



**THE PHD EXPERIENCE: A REVIEW OF THE FACTORS
INFLUENCING DOCTORAL STUDENTS' COMPLETION,
ACHIEVEMENT, AND WELL-BEING**

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ABSTRACT

Aim/Purpose	Research on students in higher education contexts to date has focused primarily on the experiences undergraduates, largely overlooking topics relevant to doctoral students' mental, physiological, motivational, and social experiences. Existing research on doctoral students has consistently found mental and physical health concerns and high attrition rates among these students, but a comprehensive understanding of these students' experiences is still lacking.
Background	The present review paper aims to offer deep insight into the issues affecting doctoral students by reviewing and critically analyzing recent literature on the doctoral experience. An extensive review of recent literature uncovered factors that can be readily categorized as external and internal to the doctoral student; external factors include supervision, personal/social lives, the department and socialization, and financial support opportunities, while internal factors motivation, writing skills, self-regulatory strategies, and academic identity.
Methodology	163 empirical articles on the topic of doctoral education are reviewed and analyzed in the present paper.
Contribution	The present paper represents a comprehensive review of the factors found to influence the experiences (e.g., success, satisfaction, well-being) of doctoral students in their programs. It represents a unique contribution to the field of doctoral education as it attempt to bring together all the factors found to date to shape the lived experiences of doctoral students, as well as evidence-based ways to facilitate students' success and well-being through these factors. More specifically, the present paper aims to inform students, faculty, and practitioners (e.g., student support staff)

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of the optimal practices and structures uncovered to date, as most beneficial to doctoral students in terms of both academic success and well-being.

Impact on Society Decreases to doctoral students' well-being as they progress in their programs, financial struggles, and the notable difficulty in maintaining a social life/family responsibilities have been widely discussed in popular culture. The present paper aims to highlight these, and other, issues affecting the doctoral experience in an attempt to contribute to the conversation with comprehensive empirical evidence. By facilitating discussions on the issues that play a role in the attribution and dissatisfaction of existing doctoral students, and perhaps deter potential doctoral students from ever entering doctoral education system, we hope to contribute to a student-centered focus in which departments are concerned with the academic success of doctoral students, but also equally concerned with maximizing students' well-being in the process of attaining a doctoral degree. This, we hope, will enhance the societal perception of doctoral education as a challenging, yet worthwhile and rewarding process.

Future Research Future research in which the confluence of the factors discussed in this review, particularly with respect to the cross-cutting impact of socialization variables, is recommended to provide a sufficiently in-depth examination of the salient predictors of doctoral student development and persistence. Future research efforts that steer away from single-factor foci to explore interactive or redundant relationships between factors are thus recommended, as are analyses of the potential effects that changes to one aspect of the doctoral experience (e.g., motivational interventions) can have on other factors.

Finally, studies employing various alternative methodologies and analytical methods (e.g., observational, questionnaire, experimental, experience sampling) are similarly expected to yield valuable knowledge as to the nature and extent of the aforementioned and novel contributing factors, as well as the utility of student intervention programs aimed at improving both the personal and professional lives of doctoral students internationally

Keywords doctoral education; doctoral well-being; higher education; graduate education; doctoral achievement

INTRODUCTION

Research on students in higher education contexts to date has focused primarily on the motivation, achievement, and well-being of undergraduates, largely overlooking topics relevant to doctoral students' mental, physiological, motivational, and social experiences (Brus, 2006; Longfield, Romas, & Irwin, 2006; Pocock, Elton, Green, McMahon, & Pritchard, 2011). In Canada and the United States, there has been a 57% and 64% increase in doctoral enrollment between 1998 and 2010 respectively (OECD, 2013), with women and visible minorities becoming increasingly represented across disciplines (Council of Graduate Schools, 2012; National Science Foundation, 2012; Statistics Canada, 2011). However, attrition from doctoral programs has remained consistently high in North American institutions over the past 50 years, with approximately 50% of students dropping out (Lovitts, 2001; MELS, 2012) even while holding prestigious fellowships (Wendler et al., 2012). To better understand the issue of attrition in doctoral education, research has predominantly focused on seven categories of the doctoral experience: completion and attrition rates, time to degree, socialization processes, dissertation logistics, supervisory roles and relationships, gender and race, and disciplinary differences (Gardner, 2009). As such, whereas most empirical efforts have been directed toward understanding the developmental and structural elements affecting the doctoral experience, issues affecting students' personal lives and well-being have been relatively overlooked.

Existing research on doctoral students' well-being has consistently found high-stress levels (Kernan, Bogart, & Wheat, 2011; Virtanen, Taina, & Pyhältö, 2016; Wyatt & Oswalt, 2013), mental-health concerns (e.g., depression; Hyun, Quinn, Madon, & Lustig, 2006; Pallos, Yamada, & Okawa, 2005), and alarming physical health symptoms (e.g., upper respiratory infections; Juniper, Walsh, Richardson, & Morley, 2012; Kernan et al., 2011; Pallos et al., 2005) to be reported by students. Moreover, studies that aim to explore the positive emotions associated with the doctoral experience unfortunately tend to report negative emotions as the dominant affective state for PhD students (Hughes, 2011). In terms of their social and personal lives, doctoral students also tend to report difficulties with maintaining relationships (Dabney & Tai, 2013; Wellington & Sikes, 2007) and engaging in social activities (Juniper et al., 2012; Longfield et al., 2006) due to a lack of time, financial resources, and motivation. For many, the added demands of family responsibilities during one's doctoral studies have also been found to negatively impact quality of life and well-being (Pocock et al., 2011; Skinner, 2009). These threats to psychological and physical well-being in doctoral studies can, in turn, negatively affect students' academic motivation and interfere with their attainment of long- and short-term goals (Geraniou, 2010; Tanaka & Watanabea, 2012). Consequently, a comprehensive understanding of the doctoral experience focusing on students' physical, psychological, and emotional well-being is warranted to provide a well-rounded perspective on the challenges faced in graduate education.

REVIEW PARAMETERS

This review paper aims to offer deeper insight into the issues articulated above by reviewing and critically analyzing recent literature on the doctoral experience. Of particular importance is understanding the various factors that influence doctoral students' experiences, with the present review drawing on recent conceptual and empirical literature in the field of doctoral education to examine common challenges in doctoral programs. Moreover, whereas the roles of demographic and structural factors such as enrollment status, discipline, gender, and race will inevitably impact the doctoral experience (see Castello et al., 2017; Ellis, 2001), the present review instead focused on literature examining psychological and social factors such as socialization, motivation, and personal/social lives that have not been synthesized together in a published review to date.

The articles in the present review were retrieved from four databases—ERIC, PsychINFO, Scopus, and Web of Science—and at least one of the following four keywords needed to appear in an article's title or abstract: "doctoral students," "PhD students," "postgraduate students," or "graduate students." The search was then narrowed by combining the initial set of keywords with a second set of keywords (using the Boolean operator AND): "experience," "well-being," "achievement," and "completion" (Table 1).

Table 1. Summary of search strategies and included literature

DATABASE	SEARCH TERMS	RETRIEVED ARTICLES	ORIGINAL ARTICLES INCLUDED
ERIC	Doctoral students OR PhD students OR postgraduate students OR graduate students AND (experience OR well-being OR achievement OR completion)	378	72
PsychINFO	Doctoral students OR PhD students OR postgraduate students OR graduate students AND (experience OR well-being OR achievement OR completion)	229	44
Scopus	Doctoral students OR PhD students OR postgraduate students OR graduate students AND (experience OR well-being OR achievement OR completion)	759	29
Web of Science	Doctoral students OR PhD students OR postgraduate students OR graduate students AND (experience OR well-being OR achievement OR completion)	528	18

Thus, an article needed to include at least one keyword from both sets of search terminology to be included in the present review. Whenever studies examining “graduate students” were incorporated, their results were included only if they explicitly pertained to doctoral-level students (i.e., analyses examined educational-level specific outcomes). These measures were taken to ensure that the present review provides insight about students in a doctoral program, as other graduate programs (e.g., terminal master’s degrees, professional internship-based graduate programs, etc.) can be vastly different from doctoral-level programs and carry their own unique set of challenges.

All searches were restricted to peer-reviewed articles written in English that were published after the year 2000 to ensure a review focus on recent literature and experiences concerning doctoral education. Additionally, selected articles published prior to 2000 were reviewed (e.g., Golde, 1998; Patchner, 1982) due to their consistent noted significance in the initial set of empirical articles. Concerning exclusion criteria, papers focusing on online doctoral education were omitted due to these students experiencing a qualitatively different educational environment and programmatic challenges as compared to typical in-person doctoral degree programs (e.g., lack of “informal” socialization through casual interactions with students and faculty, an inability to teach within the department, etc.). Finally, articles that examined the doctoral program experience through the lens of a specific student characteristic (i.e., race, gender, enrollment status, residency status) were excluded due to limited sample sizes, and the present review’s focus on experiences common to doctoral students irrespective of demographic variability.

ANALYSIS

After all relevant articles were retrieved, they were read and analyzed by the first author using a traditional content analysis approach (Hsieh & Shannon, 2005). Data analysis commenced with reading all the articles and sorting them into the following features: purpose, sample, methods, analysis, and results. Once all literature was read to obtain a sense of the whole (Tesch, 1990), articles were grouped together according to the themes of their results (i.e., inductive category development; Mayring, 2000). The initial set of themes included: supervision, the department, well-being, and personal lives, with some articles appearing in more than one group. Articles then underwent several more rounds of review; based on the findings of the articles, codes increased in specificity to reflect main results, implications, gaps, and consistencies/ inconsistencies with other literature. During this process, themes were narrowed and refined, with the goal of creating categories that reflect important (as identified by the empirical data) yet distinct aspects of the doctoral experience. Finally, when all the articles were found to accurately fit into one (or more) theme, the categories presented in this review article were established.

RESULTS

Review articles that examine the postgraduate experience often report two sets of factors affecting the progress and completion of doctoral degrees: university factors and student factors (Ali & Kohun, 2006; Dominguez, 2006; Manathunga, 2002). University factors typically include fit with supervisor and institutional (particularly departmental) expectations and regulations. On the other hand, student factors often include demographic characteristics, disciplinary background, and aptitude, as well as students’ personal life structures (e.g., financial support, living arrangements, number of dependents, etc.). Similarly, the present review uncovered factors that can be readily categorized as external and internal to the doctoral student. In this review, external factors are conceptualized as representing all relationships and structures that involve individuals, resources, and institutions outside the student that may either directly or indirectly impact doctoral progress. These include supervision, personal/social lives, the department and socialization, and financial support opportunities. Conversely, internal factors concentrate on inner processes (i.e., psychological/mental processes) that are directly associated with academic work, specifically motivation, writing skills, self-regulatory strategies, and academic identity (Table 2).

Table 2. Summary of main findings of review on the factors affecting the doctoral experience

FACTOR	NUMBER OF STUDIES	SELECTED REFERENCES	MAIN FINDINGS
<i>External Factors</i>			
Supervision	42	Cotterall, 2013; De Welde & Laursen, 2008; Gardner, 2009; Gearty & Mertz, 2012; Goldman & Goodboy; Gube et al, 2017; Latona & Browne, 2001; Lin, 2012; McAlpine & McKinnon, 2013; Walsh, 2010; Zhao, Golde, & McCormick, 2007	<ul style="list-style-type: none"> the most widely researched factor, and considered to be the most influential in the doctoral experience. open, supportive, and frequent communication with supervisor was found to be essential for student success and satisfaction. both supervisors and supervisees perceive a match in work values (e.g., communication style and frequency, commitment to timelines, etc.) as the most essential factor in the strength of the relationship. the student-supervisor relationship is further influenced by the compatibility between all supervisees. the fit with one's supervisor affects students' emotions and persistence, particularly in stem disciplines. although students' ideal supervisory relationship is that of mentorship, supervisors who adhere to the basic roles of guiding and supporting students in times of need can maintain high levels of satisfaction, positive emotions, and progress. recent research has explored the role of the students in the supervisory relationship, with students who respect timelines, prepare for meetings, and are open to feedback contributing positively to the student-supervisor fit.
Personal/ Social Lives	19	Brown & Watson, 2010; Leveccque, Anseel, De Beuckelaer, Van der Heyden, & Gisle, 2017; Longfield et al., 2006; Pocock et al., 2011; Trujillo, 2007; Wellington and Sikes, 2007	<ul style="list-style-type: none"> due to the extensive demands doctoral programs, students' health and social lives are often being neglected. this lack of leisure is correlated with high levels of burnout and depression, and low well-being. social isolation is often the result of students' lack of time and/or money, feeling "guilty" for spending time away from academic work, and an inability to discuss academic matters with friends and family. work/life imbalance was found to be the strongest predictor of psychological distress in PhD students.

FACTOR	NUMBER OF STUDIES	SELECTED REFERENCES	MAIN FINDINGS
Departmental structures and socialization	33	<p>Ali & Kohun, 2006, 2007; Barnes & Randall, 2012; Chiang, 2003; Ferrer de Valero, 2001; Gardner, 2007, 2008a, 2008b, 2010; Golde, 1998, 2005; Lovitts, 2001; Nelson & Lovitts, 2001; O'Meara et al., 2014.</p> <p>Shacham & Od-Cohen, 2009; Shulman, 2010; Stubb, Pyhalto, & Lonka, 2011; Weidman, Twale, & Stein, 2001</p>	<ul style="list-style-type: none"> • departmental structures play a major role in facilitating student agency; this is mainly through student socialization and the opportunities that departments make available. • although student attrition is often regarded as a private matter, departmental structures were found to play a big role in student completion and attrition. • one major issue that affects the doctoral experience is a mismatch between student and departmental expectations, often resulting from insufficient information for students. • socializing students into the departmental culture, providing funding opportunities, and sharing information were found to be of most importance for students success. • socialization is suggested to occur in stages; although models vary, they typically include the initial phase of communication of expectations (e.g., during coursework), a phase of informally learning role expectations (e.g., during the comprehensive examination), and a final stage when an academic identity is formed (e.g., during dissertation work). • each phase posits unique socialization challenges which require both formal and informal communications. • students who perceive themselves to be a valuable member of their departmental and/or scholarly communities report better well-being, higher interest, and better achievement. • professional models, such as cognitive apprenticeship, have been found successful in socializing students and facilitating satisfaction and achievement.

FACTOR	NUMBER OF STUDIES	SELECTED REFERENCES	MAIN FINDINGS
Financial Opportunities	10	Ampaw & Jaeger, 2012; Barnes & Randell, 2012; Ferrer de Valero, 2001; Golde & Dore, 2001; Gururaj, Heilig, & Somers, 2010	<ul style="list-style-type: none"> • Natural sciences students report greater access to financial opportunities than those in the social sciences, arts, and humanities. • Greater access to financial opportunities is associated with greater satisfaction and lower attrition. • Departmental funding was found to have the biggest impact on doctoral students' persistence. • Specifically, research grants have the most beneficial impact on doctoral student motivation due to the responsibilities and expectations that they carry.

Internal Factors

Motivation	37	Devos et al., 2017; Geraniou, 2010; Ivankova & Stück, 2007; Leonard, Becker, & Coate, 2005; O'Meara, Knudsen, & Jones, 2013	<ul style="list-style-type: none"> • Lack of motivation is cited by many as the main reason for departure from graduate school. • Due to the increasingly unstructured nature of doctoral work, students are required to self-regulate their motivation to be successful completers of their programs. • Correlates of student motivation include a variety of inter- and intrapersonal factors, such as: age, personal goals, socialization, and fit with supervisor. • Recent research has focused on the reasons students pursue their degrees (i.e., value); these range from intrinsic (e.g., interest) to extrinsic (e.g., employability prospects). • Students who pursue their degrees for intrinsic reasons report better satisfaction and well-being during their studies.
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FACTOR	NUMBER OF STUDIES	SELECTED REFERENCES	MAIN FINDINGS
Writing skills and regulatory strategies	14	Aitchison, Catterall, J., Ross, P., & Burgin, 2012; Castello et al., 2009; Ferguson, 2009; Florence & Yore, 2004; Kwan, 2008; McAlpine & Amundsen, 2012	<ul style="list-style-type: none"> • Writing is often explored with respect to the emotions and stress involved in the process. • negative emotions (e.g, frustration, confusion) were found to dominate the doctoral writing experience. • graduate writing was found to occur in five stages: planning, revision, structure, control, and the voice stage. • collaborative writing is associated with more optimal self-regulation, higher motivation, more positive emotions, better writing quality, and higher completion rates. • the doctoral reading process is inextricably intertwined with effective writing.
Academic Identity	10	McAlpine et al., 2009; McAlpine & Amundsen, 2009; Trujillo, 2007	<ul style="list-style-type: none"> • academic identity develops through engagement in academic activities (e.g, writing, conferences, research, etc.) • informal activities (e.g., peer interaction) were found to contribute more to identity formation than formal ones.
Self-worth	6	De Welde & Laursen, 2008; Hughes & Kleist, 2005; Longfield et al., 2006	<ul style="list-style-type: none"> • self-worth fluctuates during the PhD process as a result of external evaluations, progress, and self-assessment. • a sense of unworthiness to participate in doctoral studies was suggested to be at the heart of students' struggles.
Self-Efficacy	9	Forester, Kahn, & Hesson-McInnis, 2004; Lambie & Vaccaro, 2011; Litalien & Guay, 2015	<ul style="list-style-type: none"> • research self-efficacy is correlated with interest in research and research productivity. • perceived competence was found to a strong predictor of dropout intentions in doctoral students. • low self-efficacy is linked to self-handicapping behaviors.

EXTERNAL FACTORS

Supervision

The first—and often most influential—external factor that affects doctoral students’ experiences in graduate school is their relationship with their supervisor(s). Lovitts (2001) claimed that one’s supervisor “influences how the student comes to understand the discipline and the roles and responsibilities of academic professionals, their socialization as a teacher and a researcher, the selection of dissertation topic, the quality of the dissertation, and subsequent job placement” (p. 131). Additionally, supervisors can play a major role in student satisfaction, persistence, and academic achievement (Gube, Getenet, Satariyan, & Muhammad, 2017; Murphy, Bain, & Conrad, 2007; Solem, Hopwood, & Schlemper, 2011; Zhao et al., 2007). To fully appreciate the significance of the student-supervisor relationship in the doctoral experience, it is essential to consider how students and their supervisors are matched, the types of relationship patterns they develop, and how aspects of these categories (i.e., match and relationship patterns) can hinder or facilitate student success.

The role of the supervisor in the doctoral process. Quality supervision, according to Latona and Browne (2001), can be characterized as involving precise and timely feedback, frequent meetings that include open discussion about roles and responsibilities, a supportive and collegial relationship, and encouragement to begin working on topics of interest early in the program in order to maintain the flow of work throughout the program. In an investigation into the most salient criteria in supervisor selection, Ray (2007) conducted a mixed-method study of 23 junior and senior doctoral students. Controlling for education level, Ray (2007) identified ten key elements affecting the choice of a research supervisor.

These supervisory elements, organized by decreasing importance, are as follows: (a) commitment and involvement; (b) the extent to which the supervisor will defend their students’ stance in contentious situations (if that stance was agreed upon previously); (c) reputation/productivity; (d) respect for timelines; (e) convergence of interests; (f) ability to help students obtain job opportunities; (g) openness to different research approaches; (h) personal relationship (e.g., how easily the pair gets along); (i) the supervisor’s relationships with other academics (both inside and outside the institution); and (j) the number of theses supervised. From this list, it is evident that doctoral students are not only concerned with guidance on subject matter and methodology, but to a large extent value productivity, partnership, and commitment on the part of their supervisor.

Similarly, Ives and Rowley (2005) found that although both doctoral students and faculty ($N = 24$) were willing to sacrifice a match in methodology when considering new supervisors/supervisees, they were not willing to compromise on research interests and interpersonal work values (e.g., communication style and frequency, commitment to timelines, etc.), with the latter perceived as most crucial to the strength of the supervisory relationship. Moreover, these authors found that students who were allocated a supervisor by the department were more likely to be dissatisfied with their degree program compared to those who chose their supervisor. This finding was mirrored in Lovitts (2001), who found that doctoral program completers ($N = 511$) were six times less likely than noncompleters ($N = 305$) to have been assigned a supervisor (7% versus 44%, respectively). Taken together, these findings emphasize the importance of a collaborative supervisory relationship based on shared interests, collegiality, and agreed upon mutual responsibilities.

Gordon (2003) described common difficulties encountered by doctoral students in the dissertation process, including defining a research problem or being unprepared for how enjoyment of the scientific method can often turn to frustration in the process of conducting real-world research. Additionally, Gordon suggests that despite the implicit perception that doctoral students represent independent researchers in training, they may not excel at first in increasingly unstructured situations due to self-regulation difficulties; in contrast to graduate coursework that affords students an established and logical structure, research or dissertation tasks are often ill-defined and can lead to anxiety and disorientation. When encountering these challenges, Gordon argues that it is the supervisor’s responsibility to guide, redirect, and

monitor the progress of the student to ensure timely completion of the dissertation, and reduce failure experiences (e.g., attrition).

Interestingly, despite extensive literature linking dissatisfaction with supervision to doctoral student attrition, findings from Gardner (2009) suggest that faculty are often unaware of their potential role in student dropout. More specifically, semi-structured interviews with 60 doctoral students and 34 faculty from U.S. doctoral programs showed faculty to perceive program attrition as principally due to students lacking requisite skills or motivation (74%; Gardner, 2009), followed by complications arising in students' personal lives that interfered with their doctoral training (e.g., mental illness; 15%). Conversely, the most commonly cited reasons for dropping out as reported by doctoral students were personal problems (e.g., marriage, childcare issues; 34%), departmental challenges (e.g., poor supervision; 30%), and lack of motivation (21%). Similarly, Adrian-Taylor, Noels, and Tischler (2007) found graduate students to report lack of feedback as the primary source of conflict with their supervisors, with supervisors instead attributing student conflict to students' personal characteristics (e.g., inadequate research skills).

Finally, a less commonly explored dynamic in the supervision experience is the compatibility between supervisees (i.e., students having the same supervisor). Hein, Lawson, and Rodriguez (2011) were among the first to suggest that a student-supervisor relationship may be influenced by the relationships between supervisees as well as differences in resources allocated by the supervisor to their supervisees. In their qualitative study of nine supervisors and their students, supervisee incompatibility in terms of skill, motivation, openness to feedback, etc. was found to significantly alter the content and process of supervision. Supervisee incompatibility was found to result in unequal one-on-one supervision time due to some students having a higher need for support. It also influenced the types of tasks assigned by the supervisor to the research team (e.g., in terms of levels of complexity), and the way in which feedback was provided during collective supervision sessions (e.g., using simple language, reducing technical jargon to ensure understanding). Thus, attempting to accommodate the needs of one student was often found to negatively impact the doctoral supervision experience of other students by depriving them of supervision time, and altering (i.e., lessening) the collective goals they are expected to achieve.

The importance of the supervisory fit for students' satisfaction and success. Numerous empirical studies have found the fit between supervisor and supervisee to greatly affect doctoral students' emotions (Chiang, 2003; Cotterall, 2013; Gearity & Mertz, 2012; Lin, 2012; McAlpine & McKinnon, 2013) and academic persistence (Golde, 2005; Gube et al., 2017; Ives & Rowley, 2005; Leijen, Lepp, & Remmik, 2016; Litalien & Guay, 2015; Lovitts, 2008; Pauley, Cunningham, & Toth, 1999). Moreover, the importance of supervisory fit is particularly evident in STEM disciplines where students' research efforts (including their dissertation) are more closely intertwined with the work of their supervisors (De Welde & Laursen, 2008; Golde, 1998; Golde, 2005). In a study of six Australian PhD candidates, Cotterall (2013) qualitatively examined the most commonly occurring emotion-eliciting elements of the doctoral process in three hour-long interviews per year for two years and found most emotional episodes to involve interactions with supervisors. Whereas most comments concerning supervisors were positive (e.g., joy) and acknowledged their efficiency, support, feedback, and demeanor, it was the discrepancy between supervisors' and students' expectations that generated confusion, stress, and anxiety in students. Similarly, a longitudinal narrative inquiry study by McAlpine and McKinnon (2013) with 16 social sciences doctoral students (using biographic questionnaires, weekly logs, and interviews) found students' interactions with their supervisors to be largely positive and reassuring. However, they also found students to report frustration when they perceived their supervisors as not intellectually invested in their work or unavailable in times of need. Research further shows supervisors to contribute substantially to students' sense of belongingness or isolation within their research groups (Lin, 2012; Walsh, 2010) as well as students' overall dissatisfaction with their program of study (Gardner, 2009; Lin, 2012).

Although a mentorship or apprenticeship relationship with one's supervisor has been found to be ideal for doctoral student satisfaction (De Welde & Laursen, 2008), findings also indicate that this intensive, hands-on supervision method is not necessarily required to maintain student well-being (McAlpine & McKinnon, 2013; University of California, Berkeley, 2014; Walsh, 2010; Zhao et al., 2007). More specifi-

cally, studies suggest that supervisors who simply adhere to their institutionally defined responsibilities concerning research guidance, and who respond to their students in times of need, can maintain positive emotions, satisfaction, and progress in their doctoral students (Cotterall, 2013; Ives & Rowley, 2005; McAlpine & McKinnon, 2013; Murphy et al., 2007; Schniederjans, 2007). McAlpine and McKinnon (2013) found that doctoral students' need for supervision is most critical during the transitions into and out of the doctoral program (i.e., socialization into the program, thesis completion, employment guidance). During these periods, four broad categories of supervisory guidance were identified: help with writing (accounted for 37% of all needs reported by students), research-related processes (22%), institutional issues (e.g., paperwork; 21%), and disciplinary/academic practices (e.g., guidance regarding collaborations; 18%).

These findings are in line with Murphy et al. (2007) who observed that doctoral students in engineering programs largely perceived supervision as task-focused as opposed to person-focused in nature. Finally, in a survey of 4,010 doctoral students, Zhao et al. (2007) found that academic supervision (i.e., training and progress monitoring) explained 46% of the variability in student satisfaction with their supervisor, over and above a "personal touch" (i.e., interest and support beyond academic matters), help with career development, and perceptions of being employed as "cheap labor." These findings once again underscore the discrepancy between what doctoral students seek as the ideal supervisory relationship (e.g., a mentor who will closely guide them through every stage of the doctoral process) and what is empirically shown to correlate with satisfaction and progress (e.g., a supervisor who is responsive in time of need while allowing the formation of independence in the research process).

Recent work by Goldman and Goodboy (2017) on the role of student characteristics in student-supervisor relationships suggests that students' psychological maturity is also a factor in maintaining a respectful, friendly, and constructive relationship with their supervisors. While most of the studies discussed above focus primarily on the responsibility of the supervisor to create and maintain a satisfying experience for their students, recent work has increasingly focused on factors that are under the control of students themselves (e.g., bringing positivity and respect into the relationship, practicing and demonstrating gratitude; Howells, Stafford, Guijt, & Breadmore, 2017). Since the supervisor's main goal is to ensure that the student becomes an independent researcher, students who consistently respect timelines, prepare for meetings, exhibit openness and respect for feedback, and demonstrate their capabilities in their work, are likely to ensure the satisfaction of their supervisors in the relationship. This shift in focus is encouraging as it can provide evidence-based strategies for improving the supervisory relationship that are within the students' direct control.

Lastly, a case study by Gearity and Mertz (2012) provides an interesting autobiographic narrative of how a supervisory relationship focused on adhering to basic advising responsibilities can over time develop into a more "ideal" mentoring relationship in which the student increasingly perceives their supervisor as a source of guidance and motivation, and a contributor their future success. The authors provide a detailed account of a struggling student's dissertation writing process and the role of the supervisor in facilitating progress through continuous feedback and guidance. The narrative provided a reassuring example of how student-supervisor relationships that are dissatisfying in their early stages can transform into valuable sources of learning, motivation, and support for the doctoral student through open communication about both parties' values, goals, and expectations.

Personal/social lives

At the doctoral level, many students attempt to balance social and familial responsibilities with their academic work, thus requiring difficult decision-making regarding priorities and resource allocation. Consequently, personal life goals such as physical health or partner relationships are often neglected, leading to perceptions of imbalance and disruption (Brus, 2006; Rizzolo, DeForest, DeCino, Strear, & Landram, 2016). In addition, doctoral students often report declines in social interactions (Longfield et al., 2006) and difficulties maintaining family responsibilities (Austin, 2002; Flynn, Chasek, Harper, Murphy, & Jorgensen, 2012; Pocock et al., 2011) due to the demands of their graduate program. This reported lack

of leisure time and social interactions by doctoral students has, in turn, been found to correlate with higher levels of burnout (Galdino, Martins, Haddad, Robazzi, & Birolim, 2016) and depression (Uqdah, Tyler, & DeLoach, 2009), as well as lower well-being (Trenberth, 2005).

Qualitative findings from focus group interviews ($N = 47$) by Longfield et al. (2006) further suggest that doctoral students often perceive financial constraints and lack of time due to academic responsibilities (e.g., course projects, supervisor-assigned deadlines) as having a negative impact on their personal and social lives, with guilt for “wasting” time on social interactions commonly seen as detracting from academic progress. Students’ reported social interactions tended to primarily involve other graduate students and were notably limited in duration and content (i.e., mostly involved in their academic work). Participants also commented on the difficulty of maintaining physical activity since beginning their graduate education, citing various barriers (e.g., time, motivation) and guilt over time away from academic work as limiting factors, and incorporating physical and social activities as a compensatory approach (e.g., exercising with a friend).

Similarly, in a qualitative survey of 29 British doctoral students, Wellington and Sikes (2007) found doctoral program obligations to frequently impair both short-term and long-term relationships with friends and family members, with students feeling unable to discuss their research interests and obligations due to others being unfamiliar with the doctoral education context. Consequently, doctoral students in this study were found to develop feelings of social isolation from not only their undergraduate colleagues but also old friends and family members (see Trujillo, 2007 for a detailed autobiographic account). This social isolation can be particularly detrimental for doctoral students, with findings showing deficits in positive emotions due to lack of involvement in rewarding non-academic activities to correspond with lower levels of not only intrinsic academic motivation (Tanaka & Watanabe, 2012) but overall psychological and emotional well-being (Pocock et al., 2011).

Similarly, lack of social support and/or work-life conflict have also been found to correspond with lower well-being and a higher prevalence of mental illness in doctoral students. In a recent study of 3659 Belgian doctoral students across several universities and disciplines, 51% reported having at least two mental health issues (e.g., depression, anxiety), 40% reported three or more, and 32% reported at least four, with work-family conflict found to most strongly predict psychological distress (Levecque et al., 2017). These results are in line with the empirical literature showing students who report being satisfied with the way they balance their academic work and personal lives to be more motivated (Tanaka & Watanabe, 2012), more satisfied with their role as doctoral students and less depressed (University of California, Berkeley, 2014), as well as less likely to express intentions of dropping out (Castelló, Pardo, Sala-Bubaré, & Suñe-Soler, 2017).

Striking a satisfactory balance between academic work and one’s personal life is especially important for doctoral students with children. Numerous studies show having children, particularly for female doctoral students and in STEM disciplines (Rosser & Lane, 2002), to consistently correspond with lower motivation and achievement (K. White, 2003; Brown & Watson, 2010), greater role conflict (Brown & Watson, 2010; Dabney & Tai, 2013; Gardner, 2008b; Pocock et al., 2011), as well as stress (Brown & Watson, 2010; Dabney & Tai, 2013), health concerns, and diminished quality of life (Brown & Watson, 2010). Thus, the demands of doctoral programs and students’ personal and social responsibilities can take a toll on the physical and psychological well-being of these students, and influence their performance and achievement in their degree work.

Departmental structures and socialization

Departmental structures are often discussed as a key component of the doctoral experience. These structures include the ways in which departments support students socially, financially, and academically, and provide opportunities for professional development. A study by O’Meara et al. (2014) specifically examined the role of the department by highlighting the ways in which STEM departments facilitate students’ career advancement by reinforcing a sense of agency. This mixed-methods study utilized surveys ($N = 884$) and interviews ($N = 80$) to identify five ways in which departments, through their actors and cul-

tures, empowered students' agency: they approve of multiple career paths (e.g., academic and non-academic), provide opportunities to practice skills in diverse and authentic contexts, provide resources (financial and informational), facilitate networking within the department (e.g., organize orientation week activities to introduce students to one another and to faculty members), and facilitate accessible and supportive supervision. The results suggest that the department plays a major role in students' agency development through socializing incoming students into the department and the discipline, managing the opportunities available to students throughout their studies, and shaping students' career paths.

Doctoral program attrition has also been explored with respect to the role of departmental structures in shaping the doctoral experience. Lovitts (2001) argues that attrition is often considered by members of the department a private choice made by students due to personal shortcomings such as the inability to measure up intellectually. This finding is in line with results showing supervisors to similarly attribute student failure largely to students' personal characteristics (e.g., Ali & Kohun, 2006; Gardner, 2009; Herzig, 2002). According to Lovitts (2001), one possible reason for these attributions is that students often drop out of their graduate programs without providing an explanation to their department, thus contributing to the perception that attrition is the result of personal rather than departmental factors. This attributional perspective, in turn, can serve to discourage departmental reflection on the efficacy of existing structures or pursuing innovations that could benefit students (De Welde & Laursen, 2008).

Researchers have also identified an association between departmental factors and doctoral student satisfaction and progress (Austin, 2002; Cotterall, 2013; De Welde & Laursen, 2008; Herzig, 2002). Specifically, studies have found that departmental cultures and practices play a role in doctoral student attrition over and above student interest in the discipline (Barnes & Randall, 2012; Gardner, 2008b; Golde, 2005). One issue that consistently arises is a mismatch in values (Sweitzer, 2009) and expectations between the student and the department (Ali & Kohun, 2006; Gardner, 2010, 2013; Golde, 2005; Hoskins & Goldberg, 2005; Lin, 2012; Lovitts, 2001), an unfortunate situation that can arise from departments not providing students with sufficient information at the admission stage regarding student roles and responsibilities (Ali & Kohun, 2006; Gardner, 2010; Nelson & Lovitts, 2001). Instead, these expectations often remain tacit and are left to be discovered informally as students integrate into the departmental culture (Lovitts, 2001). Whether formal or informal in nature, student integration and socialization are of considerable importance for doctoral student success in their field (De Welde & Laursen, 2008; Gardner, 2008b, 2010; Golde, 2005; Herzig, 2002; Lovitts, 2001; Solem et al., 2011; Tinto, 1993).

In an interview study with students and faculty, Ferrer de Valero (2001) sought to identify critical features of departments having high vs low doctoral completion rates and short vs long times to degree completion. The author found high-completion/short-duration departments to focus on effective student socialization (e.g., facilitating supportive relationships with one's supervisor, committee members, and peers), providing financial support, and information sharing (e.g., orientation courses, skill development). Among departments with low completion rates, students consistently identified lack of department-organized social activities, lack of collaboration between faculty and students, and conflict among members of the department as factors that impeded their academic progress.

Stages of socialization. According to Golde (1998), the process of socialization in postsecondary education happens when "a newcomer is made a member of a community- in the case of graduate students, the community of an academic department in a particular discipline" (p. 56). The author goes on to discuss the double socialization of graduate students, with students being socialized into not only their roles as graduate students but also as members of their professional community. In a widely-cited report, Weidman et al. (2001) proposed that professional identities form in four stages. In the *Anticipatory Stage*, students become aware of the behaviors, attitudes, and skills expected in their new role, and in the subsequent *Formal Stage* they receive formal instruction and gain knowledge of their field. This is followed by an *Informal Stage* in which students learn additional informal role expectations by interacting with departmental faculty and peers, and finally, a *Personal Stage* consisting of role internalization and professional identity formation. Recent literature further suggests that the importance of these socialization stages may differ across cultures (Rhodes, Zheng, & Sun, 2016), with North American doctoral students relying

more heavily on the Formal Stage to become socialized into their disciplines, and Chinese students instead prioritizing unstructured socialization during the Informal Stage.

Following this framework, Weidman and Stein (2003) sought to identify specific informal departmental structures associated with socialization as perceived by doctoral students. Findings suggested that when students perceived that they were expected and encouraged by faculty to participate in scholarly activities as members of their academic discipline, they inevitably became better socialized into that scholarly community. In a series of qualitative investigations of doctoral socialization across disciplines, Gardner (2007, 2008, 2010) found scholarly independence to develop in three distinct phases, each consisting of unique socialization procedures to facilitate professional integration and growth. In the *Admission Stage*, lasting from pre-admission until the commencement of coursework, students' expectations are formed concerning their institution, discipline, and roles as doctoral students. In the subsequent *Integration Stage*, students begin their coursework, choose a supervisor and/or a committee, become integrated with their faculty and peers, and complete their comprehensive examination. In this phase, students also learn more about their professional roles and responsibilities and benefit significantly from peer support. The final *Candidacy Stage* lasts until students pass their dissertation defense and involves the formation of a professional self (i.e., professional identity), more collegial relationships with faculty and peers, and the scaling down of guidance from one's supervisor so as to not hinder independence (Gardner, 2008a). In each socialization phase, students consistently report the quality of the relationship with their supervisor as the most crucial contributor to their overall success in the program.

As highlighted in both the empirical literature on doctoral student experiences (Chiang, 2003; Kruppa & Meda, 2005; Shacham & Od-Cohen, 2009; Stubb et al., 2011) and theoretical work in this domain (Ali & Kohun, 2006, 2007), the specific socialization challenges faced by students change as they progress through their programs. Ali and Kohun (2006, 2007) argue that these unique socialization objectives at each stage of the doctoral program (e.g., preadmission to enrollment, first year, second year through candidacy, dissertation) are often not properly supported by departmental structures. For example, in the admission stage, there is typically a lack of systematic procedures for acclimatizing students into the departmental culture, with the task left largely to the student. Similarly, the candidacy stage is often characterized by lack of structure and solitary work despite students requiring significant guidance and communication with supervisors and committee members throughout this period. When support is missing at this stage of the doctoral experience, it can lead to feelings of confusion, isolation, and hopelessness in students, which in turn can negatively impact their well-being, program success, and professional growth.

Models of successful socialization. Researchers have suggested that departments can optimally accomplish doctoral student socialization by adopting a professional education model focused on collaboration and research for practical purposes (Bourner, Bowden, & Laing, 2001; Maxwell, 2003; Shulman, 2010; Usher, 2002). Similarly, cognitive apprenticeship models have also been proposed as ideal for doctoral socialization (Austin, 2009; Shacham & Od-Cohen, 2009), involving the modeling of disciplinary norms and standards, scaffolding increasingly independent academic work, and self-evaluation as facilitated by senior students and faculty. In both models, learning communities are encouraged in which a democratic and meaningful exchange of ideas is valued, as is sincere and frequent feedback as well as meaningful social support (Shacham & Od-Cohen, 2009). Shulman (2010) argues that the traditional PhD journey is notably abstract in nature and solitary, consisting mostly of ill-structured tasks requiring individual efforts. In professional programs, on the other hand, the student cohort is intended to experience each stage of the degree as a collective in order to develop a community that not only helps the student integrate academically but also provides social support throughout the degree process. Results from multiple empirical studies examining the efficacy these recommended structures indicate that doctoral students can benefit from these models in terms program success (Bhandari et al., 2013; Chiang, 2003; Shacham & Od-Cohen, 2009).

Shacham and Od-Cohen (2009) examined the experiences and learning outcomes of doctoral students after participating in communities of practice (CoP), in which students frequently worked in small group with other doctoral students and supervisors to develop ideas, share challenges and successes, and receive

feedback on research projects (including the dissertation). The authors found that students preferred the face-to-face communication, with the ability to share ideas, struggles, and coping strategies being a significant contributor to learning for these students. Students also indicated that they adopted reflective thinking habits, became more open to criticism, and gained a better understanding of concepts and ideas in their field through CoP participation. Lastly, students reported receiving considerable emotional support through their CoP involvement, underscoring the otherwise rare nature of this type of support in their PhD experience. In accordance with these findings, Stubb et al. (2011) found that among 669 Finnish doctoral students, those who perceived their scholarly community as integrative, empowering, and inspiring reported better overall well-being (e.g., lower stress, anxiety, exhaustion, isolation) as well as greater interest in their studies. However, study findings also showed over half of the doctoral student participants who responded to an open-ended question about their scholarly community to report a sense of exclusion and feeling like “a source of a burden” on their community. According to these participants, such isolation experiences hindered their learning, decreased the perceived meaningfulness of their doctoral experience, and at times led to complete disengagement.

Finally, a study by Chiang (2003) revealed that in natural sciences departments where there typically exists a ‘teamwork research training structure’ in which students and supervisors collaborate on research projects, students are significantly more satisfied with their doctoral experiences, as compared to social sciences students who participate primarily in ‘individual research training structures.’ In natural science contexts, the student is often regarded as a junior member of the research group, and interactions within the group are collegial and frequent. In social science programs, the student is instead typically perceived as a learner, with interactions with one’s supervisor being more formal and hierarchical, and less frequent. Taken together, these results suggest that departmental structures that more explicitly incorporate an apprenticeship model, in this case by virtue of disciplinary training norms, can benefit doctoral student learning, progress, and overall satisfaction. In sum, doctoral departments have been explored in terms of facilitating the doctoral experience by way of cultures and structures, demonstrating a capacity to foster not only doctoral student agency but also their skill development, socialization into academic communities, and consequently satisfaction and success.

Financial opportunities

A final external factor found to significantly shape the experience and well-being of doctoral students concerns their access to financial support opportunities. These opportunities are varied and include debt (e.g., government/bank loans), scholarships, grants, as well as employment opportunities within the university (e.g., research/teaching assistantships). Several studies of British and American doctoral students show students in natural science disciplines to report greater access to financial resources through departmental programs than students in social sciences, arts, or humanities (Barnes & Randell, 2012; Chiang, 2003; Golde & Dore, 2001). Greater access to funding, in turn, has further been found to correspond with higher levels of students’ overall satisfaction with their doctoral experience and lower attrition (Ali & Kohun, 2006; Ferrer de Valero, 2001; Gururaj et al., 2010; Leijen et al., 2016). Nevertheless, findings from Golde and Dore (2001) demonstrate that many students do not understand the financial implications of attending a doctoral program at the time of enrollment, making decisions regarding program and supervisor fit without recognizing how funding opportunities can impact achievement, lifestyle, and well-being for years to come.

To better understand the role of financial opportunities on doctoral students’ persistence, Gururaj et al. (2010) conducted a meta-analysis of existing studies from the National Postsecondary Student Aid Study (NPSAS; 1991-2005), showing increased availability of loans to correspond with lower attrition. Although contributing to substantial student debt, loan opportunities allowed graduate students to meet their financial responsibilities, thus relieving some financial concerns and allowing them to better focus on advancing their studies. However, these authors found departmental funding to have the biggest impact on student persistence, particularly when higher education institutions took into account heterogeneity in students’ backgrounds and needs in adopting a tailored approach to financial support. This finding was

echoed in a study by Litalien and Guay (2015) who similarly found access to research grants and scholarships to have a substantial impact on students' perseverance in their doctoral programs.

A study by Ampaw and Jaeger (2012) further explored the role of financial opportunities with a sample of 2,068 doctoral students at one research-intensive institution over a 10-year period. Specifically, the authors examined effects of access to financial aid on persistence across three doctoral stages, namely the transition (from admission to mid-completion of courses), development (course mid-completion to comprehensive examination), and research stages (dissertation). Results revealed that students with research assistantships were more likely to persist through every stage than students who received any other type of financial support (e.g., teaching assistantships, scholarships). This suggests that research assistantships provide students with not only financial resources but also with expectations and responsibilities as part of a research team thereby contributing to their socialization (see Weidman & Stein, 2003). In sum, scattered existing research on how access to financial opportunities affects doctoral students' well-being and success underscores the importance of available funding for the satisfaction and persistence across disciplines, with loans proving important for temporarily relief of financial distractions and substantial departmental funding having the strongest benefits for student development.

INTERNAL FACTORS

Motivation

As previously mentioned, students' lack of motivation is often cited by both faculty and students as a major reason underlying premature departure from graduate school (Gardner, 2009; Herzig, 2002; Kinman & Jones, 2003; Lovitts, 2001). Some qualitative research suggests that lack of structure in doctoral programs (relative to undergraduate programs) requires students to be self-motivated throughout their doctoral program (Flynn et al., 2012; Gardner, 2010; Ivankova & Stick, 2007; O'Meara, Knudsen, & Jones, 2013), particularly during the final dissertation phase which involves increased independence and knowledge creation (Gardner, 2009; Weidman et al., 2001). Although students who rely on external guidance and motivators can succeed at coursework, they often exhibit difficulties mastering necessary research skills and coping with emotions during independent scholarly work. Devos et al. (2017) examined the difference between completers ($N = 8$) and noncompleters ($N = 13$) of Belgian doctoral programs across disciplines, with semi-structured interviews showing students who perceived themselves as steadily moving forward on research projects (as opposed to "stuckness") to best differentiate the groups. Although other factors (e.g., supervisor support, financial freedom, etc.) did contribute to students' progress, students' expectations, motivation, and self-regulation found to be most prominent in their personal narratives of completion or attrition.

Studies have consistently shown motivation to succeed to be a salient predictor of achievement and persistence in doctoral education (e.g., Brown & Watson, 2010; Dewett, Shin, Toh, & Semadeni, 2005; Hergarty, 2011; O'Meara et al., 2013; Onwuegbuzie, Rosli, Ingram, & Frels, 2014). Research on motivation in graduate education further shows motivational variables to be correlated with individual differences such as age (Cao, 2012; Kusurkar, Kruitwagen, Cate, & Croiset, 2010) and encompass constructs such as interest (Brailsford, 2010; Dust, 2006; Lin, 2012; Uqdah et al., 2009; C. B. White, 2007) and personal goals (Dewett et al., 2005; Dust, 2006; O'Meara et al., 2013). Doctoral student motivation has also been found to be affected by external factors such as family support (Onwuegbuzie et al., 2014; Tanaka & Watanabe, 2012), socialization (Gardner, 2010; Lovitts, 2001), collaborative learning (Ferguson, 2009; Hancock, 2007), and fit with supervisor (Gearity & Mertz, 2012).

Geraniou (2010) identified two broad classes of "survival strategies" used by doctoral students to maintain their motivation throughout their degree. The first set of *internal* survival strategies included self-reliance (e.g., reminding yourself that you can overcome obstacles), interest (e.g., reflecting on whether personal interests are aligned with scholarly activities), and achievement (e.g., focusing on the desire to achieve a doctoral degree); these strategies are shown in further research to correlated positively with satisfaction and persistence despite student obstacles (Sala-Bubaré & Castelló, 2016). In contrast, *external*

survival strategies involved motivating oneself through discussion (i.e., purposeful social support with peers, supervisors, or other faculty, such as advice seeking), as well as application, with the latter involving students applying relevant literatures (e.g., trying a new teaching strategy based on peer-reviewed research) or gaining confidence by engaging in scholarly activities (e.g., presenting or publishing personal research). Building on past research on the role of motivation in scholarly productivity and persistence (e.g., Dewett et al., 2005; Pauley et al., 1999), Geraniou (2010) similarly found this relationship to be bi-directional in nature, with students purposefully engaging in scholarly activities as a means of increasing their motivation.

Sources of motivation. In addition to exploring the quantity of motivation to succeed in academic studies, researchers have examined the specific qualities of student motivation in doctoral education by investigating the reasons student pursue their degrees. With respect to internal motivational variables, various factors have been explored including intellectual development (Dust, 2006; Leonard et al., 2005; Patchner, 1982; Wellington & Sikes, 2007), interest in the field (Austin, 2002; Brailsford, 2010; De Welde & Laursen, 2008; Leonard et al., 2005; Walford, 2006), gaining research experience (De Welde & Laursen, 2008; Dust, 2006; Stubb, Pyhalto, & Lonka, 2012), the need to make a life change (Dust, 2006; Wellington & Sikes, 2007), and “drift” (i.e., gradually transitioning into graduate education through avoidance of more effortful alternatives; Walford, 2006). Additionally, external reasons motivating doctoral studies have been examined in existing research, such as employability prospects (Brailsford, 2010; Fish & Fish, 2010; Leonard et al., 2005; Patchner, 1982; Stubb et al., 2012; Wellington & Sikes, 2007), and the prestige associated with a doctoral degree (Dust, 2006; Leonard et al., 2005; Stubb et al., 2012).

In a study of 89 alumni of education programs (e.g., PhD, EdD), Leonard et al. (2005) investigated the reasons students pursued a doctoral degree and whether they now believed it was worthwhile. Findings demonstrated that the vast majority of participants pursued the degree for internal reasons, with those pursuing their doctorate for vocational reasons being most dissatisfied with both the process and the outcome of their doctorate. Similarly, Stubb et al. (2012) found students who valued the doctoral process (e.g., completing coursework, conceptualizing and conducting a dissertation) rather than the product (i.e., receiving a doctorate) to report better well-being. Moreover, this study found process-related values to be more commonly reported by social sciences students, with product-related values more commonly mentioned by natural science students. Taken together, studies on motivation in doctoral students suggest that those who are self-motivated and focus on the value of the doctoral process report higher satisfaction, well-being, and academic success during the degree process.

Writing skills and regulatory strategies

The doctoral writing process has received considerable empirical attention, particularly with respect to the extent of emotions (Aitchison, Cotterall, Ross, & Burgin, 2012; Cotterall, 2013; Gearity & Mertz, 2012) and stress involved (Gearity & Mertz, 2012; Sala-Bubaré, & Castelló, 2016). For example, Aitchison et al. (2012) found the doctoral writing process in STEM disciplines to be associated with the idea of natural selection, with those unable to “measure up” to disciplinary writing standards being at risk of not successfully completing their program. Accordingly, these authors found doctoral writing to elicit a variety of emotions, both positive (joy, pleasure) and negative (pain, frustration, confusion), with the negative emotions dominating writing-related discourse. Aitchison et al. (2012) argued that students are emotionally attached to their writing and perceive it as part of their developing scholarly identities. For supervisors, on the other hand, writing was perceived as a means to an end, with the end being dissemination of research and contribution to their field. This discrepancy in the meaning of writing was further observed to lead to a lack of support and high expectations from supervisors, thus enhancing students’ emotional experiences.

Two studies have explored the regulatory strategies associated with doctoral writing, showing them to be vital not only for achieving disciplinary standards but also reducing anxiety and negative emotions (Castello, Inesta, & Monereo, 2009; Koltz, Odegard, Provost, Smith, & Kleist, 2010). In an exploratory study, Castello et al. (2009) found graduate student struggles and strategies during the writing process to occur

in five stages, with the first stage being the planning stage in which students make the writing task explicit. This is followed by the revision stage in which stylistic and grammatical improvements are made. In the next stage, the structure stage, students organize the text in accordance with the writing objective, and in the control stage, they consciously regulate their writing to adhere to disciplinary standards. Finally, in the voice stage students incorporate personal writing style elements that reflect their personal perspective and professional identity. The authors found that students who engaged in planning and revision during the writing process felt more confidence and less anxiety, and those who found and reflected on their voice produced better quality texts than those who focused instead on lexical and syntactic precision.

Studies have also explored the role of collaborative writing in students' writing-related emotions and cognitions as a contrast to the solitary context in which most doctoral writing takes place. Findings show a variety of advantages to collaborative writing including more optimal self-regulation (e.g., time management, self-monitoring; Florence & Yore, 2004; Ferguson, 2009; Larcombe, McCosker, & O'Loughlin, 2007), more positive emotions and motivation (e.g., less procrastination; Ferguson, 2009), better writing quality (e.g., positive reviews; Cotterall, 2011), as well as higher student success and completion rates (Maher, Fallucca, & Halasz, 2013). Additionally, whereas collaborative writing with peers has been found to make the process more enjoyable, collaborative writing with supervisors (e.g., coauthorship) can serve as cognitive apprenticeship in providing meaningful insight into scientific writing, constructing arguments, and justifying claims with available evidence (Florence & Yore, 2003; Maher et al., 2013). Moreover, collaborating with supervisors in the writing process can help to situate students' writing in an authentic context and legitimize them as members of their scientific communities through dissemination in peer-reviewed journals. These findings thus highlight the discrepancy between collaborative and traditional doctoral expectations (i.e., solitary writing) in terms of both professional and personal development.

Although the writing process has received extensive research attention as a critical aspect of the doctoral experience, McAlpine and Amundsen (2012) suggest that "the equally important message that reading is the way in which one finds an intellectual home and 'parentage' for one's writing is largely invisible" (p. 690). These authors further note a common misconception among doctoral students, namely that reading and writing are linear in practice rather than iterative and interdependent in nature. Green and Macauley (2007) further argue that in the academic community, doctoral students have the greatest need for information for both short- and long-term purposes, with students' ability to read, interpret, and organize information significantly impacting their writing quality. Findings from Kwan (2008) on the changing nature of reading efforts throughout doctoral programs additionally suggest that whereas reading may be unfocused and exploratory early in the degree process, it necessarily becomes specialized and deliberate as students begin to conceptualize their research project. Accordingly, effective reading efforts in this latter doctoral stage allow students to generate novel and complex ideas that can be further refined by referring to the literature throughout the writing process. Thus, findings suggest that despite a lack of research emphasis on the doctoral reading process it is nonetheless inextricably intertwined with effective writing and warrants greater empirical attention as to its impact on students' identity formation, scholarly development, and research quality.

Academic identity

Academic identity refers to the ways in which students perceive themselves within their scholarly communities, with existing literature showing students to develop their academic identity by engaging in various academic activities including socialization (Gardner, 2008; Hughes & Kleist, 2005; Lovitts, 2001; Trujillo, 2007; Weidman et al., 2001), writing (Aitchison et al., 2012; Castello et al., 2009), and research (Forrester et al., 2004; Trujillo, 2007). Research by McAlpine, Jazvac-Martek, and Hopwood (2009) examined the specific events and activities described by doctoral students as contributing to their membership in academic communities. Although activities such as programmatic requirements (e.g., finishing one's comprehensive exam) or student responsibilities (e.g., lab meetings) were cited as critical to one's academic identity, informal activities (e.g., interactions with members of the disciplinary community) were reported

as contributing to not only identity formation but also a sense of academic membership and belonging. Interestingly, students in this study reported peer interaction as supporting their academic identity development more so than interactions with their supervisors or other faculty, highlighting the perception of peers as valued members of their academic community.

McAlpine and Amundsen (2009) further expanded upon the role of community in identity formation by differentiating between students' individual and collective identities, both of which are largely shaped by interactions (or lack thereof) with their disciplinary and institutional communities. In this study, individual identity was observed to evolve primarily through academic work (e.g., the dissertation), realizing one's role within their department and institution, and visualizing one's future career. Collective identity, on the other hand, emerged as students became members of various communities (e.g., research groups, student organizations) and began to distinguish factors that differentiated them from other community members. Findings also indicated that although the structures that facilitate students' collective identities can greatly enhance feelings of pleasure associated with the doctoral experience (e.g., group membership), doctoral students may nonetheless "be struggling to understand how they can best build their own sense of worth and efficacy as it relates to their disciplines and the university in which they are located" (p. 124).

Self-worth. Although the concept of doctoral students' self-worth has received scant empirical consideration to date, researchers theorize that "at the heart of doctoral students' struggling lie serious concerns that challenge the notion of certainty that they are indeed worthy of embarking upon doctoral study" (Di Pierro, 2007, p. 370). In a series of interviews and focus groups with 47 Canadian doctoral students, Longfield et al. (2006) found four major themes involving changes in self-worth due to one's graduate program. The first theme involved *delayed gratification*, with participants reporting their self-worth to often be compromised due to academic obstacles (e.g., paper revisions) yet enhanced once their goal was achieved (e.g., paper acceptance). The second theme pertained to *status and sacrifice*, with some students experiencing greater self-worth as a result of attaining the status of a graduate student, with others reporting lower self-worth due to focusing instead on the sacrifices made to attend the program (e.g., quitting a high paying job). Third, a theme related to *elevation/depression cycles* was observed, with numerous students reporting significant fluctuations in self-worth throughout their studies (e.g., at times feeling competent and powerful, at other times feeling frustrated and helpless). Finally, self-worth was consistently described as linked to internal regulation, with students noting that in contrast to external regulation contributing to self-worth as undergraduates (e.g., interactions with peers, family, professors), their graduate self-worth was dependent mainly on self-evaluations of their work.

As students' scholarly work and their ability to evaluate it improve throughout doctoral training, it is perhaps not surprising that novice doctoral students have been found to be most concerned about their worth as academics (Di Pierro, 2007). Other studies further suggest that doctoral students are often overly ambitious early in their doctoral program (Grover, 2007), and thus tend to more strongly associate external processes (e.g., reviewer criticism) with their self-worth, (De Welde & Laursen, 2008; Hughes & Kleist, 2005; Trujillo, 2007). In sum, existing research on identity formation in doctoral students with respect to academic tasks, doctoral progress, socialization, and self-regulation underscores the importance of continuing to examine how doctoral students' self-worth develops over time as well as the implications of low self-worth for student persistence and well-being.

Self-efficacy. Self-efficacy is another motivational factor that has been found to be influential in the identity development trajectories of doctoral students (Austin, 2002; Flowers & Lazaros, 2009; Virtanen et al., 2016). Self-efficacy refers to an individual's perceived competencies for learning and achieving desired goals (Schunk & Pajares, 2009) and in the context of doctoral research is defined by Forester et al. (2004) as "one's confidence in successfully performing tasks associated with conducting research" (p. 4). Research self-efficacy has been found to be significantly correlated with interest in research and the production of scholarly publications (Lambie & Vaccaro, 2011), with a study conducted by Litalien and Guay (2015) further showing perceived academic competence to be the strongest predictor of dropout intentions among the variables studied (e.g., perceived relatedness with colleagues, publication rate, etc.). Moreover, perceived faculty support was found to predict higher levels of autonomous regulation (e.g.,

perceiving that one has control over their behavior and goal outcomes) that, in turn, led to greater perceptions of competence, a finding consistent with those of McAlpine and Amundsen (2009) highlighting the integral role of socialization in the development of doctoral students' academic identities.

Conversely, doctoral students with lower levels of self-efficacy are more likely to engage in self-handicapping behaviors so as to avoid being perceived (or perceiving themselves) as incompetent (Schwinger & Stiensmeier-Pelster, 2011). Concerning specific behaviors exhibited by doctoral students that may be classified as self-handicapping in nature, Kearns, Gardiner, and Marshall (2008) suggest the following: overcommitment, busyness (appearing extremely busy when actually engaging with low-priority tasks), perfectionism, procrastination, disorganization, low effort, and choosing performance-debilitating circumstances (e.g., trying to work in a noisy location). Similarly, Ahern and Manathunga (2004) identified regularly changing one's thesis topic or objectives, avoiding communication with one's supervisor, department, and other students, as well as delaying submitting work for review to reflect specific doctoral student self-handicapping (stalling) behaviors. Thus, while high self-efficacy is associated with higher levels of interest, achievement, and persistence in doctoral education, low self-efficacy can be conceptualized as a risk factor for student success that may lead to debilitating behaviors, delayed academic identity development, and compromised dissertation timeliness and quality.

CONCLUSION AND FUTURE DIRECTIONS

The doctoral experience is complex and multifaceted, and although doctoral students' achievement and well-being are increasingly examined in higher education research, there is still much to explore and understand about the topic. The present review aimed to uncover some of the empirically-established factors that impact the experiences of doctoral students across the disciplines, and as such, it represents the first comprehensive review on the doctoral experience. In this process, and following the structure of previous review articles (Ali & Kohun, 2006; Dominguez, 2006; Manathunga, 2002), the contributing factors observed were classified as both external and internal in nature. The most notable external factors affecting doctoral students' experiences include supervision, their personal and social lives, departmental support and socialization, as well as financial opportunities. In contrast, the most significantly contributing internal factors included motivational variables as well as writing competencies and academic identity. Taken together, these seven factors represent the most widely explored facets of the doctoral experience that are likely to influence doctoral students across disciplines and institution types.

It is important to note that although this review paper explored these external and internal variables as discrete contributing factors, they are nonetheless largely intertwined. For example, findings suggest that doctoral student motivation can be affected by their personal life (Tanaka & Watanabe, 2012), supervisor interactions (Gearity & Mertz, 2012; Litalien & Guay, 2015), as well as socialization influences (Lovitts, 2001). Similarly, study findings consistently show socialization to have empirical links with other critical factors, such as social and personal life issues (Ali & Kohun, 2006, 2007), due to socialization influences entailing both formal and informal social interactions (external factors) necessary for the development of discipline-specific competencies required for meaningful scholarly engagement (internal factors). Accordingly, future research in which the confluence of these varied factors is examined, particularly with respect to the cross-cutting impact of socialization variables, is recommended to provide a sufficiently in-depth examination of the salient predictors of doctoral student development and persistence.

Despite doctoral education research having gained momentum over the past decade due to increasing concern over student well-being, some topics such as supervision, socialization, and motivational variables are being continuously examined, whereas issues surrounding financial opportunities and academic identity are in need of greater empirical attention. Relatedly, whereas doctoral education researchers have typically emphasized a specific variable of interest as most critical for persistence, such as supervision (Gearity & Mertz, 2012), socialization (Gardner, 2009; Lovitts, 2001), or motivation (Pauley et al., 1999), this overemphasis on specific contributors has resulted in a fragmented doctoral education literature with limited empirical data on the relative importance across varied predictors. As such, research similar to that conducted by Litalien and Guay (2015) in which various salient predictors of doctoral student develop-

ment were competitively explored (e.g., psychological need satisfaction, perceived competence, financial support, supervision) could prove beneficial in prioritizing useful directions for future research. Future research efforts that steer away from single-factor foci to explore interactive or redundant relationships between factors are thus warranted, as are analyses of the potential effects that changes to one aspect of the doctoral experience (e.g., motivational interventions) can have on other factors.

Finally, of the empirical articles reviewed, over 50% utilized qualitative methods (e.g., interviews, focus groups, case studies), 18% employed mixed-method designs, and only 29% entailed quantitative analyses. Accordingly, large-scale quantitative projects that aim to draw generalizable conclusions concerning common challenges faced by the doctoral student population at large are recommended. The qualitative methodologies utilized to date have provided much-needed, student-centered insight into the issues affecting the doctoral experience (see Corbin & Strauss, 2008) and have allowed for a notably deeper and nuanced understanding of the lives of doctoral students as situated within their academic communities (e.g., department, disciplines, etc.). Future research employing various alternative methodologies and analytical methods (e.g., observational, questionnaire, experimental, experience sampling) are similarly expected to yield valuable knowledge as to the nature and extent of the afore-mentioned and novel contributing factors, as well as the utility of student intervention programs aimed at improving both the personal and professional lives of doctoral students internationally.

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The PhD Experience

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BIOGRAPHIES



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Lynn McAlpine is Emerita Professor at McGill University and the University of Oxford. Her research explores the ways in which PhD students and graduates experience their study/work environments and navigate their careers within their broader life goals and responsibilities. This research is cross national and includes studies in Canada, the UK and a number of continental European countries. An important outcome is finding ways to ensure the findings are used for pedagogical and policy initiatives.



Kyle Hubbard is a doctoral candidate in educational psychology at McGill University. His dissertation research focuses on understanding how college students experience and cope with boredom in school.