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Cisco, Jonathan

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Using academic skill set interventions to reduce impostor phenomenon feelings in postgraduate students

Jonathan Cisco, PhD

Impostor phenomenon refers to an overwhelming feeling of intellectual fraudulence and affects individuals across a number of fields. Academia provides an environment in which these feelings can flourish, particularly within postgraduate students. In spite of the research exploring these feelings, we know little about how to reduce them in academia. Clinical research has identified guiding principles to assist those affected, particularly through mentorship. This paper describes a series of interventions for postgraduates adapted from clinical research. These four interventions identified impostor phenomenon and its consequences, explored disciplinary and academic literacies strategies, and taught postgraduate students how to read academic journal articles and use literacy strategies to write literature reviews. Parametric and nonparametric analyses show that impostor feelings reduced by 23% relative to a control group. This research suggests that programmes could use similar interventions in academic skill sets to help reduce impostor phenomenon feelings in their postgraduate students.

Keywords: impostor phenomenon; impostor syndrome; postgraduate education; disciplinary literacy; academic literacy

Introduction

Research over the past 30 years has identified that highly-capable individuals engaged in creative pursuits may be more likely to feel like intellectual impostors (Clance and O'Toole 1987). These feelings have significant physical and mental consequences (Lester and Moderski 1995; Steinberg 1987), and those affected often suffer in isolation (Laursen 2008;

Matthews and Clance 1985).

Scholars have estimated that as many as 70% of individuals have had some form of impostor feelings (Harvey and Katz 1985; Matthews and Clance 1985), including academics and postgraduate students (Ewing et al. 1996; Harvey 1981; Knights and Clarke 2014). While early clinical work provides guidance on how to reduce impostor phenomenon feelings in general (Clance and O'Toole 1987; Harvey and Katz 1985), this guidance has not yet been utilised in and adapted to the higher education community. Strategies for reducing impostor phenomenon feelings could inform the literature on postgraduate stress (Barry et al. 2018) and supervision (Lee 2008; Lee and Murray 2015; Torrance, Thomas, and Robinson 1993), as well as inform frameworks for reducing postgraduate attrition (McAlpine and Norton 2006).

The aim of this research was to determine if four interventions grounded in clinical psychology and literacy studies could reduce impostor phenomenon feelings in a group of postgraduate students relative to a control group. In this paper, I summarise the research on impostor phenomenon, outline and describe the interventions and their empirical grounding, and report the results using parametric and nonparametric analyses. I conclude with guidance on how to incorporate this study's findings into the postgraduate supervision literature.

Impostor phenomenon

Impostor phenomenon (IP) refers to an individual's belief that he or she is an intellectual fraud who will soon be exposed (Castro 1985; Clance 1985). IP tends to affect highly-successful or highly-capable individuals in a number of fields, including the arts (Harvey and Katz 1985), business (Castro 1985), health care (Huffstutler and Varnell 2006; Matthews and Clance 1985), and higher education (Cisco 2016; Edwards et al. 1987). Psychologists have argued that IP may affect nearly three-quarters of the population, and that IP can have serious consequences when ignored (Harvey and Katz 1985; Matthews and Clance 1985). Such feelings may in part relate to one's perceived inability to properly function and succeed in the

context in which IP feelings take place; in other words, if the context can be demystified, IP feelings may reduce (Clance and O'Toole 1987).

Chance and Imes's work identified the characteristics of individuals affected by IP. Those characteristics include: (1) a need to be the very best; (2) superhuman self-expectations; (3) a fear of failure and exposure; (4) a denial of abilities; (5) a habitual discount of praise; and (6) a fear or guilt about success. Not all of these characteristics manifest in those affected by IP, but they typically reinforce themselves and are quickly identified by those affected when prompted (Clance 1985; de Vries 1990; Harvey and Katz 1985).

Given that IP feelings relate to beliefs of intellectual fraudulence, students and academics are in a position to feel like intellectual failures as education level increases (Clance 1985; Knights and Clarke 2014). We know that academic researchers experience IP feelings, though they tend to decrease as one climbs the career ladder (Edwards et al. 1987; Imes 1979). An additional thread of IP research in academia finds potential minority and gender dimensions to IP feelings (Ewing et al. 1996; Harvey 1981; Onwuegbuzie 1999; Stahl et al. 1980). While this research is helpful in determining the scope of impostor feelings in academia, we lack an understanding of how to reduce impostor phenomenon and its consequences in a higher education context.

Consequences of impostor phenomenon

While identifying IP in their patients, clinical psychologists took note of its negative effects on the patients' lives (Clance and Imes 1978; Imes 1979; Harvey 1981; Harvey and Katz 1985); later, empirical researchers confirmed or added to the list of negative effects (Castro 1985; Lester and Moderski 1995; Steinberg 1987). IP 'can trigger illness and debilitating emotional trauma' and 'can cause additional problems for others who depend upon them' (Castro 1985, 60). Furthermore, those affected may experience significant lacks of confidence and energy, insomnia, and migraines (Steinberg 1987). Lester and Moderski (1995, 466) found that IP was highly correlated with 'psychoticism, neuroticism, irrational

thinking, and manic and depressive tendencies’, with some having a history of ‘prior suicidal ideation and attempts’. In less extreme cases, the largest concern is best described by Clance and O’Toole (1987, 52), who argued that ‘self-declared impostors may not be achieving all that they are capable of achieving, and they are not enjoying their success’.

General principles for reducing impostor phenomenon in clinical settings

Early clinical work related to impostor phenomenon provided general principles that could be utilised to reduce impostor feelings. First, IP needs to be identified, often providing ‘a tremendous sense of relief’ for those affected (Harvey and Katz 1985, 208). Second, those individuals need to be grouped together. This grouping encourages open conversations on IP’s effects and limits the impacts of isolation (Clance and Imes 1978; Harvey and Katz 1985). Third, impostor feelings ought to be taken seriously. Clinical psychologists argue that IP feelings ought not to be brushed off as insignificant (Matthews and Clance 1985). Finally, the context in which IP feelings arise must be demystified by a mentor. In other words, the skill sets required in the context ought to be taught within a mentor/mentee relationship that is ‘empathetic, supportive, and non-authoritarian’ (Clance and O’Toole 1987, 4). The interventions discussed in this paper are grounded in each of these principles.

Interventions to reduce impostor phenomenon feelings in postgraduate students

The goal of this research was to apply these general principles to postgraduate student development and determine if four literacy-based workshops (conducted over one month) could reduce impostor feelings in the postgraduate student participants. This project takes a novel approach by combining the research in clinical psychology above with research in literacy pedagogy in the development of the interventions. Grounded in the principles of reducing impostor feelings, these four interventions sought to help the participants identify impostor phenomenon feelings (Intervention I), explore disciplinary and academic literacies and strategies (Intervention II), successfully read academic journal articles (Intervention III), and write academic literature reviews (Intervention IV).

This project builds on earlier work related to postgraduate writing interventions and doctoral supervision. Torrance, Thomas, and Robinson's (1993) work on thesis interventions for postgraduate students found that two-day thesis writing courses that focused on product-centred and generative-writing could provide greater benefits than more generic, cognitive strategies. Throughout this project's interventions, discussions related to academic writing included focus on structure and idea generating (Interventions II and IV). Specific to doctoral supervision, this project builds on Lee (2008) and Lee and Murray's (2015) holistic framework, which argued that appropriate supervision should include functional, enculturation, critical thinking, emancipation, and relationship development elements. This project's interventions touch each of these elements, particularly as they relate to impostor phenomenon feelings.

This paper describes the intervention and its results measured by the pre and post impostor phenomenon surveys (23 control, 19 intervention) of the postgraduate student participants (34 females; 8 males). I analysed the quantitative data using parametric (i.e., independent t-tests) and nonparametric (i.e., Mann-Whitney *U*) tests to identify the statistical significance of the changes in impostor phenomenon scores among the intervention and control participants. The quantitative data showed a significant decrease of 23% in impostor feelings, relative to the control group, whose impostor feelings slightly increased from pre to post.

This study addresses the gap in the IP literature in higher education by proposing an intervention to reduce IP feelings in postgraduate students. To my knowledge, no studies have empirically explored how to reduce IP feelings in postgraduate students outside of the clinical setting. Furthermore, this study provides a flexible template for university departments who wish to develop academic skill sets in their postgraduate students.

Literacy frameworks for intervention

In the creation of the literacy interventions, I paired what we know works in clinical

settings with the literacy paradigms described below. While these paradigms were used in tandem, I separate my explanations for clarity.

Content area reading and writing

Content Area Reading and Writing (CARW) strategies seek to create generalised reading and writing strategies for students, applicable at all educational levels (Fang and Coatoam 2013; Fang 2014; Lesley 2014; Vacca, Vacca, and Mraz 2014). CARW strategies have a rich empirical backing and continue to be utilised across education levels (Faggella-Luby et al. 2012). For example, the SQ3R—Survey, Question, Read, Recite, Review—strategy (Robinson 1961) gives students a well-researched reading strategy in order to gain comprehension of a text and improve task awareness (Alvermann, Gillis, and Phelps 2013), or an understanding of what to study in a text. By using the SQ3R strategy, students survey or preview a reading; ask questions of the text; read purposefully for answers to those questions; recite and summarise the text; and review notes in order to improve one’s comprehension. Other CARW research encourages pedagogical strategies such as guiding learners to identify what they know, want to know, and have learned (e.g., KWL approach) (Buehl 2013; Ogle 1986).

Disciplinary literacy

Disciplinary literacy (DL) ‘seeks to uncover and teach the specialised strategies, routines, skills, language, or practices inherent in certain content areas that are not generalisable to other domains’ (Faggella-Luby et al. 2012, 69). DL tries to understand how disciplinary experts (e.g., university professors) read, write, and think differently because of their disciplines. One aspect of DL approaches is to identify what is emphasised in the reading process of disciplinary experts. Whereas historians may use ‘sourcing heuristics’ to contextualise their reading (Wineburg 1991, 510), mathematicians may expect more precision in their use of language (Adams 2003; Shanahan, Shanahan, and Misischia 2011). Other findings in DL explore the anticipations of readers in chemistry (Shanahan, Shanahan, and

Misischia 2011) and the strategies unique to those in literature (Hamel 2003; Moje 2007). DL rests on the assumptions that not only do disciplinary experts have distinct and identifiable literacies, but that these can and should be taught to students (Cisco 2015).

Academic literacy

Academic literacy builds on work developed in New Literacy Studies and critiques ‘autonomous models of literacy’, viewing literacy as a social practice as much as reading and writing (Lea 1998; Lea and Street 1998). Studies in academic literacies, originating in the United Kingdom, are closely aligned with studies in disciplinary literacy, which originated in the United States, given each tradition’s emphasis on disciplinary practices. One difference is that the former emphasises writing and discourse processes to distinguish between contexts and disciplines in higher education, whereas the bulk of the work in disciplinary literacy tends to focus outside of higher education. Both paradigms recognise the nature of ideology and power struggles in education (Lea and Street 1997; Lea 1998; Lea and Street 1998; Moje 2007), whether they are in a high school classroom or a postgraduate course and view literacy development as a constantly evolving process for students.

Discourse theory and mushfaking

Discourse refers to the ‘ways of behaving, interacting, valuing, thinking, believing, speaking, and often reading and writing, that are accepted as instantiations of particular identities by specific groups’ (Gee 2012, 3). Clarifying Gee’s theory, Holschuh and Paulson (2013, 6) argue that Discourse ‘includes not only knowing *what* to say, but *when* to say it, *how* to say it, in *what* context it is appropriate’. One aspect of Discourse theory is the idea of Mushfaking, which refers to using strategies to simply ‘make do’ in a particular context (Gee 2007, 180). For example, postgraduates might be tempted to use complex, disciplinary discourse in group settings despite not understanding the meaning behind what they say. Such a strategy is a mushfake, or a ‘fake it ‘till you make it’ strategy.

In short, these literacy paradigms can be converged to help inform the mentorship needed

for reducing IP in postgraduate students. CARW strategies provide practical steps with which to read and write about complex texts, DL provides a lens through which to view disciplinary discourse. Academic literacies compliments DL by emphasising academic discourse, ideology, and power struggles. Discourse theory, specifically mushfaking, helps to explain the inherent struggle that a postgraduate student moves through as he or she comes to grips both with the concrete realities of graduate school (i.e., the need to read and write a lot) with the larger, more expansive literacy needs and expectations of the institution.

Methods

Context of the study

Participants

A total of 42 full-time postgraduate students in a large midwestern university in the United States participated in this study, with 23 participants in the control group and 19 participants in the intervention group (34 females, 8 males). Participants came from a range of academic disciplines, notably disciplines within the College of Education, which made up over three-fourths of the participants. Other participants were enrolled in programs in Anthropology, Psychology, Public Health, and Communication. Over 70% of the sample were pursuing PhDs, with the other portion pursuing Master's degrees. A normal time to completion at this institution was approximately two to three years for a Master's degree and at least five (often more) years for a PhD. The deliberate recruitment of participants with two or more years left in their programmes was an attempt to capture early or budding IP feelings, given that IP feelings may decline over time for some participants (Topping and Kimmel 1985), which could have biased the results of the intervention. This deliberate recruitment of 'information-rich' participants supposes a purposive sample (Patton 2015, 266).

Recruitment procedure

A primary fear of those affected by IP is exposure (Harvey and Katz 1985). Indeed, those affected by IP take preventative measures to ensure such exposure never occurs (Harvey and

Katz 1985; Matthews and Clance 1985). I thus hoped to recruit as many participants as possible with two or more years left in the programmes to counter this (Merriam 2009). To recruit, I visited relevant postgraduate level seminars across campus to market the workshop series, in addition to distributing announcements on departmental list-serves. I marketed the workshop series as an academic skills series, listing academic reading, writing, and thinking as the primary elements of the series. Recruitment materials listed ‘Impostor Phenomenon in Graduate School’ as one of the topics to be covered, though a large majority of the participants were unaware of the concept prior to the first intervention. Three-fourths of the participants actively requested to participate in the intervention group, but student schedules determined whether or not they were able to participate. While the study cannot claim an experimental design due to the non-random nature of the sample, the self-selecting nature of recruitment was effective in recruiting a higher proportion of students who suffered from IP feelings.

Site location

All workshops took place in a classroom on the university’s campus. I arranged the classroom in a large circle and ensured each participant was able to see at least one of the two projector screens available.

Data sources

Clance impostor phenomenon survey

The Clance IP survey consists of 20 ordinal-level variables designed to capture IP feelings in the participants, providing a total of 100 points toward the indication of IP. A number of studies have validated the Clance IP score as a valid means to measure IP feelings (Edwards et al. 1987; Gerstmann 1998; Topping and Kimmel 1985), in addition to the Harvey IP Scale (Harvey 1981; Harvey and Katz 1985), developed shortly after the Clance IP Scale. Participants who score less than 40 on the Clance IP Score show minimal IP characteristics; 41-61 indicate moderate IP characteristics; and scores 62-100 indicate high IP

characteristics. All participants completed the survey prior to the first workshop and one week after the final workshop. The difference between the control and intervention groups' pre-intervention IP scores was not significant at 95% confidence. All participants were fluent in English.

Demographics

I collected demographic information on all of the participants, including: (1) final degree they are seeking; (2) graduation timeline; (3) academic department; (4) gender; (5) ethnicity; (6) age; and (7) their academic trajectory.

Data analysis

The primary purpose of the quantitative analysis was to identify any significant differences in IP scores between the control and intervention groups via independent t-tests (Wooldridge 2008). In accordance with a quasi-experimental design, the pre/post survey results were compared between the control and intervention groups. I used an independent-sample t-test to identify if the difference in the average IP score of each group at the end of the intervention (e.g., the intervention group shows a lower average post IP score than the control group) was statistically significant, the null hypotheses being that the interventions had no impact on IP feelings. To counteract the possible effect of extremes in IP scores, I also used a Mann-Whitney *U* test to test the differences in the medians of IP scores. Further analyses also identified how changes in IP scores in the intervention group were broken down by the degree sought (i.e., PhD versus Master's) and gender. The data were run through a series of assumption tests for independent t-tests, including Levene's test for homogeneity to ensure appropriate validity, which are detailed in the findings. I completed all quantitative analyses in SPSS and Wizard Pro statistical software.

Interventions

While the skill set interventions explained below pulled from literacy paradigms, the overall approach to the interventions followed established principles in clinical psychology.

All proposed interventions took place in a group setting (Clance et al. 1995; Clance and Imes 1978) in which IP feelings were openly discussed and taken seriously (Matthews and Clance 1985). Furthermore, each intervention attempted to provide a form of mentorship that could provide a ‘supportive, and non-authoritarian’ attitude required for successful mentorship through IP feelings’ (Clance and O’Toole 1987, 4). Each intervention lasted approximately 90 minutes with more time for group discussion, as needed.

Intervention I: what is impostor phenomenon?

The first intervention provided an environment in which participants could discuss their own IP feelings after reviewing its theoretical and empirical foundations. Pulling from Langford and Clance (1993, 99), the purpose of this first intervention was to make the metaphorical ‘mask’ worn by IP sufferers ‘no longer necessary’. During this intervention, I explicitly defined IP and its various features identified across the psychological literature, particularly how it may pertain to those in postgraduate education. At various stages, participants were encouraged to explore their own experiences relative to the IP information. This intervention began with a description of what we know about IP, but then ended with an open discussion among the participants.

Intervention II: disciplinary and academic literacies

The next intervention encouraged an open discussion on how disciplines may shape the way disciplinary experts read, write, talk, and think, both about the world and in their own disciplines (Lea 1998; Lea and Street 1998; Shanahan and Shanahan 2008) Using the guiding metaphor of being a Stranger in a Strange Land, I led students into seeing how disciplinary literacy is developed during, rather than obtained prior to, postgraduate school. Using an adapted strategy from Swan’s (2014) recent work related to discourse and rhetoric, I provided participants with two disciplinary texts—an article from comparative literature and an article from biological chemistry—and then asked, ‘What kinds of knowledge do these disciplines prefer, and in what ways is that shown in the academic texts?’ Once basic differences were

identified across disciplines, the group explored common rhetorical moves in academic writing (Murray 2013; Graff and Birkenstein 2006). Participants then worked with a random page from my own manuscript to identify all the rhetorical moves I was using to make arguments. We closed the intervention by exploring how rhetorical moves can help demystify writing academic prose and structure. Intervention II acted as the foundation upon which all subsequent interventions were based.

Intervention III: reading the academic journal article

The third and fourth interventions provided practical steps with which a postgraduate student could better succeed in postgraduate school (Matthews and Clance 1985). Based on Content Area Reading strategies outlined above (Alvermann, Gillis, and Phelps 2013; Ehlinger and Pritchard 1994; Robinson 1961; Wilhelm 2001), the third intervention attempted to demystify the challenging process of reading an academic journal article (Baram-Tsabari and Yarden 2005; MacMillan 2014; Nadelson et al. 2013). Using a combined SQ3R strategy (Robinson 1961) with Think Along/Aloud protocols (Ehlinger and Pritchard 1994; Wilhelm 2001), I read an article I had never seen before aloud to the group using surveying and questioning strategies. Participants were encouraged to first identify a purpose for reading the article prior to the read aloud. After the reading, we discussed the article in full and wrote a collective abstract and critique. Participants then utilised the adapted SQ3R strategy to read another article in pairs. We then extended this conversation into identifying how the SQ3R strategy could be adapted to other types of academic work (e.g., books, theoretical articles, etc.).

Intervention IV: writing the literature review

The purpose of the fourth and final intervention was to provide students with an empirically-based template through which to write a common disciplinary assignment (i.e., the literature review) and to provide successful research strategies. The first part of this intervention was based on empirical work that explored students' challenges and

misunderstandings regarding the literature review and provided a lesson-based approach to demystify the review (Cisco 2014). The lesson first identified how budding academic writers tend to default into writing annotated bibliographies (i.e., author-based paragraphs without synthesis). Then, drawing on the Burkean Parlor Metaphor (Burke 1973), which helps to explain the nature of academic discourse and how it relates to the review, I presented a general template in the spirit of Graff and Birkenstein (2006) for the ‘theme-based literature review’, which forms a thematic basis for academic conversation. Participants then had the opportunity to outline their own budding literature reviews with guided instruction on the literature review matrix (Garrard 2011), a technique in organising source material. In the workshop’s conclusion, I projected my own mid-draft manuscripts and explicitly emphasised the changes made from draft to draft, including false starts and failed approaches. The purpose of this final step was to give the participants a real-world example of writing as revision (Murray 1996).

Findings

Descriptive statistics

Table 1 shows the demographic comparisons of the control and intervention groups. Both groups were skewed toward females, with 91.30% and 68.42% of females in the control and intervention group, respectively. The sample was also skewed toward Caucasian participants, with nearly three-fourths of the control group and nearly a third of the intervention group, respectively. Ages for the control group ranged from 22-48 ($M = 30.17$, $SD = 6.20$), whereas ages for the intervention group ranged from 23-58 ($M = 34.16$, $SD = 9.26$). Approximately 73.8% of the control and 77.7% of the intervention groups had two or more years left until the completion of their programme, indicating a relative success in the purposive sampling strategy. Specific to degree, 54.6% of the Master’s students and 83.3% of the PhD students had 2 or more years until completion. The majority of the control and intervention groups were seeking PhDs in their respective fields, with 82.61% and 57.90%, respectively. Both

groups were biased toward the College of Education, with over 90% of control participants seeking degrees in Learning, Teaching, and Curriculum (LTC) or Educational Leadership and Policy Analysis (ELPA) and nearly three-fourths in the intervention group. Note, however, that LTC subsumes Art, English, Literacy, Math, Music, Science and Social Studies Education programmes. The remainder of the degrees were primarily in the social sciences (i.e., Anthropology, Psychology, and Public Health).

Holmes et al. (1993) found that a score above 61 indicated high IP characteristics on the Clance IP Scale. Specific to this study's participants, the control group's mean pre-intervention score was 58.95 ($SD = 12.44$) with a range of 35-78, indicating that the average control participant had moderate IP feelings; the intervention group's mean pre-intervention score (i.e., impostor score prior to the interventions) was 74 ($SD = 16.90$) with a range of 47-97, indicating that the average intervention participant could be classified as an 'IP victim', according to the psychological literature. Post impostor scores for the control group remained flat with an average IP score of 59.52 ($SD = 13.63$), while the mean post IP score for the intervention group (i.e., after Interventions I-IV) decreased to 57.05 ($SD = 13.37$). Below, I determine if these pre to post shifts were statistically significant after testing for assumption violations.

Table 1. Demographic comparisons between control and intervention groups

Demographic	Participants	
	Control Group	Intervention Group
Study participants	23	19
Gender of Participants, <i>n</i> (%)		
Male	2 (8.7)	6 (31.6)
Female	21 (91.3)	13 (68.4)
Ethnicity of Participants, <i>n</i> (%)		
Caucasian	17 (73.9)	12 (63.2)
African American	0 (0)	2 (10.5)
Hispanic	2 (8.7)	2 (10.5)
Asian	3 (13.0)	1 (5.3)
Pacific Islander	0 (0)	1 (5.3)
Other	1 (4.3)	1 (5.3)
Age (range 23-58)	30.2	34.2
Graduation Timeline, <i>n</i> (%)		
1 More Year	6 (26.1)	4 (22.2)
2 More Years	9 (39.1)	8 (44.4)
3 More Years	5 (21.7)	2 (11.1)
4 More Years	2 (8.7)	4 (22.2)
5+ More Years	1 (4.3)	0 (0)
Expected Degree		
PhD	19 (82.6)	11 (57.9)
Masters	4 (17.4)	8 (42.9)
Department		
Learning, Teaching, and Curriculum	15 (65.2)	8 (42.1)
Educational Leadership and Policy	6 (26.1)	6 (31.6)
Analysis		
Anthropology	0 (0)	2 (10.5)
Communication	1 (4.3)	1 (5.3)
Psychology	1 (4.3)	0 (0)
Public Health	0 (0)	2 (10.5)
Average Impostor Phenomenon Scores (0-100)		
Pre Intervention Score	58.9	74
Post Intervention Score	59.5	57.1

Note: Learning, Teaching, and Curriculum includes Art, English, Literacy, Math, Music, Science, and Social Studies Education degrees.

Statistical assumptions tests

Independent t-tests require several assumptions to be met for valid results: (a) a

continuous dependent variable; (b) a categorical independent variable; (c) independence of observations; (d) no significant outliers; (e) a normally-distributed dependent variable; and (f) homogeneity of variance. The first three assumptions are met due to the dependent variable measured on a scale of 0-100 (i.e., IP score); there were two groups of participants, and those groups were independent. I address the other assumptions below.

Assumption of no outliers

There were no outliers in the data based upon an inspection of box plots. The potential for missed outliers are addressed in the section on the Mann-Whitney *U* test.

Assumption of normality

Impostor phenomenon scores for each participant group and the differences between scores were normally distributed, as assessed by a Shapiro-Wilk's test ($p > .05$).

Assumption of homogeneity of variances

The assumption of homogeneity of variances was violated, as assessed by Levene's test for equality of variances ($p = .001$). Thus, subsequent interpretations of and references to the independent t-test refer to an unequal variance t-test to remedy this violation.

Independent t-tests of changes in mean impostor phenomenon scores

There was a statistically significant decrease in the intervention group's post-IP scores as compared to the control group (See Table 2). The analysis indicated that the average change score of the intervention group was -16.95 ($SD = 20.16$), whereas the control group's average change score was 0.57 ($SD = 5.57$), $t(20.27) = -3.67$, $p = .001$. The effect size of the interventions was large, as indicated by Cohen's d , $d = 1.12$. The differences in the differences (i.e., the difference between the average change score in the intervention group and the average change score of the control group) was estimated as -17.52 ($SE=4.77$), as indicated by the unequal variance t-test. Thus, I can reject the null hypothesis that the intervention series had no effect on the intervention participants' IP scores. In short, the average participant in the intervention group could no longer be classified as suffering from

extreme impostor feelings post intervention.

Table 2. Results of independent t-test on mean difference of impostor phenomenon scores by group

	Group						95% CI for Mean Difference		
	Intervention			Control					
	M	SD	n	M	SD	n		t	df
IP Score Change	-16.95	20.16	19	0.57	5.57	23	-27.45, -7.58	-3.67*	20.27

Note: Unequal variance t-test

* $p < .001$

Mann-Whitney U test of changes in median impostor phenomenon scores

Given the range of IP scores between the groups, a Mann-Whitney *U* test, a nonparametric test using medians rather than means to identify significant differences between groups, is useful. Like the independent t-test noted above, the Mann-Whitney *U* test requires that several assumptions be met for valid results: (a) a continuous or ordinal dependent variable; (b) a categorical independent variable with two groups; (c) independence of observations; and (d) similar distribution shapes for scores of each group. Again, the first two assumptions were met due to the continuous dependent variable and study design.

A Mann-Whitney *U* test was run to determine if there were statistically significant differences in the pre/post IP scores of the intervention and control groups. Distributions of the change in IP scores were similar, as assessed by visual inspection. The median change in IP scores statistically significantly dropped in the intervention group ($Mdn = -18$) relative to no drop in the control group ($Mdn = 0$), $U = 366.50$, $z = 3.75$, $p < .001$.

In other words, both tests indicate significant drops in IP scores among the intervention group using an independent t-test ($M = -16.95$) and a Mann-Whitney *U* test ($Mdn = -18$), $p < .001$.

Other findings

Other intriguing findings were found using paired t-tests of pre and post IP scores within the intervention group. These findings are presented with caution, however, as the sample

sizes for these tests were low. Nevertheless, these findings may provide a more nuanced view of the overall drops in IP scores within the intervention group and provide guidance for future research.

Change in impostor phenomenon scores of PhD students

The drop in IP scores in the PhDs tended to be larger than the Master's students. A paired t-test showed that the interventions elicited a significant mean decrease of -19.46, 99% CI [-32.256, -6.654], in IP scores for PhD students. This may indicate that the PhD students were more affected by the interventions compared to the Master's students.

Change in impostor phenomenon scores of males and females

Male participants tended to have a larger drop in IP scores relative to females. A paired t-test showed that the interventions elicited a significant mean decrease of -26 for males, 95% CI [-47.24, -4.47], whereas the interventions elicited a significant mean decrease of -12.77 for females, 95% CI [-24.53, -1.00]. This may suggest that men were slightly more affected by the interventions than women.

Limitations

This study had some limitations that limit generalisability. First, this study used a purposive, non-random sample for its data collection (Patton 2015). Second, the sample was skewed toward the College of Education, though participants ranged in their majors from the various Learning, Teaching, and Curriculum foci (e.g., mathematics education) to Educational Leadership and Policy Analysis within that college. Third, though the difference between the groups' pre-intervention scores was not significant at 95% confidence, the differences do suggest a self-selection bias in the intervention group. Fourth, the sample is limited in size and non-normality, though independent t-tests are generally considered robust when statistical assumptions are violated (Wooldridge 2008). This study used both parametric and non-parametric tests—in the form of independent t-tests and Mann-Whitney *U* tests—in order to compensate and better explain the results despite these violations.

Discussion

Given the estimated rates of IP feelings, it is likely that most academics have experienced feeling like an intellectual fraud. Indeed, the prevalence of these feelings may lead us to believe that IP in postgraduate school is merely a reality of academia. What researcher has not felt inadequate when faced with challenging concepts? What educator has not feared exposure whilst lecturing on a topic for which he or she feels unprepared? The danger of brushing aside these feelings is illuminated by the abundance of IP research and its consequences, from substance abuse and depression to an inability to enjoy success (Clance and O'Toole 1987). Given that those affected by IP rarely expose themselves (Harvey and Katz 1985), it is possible that many of our most promising postgraduate students suffer from IP in isolation and will likely not seek help.

Fortunately, clinical psychologists have identified explicit solutions to help those affected, and these solutions can be adapted to an academic context through interventions based on literacy theory and practice. Work in academic and disciplinary literacies (Lea 1998; Lea and Street 1998; Shanahan, Fisher, and Frey 2012), paired with other strategies in content area reading and writing studies (Ehlinger and Pritchard 1994; Wilhelm 2001; Robinson 1961) and Discourse (Gee 2012) can help bridge the intellectual gap postgraduate students may experience. When combined with the power of identifying impostor phenomenon as something common, providing mentorship, and building community among sufferers, these strategies may help decrease impostor feelings and allow postgraduate students to better succeed in academia. Such strategies could also inform recent findings on postgraduate student stress and the need for institutional support, including support for postgraduate students excelling in their programmes (Barry et al. 2018).

Naturally, we can see the importance of academic mentorship in this project's findings. Lee's (2008) holistic framework for mentoring postgraduate students argued that appropriate supervision should include functional, enculturation, critical thinking, emancipation, and

relationship development elements. For example, Lee wrote that supervisors ought to provide a rational progression through tasks (functional), encourage reflection (emancipation), and supervise by experience (relationship development). Later, Lee and Murray (2015) expanded on this framework by identifying practices specific to writing. For example, supervisors could provide instruction on the practice of academic writing (functional), discuss approaches to writing motivation (emancipation), and discuss writing processes (relationship development). This project finds support in this approach to supervision by following this holistic approach and expanding it to larger literacy principles.

Building on Lee (2008) and Lee and Murray's (2015) framework, this project suggests steps advisors could take to reduce IP in their mentees. First, advisors can identify the prevalence of impostor feelings in academia, connecting to enculturation and relationship development elements. Second, advisors can identify and explain their own literacy practices, coinciding with the enculturation, critical thinking, and relationship development elements. Finally, advisors can give equal emphasis to academic processes and discourse as they do academic content to ensure appropriate emancipation and relationship development. Including these elements into doctoral supervision would provide similar guidance as the interventions in a mentor-mentee relationship.

Conclusion

The context of academia provides a fertile ground for impostor phenomenon feelings to flourish. While the consequences of these impostor feelings identified by clinical psychologists are worrisome, early work in the psychological literature has identified general principles that could be utilised to reduce impostor feelings and their effects. Paramount to these principles are to take seriously the effects of impostor feelings and to provide appropriate mentorship that could demystify the context of the environment in which those feelings occur.

This article shows how these general principles from clinical psychology can be

combined with research in literacy pedagogy to create interventions to reduce impostor phenomenon feelings in postgraduate students. Inspired by research in literacy, rhetoric and composition, and academic writing, the interventions sought to reduce impostor phenomenon feelings by teaching the academic skill sets required for success in a postgraduate degree. Relative to a control group, those who participated in the interventions experienced a drop in impostor phenomenon feelings.

Such interventions could be adapted by postgraduate programmes and advisor/advisee relationships. This project builds on Lee (2008) and Lee and Murray's (2015) holistic framework for doctoral supervision by identifying how the framework could be expanded to reducing impostor phenomenon feelings via functional, enculturation, critical thinking, emancipation, and relationship development elements.

More research is needed to explore impostor phenomenon feelings and how to reduce them in postgraduate students. For example, future research could clarify our understanding of impostor phenomenon in postgraduate education by exploring how the reduction in impostor feelings can remain reduced. While many authors have argued that IP feelings are situation-specific (Edwards et al. 1987; Harvey and Katz 1985; Mischel 1968; Peterson 1968), we do not know the extent to which IP feelings can be reduced and remain reduced within the same context. My most recent follow up with the intervention participants suggests that the decreased IP feelings remained low, as all participants ultimately completed their graduate programmes or are in their final year as of this writing. That said, future research could identify the long-term nature of impostor feelings in postgraduates. Additional research could also explore more fully how to reduce impostor phenomenon feelings in the domains of gender (Clance and Imes 1978), ethnicity (Ewing et al. 1996), and postgraduate qualifications and disciplines. Finally, additional research could build on these literacy-based interventions to determine which elements of instruction tend to have the most impact on the reduction of impostor feelings. What other elements of academia could be demystified in a workshop

setting? Would other workshop structures (e.g., one-day workshops or term-long meetings) be more beneficial? What affect do postgraduate communities have on impostor phenomenon feelings outside of explicit skill set instruction? Each of these questions could serve as a research foundation to any scholar interested in reducing impostor feelings in academia.

In conclusion, this paper hopes to transition the current conversation from impostor phenomenon as merely a feature of academia to one exploring how we can reduce impostor feelings and their consequences in our postgraduate students. Additional research could help identify the various ways postgraduate students experience impostor feelings and how additional intervention approaches could reduce the effects.

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