supervisory and research community support, experience a moderate amount of burnout, and the majority of them have no drop-out intentions. To test the hypothesis, we first carried out a series of exploratory factor analyses to investigate the factorial structure of the Supervision and Researcher Community and Burnout experienced scale variables. The EFAs suggested that three factors of supervision and researcher community (supervisory support, community support, and destructive friction), explaining 52.2% of the variance should be retained. This result was further

supported by the results of the testing of a three-factor CFA model (CFI = .95, GFI = .86, TLI = .92, RMSEA = .062). As for burnout experienced, a two-factor solution (cynicism and exhaustion) explaining 53.4% of the variance seemed most plausible. It also had an acceptable fit according to the results of the corresponding CFA (CFI = .911, GFI = .94, TLI = .915, RMSEA = .087). Table 1 provides the means, standard deviations, Cronbach's alphas and minimum and maximum values of the aforementioned subscales and a single variable measuring satisfaction with supervision.

Table 1. Cronbach's alphas, means, standard deviations and minimum and maximum values for satisfaction, supervisory support, community support, destructive friction, cynicism, and exhaustion

Items/Scales	N of items	Alpha	M	SD	Min	Max
Satisfaction with supervision	1	-	5.19	1.67	1	7
Supervision and Researcher Community						
Supervisory Support	13	.94	5.28	2.13	1	7
Researcher Community Support	9	.71	4.59	.90	1.11	7
Destructive friction	5	.70	2.21	1.10	1	7
Experienced Burnout						
Cynicism	5	.86	3.04	1.47	1	7
Exhaustion	6	.83	3.45	1.34	1	7

As shown in Table 1, doctoral students were very satisfied with their supervision. On average, they felt that they received a fair amount of support from their supervisors, researcher communities, and experienced a relatively small amount of destructive friction (e.g., exploitation of their ideas, bullying, and unfair treatment). As for experienced burnout, the means of the cynicism and exhaustion subscales indicated that doctoral students experienced a moderate amount of burnout.

The majority of the doctoral students (255, 64.7%) had not considered dropping out of their doctoral studies, but about one third of them experienced drop-out intentions at least occasionally. We also examined gender differences with a series of t-tests. Females reported slightly more cynicism ($t(329.81) = 2.29, p = .023$) and exhaustion ($t(390) = 2.40, p = .017$) and less community support ($t(369) = 2.55, p = .011$) than males. In summary, these findings all support our first hypothesis.

SUPERVISION AND RESEARCH COMMUNITY SUPPORT PROFILES AMONG DOCTORAL STUDENTS

Our second hypothesis predicted that different kinds of social support profiles in terms of researcher community and supervisory support can be detected among doctoral students. To examine students' supervision and researcher community profiles, LPA was performed on the three supervision and researcher community scale factors using factor scores. Several LPAs were performed that specified models with one through four classes. According to AIC, BIC and aBIC, adding a new latent class enhanced the model fit up to the 4-class solution. The entropy value, however, suggested that, in terms of clarity, the 1- and 3-class solutions were clearly inferior to the 2- and 4-class solutions, the last two being practically equal with a value of .816. According to aLRT, VLMR and BLRT, the 2-class solution fit the data better than the 1-class solution, the 4-class solution fit better than the 3-class solution, but the 3-class solution did not fit the data better than the 2-class solution. Based on the available statistical criteria, the 2- and 4-class solutions fit the data best and provided the best class separation (see Appendix B). However, since one of the classes in the 4-class solution consisted of only 16 cases, the 2-class solution was selected, which was the best option content-wise and in terms of parsimony.

As Figure 1 indicates, the members of the class labelled Sufficient support ($n = 269, 76.6\%$) expressed more supervisory and community support and clearly less destructive friction. The second

latent profile culled from the analysis was Insufficient support. Doctoral students that had an insufficient support profile showed a reduced sense of supervisory and researcher community support combined with increased levels of friction experienced. Altogether, 82 (23.4%) of the students had this profile.

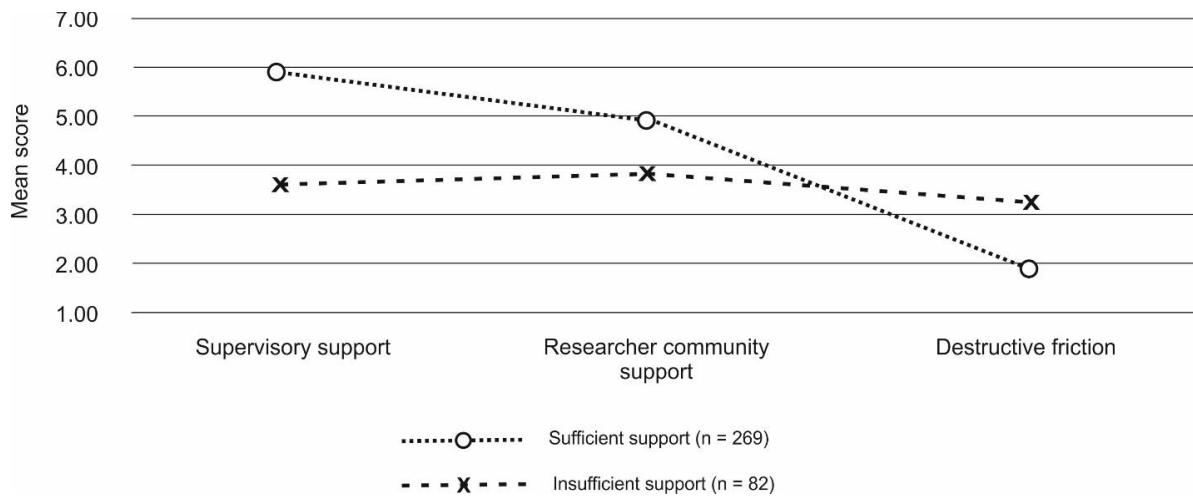


Figure 1. Latent profiles of doctoral students' social support

In summary, the results based on the LPA support our second hypothesis. We were able to detect two clearly different profiles in terms of supervisory support, researcher community support and destructive friction. The first group seems to receive a sufficient amount of support from their social environment while the second group suffers from insufficient support and destructive frictions with other students and/or supervisors.

HOW DO THE PROFILES DIFFER IN TERMS OF DOCTORAL TRAINING PROGRAM AND DEPARTMENT, RESEARCH GROUP STATUS, TYPE OF STUDENT, GENDER, AND THE FORM OF THE DISSERTATION?

Our third hypothesis suggested that the social support profiles differ from each other in terms of department, research group status, type of student, gender, and the form of the dissertation. Students from different doctoral training committees differed in terms of their LPA class membership ($\chi^2(2, N=344) = 8.30, p < .05$). For all the students of different doctoral training committees, belonging to a sufficient support group was the most typical. However, doctoral students in the field of technology and natural sciences or STEM disciplines (31.3%) were more typically members of an insufficient support class than students in the human sciences (16.7%), or in health and biosciences (19.6%). Department was not related to class membership and both native and international students had fairly similar distributions regarding the classes. Research group status (alone, mainly in a group, both) was not related to LPA class memberships, nor was gender. The form of dissertation, however, was ($\chi^2(2, N=340) = 14.69, p < .001$): For those students who did not yet know the final form of their dissertation (50.0%) and for those who planned to complete their dissertation as a monograph (30.4%) it was more typical to belong to the insufficient support class than for those students who planned to complete their dissertation as a summary of articles (18.6%). Therefore, our third hypothesis was only partially supported: department and research group status was not related to student profile.

HOW DO THE PROFILES DIFFER IN TERMS OF SATISFACTION WITH SUPERVISION, EXPERIENCED BURNOUT, TIME TO CANDIDACY, AND DROP-OUT INTENTIONS?

Our last hypothesis predicted that the social support profiles differ from each other in terms of satisfaction with supervision, experienced burnout, time to candidacy, and drop-out intentions. The

means and standard deviations of the profiles and the independent sample t-test results of these variables are presented in Table 2.

Table 2. Means, standard deviations, and t-test results for class differences on cynicism, exhaustion, satisfaction with supervision, and time to candidacy

	Insufficient support (n = 98 - 118)		Sufficient support (n = 198 - 230)		t	p	η^2
	M	SD	M	SD			
Experienced burnout							
Cynicism	4.12	1.51	2.66	1.24	7.86	.000	.18
Exhaustion	4.21	1.37	3.22	1.26	6.05	.000	.10
Satisfaction with supervision	3.14	1.39	5.92	1.02	-16.57	.000	.53
Time to candidacy	6.78	5.18	5.65	2.81	1.66	.100	.02

As Table 2 indicates, doctoral students belonging to the insufficient support group experienced more burnout, both in the form of cynicism and exhaustion, and were less satisfied with their supervision than doctoral students belonging to the sufficient support group. However, the groups did not differ statistically significantly in their expected time to candidacy.

The classes also differed in terms of drop-out intentions ($\chi^2(2, N = 346) = 30.24, p < .001$). Doctoral students with the insufficient support profile experienced more typically (60.0%) drop-out intentions than students who experienced sufficient support (26.7%). In summary, the results supported H4, with the exception of the difference between groups in their expected time to candidacy.

DISCUSSION

RESULTS IN LIGHT OF PREVIOUS RESEARCH

Although previous research has identified supervisory and researcher community support as a central determinant for a doctoral journey, to the best of our knowledge, the present study is among the first to explore doctoral student social support profiles and their association with experienced burnout, satisfaction with supervision, disciplinary differences, drop-out intentions, and time to candidacy by applying a person-centered approach. Two distinctive social support profiles were identified. The majority of students had a sufficient support profile, whereas the minority of students had an insufficient support profile. Those students with an insufficient support profile suffered more from exhaustion and cynicism, were less satisfied with their supervision, and were more likely to consider dropping-out than students with sufficient support profiles. The results confirm the findings of previous studies by showing that social support is a central determinant for successful doctoral studies (Ali & Kohun, 2007; Gardner, 2007, 2008; Martinsuo & Turkulainen, 2011; Zhao et al., 2007). The results also show that social support experienced was associated with drop-out intentions and burnout. Consequently, the present study extends Jairam and Kahl's (2012) findings on the interrelation between social support and stress experienced during doctoral studies by showing that social support from the supervisor also decreases the level of exhaustion and cynicism experienced, reduces the risk of dropping-out and increases satisfaction with supervision. Accordingly, receiving sufficient support both from the researcher community and from the supervisor(s), combined with reduced levels of reported friction, promotes doctoral studies and increases the odds of successfully completing a PhD.

Doctoral students in the natural and technical sciences were more likely to have an insufficient support profile than their counterparts in the human sciences and in health and biosciences. This partly contradicts the findings of previous studies that suggest that doctoral students in STEM disciplines are often more satisfied with their supervision and researcher community support and have higher

completion rates and shorter completion times than their counterparts in the human sciences (Gardner, 2010; Pyhältö et al. 2015; Visser, Luwel, & Moed, 2007; Wright & Cochrane 2000). A reason for this discrepancy may be that these studies have typically been primarily focused on exploring attributes between disciplines. However, individual differences in social support experienced within a discipline are likely to vary greatly. Consequently, the kinds of latent differences or similarities in support experienced that do not occur in variable-based exploration may become observable when a person-centered approach is adopted.

Students who work at least partly in a research group and conduct their doctoral thesis in the form of an article compilation were equally likely to have a sufficient support profile. This is slightly surprising, as it would be expected that working in a research group and writing articles that are typically co-authored with the supervisor would provide more opportunities for researcher collaboration and networking. Previous research suggests that international students have a greater risk of lack of integration into the researcher community (Evans & Stevenson 2011). However, in the present study, no differences in supervisory and researcher community support profiles were detected between native and international doctoral students. Moreover, no gender differences were found in the support profiles, although, in previous studies, many differences between female and male doctoral students and PhD degree holders have been detected (Appel & Dahlgren, 2003; Bell-Ellison & Dedrick, 2008).

IMPLICATIONS FOR DEVELOPING DOCTORAL EDUCATION

The present findings imply that providing sufficient supervisory and researcher community support for doctoral students increases the odds for completing studies and reduces the risk of experiencing burnout. Recognizing the importance of supervisory and researcher community support as one of the key assets of doctoral education in researcher communities, at institutions and in departments, provides a foundation for developing doctoral education. Although the majority of doctoral students had sufficient support profiles, a significant number of students still received insufficient support. In other words, it would be beneficial to identify students at risk as early as possible and assist them with sufficient support in order to avoid the development of cynicism and exhaustion, which have been shown to be detrimental to students both intellectually and personally, and to reduce the risk of study prolongation and dropping-out. However, to be effective, the additional support provided to a student must match the student's needs. This requires dialog with the student. Moreover, developing and embedding the kinds of structures into doctoral education that provide opportunities for networking and researcher collaboration, such as co-authoring and utilization of multiple supervisory sources, is likely to facilitate adequate supervisory and researcher community support.

Doctoral students themselves can also learn how to actively seek and provide support for each other and to cope and solve conflicts within the researcher community. The authors' previous study showed that, although early career researchers regarded received support as being highly significant to a student's study progress, students less often provided support for others (Vekkaila et al., 2016). This implies that opportunities and arenas in which to learn how and when to provide reciprocal support are needed. This includes identifying and skillfully using the potential resources of the support available.

METHODOLOGICAL LIMITATIONS

Due to the limited sample size, a 2-class LPA solution, which leads to acceptable class sizes, was considered superior to a 4-class solution. With a larger sample size, the 4-class solution, however, would also have given interesting results and a basis for additional analyses.

While this study supports some of the other research linking social support, burnout, and study completion, it shares certain methodological shortcomings rather common to the field as a whole. Because of the cross-sectional design, it is not possible to discern causal relationships. Also, due to the small number of members in the insufficient support group, the power of statistical tests was limited and only relatively pronounced group differences could be recognized.

CONCLUSIONS

This study examined the individual variations in supervisory support and researcher community support experienced among doctoral students. As predicted by our second, third, and fourth hypotheses, we were able to detect two distinctive social support profiles that differed in terms of satisfaction with supervision, disciplinary differences, drop-out intentions, and time to candidacy. Although the supervisor role has shown itself to be important in previous studies, the relationship to burnout, time-to-candidacy, and intentions to leave has not previously been as clearly identified. Moreover, this study demonstrates not only the criticality of supervisors but also the wider researcher community support, including both peers and more senior researchers for doctoral students. Our results showed that, while the majority of doctoral students reported sufficient support, there was still a significant number of students who received insufficient support.

Based on the results, it is recommendable to identify doctoral students at risk as early as possible in order to reduce personal harm, intellectual losses, and supervisory and researcher community costs. The further development of social and collaborative structures and practices that enable doctoral students, supervisors and other researchers to identify, receive and provide support is necessary.

Follow-on qualitative research on the support experienced by doctoral students is needed in order to better understand how the interrelations between support experienced, well-being, and progress of doctoral studies work. Further quantitative and qualitative research is also required in order to shed light on longitudinal perspective and causal relationships. Providing sufficient support and guiding doctoral students to seek support from and provide support to others in their academic environment is an investment in future academia. At best, the PhD holders who have developed sufficient support networks have the greatest potential to provide support for the next researcher generations.

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APPENDIX A. SCALES, ITEMS, AND CRONBACH'S ALPHAS

Scales
<i>Supervisory support</i> ($\alpha = .94$)
I receive encouragement and personal attention from my supervisors.
I feel that my supervisors are interested in my opinions.
I can negotiate about central choices regarding my dissertation with my supervisors.
I feel that my supervisors appreciate my work.
I often receive constructive criticism.
I receive supervision when I need it.
I can openly discuss any problems related to my doctoral education with my supervisors.
My supervisors express critical comments on my research in a friendly manner.
I can tell my supervisor if a personal matter is affecting my work on the dissertation.
My supervisors treat doctoral students in a fair way.
My supervisors encourage me to explore alternative viewpoints in my research.
I feel that I am treated with respect.
My supervisors regard it as important that everybody who is mentioned as an author in an article or similar has actually made a sufficient contribution.
<i>Researcher community support</i> ($\alpha = .87$)
I feel accepted by my research community.
I feel that other members of my research community appreciate my work.
There is a good sense of collegiality among the researchers I interact with.
I feel like an outsider in my own research community.
My expertise is put to use in the research community.
I receive encouragement and support from other doctoral students.
I am treated equally in my research community.
My research community addresses problems in a constructive way.
I can influence matters concerning doctoral education in my research community.
<i>Destructive friction</i> ($\alpha = .70$)
I feel that my supervisor has unfairly exploited my thoughts or products.
I have been bullied during my doctoral education.
I have learned how to hide viewpoints that differ from those of my supervisors.
My supervisor shows favoritism to some of the doctoral students.
The progress of my dissertation is hindered by the fact that my supervisors make me do the work of others in the research group.
<i>Cynicism</i> ($\alpha = .86$)
I have difficulty finding any meaning in my doctoral dissertation.
I feel my doctoral dissertation is useless.
I feel that I am losing interest in my doctoral research.
I used to have higher expectations of my doctoral research than I do now.
I often feel that I am failing in my doctoral research.
<i>Exhaustion</i> ($\alpha = .83$)
I feel burned out.
I brood a lot in my free time over matters related to my doctoral research.
I often sleep badly because of matters related to my doctoral research.
The pressure of my doctoral dissertation is causing me problems in my close relationships with others.
I feel overwhelmed by the workload of my doctoral research.

APPENDIX B. FIT INDICES AND CLASS FREQUENCIES FOR LATENT PROFILE ANALYSES (LPA) WITH DIFFERENT NUMBER OF LATENT CLASSES

No. of classes	LogL (nf)	AIC	BIC	aBIC	Entropy	Latent class probabilities	VLMR (p value)	aLRT (p value)	BLRT (p value)	Class counts (most likely / posterior) ^a
1	-1549.016 (6)	3110.031	3133.196	3114.162	N/A	1.000	N/A	N/A	N/A	351 / 351
2	-1426.714 (10)	2873.429	2912.036	2880.313	.816	.90, .96	.0102	.0119	.0000	82, 269 / 84, 267
3	-1383.931 (14)	2795.863	2849.914	2805.500	.799	.86, .93, .93	.2382	.2475	.0000	125, 204, 22 / 123, 204, 24
4	-1356.385 (18)	2748.770	2818.264	2761.161	.816	.93, .92, .94, .86	.0158	.0172	.0000	57, 142, 16, 136 / 60, 143, 16, 131
5	-1336.577 (22)	2717.154	2802.092	2732.299	.838	.96, .90, .89, .90, 1.00	.0233	.0260	.0000	14, 59, 139, 138, 1 / 14, 61, 134, 141, 1

Note. LogL = log-likelihood value, nf = number of free parameters; AIC = Akaike information criterion; BIC = Bayesian information criterion; aBIC = adjusted Bayesian information criterion; VLMR = Vuong-Lo-Mendell-Rubin likelihood ratio test; aLRT = Lo-Mendell-Rubin adjusted likelihood ratio test; BLRT = bootstrapped likelihood ratio test. The selected model is in boldface.

^aClassification of individuals based on their most likely latent class membership (before slash) and final class counts based on estimated posterior probabilities. N for all solutions is 351.

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Pauliina Rautio is a post-doctoral research fellow and a PhD program coordinator at the Faculty of Education, University of Oulu, Finland. Her research interests lie broadly in people's perceived well-being in everyday life, especially through qualitative research approaches. The paper at hand explores critical issues in doctoral candidate's experiences. Thus, the study is also an exploration of Rautio's tasks as a PhD program coordinator with a direct impact on the development of doctoral training.



Kaisa Haverinen has emerging research interests in higher education, in terms of learning, motivation and well-being in teacher education, doctoral studies and in the transition from upper secondary education to higher education.



Kirsi Pyhältö is professor of educational sciences in the Faculty of Educational Sciences, University of Oulu, and research director at the Centre for Research and Development of Higher Education at the University of Helsinki. She is an expert in the field of researcher education and careers. Her research interests include doctoral education, supervision, researcher communities and post-doctoral careers.

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