



PHD IMPOSTER SYNDROME: EXPLORING ANTECEDENTS, CONSEQUENCES, AND IMPLICATIONS FOR DOCTORAL WELL-BEING

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ABSTRACT

Aim/Purpose	Research on doctoral students' well-being suggests that an interplay of social and psychological factors, such as integration into the scholarly community and perceptions of self-worth, shape students' experiences. The present research examined the role of these factors in the well-being of doctoral students.
Background	Imposter syndrome has long been discussed both formally and informally as a prevalent experience of doctoral students. Existing research provides empirical support for the role of perceived belongingness to one's scholarly community in maladaptive self-perceptions (i.e., imposter syndrome), as well as the role of imposter syndrome in doctoral students' well-being. However, no studies to date have directly explored the extent to which imposter syndrome mediates the relationship between perceived belongingness and well-being in a single model.
Methodology	The present research sought to evaluate perceived belongingness as a predictor of imposter syndrome and how imposter syndrome, in turn, predicts well-being (i.e., depression, stress, and illness symptoms) in doctoral students. Depression, stress, and illness symptoms were identified in the literature as the most prevalent well-being concerns reported by doctoral students and therefore were evaluated as the outcome variables in the present research. In line with previous research, we expected perceived belongingness to negatively predict imposter syndrome, and imposter syndrome, in turn, to positively predict depression, stress, and illness symptoms. Two studies evaluated the proposed model. Data for

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both studies was collected simultaneously (i.e., one large sample) with 25% of the sample randomly selected for Study 1 (cross-sectional) and the remainder included in Study 2 (longitudinal). In Study 1, we tested this hypothesis with a cross-sectional design and explored whether imposter syndrome was a significant mediator between perceived belongingness and well-being. In Study 2, we aimed to replicate and extend the results of Study 1 with a prospective design to further assess the directionality of the relationship from perceived belongingness to imposter syndrome and, in turn, the role of imposter syndrome in changes in depression, stress, and illness symptoms over a five-month period.

Contribution

The present results represent evidence of the process by which doctoral students develop imposter syndrome and some of the consequences of imposter syndrome on doctoral well-being. Additionally, the present study includes a large-scale sample of international doctoral students across the disciplines, thus revealing the prevalence of imposter syndrome in the doctoral experience.

Findings

Overall, the results of the present research provided support for our hypotheses. In Study 1, perceived belongingness was found to be a negative predictor of imposter syndrome that, in turn, predicted higher levels of depression, stress, and illness symptoms. Additionally, imposter syndrome was found to significantly mediate the relationship between perceived scholarly belongingness and the three outcome variables assessing psychological well-being. Study 2 further revealed perceived scholarly belongingness to negatively predict imposter syndrome five months later, with imposter syndrome, in turn, predicting increases in depression, stress, and illness symptoms in our doctoral student sample.

Recommendations for Practitioners

Several recommendations are made for practitioner based on the present findings: First, by acknowledging the critical role of perceived social belongingness in students' well-being, faculty and administrators can establish structures to better integrate students into their scholarly communities, and departments can foster a supportive social atmosphere for their doctoral students that emphasizes the quality of interactions and consultation with faculty. Second, information sessions for first-year doctoral students could highlight the prevalence and remedies of feeling like an impostor to normalize these otherwise deleterious feelings of inadequacy. Finally, professional development seminars that are typically taught in graduate programs could incorporate an explicit discussion of well-being topics and the prevalence of imposter syndrome, alongside other pragmatic topics (e.g., publishing protocols), to ensure that students perceive their departmental climate as supportive and, in turn, feel less like an imposter and better psychologically adjusted.

Recommendations for Researchers

Researchers should continue exploring the various antecedents and consequences of imposter syndrome, specifically focusing on at-risk students, as well as the role of imposter syndrome in doctoral-level dropout.

Impact on Society

Imposter syndrome is a harmful experience that can lead to a variety of life-altering outcomes, such as developing or intensifying a mental illness. Doctoral students, as society's future researchers and high-skilled professionals, have a great impact on society as a whole, and efforts should be extended into maintaining doctoral students' well-being in order for them to perform at an optimal level. The present research sheds light on one aspect of the doctoral experience that is detrimental to the well-being of doctoral students, thus informing doctoral students, advisors, and departments of one area where more resources can

be allocated in order to facilitate the health, both physical and psychological, of their students.

Future Research	Future research should explore additional outcomes to fully understand the impact of perceived belongingness and imposter syndrome on doctoral students. Some such outcomes may include academic performance (e.g., presentation /publication rates), motivation (e.g., perseverance vs. intention to quit), and more general psychological adjustment measures (e.g., satisfaction with life). Such research, in combination with the present findings, can help the understanding of the full impact of imposter syndrome on the academic and personal experiences of doctoral students and can contribute to psychologically healthier and more academically productive experiences for doctoral students as they navigate the myriad challenges of doctoral education.
Keywords	doctoral education, doctoral well-being, imposter syndrome, mental health, graduate education, doctoral socialization

INTRODUCTION

The experiences of students in doctoral programs are multifaceted. In addition to acquiring knowledge about their field of choice, students are required to not only identify and adopt the values and skills necessary to secure careers in their discipline (Gardner, 2008), but also to master a new academic genre: the dissertation (Vos 2013). To this end, doctoral students become immersed in their field of study, frequently engaging in long hours of solitary work, in an attempt to successfully tackle a sequence of often ill-structured and ill-defined tasks that will culminate in a doctoral degree. One increasingly problematic aspect of this process, however, is the deterioration of these students' mental health and well-being as a direct result of the demands of the doctoral education process (Jaschik, 2015; Walker, 2015; Wilcox, 2014). Although these concerns have been largely highlighted by recent empirical research (e.g., high stress levels, depression; Brown & Watson, 2010; Dabney & Tai, 2013; Pallos et al., 2005; University of California, Berkeley, 2014), few large-scale studies to date have examined the determinants of well-being in doctoral students. Instead, studies that explore the issue of well-being in doctoral students often adopted a qualitative approach, in order to gain an in-depth understanding of the lived experiences of these students as they progress through their doctoral programs (e.g., Juniper et al., 2012; Pyhältö et al., 2012; Stubb et al., 2011).

Some empirical work that attempted to understand the reasons for doctoral students' mental health struggles suggests that students' concerns about their worth and competence in their academic role lie at the heart of these struggles (e.g., Di Pierro, 2007; Litalien & Guay, 2015; McAlpine & Amundsen, 2009). In other words, students' perceptions of being unworthy of their positions as doctoral students and their doubts regarding their academic competencies may play a role in well-being declines. Furthermore, the scarce literature that has explored such negative self-perceptions in doctoral students consistently highlights isolation, or a lack of perceived belongingness, as a precursor to such maladaptive cognitions (e.g., Cope-Watson & Smith-Betts, 2010; Litalien & Guay, 2015; Longfield et al., 2006; McAlpine & Amundsen, 2009). Thus, research is currently lacking in which perceived belongingness, maladaptive self-perceptions, and well-being are explored concurrently. Accordingly, the present research examined the extent to which perceptions of belongingness to one's academic community predict negative self-evaluations of worth and competence (i.e., imposter syndrome) and how this psychological experience, in turn, predicts doctoral students' well-being (i.e., depression, stress, illness symptoms). Two studies empirically evaluated this model both cross-sectionally and over time, in order to assess the directionality of the proposed model with respect to perceived belongingness as an antecedent of imposter syndrome and, in turn, changes in students' well-being over the course of an academic term.

LITERATURE REVIEW

WELL-BEING IN DOCTORAL STUDENTS

In the empirical literature, well-being in doctoral students often lacks an operational definition, with researchers relying largely on participants' interpretation of the concept (e.g., Trenberth, 2005; University of California, Berkeley, 2014), thus posing an obstacle to the generalizability of existing findings. Some consistencies in well-being definitions across existing studies with doctoral students include maladaptive levels of stress (Kernan et al., 2011; Wyatt & Oswald, 2013), mental-health concerns (e.g., depression; Hyun et al., 2006; Pallos et al., 2005), suicidal ideation (University of California, Berkeley, 2005), and physical health problems (e.g., upper respiratory infections; Juniper, et al., 2012; Kernan et al., 2011; Pallos et al., 2005) resulting from doctoral program demands. Thus, empirical efforts to date have shown doctoral students to demonstrate various psychological and physical concerns during their studies.

Recent review articles focusing on doctoral students' well-being provide critical insight into some of the elements that shape the psychological experiences of students in their programs. Based on a review of 163 empirical articles on doctoral students' well-being, Sverdlik et al. (2018) identified seven main factors that shape doctoral well-being. These factors include both external factors such as supervision, personal/social lives, departmental structures, and financial opportunities, as well as factors that are internal to the students including motivation, writing skills and strategies, and the development of an academic identity. The authors suggest that in order to understand some of the processes involved in shaping the well-being of doctoral students, researchers are advised to explore both external (e.g., social) and internal (e.g., motivational) factors in a single model. These recommendations were further supported by Schmidt and Hansson (2018), who found triggers of psychological distress in doctoral students to be both external (e.g., perceived departmental/faculty support) and internal (e.g., passion toward one's area of research) in nature. Related work on the prevalence of well-being concerns in doctoral students by Pallos et al., (2005) investigated the well-being of 219 doctoral students from 12 universities in Tokyo, Japan. Findings showed 53% of students to suffer from emotional disturbances, which consisted of anxiety and insomnia (accounted for 29% of the total variance), social dysfunction (10.9% of the variance), symptoms of depression (5.9% of the variance), and feelings of incompetence (5.2% of the variance). These results corroborate that both interpersonal (e.g., social dysfunction) and intrapersonal (e.g., feelings of incompetence) factors are important to examine when trying to gain a comprehensive understanding of the determinants of well-being in doctoral students.

A more recent report on doctoral students' well-being by the University of California, Berkeley (2014) found 47% of doctoral students across the disciplines to be depressed (as compared to 15% in the general population in the Americas; World Health Organization, 2017). With respect to differences between disciplines, Berkeley students enrolled in Arts & Humanities programs reported the highest depression rates (64% of students at depression threshold) as compared to 43-46% in the biological, physical, and social sciences, while law, social sciences, business students reported the "lowest" depression rates (37%, 34%, 28%, respectively). Similarly, research by El-Ghoroury et al. (2012) with 387 American doctoral students showed 68.1% to report that their daily functioning was disrupted due to stress resulting from their academic pressures and responsibilities. A recent article by Sverdlik and Hall (2019) provides further insight into the determinants of stress by demonstrating that in a sample of 3004 North American doctoral students, stress was found to be highest during the comprehensive/qualifying examination phase¹, while being lowest during the coursework phase. The

¹In North America, the comprehensive exam follows coursework. While it varies considerably across universities and disciplines, generally it is designed to assess the individual's content and methodological knowledge of their field of study. Once successfully completed, the student defends his/her research proposal and moves from the position of PhD student to PhD candidate.

authors suggest that this is perhaps due to the increases in isolation and lack of structure that students face during the comprehensive examination phase, as compared to the group work and externally-structured tasks that are common to many graduate courses.

The previously discussed quantitative findings are consistent with a large body of qualitative literature on doctoral education in which maladaptive indicators of well-being (e.g., stress, depression, low life satisfaction) are consistently uncovered but are not being addressed on a larger scale due to small sample sizes and their anecdotal nature (e.g., Ali & Kohun, 2006; Brailsford, 2010; Brown & Watson, 2010; Golde, 1998). Although some stress is expected during the doctoral process due to the challenging and intensive nature of doctoral education, these qualitative studies highlight that doctoral students often experience maladaptive levels of stress and other psychological concerns (e.g., depression) that interfere with daily functioning and can lead to long-term psychological suffering. Furthermore, even when students can identify coping strategies to improve their well-being (social interaction, exercise, engaging in hobbies, etc.), they often report being unable to engage in such strategies due to the demands of their doctoral programs. For example, 71% of participants in the University of California, Berkeley study (2014) reported a lack of time and 47% reported financial constraints as major obstacles to participating in any recreational activities. Taken together, findings on doctoral students' well-being to date highlight the grim psychological experiences of these students, as well as some hurdles that students face when attempting to use coping strategies to improve these experiences.

PERCEIVED BELONGINGNESS AND IMPOSTER SYNDROME IN DOCTORAL STUDENTS

Another obstacle to improving the well-being of doctoral students is that the determinants of well-being among these students are not well understood. According to Di Pierro (2007), "at the heart of doctoral students' struggling lie serious concerns that challenge the notions of certainty that they are indeed worthy of embarking upon doctoral study" (p. 370). This assertion was supported by a comprehensive review of the doctoral education literature (Sverdlik et al., 2018) that identified self-worth and self-efficacy as important contributors to doctoral students' well-being. Furthermore, qualitative studies on the development of doctoral students' academic identities (i.e., perceptions of one's academic competencies) underscore the prevalence of students experiencing maladaptive self-perceptions and reveal such perceptions to be closely tied to a sense of isolation from their departmental and/or scholarly communities (e.g., Cope-Watson & Smith-Betts, 2010; Longfield et al., 2006; McAlpine & Amundsen, 2009).

It is thus not surprising that much of the research on the development of an academic identity in doctoral students explores identity development as a function of a sense of belonging to the academic community (e.g., Emmioglu et al., 2017; Longfield et al., 2006; McAlpine & Amundsen, 2009; McAlpine et al., 2009), usually in the context of specialized activities such as academic writing (see Inouye & McAlpine, 2019, for a review). McAlpine and Amundsen (2009) further suggest that students' academic identity is best conceptualized as having both individual and social aspects, with the former evolving primarily through academic work (e.g., writing research manuscripts) and involves perceptions of oneself as an academic, and the latter emerging over time as students engage with their academic communities (e.g., research groups) and begin to find their unique role within these communities. Much of the struggle that doctoral students face, according to the authors, is establishing a sense of their own worth and efficacy with respect to the development of their personal competencies, as well as how they 'fit' within their academic community.

Imposter syndrome

One lens through which doctoral students' negative self-perceptions can be understood is referred to as imposter syndrome. Imposter syndrome (Clance, 1985) is characterized by an inability to internalize one's own academic success, attributing any success to external factors (e.g., luck, networking) as

well as a fear of not being able to repeat successful outcomes and a fear of being exposed as a “fraud.” Individuals struggling with imposter syndrome will thus tend to attribute their achievement to a lowering of standards, timing of opportunities, or personal charm, and will focus their efforts on maintaining what they believe to be a very positive but very false impression of themselves. Their efforts are thus geared toward impression management, and they avoid new and challenging opportunities due to a fear of failure (see Parkman, 2016 for a review). Thus, imposter syndrome represents a particularly relevant construct as it captures both negative perceptions of self-worth as a doctoral student (such as that they obtained their position by chance/luck and are therefore not worthy of it), as well as distorted views of one’s abilities (e.g., success as a result of circumstances rather than efforts). In fact, research on imposter syndrome in doctoral students shows imposter syndrome to be negatively associated with both research self-efficacy (Haley, 2006; Jöstl et al., 2012) and academic self-concept, defined as the self-assessment of one’s academic abilities (Ewing et al., 1996).

One notable aspect of imposter syndrome is the over-estimation of the abilities of others and under-estimation of the effort required for others’ successes (Parkman, 2016). Thus, when doctoral students are isolated from their academic communities, their evaluations of the efforts necessary for scholarly achievements (e.g., scholarly dissemination, winning research grants) become additionally skewed as they do not witness the work required for such achievements. When students are integrated into their communities, on the other hand, they are more involved in the work performed by community members and have a deeper understanding of the academic standards, as well as the efforts and skills required to meet those standards. Finally, doctoral students’ sense of belonging to their scholarly community is closely related to feeling like a valued, involved, an integral part of that community and, therefore, an academic.

The relationship between imposter syndrome and psychological health (e.g., depression) in the general population has been primarily explored in professional contexts (e.g., workplaces) and has been demonstrated in numerous studies (see Sakulku & Alexander, 2011, for a review). In higher education, this association between the imposter syndrome and poor mental health, including anxiety, depression, and burnout, has been demonstrated in undergraduate students (e.g., Austin et al., 2009; Bernard et al., 2002; Ross et al., 2001; Sonnak & Towell, 2001), postdoctoral trainees (e.g., Chakraverty, 2020), and medical residents (i.e., Legassie et al., 2008; Oriel et al., 2004). Although this research in academic domains has addressed the correlates and consequences of imposter syndrome, it has largely overlooked any possible antecedents of the phenomenon (such as perceived belongingness).

Among doctoral students, the imposter phenomenon has been extensively discussed in the public domain as a potentially salient determinant of students’ well-being (e.g., Blake-Hedges, 2018; Farkas, 2018; Hayton, 2017; Joose, 2017), but it has not received an equal amount of empirical attention. Of the limited existing research conducted to date on imposter phenomenon in doctoral students, studies have focused mainly on the experiences of women (e.g., Cope-Watson & Smith-Betts, 2010; Gibson-Beverly & Schwartz, 2008; Jöstl et al., 2012; Long et al., 2000; Spies, 1999) and uncovered trends related to fear of being exposed an imposter (Cope-Watson & Smith-Betts, 2010) as well as a lack of perceived membership within their academic community (e.g., the department; Cope-Watson & Smith-Betts, 2010; Jöstl et al., 2012). Recent research on the imposter phenomenon in doctoral students also highlights students’ sense of doubt regarding the legitimacy of their position within their doctoral programs (Bothello & Roulet, 2018; Henning et al., 1998; Parkman, 2016; Villwock et al., 2016) and the associated anxiety of being “exposed” (e.g., Bothello & Roulet, 2018), as well as the extent to which a lack of perceived membership within one’s academic community may exacerbate these beliefs (e.g., the department; Cope-Watson & Smith-Betts, 2010; Jöstl et al., 2012).

In sum, imposter syndrome appears to be a potentially important construct to understand in the context of doctoral education as it has been consistently found to be associated with mental health concerns in higher education in general and in doctoral programs in particular, and has been informally

highlighted by the students themselves as a factor influencing their mental health. Furthermore, recent findings on this construct have implicated perceived belongingness as a possible social-environmental contributor to imposter syndrome, therefore suggesting that doctoral students' well-being is shaped by intrapersonal process that can be affected by interpersonal structures at the departmental level.

METHOD

THE PRESENT RESEARCH

Existing research provided empirical support for the role of perceived belongingness to one's scholarly community in maladaptive self-perceptions, as well as the role of imposter syndrome in doctoral students' well-being. In the present research, perceived belongingness is defined as students' self-reported perceptions of membership within their academic (e.g., departmental, scholarly) communities. No studies to date have directly explored the extent to which imposter syndrome mediates the relationship between perceived belongingness and well-being in a single model. Accordingly, the present research sought to evaluate perceived belongingness as a predictor of imposter syndrome and how imposter syndrome, in turn, predicts well-being (i.e., self-reported depression, stress, and illness symptoms) in doctoral students. Depression, stress, and illness symptoms were identified in the literature as the most prevalent well-being concerns reported by doctoral students (e.g., Kernan et al., 2011; Pallos et al., 2005) and therefore were evaluated as the outcome variables in the present research. In line with the research reviewed above, we expected perceived belongingness to negatively predict imposter syndrome, and imposter syndrome, in turn, to be positively associated with depression, stress, and illness symptoms. Two studies evaluated the proposed model. Data for both studies were collected simultaneously (i.e., one large sample) with 25% of the sample randomly selected for Study 1 (cross-sectional) and the remainder included in Study 2 (longitudinal). In Study 1, we tested this hypothesis with a cross-sectional design and explored whether imposter syndrome was a significant mediator between perceived belongingness and well-being. In Study 2, we aimed to replicate and extend the results of Study 1 with a prospective design to further assess the directionality of the relationship from perceived belongingness to imposter syndrome and, in turn, the role of imposter syndrome in *changes* in depression, stress, and illness symptoms over a five-month period. All study protocols were approved by the ethics board of the first author's institution prior to data collection.

STUDY 1

Study 1 examined how doctoral students' perceived belongingness to their scholarly community predicted imposter syndrome and the role of imposter syndrome in students' reported depression, stress, and illness symptoms. Because perceptions of self-worth and ability among doctoral students were previously found to be positively shaped by faculty support (e.g., Cope-Watson & Smith-Betts, 2010; Litealien & Guay, 2015), we expected perceived belongingness to correspond with lower levels of imposter syndrome (as it represents negative self-perceptions). Furthermore, in line with previous research linking imposter syndrome with poor mental health (e.g., greater depression; Henning et al., 1998; Villwock et al., 2016), we expected higher levels of imposter syndrome to be associated with higher levels of depression, stress, and illness.

Participants and procedure

The study sample consisted of 831 doctoral-level students from across the disciplines and from all stages of the doctoral process. Participants for the present study were recruited online (e.g., doctoral education-related groups on Facebook) and via email listservs in cooperation with administrative staff at four research-intensive Canadian universities. After consenting to participate in the web-based study, students completed a comprehensive self-report survey comprised of demographic measures (e.g., gender, age, ethnicity, relationship status, number of dependents, and program information; Table 1), as well as measures of perceived scholarly belongingness, imposter syndrome, and

well-being (depression, stress, illness symptoms). Participants' ages ranged from 21-58 years ($M = 30.55$; $Mode = 28$, $SD = 6.35$), 76.7% were female, 76.2% were Caucasian, and 59.2% were from North American universities. After completing the survey, all participants were entered into a \$250 prize draw.

Table 1. Demographic characteristics of the sample: Study 1 ($n = 831$).

VARIABLE	FREQUENCY	PERCENT
Gender		
Female	637	76.7%
Male	157	18.9%
Other	14	1.7%
Age		
21-30	516	62.1%
31-40	246	29.6%
41-50	56	6.7%
51-58	13	1.6%
Ethnicity		
Caucasian	633	76.2%
Asian	53	6.4%
Latin	45	5.4%
Middle-Eastern	22	2.6%
African	14	1.7%
Caribbean	12	1.4%
Aboriginal	2	0.2%
Pacific Islander	1	0.1%
Other	23	2.8%
Country		
United States	411	49.5%
Europe	125	15.1%
Canada	81	9.7%
United Kingdom	76	9.1%
Australia	28	3.4%
Other (e.g., Asia, Middle East)	24	2.9%
Relationship status		
Single	395	47.5%
Married	386	46.5%
Separated	2	0.2%
Divorced	20	2.4%
Widowed	0	0.0%
Dependents		
None	676	81.3%
One	71	8.5%
More than one	59	7.1%

VARIABLE	FREQUENCY	PERCENT
Living arrangement		
Alone	164	19.7%
With a roommate(s)	176	21.2%
With parents	25	3.0%
With extended family	4	0.5%
With partner (no children)	291	35.0%
With partner (and children)	119	14.8%
Other	25	3.0%
Discipline		
Humanities	100	12.0%
Social sciences	243	29.2%
Natural sciences	130	15.6%
Other (e.g., professions)	211	25.4%
Enrollment status		
Full-time	691	83.2%
Part-time	92	11.1%
Employment within university		
No	246	29.6%
Yes (part-time)	335	40.3%
Yes (full-time)	199	23.9%
Employment outside university		
No	567	68.2%
Yes (part-time)	127	15.3%
Yes (full-time)	84	10.1%
Teaching		
No	561	67.5%
Yes (1-2 courses/year)	145	17.4%
Yes (> 2 courses/year)	68	8.8%
Phase		
Coursework	192	24.6%
Comprehensive examination	94	12.1%
Dissertation	451	57.8%
Other (e.g., internship)	43	5.5%

Study measures

Demographic variables. A 17-item demographic questionnaire solicited information relevant to participants' demographic characteristics such as gender, age, ethnic background, country of residence, relationship status, living arrangements, number of dependents, program information (program of study, full/part-time status, discipline, university, phase in program), employment status, and teaching experience.

Perceived scholarly belongingness. The perceived scholarly belongingness measure was adapted from Adams et al.'s) Professional Identity scale to assess perceptions of membership within one's scholarly community. Sample statements from the six-item scale include: "I feel like I am a member

of this scholarly community” and “I feel I have strong ties with members of this research community” ($\alpha = .89$; 1 = *strongly disagree* to 6 = *strongly agree*).

Imposter syndrome. Participants completed a 10-item imposter syndrome scale (Clance, 1985) and were asked to respond to items such as “I’m afraid people important to me may find out that I’m not as capable as they think I am” and “At times, I feel my success has been due to some kind of luck” ($\alpha = .89$; 1 = *not at all true* to 5 = *very true*).

Depression. The short version of the Center for Epidemiological Studies Depression Scale (CESD-10; Radloff, 1977) was used to assess depressive symptoms (e.g., “I felt depressed” and “I could not get ‘going’”; $\alpha = .76$). Frequency of symptoms ranged from 1 = *rarely or none of the time (less than 1 day a week)* to 4 = *most of the time (5-7 days a week)*.

Stress. Perceived stress was evaluated with a 10-item Strain scale from Cohen and Williamson (1988) assessing the frequency of stressful thoughts and feelings, such as: how often “Have you felt unable to control the important things in life?” and “Have you felt difficulties were piling up so high that you could not overcome them”? (1 = *never* to 5 = *very often*; $\alpha = .87$).

Illness symptoms. Students’ physical health was assessed with an 8-item Health and Illness scale, adapted from Cohen and Hoberman (1983; also see Hall et al., 2006). Participants were asked to report the frequency with which they experienced the following health concerns: sleep problems, headaches, feeling low in energy, muscle tension, constant fatigue, stomach pain, heart pounding or racing, and poor appetite (1 = *not at all a week* to 5 = *5 or more times a week*; $\alpha = .82$).

Results

Preliminary analyses. Preliminary analyses included zero-order correlations between all study variables (Table 2), as well initial differences tests using as t-tests and ANOVAs on study variables as a function of demographic characteristics. Although no significant differences were observed as a function of the demographic variables, selected background variables were included as covariates in the present study based on previous literature. Specifically, gender (Jöstl et al., 2012), discipline (University of California, Berkeley, 2014), and phase in the doctoral program (Sverdlik & Hall, 2019) have been demonstrated to have differential effects on perceived scholarly belongingness and/or imposter syndrome (or related self-perceptions like self-efficacy) and were therefore included as control variables.

Table 2. Descriptive statistics and bivariate correlations: Study 1.

	<i>M</i>	<i>SD</i>	1	2	3	4
1. Scholarly belongingness	4.45	0.95	1			
2. Imposter syndrome	3.57	0.87	-.16**	1		
3. Depression	2.28	0.64	-.26**	.51**	1	
4. Stress	3.22	0.68	-.24**	.54***	.76**	1
5. Illness Symptoms	2.68	0.87	-.14**	.36**	.67**	.57**

** $p < .001$

Main Analyses. Descriptive statistics for all studies were analyzed with SPSS 20.0 (IBM, 2011). AMOS 24 (Arbuckle, 2014) was used to test the hypothesized models in the two studies. The following fit indices were evaluated to assess the fit of the model to the data: the comparative fit index (CFI), Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA). Satisfactory fit to the data was indicated by CFI/TLI > .90 and RMSEA < .08 (Kline, 2011; Tabachnick & Fidell, 2007). The present model was tested using a structural equation modeling (SEM) analysis with a full measurement model, and paths corresponding to the hypotheses presented above. The

model had a satisfactory fit to the data: χ^2 ($df = 892$, $N = 831$) = 1703.892, $p < .001$, CFI = .953, TLI = .945, and RMSEA = .033 [.031; .035]. As shown in Figure 1, results provided support for the hypothesized model. Specifically, self-reported perceived scholarly belongingness negatively predicted imposter syndrome ($\beta = -.15$, $p < .001$), and imposter syndrome, in turn, was a moderate to strong positive predictor of self-reported depression ($\beta = .55$, $p < .001$), stress ($\beta = .60$, $p < .001$), and illness symptoms ($\beta = .42$, $p < .001$). Furthermore, the mediating role of imposter syndrome between perceived scholarly belongingness and well-being was tested with a calculation of the bootstrapped confidence interval estimates for the indirect effects. Results revealed that imposter syndrome significantly mediated the negative relationship between perceived scholarly belongingness and depression ($\beta = -.05$; 95% CI = $-.08$ to $-.02$, $p = .008$), stress ($\beta = -.08$; 95% CI = $-.13$ to $-.03$, $p = .008$), and illness symptoms ($\beta = -.06$; 95% CI = $-.11$ to $-.02$, $p = .008$).

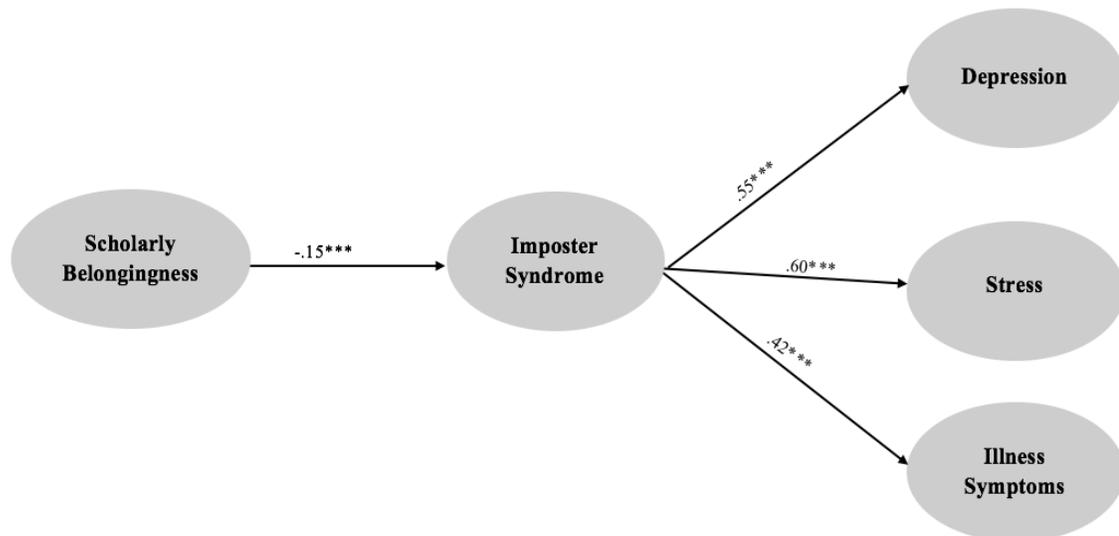


Figure 1. Results from a structural equation modeling analysis on cross-sectional data: Study 1 ($n = 831$). Analysis conducted with full measurement model. Standardized path coefficients are presented, *** $p < .001$. Controlling for gender, phase, and discipline.

Study 1 discussion

The results of Study 1 provided empirical support for the hypothesized model: doctoral students' perceptions of belonging to their scholarly community corresponded with lower levels of imposter syndrome (i.e., a negative outlook on their worth and abilities). In turn, imposter syndrome was a moderate to strong positive correlate of depression, stress, and illness symptoms in our doctoral student sample. In addition, imposter syndrome was a significant mediator of relations between perceived belongingness and the well-being outcomes assessed. These results are in line with previous literature and suggest that a sense of membership within one's academic community may protect doctoral students against maladaptive beliefs that could lead to psychological distress and poor physical health.

STUDY 2

The purpose of Study 2 was to replicate and extend the results of Study 1 by using a prospective design to provide additional evidence concerning the proposed directional effects of perceived scholarly belongingness on imposter syndrome and well-being. In Study 1, all study variables were analyzed cross-sectionally thus raising concerns about whether perceived scholarly belongingness should indeed be modelled as an antecedent of impostor syndrome and well-being. To provide additional empirical support for this directional hypothesis, the present study used a prospective design with a five-

month interval between the perceived scholarly belongingness at Time 1 and imposter syndrome at Time 2. Additionally, *changes* in well-being were included as the outcome variable, in order to evaluate the role of imposter syndrome in any fluctuations in participants' well-being that occurred from Time 1 to Time 2. In line with the hypotheses for Study 1, perceived scholarly belongingness at Time 1 was expected to negatively predict imposter syndrome at Time 2, with imposter syndrome expected to positively predict changes (i.e., increases) in depression, stress, and illness symptoms from Time 1 to Time 2.

Participants and procedure

The study sample consisted of 2,477 doctoral-level students across the disciplines and from all stages of the doctoral process. Participants for the present study were recruited online and in cooperation with administrative staff at four research-intensive Canadian universities. Students completed an identical self-report survey to that administered in Study 1 comprised of demographic measures (e.g., gender, age, ethnicity, relationship status, program information; Table 3), as well as measures of perceived scholarly belongingness, imposter syndrome, and well-being (depression, stress, illness symptoms). Approximately five months later, participants were contacted by email and invited to complete the same survey once again. A total of 1,783 participants completed the survey at Time 2, representing a 72% retention rate. Participants' ages ranged from 21-69 years ($M = 30.27$; $Mode = 28$, $SD = 6.27$), 78.1% were female, 77.2% Caucasian, and 63% from North American universities. After completing each survey, participants were entered into a \$250 prize draw.

Table 3. Demographic characteristics of the sample: Study 2 (n = 1,783).

VARIABLE	FREQUENCY	PERCENT
Gender		
Female	1,393	78.1%
Male	346	19.4%
Other	20	1.1%
Age		
21-30	1,136	63.7%
31-40	515	28.9%
41-50	103	5.8%
51-69	29	1.6%
Ethnicity		
Caucasian	1,376	77.2%
Asian	134	7.5%
Latin	89	5.0%
Middle-Eastern	34	1.9%
African	34	1.9%
Caribbean	16	0.9%
Aboriginal	5	0.3%
Pacific Islander	1	0.0%
Other	86	4.8%
Country		
United States	786	44.1%
Europe	351	19.7%
Canada	337	18.9%
United Kingdom	175	9.8%
Australia	78	4.4%
Other (e.g., Asia, Middle East)	55	3.1%

VARIABLE	FREQUENCY	PERCENT
Relationship status		
Single	878	52.2%
Married	731	43.4%
Separated	11	0.7%
Divorced	61	3.6%
Widowed	2	0.1%
Dependents		
None	1,458	86.6%
One	71	6.0%
More than one	59	7.4%
Living arrangement		
Alone	410	24.3%
With a roommate(s)	344	20.4%
With parents	56	3.3%
With extended family	10	0.6%
With partner (no children)	624	37.0%
With partner (and children)	189	11.2%
Other	53	3.1%
Discipline		
Humanities	300	16.8%
Social sciences	638	35.8%
Natural sciences	440	24.7%
Other (e.g., professions)	405	22.7%
Enrollment status		
Full-time	1,599	89.7%
Part-time	184	10.3%
Employment within university		
No	435	25.9%
Yes (part-time)	764	45.4%
Yes (full-time)	483	28.7%
Employment outside university		
No	1,218	72.4%
Yes (part-time)	319	19.0%
Yes (full-time)	146	8.7%
Teaching		
No	1,250	74.2%
Yes (1-2 courses/year)	288	17.1%
Yes (> 2 courses/year)	146	8.7%
Phase		
Coursework	407	22.8%
Comprehensive examination	253	14.2%
Dissertation	1,022	57.3%
Other (e.g., internship)	96	5.4%

Study measures

Time 1 measures. Identical measures from Study 1 assessing perceived scholarly belongingness (Adams et al., 2006; $\alpha = .88$), depression (CESD-10; $\alpha = .72$), stress (Cohen & Williamson, 1988; α

= .87), and illness symptoms (adapted from Cohen & Hoberman, 1983; $\alpha = .81$) were administered at Time 1.

Time 2 measures. Measures from Study 1 administered at Time 2 included imposter syndrome (Clance, 1985; $\alpha = .88$) as well as depression (CESD-10; $\alpha = .75$), stress (Cohen & Williamson, 1988; $\alpha = .89$), and illness symptoms (Cohen & Hoberman, 1983; $\alpha = .84$).

Results

Preliminary analyses included zero-order correlations between all study variables (Table 4). In line with Study 1, gender, discipline, and phase in the doctoral program were included as covariates in the present model. To assess changes in well-being over a five-month period, the present SEM model included a path analysis on the standardized scales (i.e., perceived belongingness and imposter syndrome) and manifest residualized change scores (depression, stress, and illness symptoms; Crocker et al., 2003; Gunnel et al., 2017; Zumbo, 1999). Residualized change scores were obtained by conducting a regression analysis on each outcome variable, with the Time 1 measure entered as the independent variable and the Time 2 as the dependent variable. Results revealed that the hypothesized model has acceptable fit to the data: $\chi^2 (df = 3, N = 2477) = 3.328, p = .344, CFI = .999, TLI = .997,$ and $RMSEA = .007 [0.000; .035]$. As shown in Figure 2, self-reported perceived scholarly belongingness at Time 1 negatively predicted imposter syndrome at Time 2 ($\beta = -.17, p < .001$), and imposter syndrome was a positive predictor of changes in self-reported depression ($\beta = .29, p < .001$), stress ($\beta = .29, p < .001$), and illness symptoms ($\beta = .19, p < .001$) from Time 1 to Time 2.

Table 4. Descriptive statistics and bivariate correlations: Study 2.

	<i>M</i>	<i>SD</i>	1	2	3	4
1. Scholarly belongingness	4.49	0.94	1			
2. Imposter syndrome	3.64	0.80	-.14**	1		
3. Δ Depression	-	-	-.01**	.27**	1	
4. Δ Stress	-	-	-.10**	.28***	.60**	1
5. Δ Illness Symptoms	-	-	.02**	.17**	.58**	.39**

** $p < .001$

Study 2 discussion

In line with Study 1, the present results provide support for the role of self-reported perceived scholarly belongingness and imposter syndrome in doctoral students' psychological and physical well-being. Additionally, this study provides empirical support for the directionality of the relationship between reported perceived belongingness and imposter syndrome. As expected, perceived scholarly belongingness at Time 1 negatively predicted symptoms of imposter syndrome five months later. Feeling like an imposter, in turn, predicted *increases* in depression, stress, and illness symptoms over the following five months, suggesting that such feelings of personal inadequacy may have long-term implication for doctoral students' well-being.

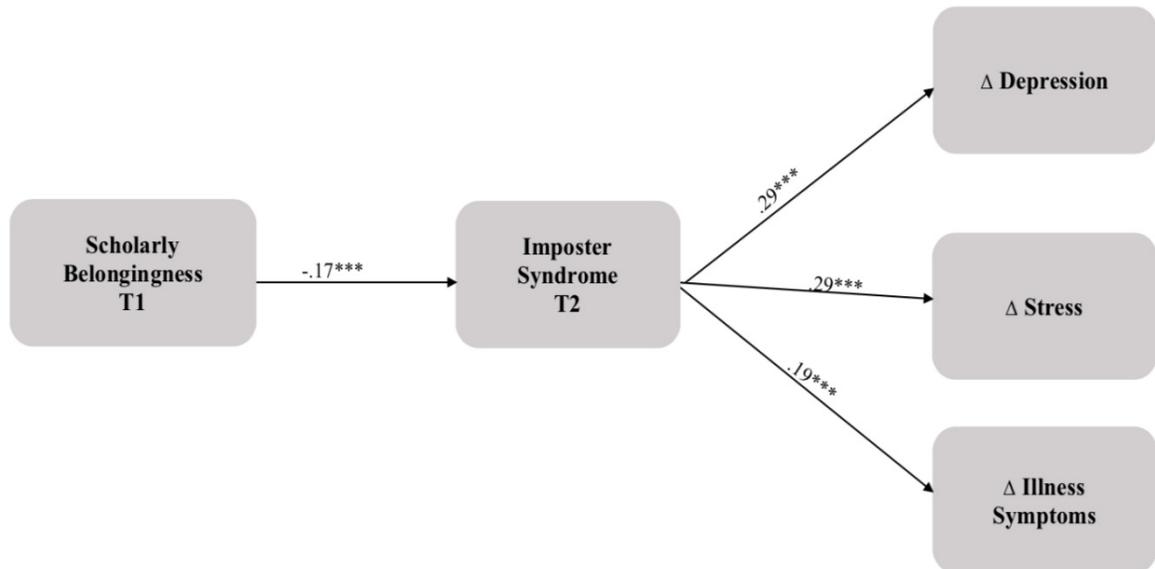


Figure 2. Results from a structural equation modeling analysis on prospective data: Study 2 ($n = 1783$). Analysis conducted with standardized measures and residuals. Standardized path coefficients are presented, $***p < .001$. Controlling for gender, phase, and discipline.

GENERAL DISCUSSION

The present paper explored the role of perceived scholarly belongingness in imposter syndrome and the role of imposter syndrome in the psychological and physical well-being of doctoral students. Based on previous research, we hypothesized that feelings of membership in one's scholarly community would negatively predict imposter syndrome, defined as the inability to internalize personal success, with imposter syndrome, in turn, expected to positively predict self-reported depression, stress, and illness symptoms. Two studies assessed this hypothesis. Study 1 utilized a cross-sectional design to empirically evaluate the hypothesis presented above, as well as assess the mediating role of imposter syndrome in the relationship between perceived scholarly belongingness and well-being. Study 2 used a prospective, longitudinal design to ascertain empirical support for the assumed role of perceived scholarly belongingness as an antecedent to imposter syndrome beliefs and well-being, as well as to evaluate the mediational role of imposter syndrome in predicting *changes* in well-being over a five-month period.

Overall, the results of the present research provided support for our hypotheses. In Study 1, perceived belongingness was found to be a negative predictor of imposter syndrome that, in turn, predicted higher levels of depression, stress, and illness symptoms. Additionally, imposter syndrome was found to significantly mediate the relationship between perceived scholarly belongingness and the three outcome variables assessing psychological well-being. Study 2 further revealed perceived scholarly belongingness to negatively predict imposter syndrome five months later, with imposter syndrome, in turn, predicting increases in depression, stress, and illness symptoms in our doctoral student sample.

PERCEIVED SCHOLARLY BELONGINGNESS AND IMPOSTER SYNDROME

The positive relationship between social membership in the academic context and perceptions of self has been previously evaluated theoretically (e.g., Lovitts, 2001) as well as empirically (e.g., Litalien & Guay, 2015). Overall, the findings of our research supported the assumption that perceived scholarly membership is a significant negative predictor of imposter syndrome, a maladaptive psychological state characterized by the inability to accept success (in this case, academic success) as a result of

one's efforts or ability, and a general perception of being unworthy of one's role as a doctoral student. Students who felt they were contributing members of their scholarly communities (e.g., research discipline, department) reported lower imposter syndrome levels, suggesting that they felt worthy of their academic positing.

Imposter syndrome and perceived belongingness can thus be viewed as two sides of the same coin; whereas those who experience imposter syndrome can feel isolated from their community due to their perceived lack of fit, perceived scholarly belongingness reflects the extent to which students feel like valued and integrated members of their departments and academic communities. Among doctoral students, it is thus plausible that feeling integrated into one's scholarly community may increase clarity of the kinds and extent of efforts required to accomplish academic goals thereby contributing to more realistic expectations of other's efforts and aptitudes (i.e., reduced perceptions of feeling like a fraud in comparison). It is thus not surprising that this previously theorized relationship (Cope-Watson & Smith-Betts, 2010; Jöstl et al., 2012) was empirically supported in this study.

As a whole, the present results highlight the role of social elements in shaping doctoral students' psychological experiences within their doctoral programs and have several significant implications for doctoral supervisors and administrators. First, the existing literature outlines how socialization effort to integrate doctoral students into their departments and scholarly communities are crucial for academic success (e.g., Lovitts, 2001; Weidman et al., 2001) and well-being (see Sverdlik et al., 2018, for a review). The present findings support this premise, underscoring once again the importance of *perceptions* of belongingness for adaptive psychological processes through doctoral education. By acknowledging the critical role of perceived social belongingness in students' well-being, faculty and administrators can establish structures to better integrate students into their scholarly communities (e.g., allocate more resources for scholarly conferences; establish and encourage paths for collaboration between members of the community), and departments can foster a supportive social atmosphere for their doctoral students that emphasizes the quality of interactions and consultation with faculty. In this regard, information sessions for departmental advisors and faculty on how to better communicate with doctoral students are encouraged, as are orientation sessions for doctoral students encouraging them to take advantage of avenues for departmental interaction and assistance.

Finally, while it is important to target perceived belongingness as a determinant of such negative experiences as imposter syndrome, it is also important for future research to more specifically address the antecedents (e.g., social integration), consequences (e.g., stress, depression), and prevalence of such maladaptive self-perceptions within students themselves. For example, information sessions for first-year doctoral students could highlight the prevalence and remedies of feeling like an impostor to normalize these otherwise deleterious feelings of inadequacy. While it is possible that such interventions will not substantially reduce these experiences in doctoral students (e.g., due to persistent comparisons with more productive peers), they may nonetheless inform students that their feelings are not uncommon and to be expected as part of the doctoral experience. Coupled with a supportive and collegial departmental climate, such programs have the potential to enhance students' self-worth and perceived belongingness, and consequently improve doctoral students' well-being.

IMPOSTER SYNDROME AND WELL-BEING

The deterioration of doctoral students' well-being is a prominent topic in conversations about doctoral education and has been increasingly gaining empirical attention in recent years (see Sverdlik et al., 2018, for a review). Whereas doctoral students themselves consistently identify imposter syndrome as critical to their well-being (e.g., Blake-Hedges, 2018; Farkas, 2018; Hayton, 2017; Joose, 2017), empirical evidence on this relationship is scarce. The present research provides support for the role of imposter syndrome in shaping doctoral students' well-being. Specifically, the present findings demonstrate that imposter syndrome is a moderate to strong predictor of depression, stress, and illness symptoms cross-sectionally (Study 1), as well as of changes in depression, stress, and illness

symptoms over a five-month period (Study 2). Moreover, imposter syndrome was found to significantly mediate the relationship between perceived belongingness and well-being in Study 1; a relationship outlined in numerous studies as an important factor in doctoral students' well-being (e.g., Cotterall, 2013; De Welde & Laursen, 2008; Lovitts, 2001; Shacham & Od-Cohen, 2009). These results imply that it is perhaps not perceived belongingness alone that contributes to doctoral students' well-being, but rather its psychological consequences, such as more adaptive self-perceptions, that protect students from the mental health concerns associated with doctoral education.

Finally, it is important to note that in both studies, although imposter syndrome did correspond with significantly more illness symptoms, it was nonetheless a stronger predictor of mental health than physical health outcomes. Furthermore, imposter syndrome accounted for 30% of the variance in depression, and 36% of the variance in stress in the Study 1 sample. This is particularly important because depression and stress are the most commonly explored well-being factors in the doctoral population (e.g., Hyun et al., 2006; Kernan et al., 2011; Pallos et al., 2005; Sverdlik & Hall, 2019; Vekkaila et al., 2016; Wyatt & Oswalt, 2013), and represent two salient mental health struggles for doctoral students. It is therefore important to continue exploring the role of imposter syndrome and seriously consider targeting imposter syndrome as an intervention focus for improving the mental health of doctoral students.

Two such interventions (e.g., increasing belongingness; informing first-year students of the prevalence of imposter syndrome) are outlined above, with other possible approaches including counseling services that specifically target imposter syndrome (e.g., University of British Columbia graduate workshops; Joose, 2017) and training graduate supervisors to identify imposter syndrome in their students and provide access to resources that can help reframe negative self-perceptions. Finally, professional development seminars that are typically taught in graduate programs could incorporate an explicit discussion of well-being topics and the prevalence of imposter syndrome, alongside other pragmatic topics (e.g., publishing protocols), to ensure that students perceive their departmental climate as supportive and, in turn, feel less like an imposter and better psychologically adjusted. Taken together, these strategies may help reduce feelings of inadequacy among doctoral students and could play a role in improving their overall psychological experiences during the doctor process.

LIMITATIONS AND FUTURE DIRECTIONS

The present research has several noteworthy limitations: First, although the study samples were notably international in nature, they were largely homogenous in terms of gender (~75% females), race (~78% Caucasian), and geographic location (~60% North-American) warranting future replication with more diverse populations in terms of gender, ethnicity, and nationality. Second, although perceived scholarly belongingness was a significant predictor of imposter syndrome, it was not a strong predictor. Future research should explore other, more proximal, social predictors such as departmental membership, perceived faculty support, and perceived supervisor support. Third, as all study measures were self-report scales, further research is needed to triangulate these results on the role of perceived belongingness and imposter syndrome in predicting well-being, in which more objective variables such as conferences attendance rates, actual academic productivity (e.g., publication/presentation rates), and the extent of collaborative activities (e.g., writing group participation) are assessed. Finally, future research should explore additional outcomes to fully understand the impact of perceived belongingness and imposter syndrome on doctoral students. Outcomes may include academic performance (e.g., presentation/publication rates), motivation (e.g., perseverance vs. intention to quit), and more general psychological adjustment measures (e.g., satisfaction with life). Such research, in combination with the present findings, can help understand the full impact of imposter syndrome on the academic and personal experiences of doctoral students, and can contribute to psychologically healthier and more academically productive experiences for doctoral students as they navigate the myriad challenges of doctoral education.

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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.