Exploring the Occurrence of the Impostor Phenomenon and Level of Self-efficacy Amongst Students in University Courses Dominated by the Opposite Gender

by

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Declaration

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I declare that

EXPLORING THE OCCURRENCE OF THE IMPOSTOR PHENOMENON AND LEVEL OF SELF-EFFICACY AMONGST STUDENTS IN UNIVERSITY COURSES DOMINATED BY THE OPPOSITE GENDER

is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete reference.

Ms Matilde van Niekerk

.....

SIGNATURE

DATE: 27/08/2020

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Abstract

The impostor phenomenon (IP) refers to a feeling of intellectual inadequacy which is especially prevalent in university contexts and leads to high attrition rates (Parkman & Beard, 2009), depression (McGregor, Gee, & Posey, 2008), and anxiety (Fraenza, 2016) among students. The impostor phenomenon is negatively related to career development, as sufferers may fail to plan for their careers or to create appropriate strategies to reach their goals (Neureiter & Traut-Mattausch, 2016). The primary purpose of this study was to determine whether participants enrolled in a university course which is dominated by the opposite gender are more likely to experience the impostor phenomenon. This study specifically looked at engineering and nursing undergraduate students. The objectives of this study included exploring the relationship between the impostor phenomenon and self-efficacy, as well as exploring the occurrence thereof among participants in either traditional or non-traditional university courses. This quantitative study (N = 214) made use of a factorial design and data were collected through the use of the Clance Impostor Phenomenon Scale (Clance, 1985) and the Career-Decision Self-Efficacy Scale, short form (Betz, Klein, & Taylor, 1996). Results indicated that, as expected, women who are enrolled in male-dominated engineering courses do score higher on the Impostor Phenomenon Scale than both men and women in traditional courses. However, this study did not find differences in the level of career-decisions self-efficacy between the male and female samples, regardless of the gender composition of their specific courses. The researcher postulates that this may be due to the sheer determination of the women in atypical courses to succeed and persist in their studies. The researcher also found a negative relationship between IP and self-efficacy.

Key words: Impostor Phenomenon, self-efficacy, gender, career decisions, engineering, nursing

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Chapter 1: Introduction

1.1 Introduction

The term Impostor Phenomenon (IP) refers to an internal experience of intellectual phoniness (Clance & Imes, 1978). Individuals who are experiencing the impostor phenomenon believe that they have faked their success and falsely led those around them to believing that they are more competent or intelligent than they truly are. They experience intense feelings of inauthenticity related to their achievements as they are unable to internalise their success, often attributing it to external factors such as luck, charm or effort. Such individuals also experience intense anxiety over the possibility of being exposed as impostors (Harvey & Katz, 1985). Since these individuals believe that rewards and acclaim were falsely bestowed upon them, they experience an intense fear of being discovered as imposters, which lead to heightened feelings of stress and anxiety. Thus, the imposter phenomenon refers to individuals who are successful by external standards but experience an illusion of personal incompetence (Chrisman, Pieper, Clance, Holland, & Glickauf-Hughes, 1995).

This study is rooted in Bandura's (1986) social cognitive theory with specific reference to self-efficacy. Self-efficacy refers to an individual's judgement of their capabilities to produce designated levels of performance (Bandura, 1986). Self-efficacy is intrinsically linked to IP, as those who experience it chronically doubt their capabilities (Clance & Imes, 1978). Bandura (1986) argues that self-efficacy beliefs are as influential as ability in predicting task attainment, and high self-efficacy is related to successful outcomes. Efficacy beliefs refer to an individual's beliefs about their own capabilities to achieve specific tasks, thus these beliefs are not related to actual outcomes but rather refer to a subjective, internal experience. Bandura (1986) argues that an individual's beliefs about their capabilities influence the choices they make, the activities they undertake and how much effort they put forth. Therefore, individuals will pursue activities they feel capable of doing while avoiding those in which they doubt themselves.

1.2 Operationalisation of Terms

For the purpose of this study, the researcher employed an operational definition which defines IP as "observed anxiety caused by an individual's feelings of fraudulence, fear of being exposed as a fraud, and inability to internalise personal achievement" (Clark,

Vardeman, & Barba, 2014, p. 225). Regarding self-efficacy, the researcher employed an operationalised definition of career-decisions' self-efficacy as "an individual's confidence in their capacity to successfully complete tasks related to making decisions about their career" (Lo Presti et al., 2013, p. 337).

1.3 Research Problem and Objectives

The researcher sought to determine the occurrence of the impostor phenomenon and level of self-efficacy among undergraduate students in university courses that are traditionally dominated by the opposite gender at the University of Pretoria. IP occurs across all walks of life, and an estimated 70% of all individuals will experience some level of impostor experiences during their lifetimes (Gravois, 2007). IP is especially prevalent amongst those who are undertaking new challenges or undergoing life changes, such as entering university. IP has been studied on both graduate and undergraduate level across a variety of disciplines, including psychology (Clancey, 2013; Dompe, 2010; Ferrari & Thompson, 2006); engineering (Felder, 1988); and medical, dental, nursing and pharmacology students (Henning, Ey, & Shaw, 1998; Prata & Gietzen, 2007).

Participants were asked to complete an online questionnaire which consisted of biographical data, the Clance Impostor Phenomenon Scale (CIPS), and a short form of the Career-Decision Self-Efficacy Scale (CDSES-SF). This allowed the researcher to determine how self-efficacy (SE) influences the impostor phenomenon (IP) as well as the extent to which IP is occurring amongst the participants.

The research question is as follows: How do the levels of IP and self-efficacy of men and women in traditionally male university courses (engineering) and traditionally female (nursing) university courses differ?

The primary aim of this study was to determine whether participants enrolled in a university course which is dominated by the opposite gender are more likely to experience IP. In order to address this aim, the following objectives were formulated:

- The objective of the proposed study was to collect data on the participants' levels of IP and self-efficacy.

- This study's objective was to compare the levels of IP and self-efficacy between the groups divided on gender and study course to determine whether those who are in non-traditional courses are more likely to experience high levels of IP and low levels of self-efficacy.
- Another objective of this study was to determine whether there is a relationship between IP and self-efficacy.

1.4 Justification

According to a recent survey in the United Kingdom, a mere 15% of engineering undergraduate students are women (Greig & Pell, 2017). At the University of Pretoria (UP), enrolment data shows that from 2018 to 2020 the gender composition of the Nursing Science degree is consistently 90% women and 10% men. Electrical engineering figures show a similar pattern as in 2018; of the 251 students, 14% were women, while 86% were men; in 2019, of the 192 students, 14% were again women, while 86% were men, and in 2020, of the 126 students, 13% were women, while 87% were men. These patterns are consistent for all the engineering courses, as in 2020, of the 257 Electronic engineering students, 19% were women and 81% were men, and of the 338 Computer engineering students, 11% were women while 89% were men. Thus, the field of engineering remains male-dominated and nursing sciences remain female-dominated. Gender stereotypes are often prevalent in these disciplines and since so much of the impostor experience stems from violating gender expectations, the impostor phenomenon may be brought forth by being a male in a female-dominated course, or vice versa.

The scope of this study pertained specifically to individuals enrolled at a South African university in either nursing or engineering undergraduate courses. While the study only looked at these disciplines specifically, it may still provide valuable information on the influence of the gender composition of a discipline and the incidence of IP.

According to Neureiter and Traut-Mattausch (2016), IP is negatively related to career development, specifically to career planning. Career planning refers to future-oriented thinking and the visualisation of possible pathways to specific career goals. Since individuals suffering from IP are unaware of their competencies, they may fail to plan for their careers or to create strategies to reach their goals. IP also has a range of adverse effects on students'

mental health. Studies have found that IP is linked to higher incidences of depression (McGregor et al., 2008), and high levels of anxiety (Fraenza, 2016). Furthermore, those who experience IP tend to suffer in silence as their fear of being discovered as an "impostor" prevents them from seeking help (Clance & Imes, 1978). According to Halvorson (2010), reading about loneliness can actually help to decrease such feelings as it makes one aware of just how common such experiences are. This leads the individual to the realisation that they are not alone. The proposed study has the potential to increase awareness about this little-known phenomenon, which may encourage sufferers to reach out or to feel less alone, which in turn could improve student mental health care. Furthermore, the way in which IP is expressed differently across genders is still poorly understood and this study could provide an insight into this link. Furthermore, this study adds to the existing body of knowledge by furthering our understanding of how the gender composition of the enrolment to a course relates to the occurrence of IP. While most of the seminal work on IP is concerned with women's experiences, this study has the potential to also further our understanding of IP amongst men, as it offers a novel look into how males experience IP in female-dominated courses.

1.5 Chapter Outline

This chapter provided an overview of the research problem as well as a brief background of the study. This chapter also outlined the purpose, aim and objectives of the study. In Chapter 2 the researcher provides a review of the literature. The literature review is focused on the impostor phenomenon, self-efficacy, the role that gender plays in these variables, all within the context of tertiary education. In the third chapter the researcher gives a detailed account of how data were collected and analysed as well as descriptions of the measurement instruments used in this study. Chapter 4 provides an analysis of the data obtained by the researcher, which is discussed in further detail in Chapter 5. Finally, the researcher concludes the study in Chapter 6 along with the limitations of this study and research recommendations for future studies.

Chapter 2: Literature Review

2.1 Introduction

In this chapter the researcher explored both formative and recent literature, using the emergence and development of the impostor phenomenon as the point of departure. The researcher discussed the characteristics of IP, as well as the cyclical nature thereof. This was followed by an exploration of the concept of self-efficacy and the sources thereof. Furthermore, the researcher examined the role of gender in relation to both IP and self-efficacy and, finally, the intersection of these variables was explored within the context of tertiary education.

2.2 The Impostor Phenomenon

Author Neil Gaiman (2017) shares a story on his blog:

> Some years ago, I was lucky enough to be invited to a gathering of great and good people: artists and scientists, writers and discoverers of things. And I felt that at any moment they would realise that I didn't qualify to be there, among these people who had really done things.
>
> On my second or third night there, I was standing at the back of the hall, while a musical entertainment happened, and I started talking to a very nice, polite, elderly gentleman about several things, including our shared first name. And then he pointed to the hall of people, and said words to the effect of, "I just look at all these people, and I think, what the heck am I doing here? They've made amazing things. I just went where I was sent." And I said, "Yes. But you *were* the first man on the moon. I think that counts for something.

This story highlights the widespread and indiscriminate nature of the impostor phenomenon, an experience that 70% of us will face at one point or another (Gravois, 2007). The term *Impostor Phenomenon* (IP) was coined by psychotherapists Clance and Imes (1978), who treated several high-achieving women who reported the secret belief that they were undeserving of the success and recognition they received. "Despite their earned degrees scholastic honours, high achievements on standardised tests, praise and professional recognition from colleagues and respected authorities these women do not experience an

internal sense of success" (Clance & Imes, 1978, p. 1). These women held the conviction that they were less intelligent and competent than others believed them to be and tended to attribute their success to luck, charm or effort. Those who experience the imposter phenomenon therefore fail to internalise their success and instead attribute this success to external factors unrelated to their abilities (Clance, Dingman, Reviere, & Stober, 1995).

Clance and Imes (1978) report that most of the individuals they studied admitted to experiencing a combination of the following: dwelling on what they do not know, a fear of not living up to expectations, a desire to be a top performer, remaining overwhelmed by meeting a perfectionist level of performance, feeling terrorised by failure, a constant feeling of incompetence and guilt feelings when experiencing success. Such individuals also tend to compare themselves to others, emphasising the strengths of others along with their own deficits, while simultaneously denying the effort put forth by others and their own power and capabilities (Clance et al., 1995). Since such individuals believed that rewards and acclaim were falsely bestowed upon them, they experienced an intense fear of being discovered as imposters, which led to heightened feelings of stress and anxiety. The imposter phenomenon therefore refers to individuals who are successful by external standards but experience an illusion of personal incompetence (Chrisman et al., 1995). For those experiencing the impostor phenomenon, success does not always equal happiness, as feelings of being an intellectual impostor can cause personal distress and lead to maladaptive behaviours. Such individuals are prone to fear, worry, low levels of confidence and awkward feeling surrounding their own success (Sakulku & Alexander, 2011). Since feeling like an impostor is an internal experience, those experiencing IP will try to hide these experiences, fearing that someone will indeed confirm that they are intellectual impostors. Such individuals experience terror at the thought of failure and go to great lengths to avoid mistakes (Wierzchowski, 2019).

Subsequent research has revealed varied conceptualisations of IP. Harvey and Katz (1985) employed a more specific conceptualisation of IP than Clance and Imes (1978). Harvey and Katz (1985) described someone as possessing imposter tendencies if: (a) they believe they have fooled others, (b) fear being exposed as a fraud, and (c) are unable to internalise their successes. Kolligian and Sternberg (1991) criticise the term impostor phenomenon as it could be mistaken for a mental disorder, rather than an experience or phenomenon. They propose using the term *Perceived Fraudulence* instead.

The impostor phenomenon is also sometimes referred to as impostor syndrome; however, since it refers to a subjective reaction to a certain set of stimuli or events and comprises an experience and not a mental disorder recognised by the Diagnostic and Statistical Manual (DSM) of mental disorders, *Impostor Phenomenon* is considered to be the correct term as the word 'syndrome' is indicative of an illness or disorder (Clance, 2013). As Clance (1985, p. 23) states, IP is not a "pathological disease that is inherently self-damaging or destructive", but rather refers to an interference in an individual's psychological well-being. IP is now thought of as an evoked affective response to particular situations (McElwee & Yurak, 2010). High levels of IP may lead to feelings of self-doubt and anxiety, which in turn limit self-acceptance of success due to the lack of *perceived* personal ability (Clance et al., 1995).

2.2.1 The Impostor Cycle

The impostor phenomenon comprises six (6) characteristics, each of which can have an impact on an individual's IP experiences, namely the impostor cycle, the need to be special or the "very best", a fear of failure, superwoman/superman aspects, a denial of competence and discounting of praise, as well as a fear of guilt concerning success. According to Clance (1985), the impostor phenomenon is marked by all six (6) of these characteristics; however, a minimum of two (2) are necessary for one to experience the impostor phenomenon.

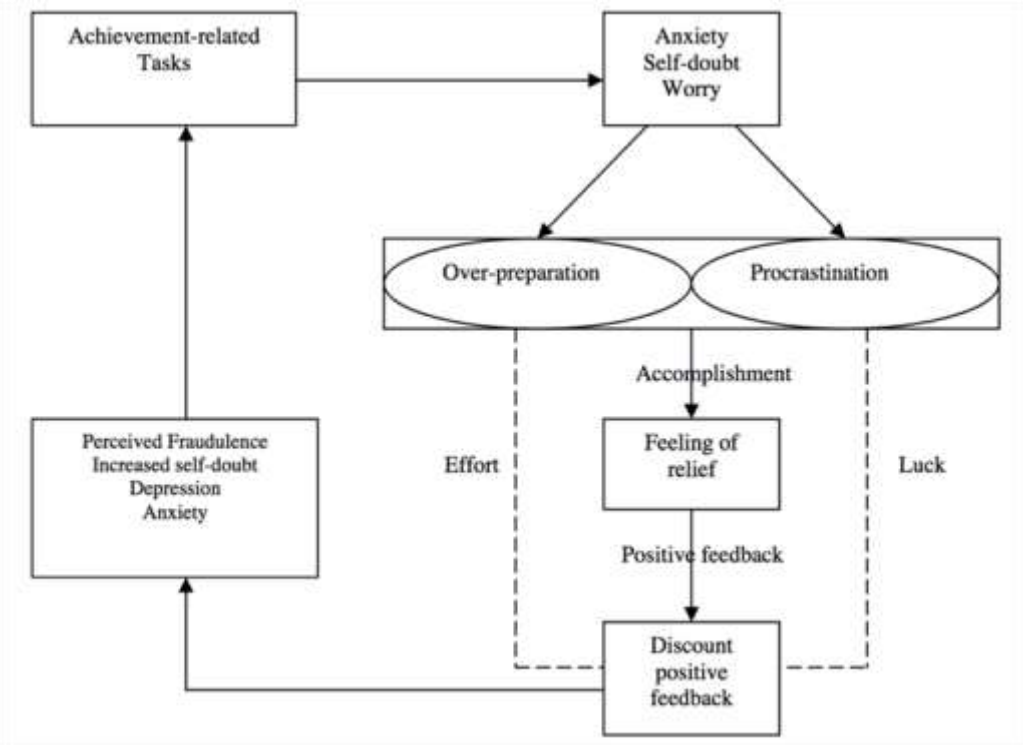
The impostor cycle takes place whenever an individual participates in an achievement-related task. Such tasks may cause those with impostor tendencies to experience anxiety, which typically leads to one of two responses, as illustrated in Figure 1. The individual may over-prepare for the task due to their anxiety, or they may continuously put the task off. This initial period of procrastination is then followed by a period of frenzied preparation (Sakulku & Alexander, 2011). After the completion of the task, the individual experiences an initial sense of relief and accomplishment; however, these feelings are short-lived and the individual may develop a false belief that they must suffer to ensure success (Pratt, 2020). Unfortunately, despite positive feedback for a task well done, these individuals fail to internalise their success as those who over-prepared attribute their success to working harder than their peers, while those who procrastinated attribute it to luck. Regardless of the preparation style, these individuals do not believe that their success is reflective of their true abilities. These feelings

induce a feeling of "having gotten away with it" as the individual feels that they have fooled those around them by hiding the fact that they are "impostors" (Sakulku & Alexander, 2011).

The combination of these flawed beliefs about the mechanisms of success and the individual's perceptions of luck start to create and reinforce a cycle of self-doubt which is repeated whenever a new task is introduced. This harmful cycle interferes with the individual's other priorities, leading to anxiety and working harder than necessary, as each task completed successfully further reinforces the individual's feelings of fraudulence. This is further exacerbated by the impossibly high standards those with impostor tendencies often set for themselves, as well as the predisposition to discount positive feedback (Clance, 1985).

Figure 1

Diagram depicting the Impostor Cycle based on Clance (1985), as illustrated by Sakulku and Alexander (2011)



In addition to the impostor cycle, Sakulku and Alexander (2011) also discuss the other five aspects of the impostor phenomenon. Firstly, concerning the need to be special or the very best, Sakulku and Alexander (2011) report that those with imposter tendencies are likely to find themselves at the top of their classes. However, when entering larger settings, they often come to realise that they are not as exceptional as they previously thought. This realisation

may reinforce the idea that if one is not the absolute best, they are not intelligent. Secondly, the superman/superwoman aspect of IP comprises perfectionistic tendencies. IP sufferers have a desperate need to be special, to not only overcome obstacles but to be outstanding (Patzak, Kollmayer, & Schober, 2017). These individuals set impossibly high standards for themselves which often lead to feeling overwhelmed and disappointed, and they may begin to overgeneralise themselves as failures. Thirdly, a denial of competence and rejection of praise also plague those suffering with IP as they have difficulty internalising their success. Fourthly, the fear of failure is likely to present itself when the individual is exposed to an achievement-related activity. To an impostor, failure is associated with making errors, not performing to the best of one's ability, shame and humiliation. Finally, a fear of success is also related to the negative consequences of completing an achievement-related task successfully. If success is novel to the individual or their social circle, it may lead the individual to feel more disconnected from their peers, exacerbating their worries of rejection. Fear of success is also related to how individuals will respond to future tasks; after the successful completion of a task, the individual may worry about an increase in demand and expectation from those around them. Such individuals worry about maintaining their current level of performance, which may make them more reluctant to accept additional responsibilities out of a fear of revealing their intellectual phoniness (Sakulku & Alexander, 2011). Importantly, Clance and Imes (1978) note that most individuals suffering from IP would not describe themselves as victims of this phenomenon; however, when they are confronted with a description of the IP features such as the ones above, they often identify with several of the characteristics.

2.3 Self-Efficacy

Self-efficacy refers to an individual's judgement of their capabilities to produce designated levels of performance (Bandura, 1986). Self-efficacy is intrinsically linked to IP as those who experience it chronically doubt their capabilities (Clance & Imes, 1978). Bandura (1986) argues that self-efficacy beliefs are as influential as ability in predicting task attainment and high self-efficacy is related to successful outcomes. Efficacy beliefs refer to an individual's beliefs about their own capabilities to achieve specific tasks, thus these beliefs are not related to actual outcomes but rather refer to a subjective, internal experience. Bandura (1986) argues that an individual's beliefs about their capabilities influence the choices they make, the activities they undertake and how much effort they put forth. Therefore, individuals will

pursue activities they feel capable of doing while avoiding those in which they doubt themselves. This can prove to be problematic since those suffering from IP chronically doubt their capabilities. According to Vergauwe, Wille, Feys, De Fruyt and Anseel (2015), the concept of *perceived fraudulence* or the belief that others perceive you as more capable than you are, is responsible for these individuals' low self-efficacy. Compared to other core self-evaluations, such as emotional stability and self-esteem, self-efficacy showed the strongest relationship to IP.

2.3.1 Sources of Self-Efficacy

According to the social cognitive theory, individuals form their self-efficacy perceptions by interpreting information from four sources. The first, and most important source of information, comes from *mastery experience* (Bandura, 1986). Authentic mastery experiences create a strong sense of efficacy to accomplish similar tasks, while negative experiences or perceived failures decrease self-efficacy. This concept has an interesting relationship with IP, as sufferers chronically doubt their ability to replicate previous successes due to a failure to internalise their previous successes. Additionally, impostors often experience a fear of being evaluated, which may make them unable to master experiences, as they may refrain from undertaking tasks due to this fear (Clance & Imes, 1978).

The second source of self-efficacy information comes from the *vicarious experience* that individuals undergo when they observe others performing a task successfully (Bandura, 1986). Observing a social model, someone an individual perceives as similar to themselves in terms of capability, contributes to an individual's beliefs about their own capabilities.

This source of self-efficacy is often used during transitional periods when the standards by which proficiency are measured are unknown (Chen & Usher, 2013). This source of self-efficacy may be negatively affected by the gender make-up of a course as the individual may not have access to a role model or mentor they perceive as similar to themselves. Mentoring of this kind can be an essential source of emotional support, guidance and modelling, promoting academic engagement and confidence. Previous research on university students enrolled in science, technology, engineering and mathematics (STEM) fields consistently finds that women report feeling more isolated and receiving less mentoring than their male counterparts (Burke & Sunal, 2010).

The third source of information comes from *verbal persuasions;* verbal messages and social encouragement assist individuals in exerting extra effort and maintaining the persistence required to succeed. This results in the continued development of skills and self-efficacy (Bandura, 1986). However, verbal messages can also work to undermine efficacy beliefs when used to convince individuals that they lack capabilities (Chen & Usher, 2013). This is evident when women receive messages that they do not belong in male-dominated fields. Such messages make women vulnerable to internalising the belief that they are not and cannot be competent in such fields. Furthermore, it is easier to undermine efficacy beliefs through verbal persuasion than it is to encourage them (Bandura, 1986).

The fourth source of information is derived from individuals' *arousal states* (Bandura, 1986). Stress and tension are often interpreted as indicators of susceptibility to failure. An individual's mood also affects self-efficacy beliefs, as optimism and a positive mood enhance self-efficacy beliefs while depression and despondency diminish them (Pajares & Zeldin, 2000).

These four sources of information have varying effects on self-efficacy beliefs related to STEM fields. Pajares and Zeldin (2000) report interesting gender differences, including that males report more mathematics-related performance accomplishments than women, while women report more vicarious learning and persuasive experiences than their male counterparts. Additionally, women in universities' perceptions of their capabilities to succeed in STEM fields are significantly lower than those of men in the same fields. Women who are competent in such fields often fail to pursue field-related careers due to their lower self-efficacy perceptions regarding their competence (Pajares & Zeldin, 2000).

Similar to IP, self-efficacy is also cyclical. Rittmayer and Beier (2009) state that STEM self-efficacy predicts academic performance beyond one's own ability or previous achievements, as higher self-efficacy tends to be positively related to STEM task performance. Bandura (1997) argues that the relationship between self-efficacy and performance is reciprocal and ongoing. When an individual completes a task successfully, their self-efficacy should increase, which should lead to the adoption of more difficult goals. In turn, these more difficult goals may lead to greater effort in completing a task, which should also affect performance positively. When the individual completes the new and more difficult tasks

successfully, their self-efficacy should increase again, creating a cycle. Due to the reciprocal nature of the self-efficacy-performance cycle, it is essential that the individual's beliefs about their capabilities are accurate in order to produce positive results and not undermine one's own performance (Vancouver & Kendall, 2006). For example, if one student has high mathematics self-efficacy while another has low mathematics self-efficacy, the way they study for and perform in an examination will differ.

2.3.2 Career-Decisions Self-Efficacy

Self-efficacy refers to an individual's belief in their ability to perform a particular behaviour; the concept of self-efficacy is specific to particular scenarios, therefore it has to be related to behaviour to have meaning. There are therefore several different types of self-efficacy, such as research self-efficacy, academic self-efficacy and career-decisions self-efficacy. When an individual has low self-efficacy expectations regarding a specific behaviour, they may avoid that behaviour (Reddan, 2015). According to Betz (2000), perceived self-efficacy has an influence on our behaviour in that it may lead to the approach or avoidance of certain behaviours, influences the quality of our behaviour and affects our persistence in the face of obstacles in a specific domain. Therefore, self-efficacy can be useful for predicting and understanding behaviour. *Career-decision self-efficacy* refers to an individual's confidence in their capacity to complete tasks related to making decisions about their careers successfully (Lo Presti et al., 2013). These tasks and behaviours include self-appraisals, setting goals, solving problems, planning ahead, and gathering information related to an occupation (Betz et al., 1996). Having low self-efficacy expectations in career decision-making may lead to the restriction of career choices, which in turn leads to anxiety and avoidance of career pursuits (Jiang, 2014).

Concerning the relationship between career-decisions self-efficacy and the Impostor Phenomenon, Neureiter and Traut-Mattausch (2017) investigated the relationship between career adaptability resources and IP. They argue that the thoughts and behaviours concerning career developmental tasks can be described as "adapting resources" which consist of career planning, career decision-making difficulties, career exploration and occupational self-efficacy. In their results, IP emerged as a negative mediating variable. IP was shown to have a strong negative effect on career planning and career decision-making, as participants with

more IP experiences reported less career-planning and more difficulty in making career decisions.

2.4 The Role of Gender in IP and Self-Efficacy

Since so much of the concern imposters experience stems from violating expectations, gender is likely to play a unique role in the relationship between IP and performance-related outcomes. In their seminal work, Clance et al. (1995) propose that IP is rooted in interpersonal and social contexts for women specifically. Familial and societal messages impose certain values on children and what is deemed to be socially desirable differs depending on the gender of the child.

According to the social role theory, society expects agentic behaviour, such as competence and objectivity from men, while expecting communal behaviour such as warmth and expressiveness from women (Eagly & Wood, 2012). These norms are communicated and enforced through interactions with society, and form part of the individual's identity. IP is thus linked to an individual's perception of their success. These societal messages establish qualities associated with achievement and success; independence, assertiveness, power and self-confidence in direct conflict with femininity. This conflict leads to women experiencing confusion concerning their success. Women may then attempt to deal with this confusion by keeping their achievements out of their awareness through denying their success or attributing their success to more acceptable and traditionally feminine skills, such as their interpersonal skills.

This relates back to Bandura's (1986) sources of self-efficacy, specifically mastery experience, as it is related to how one perceives and interprets past experiences. When individuals complete a task successfully, their beliefs about their capabilities to perform well increase; however, this cannot occur if the individual rejects their success or fails to internalise it, as is the case with those experiencing IP. In their work, Eccles et al. (1993) examined childhood parental messages and found that parents were more likely to attribute a male child's success in mathematics to natural ability, while attributing a female child's success to effort on her part. Such overt and covert messages concerning the ways that achievement is related to effort rather than talent may contribute to the development of IP in women. Societal and parental messages therefore encourage children to behave in ways

which confirm gender stereotypes. Such children may then develop IP when their chosen career paths or their successes create confusion.

2.4.1 IP in Men and Women

IP was initially thought to pertain exclusively to high-achieving women, as Clance and Imes (1978) describe IP as gender typical; however, subsequent research has found mixed results. While a significant body of literature found no differences in IP across genders (Kumar & Jagacinski, 2006; McGregor et al., 2008; Oriel, Plane, & Mundt, 2004; Prata & Gietzen, 2007), other studies found that IP is expressed differently in men and women.

A study in the United States of America investigated IP and levels of burnout amongst medical students and found a significant association between women and IP, with nearly half of the female sample reporting IP experiences compared to a quarter of their male counterparts (Villwock, Sobin, Koester, & Harris, 2016). Badawy, Gazdag, Bentley, and Brouer (2018) also explore the relationship between IP and gender. They argue that those with IP experience self-discrepancies as they perceive differences between the way they view themselves (self-view) and how they believe others view them (other view). When an individual experiences such self-discrepancies, they feel uncomfortable and are motivated to behave in ways that reduce these discrepancies. Individuals experiencing IP suffer from discrepancies about their competencies as they do not believe themselves to be as competent as others view them to be, while at the same time doubting their ability to boost their competencies. Since these individuals experience these competence-based self-discrepancies chronically, they adopt coping mechanisms though which they use external means of justifying poor performances. This is done to resolve their self-discrepancies and avoid both the discomfort and consequences of being found out by others.

One such coping mechanism refers to feedback (Badawy et al., 2018). Feedback encourages individuals to either continue or stop engaging in certain behaviours. Negative feedback could prompt a self-discrepancy in some individuals as it is often met with denial, defensiveness or corrective behaviours, such as working harder. However, individuals experiencing IP tend to react differently to negative feedback. Since these individuals experience a lack of personal agency and believe they are incapable of having the competence others believe they possess, negative feedback serves to confirm their beliefs

about their agency and competence, thus inhibiting an increase in subsequent work effort. These individuals tend to feel guilt and humiliation when receiving negative feedback; they internalise the blame for the failure and tend to interpret a single feedback instance as indicative of their entire self. This pattern is in direct contrast with normative reactions of defensiveness or denial. Therefore, individuals experiencing IP may engage in self-handicapping behaviours, as noted by Cowman and Ferrari (2002); imposters create an impediment to their success, for example not exerting enough effort, and then blame their eventual poor performance on that impediment.

Another coping mechanism refers to accountability; like negative feedback, accountability should also activate competence-based components of the self-concept and it can also strain an individual experiencing IP's performance (Badawy et al., 2018). Feelings of accountability in the workplace or academic setting cause individuals to believe that failure to perform appropriate actions will be met with personal consequences. Experiencing high levels of accountability leads one to expect to have to answer to the appropriate authorities if the required standards are not met. Accountability therefore heightens the salience of an individual's competence-based self-concept and the importance of acting in line with others' views of their competence. Therefore, accountability motivates non-imposters to enhance their efforts in anticipation of such expectations, while having the opposite effect on those experiencing IP. Experiencing high accountability may lead those experiencing IP to perform poorly, as their self-perceived lack of competence triggers negative emotions and anxiety. This motivates these individuals to reduce their initial effort as a means of preserving how others view their competency.

Badawy et al.'s (2018) study found that men experiencing IP fare far worse than women when confronted with performance cues. Men with IP experience greater anxiety after receiving negative feedback and exhibit less effort and poorer performances on tasks when held accountable. This greater negative reaction of male imposters could possibly be linked to the expectations of agentic and competent behaviours from men (Bian, Leslie, & Cimpian, 2017). In contrast, Badawy et al. (2018) found that when women with high IP scores were faced with negative feedback, they exerted more effort and performed marginally better. These results reflect those of Villwock et al. (2016), who found that gender differences in IP led to different coping mechanisms, as women tended to manage their IP by working harder, while men tended to avoid areas in which they lacked self-efficacy.

Hutchinson, Follman, and Antoine (2006) explored the idea that those who are experiencing IP define their success by a single factor, negating their previous successes. Due to a fear of evaluation, those experiencing IP are more likely to reject opportunities for advancement, which has an exacerbating effect on their self-confidence. Gender stereotypes are another aggravating factor which prevents women specifically from achieving their potential. According to Hutchinson et al. (2006), men receive encouragement from faculty and mentors to pursue their goals despite their fears, while women in similar positions lack such support systems. This shows us the unequal availability of sources of self-efficacy to men and women, such as verbal persuasions and vicarious experiences. This can be especially damaging, as research has shown that women tended to rely on verbal persuasion and vicarious learning to influence their self-efficacy, while men showed a preference for mastery experience (Management Association Information Resources, 2011). This may be because women lack opportunities to engage in authentic mastery experiences in male-dominated domains (Pajares & Zeldin, 2000).

These gender stereotypes create a situation in which women are torn between the solidarity of their identities as women and the autonomy that would accompany their success. Women's positions as nurturers are more generally accepted by society, making them more likely to have other duties less committed to by their male counterparts (Ertl, Luttenberger, & Paechter, 2017). If obstacles to support and responsibility coincide with IP, women are far less likely to pursue goals that can influence their level of achievement and satisfaction. Clance and Imes (1978) found that compared to men, women tended to have lower expectations of their ability to perform effectively in a wide range of tasks; women were also more likely to attribute their success to luck or effort and tended to interpret their failures as due to a lack of ability. As women shared their lower expectancies, they also displayed an internalised self-stereotype of societal gender role stereotypes which do not view women as capable. Although women wish to consider themselves as successful and intelligent, when societal expectations and their own self-evaluations are enabled, they experience a state of discordance which causes them to perceive their accomplishments as a result of factors other than their ability.

However, Patzak et al. (2017) argue that we must take into consideration the extent to which individuals identify with typical gender role orientations. Femininity and masculinity are

independent psychological dimensions which individuals can possess regardless of their gender. Masculinity is typically associated with achievement-oriented traits, while femininity has been associated with social-oriented traits. This argument was supported by the research findings of Patzak et al. (2017), which illustrated that students with undifferentiated or feminine gender-role orientations suffered more intensely from IP than those with masculine or androgynous gender-role orientations.

2.5 The Impostor Phenomenon and Self-Efficacy in the University Context

IP occurs across all walks of life; according to Gravois (2007), an estimated 70% of all individuals will experience some level of impostor feeling during their lifetime. This phenomenon has been found to be especially prevalent in university contexts which can have negative consequences on the retention of students, faculty and staff (Parkman & Beard, 2009). According to Kaiser (2005), students tend to exhibit higher levels of IP than those in the workforce, as they are prone to experiencing intense feelings of intellectual inadequacy and worry about being exposed as academic frauds. IP has been studied on both graduate and undergraduate level, across a variety of disciplines, including psychology (Clancey, 2013; Dompe, 2010; Ferrari & Thompson, 2006; Pratt, 2020), STEM fields (Chakraverty, 2019; Felder, 1988; Simon & Choi, 2018), and medical, dental, nursing and pharmacology students (Henning et al., 1998; Metz, Ballard, & Metz, 2020; Prata & Gietzen, 2007; Villwock et al., 2016).

Klinkhammer and Saul-Soprun (2009) identify four factors which make the university context likely to contribute to IP for faculty and students. Firstly, since IP is often accompanied by decreased self-confidence and low self-efficacy, the evaluative environment at universities causes a testing situation which leads to feelings of deficiency. Secondly, the competitive environment at universities makes individuals more likely to conceal their struggles. Faced with decreasing self-confidence, students may be more likely to internalise their mistakes, ruminate over failures and experience increased levels of anxiety and stress. Thirdly, within university contexts, students are faced with the "myth of the ingenious scholar" (Macha, 1992), which leads to the belief that they must work hard without needing rest or recreational time. This may lead students to associate rewards and recognition with anxiety and stress. Finally, students are faced with the need to adjust to new role expectations

and increased challenges which promote feelings of IP, as per Clance and Imes' (1978) statement that IP feelings are exacerbated when individuals are faced with new challenges.

In evaluative environments, such as the university context, distressing impostor feelings can increase quickly, and higher IP levels lead to higher attrition rates. When evaluation is constant and imminent, a cycle of fear starts in those experiencing feelings of fraudulence and self-doubt. As previously mentioned, the impostor cycle is concerned with two types of fear, a fear of failure and a fear of success. While previous literature has focused more on the fear of failure, fear of success seems to be equally intriguing as it is more difficult to measure quantitatively. Since both fears are provoked without conscious knowledge, they are often misinterpreted as anxiety, confusion, low self-esteem, or anger. These fears arise when an individual's script or sequence of expected behaviour in a specific context does not include success of the type they have achieved, and this leads to increased inhibition and soon negative consequences appear (Wierzchowski, 2019). For women in male-dominated STEM fields, achievement needs may be more closely related to self-image and social devaluation may cause significant levels of distress. Since both the fear of failure and fear of success have an impact on women's relationships with others, the need for social approval becomes more important. For those who value social acceptance highly, fear of success may become synonymous with fear of failure, suggesting considerable overlap between the two motives (Wierzchowski, 2019).

While students struggling with IP are often bright, hard-working and energetic, their chronic fears or misperceptions of their abilities may be persistent and unchanging. Such worries may manifest in self-doubt, anxiety or self-handicapping behaviours. Such students often feel guilty about their success and they may convince themselves that they were accepted into their university based on a mistake or dumb luck (Wierzchowski, 2019). IP has a number of implications for university students, as those who suffer are less likely than their unaffected peers to speak up or respond to questions voluntarily in class. This causes inherent differences in learning styles and the subsequent need to tailor curricula to accommodate the large portion of students struggling with IP (Villwock et al., 2016). IP has been found to reduce career adaptability resources that are positively related to career planning, career exploration, and occupational self-efficacy, and negatively related to career decision-making difficulties (Neureiter & Traut-Mattausch, 2017).

IP has also been linked to depression, and McGregor et al. (2008) investigated this relationship among 186 university students through the use of the Clance Impostor Phenomenon Scale (CIPS) and the Beck Depression Inventory. They found a positive correlation between impostor scores and depression, with the most significant relationship noted among women. The researchers stated that no significant gender differences were noted; however, they did find that most students who scored high on the IP scale also had higher depression scores. Unfortunately, university students are already a vulnerable population, as research shows that the age group of the average undergraduate student (18-24) coincides with a higher risk of mental health issues (Goodman, 2017; McBeath, Drysdale, & Bohn, 2017).

While students as a group are susceptible to IP, some students may be more vulnerable than others. IP is especially prevalent amongst minority students, regardless of whether that minority status is racial, ethnic or gender-based. A study by Cokley, McClain, Enciso and Martinez (2013) investigated IP and minority student status stress and reported a strong correlation between minority student status stress and IP with psychological stress and psychological well-being. Their findings indicate that IP was the strongest predictor in these relationships. These findings illustrate the importance of acceptance and integration, as Chapman (2017) argues that a sense of belonging, or rather a lack thereof, can contribute to the development, emergence and maintenance of IP. Some researchers have argued that first-generation students are also more susceptible to IP; however, a recent study by Haggard (2019) compared the IP experiences of first-generation undergraduate students to those of non-first-generation student. She found that non-first-generation students experienced greater impostor feelings compared to first-generation students and that there was no relationship between semesters at university and impostor scores. These results contraindicate those of previous studies, which have shown that first-generation students face many unique obstacles not faced by their non-first-generation peers, such as higher attrition rates (Ishitani, 2006), poorer confidence in their academic abilities (Hottinger & Rose, 2006), and feeling less prepared for university and an increased fear of failing (Bui, 2002). Haggard (2019) argues that one potential reason for the results she found is that non-first-generation students may experience pressure from highly educated family members, leading to feelings of intellectual inadequacy.

Concerning the South African context, currently no empirical work has been conducted on this particular combination of variables, which further justifies the need for this study.

2.5.1 Men in Nursing

Nursing has been a predominantly female career choice for centuries. Historically, nursing was one of the only options open to women who wanted to work; today women are drawn to the career due to the nurturing component thereof. Caring forms a central principle of the nursing profession, and when caring has been researched with implications of gender, it has been traditionally associated with femininity and women. When men who worked from home defined caring, they have described it as protecting and providing. This may make us question why society considers one definition to be any more or less caring than the other as, according to O'Lynn and Tranbarger (2007), the challenges posed by societal gender expectations depicted the definitions at large. In a phenomenological study Grady, Stewardson, and Hall (2008) report that male nursing students identified several obstacles to their participation in the nursing profession, including an absence of male faculty role models, faculty use of the word "she/sister" when referring to nurses, limited opportunities to work with male professional nurses, no history on men in nursing, little or no discussion of the appropriate use of touch, anxiety related to female patient care and inequitable treatment by the nursing faculty. Grady et al. (2008) argue that male nursing students feel discriminated against within the nursing profession and suggested further research. Lou, Yu, Hsu, and Dai (2007) investigated whether gender and sex role stereotyping were obstacles to the professional development amongst male nurses and reported that patients, co-workers and society all added to the widespread stereotyping which formed a major role stressor. Such stressors may pressure men into quitting the profession to find jobs which are traditionally more masculine.

2.5.2 Women in Engineering

Women now surpass men in overall rates of university graduation in many developed countries; however, gender segregation in fields of study persists. In a world where gender norms have changed while gender stereotypes remain strong, women may face many obstacles in STEM fields. Self-efficacy beliefs play a crucial role for those in STEM fields as they are often measured by comparing oneself to one's peers (Cech, Rubineau, Silbey, & Seron, 2011). Self-efficacy is also believed to affect specific groups significantly. Although

women have been reported to obtain higher grades than their male counterparts, they still demonstrate lower levels of self-efficacy in STEM-related fields (Huang & Brainnard, 2001). This may be due to the fact that girls and women are bombarded with messages that claim that their in-group performs worse in science and mathematics when compared to their male peers (Stout, Dasgupta, Hunsinger, & McManus, 2011). Worse still, these messages are often endorsed by teachers and family members. According to Cheryan, Plaut, Davies, and Steele (2009), subtle situational cues in STEM environments send messages to girls, indicating that they are out of place, which serve to effectively reduce women's sense of belonging and lower interest in pursuing STEM majors. When women enter university, they have received the message that they are out of place, and as a result, the gender gap remains clear and strong; consequently, women may fail to utilise their individual competencies, talents and interests in their career pursuits.

According to Nelson and McDaniel (2019), women in particular have significant fears of not being valued in the field of engineering and these fears are understood to be associated with their personal self-worth and self-esteem (Nelson, Newman, McDaniel, & Buboltz, 2013). Additionally, women in tertiary institutions have also been found to be less self-efficacious regarding their abilities in mathematics than men (Nelson & McDaniel, 2019). For men, having higher self-efficacy feelings contributed significantly to their consideration of a career that would utilise their mathematical and science abilities. Former investigations have identified that females are vulnerable to feelings of low self-esteem and low self-worth regarding personal self-efficacy, which are influential when they consider education or employment in engineering or other STEM fields. Women, having low self-efficacy, were significantly correlated to the number of women who chose and remained in engineering as a career (Rittmayer & Beier, 2009).

Furthermore, a significant number of women enrol in STEM disciplines, withdraw and change to different disciplines, a phenomenon referred to as STEM attrition. Chen and Soldner (2013) examined potential variables that may be contributing to STEM attrition, including the fear of failing, self-efficacy and IP. Their outcomes identified a negative correlation between fear of failure and self-efficacy, indicating that as fear of failure increased for STEM students, their individual self-efficacy feelings decreased. When personal self-efficacy disintegrates, it causes self-doubt that interferes with the students' motivation to pursue an education in a STEM field. This study also identified a positive

correlation between fear of failure and IP, indicating that as the students' fear of failure increased, so did their likelihood to display IP characteristics. These results are not surprising, as a fear of failure has previously been identified as a component to the construct of IP, thus these findings reinforce the original theoretical framework identifying fear of failure as a significant factor element to having IP (Clance, 1985).

Further studies on women in STEM fields, or rather a lack of women in STEM fields, make mention of *stereotype threats* by arguing that being outnumbered by men in a setting would be enough to cause women to experience detrimental effects from the negative stereotypes about their mathematical ability. Any environment that activates the threatening effects of gender stereotypes is considered to be a threatening intellectual environment. According to Inzlicht and Ben-Zeev (2000), any minority status evokes a group identity which is then incorporated into one's self-concept (e.g. a women being aware of their gender in a male-dominated workplace). This is also related to tokenism theory, in which Lord and Saenz (1985) argue that having a token status in an otherwise homogenous group can elicit cognitive deficits in all domains and even invoke feeling responsible for representing one's minority group favourably.

2.6 Conclusion

In conclusion, in this chapter the researcher discussed formative research and the emergence of the impostor phenomenon in 1978 by Clance and Imes, as well as the development of Bandura's (1986) concept of self-efficacy. Additionally, the researcher discussed more recent literature to explore the role of gender in these variables, as well as how they intersect within the university context as well as how the literature informed the study's design.

Chapter 3: Research Methodology

3.1 Introduction

This chapter focuses on this study's methodological approach and outlines the research design, the sampling methodology as well as the processes whereby data were collected and analysed. This study employed a quantitative approach whereby data were collected through the use of a questionnaire. This chapter also contains an exploration of the ethical considerations that were applicable to this study.

3.2 Paradigmatic Assumptions

This study ascribes to a post-positivistic paradigm. The post-positivistic paradigm was developed in response to the limitations of positivism. Positivism is concerned with that which can be observed and scientifically measured which is incompatible with the social sciences. Post-positivism was therefore created by combining aspects of positivism and interpretivism (DeLuca, Gallivan, & Kock, 2008). Post-positivistic research rejects the idea of an absolute truth and instead strives to explore phenomena scientifically, thus understanding phenomena rather than determining causality is the goal. Furthermore, post-positivism argues that for researchers to understand a phenomenon and those who experience it, they must take the meanings and interpretations of those individuals into account. This perspective is both interpretivist, as it recognises the need to understand and interpret the meanings participants ascribe to experiences, as well as constructivist, as it does not view social reality as something which is objective and independent, but rather something which emerges from participants' individual or collaborative construction of concepts, beliefs, values, ethics and norms (Fox, 2008).

3.3 Research Design

This study was of a quantitative nature. According to Faulkner and Faulkner (2014), quantitative research seeks to explain the relationships between two or more factors using numerical representation. The researcher made use of a factorial design in which a factor referred to an independent variable and a factorial design referred to studies that included two or more factors (Gravetter & Forzano, 2016). The researcher employed a 2x2 factorial design. The two factors at play in this study referred to the gender of the participant (male and

female) and the university course (engineering and nursing) for which the participant was enrolled. Since neither gender nor university course could be manipulated, it was a quasi-independent design. The dependent variables in this study were the IP and self-efficacy scores. Regarding the types of conclusions that can be drawn from a study of this nature, quasi-experimental designs can only make causal inferences when certain controls and checks are in place. Since quasi-experimental designs do not allow for random assignment of participants to treatment groups and manipulation cannot be done, it is essential that groups that are to be compared are equal with regard to confounding variables. Since the researcher has limited information on the participants, any comparisons drawn between groups are based on the assumption that groups are equal, therefore these inferences are speculative.

The factorial design was seen as advantageous as the exploration of two or more factors created a more realistic situation than only one factor could. This is because our behaviour is influenced by a variety of factors which may act together (Gravetter & Forzano, 2016). In addition to the main effects (of gender and university course), interaction between the factors was of interest, since one would expect females and males in traditional roles to have high self-efficacy and low IP scores, whilst the converse is true for males/females in non-traditional courses. Males studying nursing might therefore have high IP but low SE scores and the same applies to females in engineering.

3.3.1 Sampling

This study made use of purposive sampling which refers to a non-probability sampling method that takes place when the researcher uses their own judgement to select elements. The researcher sought a sample of 300 undergraduate students at a university in South Africa who were enrolled in electrical engineering or nursing. These sample sizes were derived from the sizes and gender composition of the respective undergraduate courses based on the university's enrolment data for 2018. The desired sample would have consisted of approximately 120 men and 30 women enrolled in electrical engineering and 30 men and 120 women enrolled in nursing.

An invitation to participate was shared on the target group's online learning portals on 24 February 2020, and over the next month 222 responses were collected. The researcher attempted to send out a second invitation to participate; however, due to the Covid-19

pandemic, no further responses could be collected. The sample consisted of 36 students enrolled in electrical engineering and 34 students enrolled in nursing; the remaining 144 responses came from students enrolled in other engineering courses. The study's design was adjusted to allow for these participants. The planned sample size was therefore 300, while the realised sample size was 222; however, after cleaning the data and removing incomplete responses, the researcher was left with an actual sample size of 214.

3.3.2 Measurement Instruments

This study made use of a questionnaire on Qualtrics which consisted of three sections. The first section was a brief biographical section in which the participants were asked to indicate their gender, university course and age. The second element consisted of the Clance Impostor Phenomenon Scale (CIPS) (Clance, 1985). The CIPS is a 20-item, self-report measure which examines specific attributes related to IP. These attributes include fear of being evaluated, fear of being unable to repeat success and fear of being less capable than others (Clance, 1985). Each of the 20 items was scored on a five-point Likert scale in which the scores ranged from 1 (not true at all) to 5 (very true). Items included "I'm afraid people important to me may find out I am not as capable as they think I am" and "I rarely do a project or task as well as I'd like to do it" (Clance, 1985). The scores of each item added up to produce a total score out of 100. Higher scores are indicative of more severe impostor phenomenon characteristics (Simon & Choi, 2018). In terms of interpreting the scores, a score of 40 or less is indicative of few impostor characteristics, a score between 41 and 60 indicates that the respondent has moderate IP experiences, a score between 61 and 80 indicates frequent impostor experiences, while a score above 80 indicates that the respondent suffers from intense IP experiences (Clance, 1985).

The CIPS was developed to assess self-reported levels of the concept that individuals are successful by external standards but have an illusion of personal incompetence. The CIPS was designed specifically to address the concerns with the Harvey Impostor Phenomenon Scale (Harvey, 1981), which was critiqued for its use of negative language and inability to differentiate between impostors and non-impostors (French, Ullrich-French, & Follman, 2008).

French et al. (2008) investigated the psychometric properties of the CIPS and found that the reliability and validity were satisfactory. Moreover, the total scale score internal consistency reliability and item discrimination were also satisfactory. Furthermore, the internal consistency reliability was 0.92 (French et al., 2008). A study comparing the Clance IP Scale and the Harvey IP Scale indicated that the Clance instrument was more sensitive as it was better able to differentiate between groups of identified impostors and non-impostors. This seems to be due to the fact that Clance's scale is measuring a broader construct than Harvey's scale. Additionally, the suggestion that Clance's scale is more sensitive is also supported by an analysis of cut-off scores for each of the scales. The scores on Clance's scale have much less overlap between independently identified impostors and non-impostors, as a cut-off score of 62 reduced the number of false positives and false negatives, while no satisfactory cut-off score for the Harvey scale could be established (Holmes, Kertay, Adamson, Holland & Clance, 1993). The CIPS is often preferred over other IP measures because it is easy to administer and it is shorter and more useful for clinical and researcher proposes (French et al., 2008).

The final section consisted of a *short form* of the Career-Decision Self-Efficacy Scale (CDSES-SF). The CDSES-SF is a measure of an individual's perception of their ability to make educational and vocational decisions. The Career-Decisions Self-Efficacy Scale (CDSES) was introduced by Taylor and Betz in 1983. The purpose of this scale is to determine an individual's degree of belief in their ability to complete tasks necessary for making career decisions successfully. The CDSES is one of the most frequently used scales in career counselling and vocational guidance (Reddan, 2015). It consists of 50 items which can be divided into five sub-scales, namely (1) self-appraisal, (2) occupational information, (3) goal selection, (4) planning, and (5) problem-solving. Career-decisions self-efficacy expectations are thus measured by the respondent's confidence in their ability to complete specific tasks, such as finding information about a career they are interested in and identifying employers relevant to their career possibilities. After receiving criticism about the length of the CDSES, Betz et al. (1996) developed as short form of the scale, which was used in this study. The Career-Decisions Self-Efficacy Scale - short form consists of 25 items and in 2005, the original 10-level confidence scale was updated to a 5-level confidence continuum in which 1 = no confidence at all, and 5 = complete confidence (Betz, Hammond, & Multon, 2005). The score therefore ranges from a minimum of 25 to a maximum of 125. Regarding the reliability and validity of this scale, it has been found to be highly reliable,

with a reliability coefficient of .94 for the total scale (Betz & Luzzo, 1996), and a Cronbach's alpha coefficient of .93 for South African samples (Creed, Patton & Watson, 2002) (see Appendix A).

3.4 Data Collection Procedure

The researcher sought permission from the Deans of both the nursing and engineering faculties, prior to the commencement of data collection. The researcher also obtained permission from the author of the CIPS, Dr Pauline Rose Clance, to make use of the survey.

Informed consent was obtained on Qualtrics from the participants prior to the collection of data and the voluntary nature of participation was stressed. The Qualtrics questionnaire, consisting of biographical data, the CIPS and CDSES-SF, was placed on the identified samples' learning portals along with an invitation to participate. Qualtrics is an online survey tool which is used to build and distribute surveys and analyse responses (Bosch, 2020) (see Appendix B).

3.5 Data Analysis

Typically, a two-way ANOVA is used to analyse data obtained from a study using a factorial design. The two-way ANOVA is used to compare the mean differences between groups that have been split on two independent variables or factors (Gravetter & Forzano, 2016). The primary purpose of this analysis is to determine whether there is an interaction between gender and study direction on the occurrence of IP and level of career-decisions self-efficacy.

In terms of data analysis, a 2x2 factorial design consists of two factors, namely gender and study direction, each of which consists of two levels. The first factor, genders' two levels, consists of males and females, while the second factor, study direction's two levels, consists of nursing and engineering.

Table 1

Table of the 2 Factors and their 2 Levels

Factors		Gender	
Study	Levels	Male	Female
Direction	Engineering	Scores of men in	Scores of women in

	engineering on CIPS and CDSES-SF	engineering on CIPS and CDSES-SF
Nursing	Scores of men in nursing on CIPS and CDSES-SF	Scores of women in nursing on CIPS and CDSES-SF

Table 1 shows the factors and their levels, as well as the dependent variables of this study.

Concerning the *planned* analysis, before conducting an independent sample t-test, the researcher must check that the assumptions of homogeneity of variances have been met. Levene's test for equality of variances determines whether the variation of scores for the different groups is the same. This test is of great importance in cases with unequal group sizes (Field, 2017). If the significance value for Levene's test for equality of variances is larger than .05, equal variances have been met; if it is less than .05, the assumption of homogeneity of variance has been violated and adjustments to correct the violation must be applied (Field, 2017).

The results from a two-way ANOVA will calculate a main effect and an interaction effect. In the main effect, each factor's effect is considered separately. In the interaction effect, both factors are considered at the same time. This is because there are two different explanatory variables and the effects on the outcome of a change in one variable may depend on the level of the other variable in the additive model, or it may be dependent on the other variable in the interaction model (Seltman, 2013).

In other words, the researcher will look for two (2) main effects (one for each factor), as well as whether there is an interaction between the two (2) factors. In this study, the two (2) factors referred to gender and study direction. A main effect referred to an effect on the levels of one factor, while ignoring the levels of the other factor. In other words, the researcher would determine whether there was a main effect of gender by examining whether the data from one gender differed from the data of the other, while ignoring the study directions. This procedure was then repeated for the other factor as well. To determine whether there was an interaction between the two factors, the researcher had to examine whether there was a "difference of differences", or whether the effect of one factor depended on the level of the

other factor. ANOVA tests indicate whether there is an overall difference between groups, but it cannot indicate which group differed, thus post-hoc tests must be conducted. When significant main effects are not qualified by an interaction, a post-hoc test can determine which groups differ and where those differences lie. Post-hoc tests work by controlling the experiment error rate (Field, 2017).

Concerning the *realised* analysis of this study, as Table 3 indicates, the number of responses in the category males in nursing was 1, thus a proper factorial analysis for the intended hypothesis could not be completed. For this reason some modifications were made to the data analysis, specifically the researcher utilised t-tests with Bonferroni adjustment (Field, 2017). The researcher obtained the adjusted p-value by dividing the p-value criterion by the number of groups that are compared, in this case two, thus p <= 0.025. A t-test for independent groups was thus done between males and females for IP and SE, where appropriate. Table 6 indicates that the effect of gender and years at university on both IP and SE can be investigated. A 2x3 factorial ANOVA with post-hoc tests was thus done. Years of study were restricted in this instance to the first three years because there were no women in engineering in the 4th year (see Table 6). Furthermore, the researcher conducted an additional exploration regarding the year level and study direction in order to further investigate the differences between men and women and to clarify the description of IP and self-efficacy in the realised sample.

3.6 Ethical Considerations

Institutional approval was received from the Research Ethics Committee at the university (Faculty of Humanities) prior to the commencement of the study. Additional permission was received from both the Engineering and Nursing faculties as the sample constituted students from these faculties.

Voluntary participation in this study was of paramount importance. The personal informed consent document clearly stated that participation was completely voluntary and that participants had the right to withdraw at any stage if they wished to do so. Furthermore, the informed consent document also clearly stated that participation in this study was in no way related to any results or outcomes for any modules at the university, nor would it influence any of the relationships participants have with their lecturers. In order to uphold the principle

of informed consent, the aim of study, the length of time it would take to participate, foreseeable risks and discomfort to the participant, as well as the benefits of the research to society and possibly to the individual participants, were also made available. The participants were also afforded the opportunity to pose questions to either the researcher or the supervisor via e-mail.

This study did contain an element of deception by omission as the term "impostor phenomenon" would not be appearing on the information communicated to the participants. This was done in an effort to avoid demand characteristics and reduce the risk of response bias from the participants. The information communicated to the participants instead focused on the self-efficacy aspect of the study. It was not anticipated that this form of deception would cause any type of distress. Those who did experience distress caused by their participation were referred to the university's psychological services.

Confidentiality was maintained by ensuring that only the researcher and supervisor had access to the data. All information relating to the study was stored on password-protected personal computers. Copies of relevant material were made available to the university's archives to be stored securely for 15 years for archiving purposes, after which it would be destroyed. Any information shared in the form of results, whether in this dissertation, at a conference or in academic papers, would not make mention of participants' individual particulars.

3.7 Conclusion

This chapter outlined the methodological considerations for the design, execution and analysis of the study. Sampling and data collection were also discussed, and the chapter concluded with an explanation of the ethical considerations and strategies followed by the researcher.

Chapter 4: Results

4.1 Description of Sample

Descriptive statistics refer to the analysis of data which assists in describing, showing or summarising data in a meaningful way which allows patterns to emerge. However, in descriptive statistics, the determinations reached are only applied to the data set being studied (Keller, 2006).

Of the total of 222 responses, 214 were complete and useable. The sample consisted of 43% females and 57% males (Table 2). Respondents enrolled in an Engineering degree comprised 84% of the sample while respondents enrolled in a Nursing degree made up the remaining 16%.

Table 2

Frequency Table of Gender

Gender	N	%
Male	123	57.49
Female	91	42.52
Total	214	100

Table 2 shows that the total sample of 214 consisted of 57% men and 43% women.

Table 3

Cross-tabulation of Gender and Direction of Study

Course	Male		Female	
	N	%	N	%
Nursing	1	0.81	33	36.26
Chemical engineering	5	4.07	11	12.09
Civil engineering	14	11.38	9	9.89
Computer engineering	27	21.95	8	8.79
Electrical engineering	32	26.02	15	16.48
Electronic engineering	34	27.64	9	9.89

Mechanical engineering	6	4.88	1	1.10
Metallurgical engineering	2	1.63	4	4.4
Mining engineering	2	1.63	1	1.10
Total	123	100	91	100

Table 3 shows the distribution of the participants' enrolment in study courses, per gender. Electronic engineering formed the largest group of males, with 34 participants, while Nursing formed the largest group of women, with 33 participants.

Table 4

Summary of Cross-tabulation between Study Direction and Gender

Study direction	Nursing	Engineering	Total
Male	1	122	123
Female	33	58	91
Total	34	180	214

Table 4 shows the gender composition of the nursing and engineering groups. It shows that the total nursing sample consisted of 34 participants, while the engineering sample consisted of 180 participants. Furthermore, it also shows that the total male sample consisted of 123 participants, while the total female sample was 91.

Table 5

Ages of Participants

Age	N	%
17	6	2.8
18	47	21.8
19	44	20.4
20	46	21.3
21	35	16.2
22	15	6.9
23	6	2.8
24	9	4.2
25	3	1.4

26	1	0.5
27	3	1.4

Table 5 shows the ages of the participants, with a minimum age of 17 and a maximum of 27. The majority of the participants were aged 18 or 20.

Table 6

Year of Study Participants are Currently Enrolled in

Year of enrolment	N	%
First year	73	33.8
Second year	71	32.2
Third year	54	25.0
Fourth year	16	7.4
Total	216	100

Table 6 shows the year of study the participants are currently enrolled in, with the majority (33.8%) of the participants being in the first year.

Table 7

Frequency of Gender, Year of Study and Study Direction

Year of study	Study direction			
	Nursing		Engineering	
	Male count	Female count	Male count	Female count
Year 1	0	10	34	29
Year 2	1	7	47	16
Year 3	0	7	34	12
Year 4	0	9	7	0
Total	1	33	122	57

Table 7 illustrates the frequencies of gender, study course and year of study. It shows that the largest group of participants for this study was men enrolled for their second year of engineering. From this table one could derive the need for a 2x3 factorial analysis which

could indicate what happens to the men's and women's IP and self-efficacy scores over the course of the years.

Table 8

Frequency of Study Directions

Study Direction	N	%
Nursing	34	15.89
Chemical engineering	16	7.48
Civil engineering	23	10.75
Computer engineering	35	16.36
Electrical engineering	47	21.96
Electronic engineering	43	20.09
Mechanical engineering	7	3.27
Metallurgical engineering	6	2.80
Mining engineering	3	1.40
Total	214	100

Table 8 shows how many participants were enrolled in each of the study directions. The largest group of participants referred to electrical engineering, with almost 22%, while the smallest group referred to mining engineering, with 1.4% of the total sample.

4.2 Description of Instruments

Table 9

Descriptive Statistics for IP and Self-efficacy Scale for Total Sample

						Group differences (males/females)			Reliability for total sample	
	N	Minimum	Maximum	Mean	Std. deviation	t-value	df	p	Cronbach's alpha	No. of items
CIPS	199	27	96	63.04	14.12	-2.29	157.93	0.001	.885	19
CDSES-SF	190	43	120	86.76	14.59	.652	152.09	0.001	.914	24

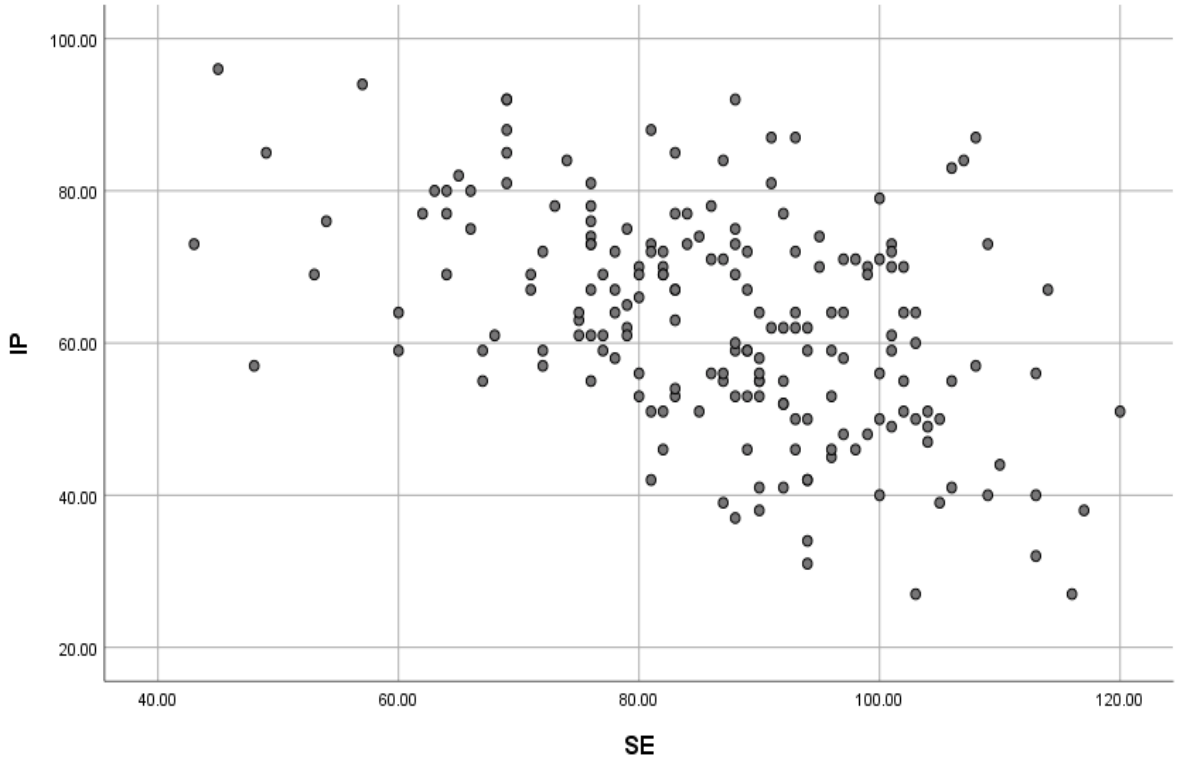
Table 9 indicates the descriptive statistics for the Self-Efficacy and IP Scales. It can be seen that the mean for the CIPS was 63.04 (SD=14.12). According to Clance (1985), a total CIPS score of 40 or less indicates that the respondent has few impostor experiences, a score between 41 and 60 is indicative of moderate impostor experiences, while a score between 61 and 80 indicates frequent impostor experiences. Finally, a score higher than 80 is indicative of intense imposter experiences. Thus, the groups' mean CIPS score of 63.04 is rather high and indicative of moderate impostor tendencies. The male participants' mean score on the CIPS was 61.07 (SD = 12.93), while the female participants' mean score on this scale was 65.78 (SD = 15.28), both of which fall within the moderate impostor experiences category

In terms of the self-efficacy, the CDSES-SF has a maximum score of 125, with higher scores indicating higher levels of career-decision self-efficacy. The group's mean score on the CDSES-SF was 86.76 (SD = 14.59), while the men's mean on this scale was 87.34 (SD = 13.99) and the women's mean score was 85.91 (SD = 15.49). Despite the means being very similar, this difference is statistically significant.

In terms of the reliability of the measures, according to French et al. (2008), the CIPS has good internal consistency, with a Cronbach's alpha coefficient of .92. In the current study the Cronbach's alpha coefficient was .885. According to Creed et al. (2002), the CDSES-SF also has good internal consistency, with a Cronbach's alpha coefficient of .93 for South African samples. In the current study the Cronbach's alpha coefficient was .914.

Figure 2

Scatterplot of IP and SE



The Pearson correlation between IP and self-efficacy was -.47 ($p \leq 0.001$, two-tailed). Figure 2 shows a negative relationship between IP and self-efficacy, indicating that as impostor phenomenon experiences increase, self-efficacy decreases, and vice versa.

4.3 Comparison of Groups

Inferential statistics refer to a statistical method which deduces from a small but representative sample the characteristics of the bigger populations, allowing the researcher to make assumptions about a wider group (Keller, 2006). The researcher initially intended to draw comparisons between the groups of participants as per their study directions and gender; however, as Table 2 indicates, the number of participants in each of the groups was inconsistent and some categories only contained one response. Furthermore, the researcher only obtained a single response from a male enrolled in nursing, therefore the data would not allow for evaluation or comparison of the men and women enrolled in nursing.

Figure 3

Mean IP Scores in Relation to Gender and Study Direction

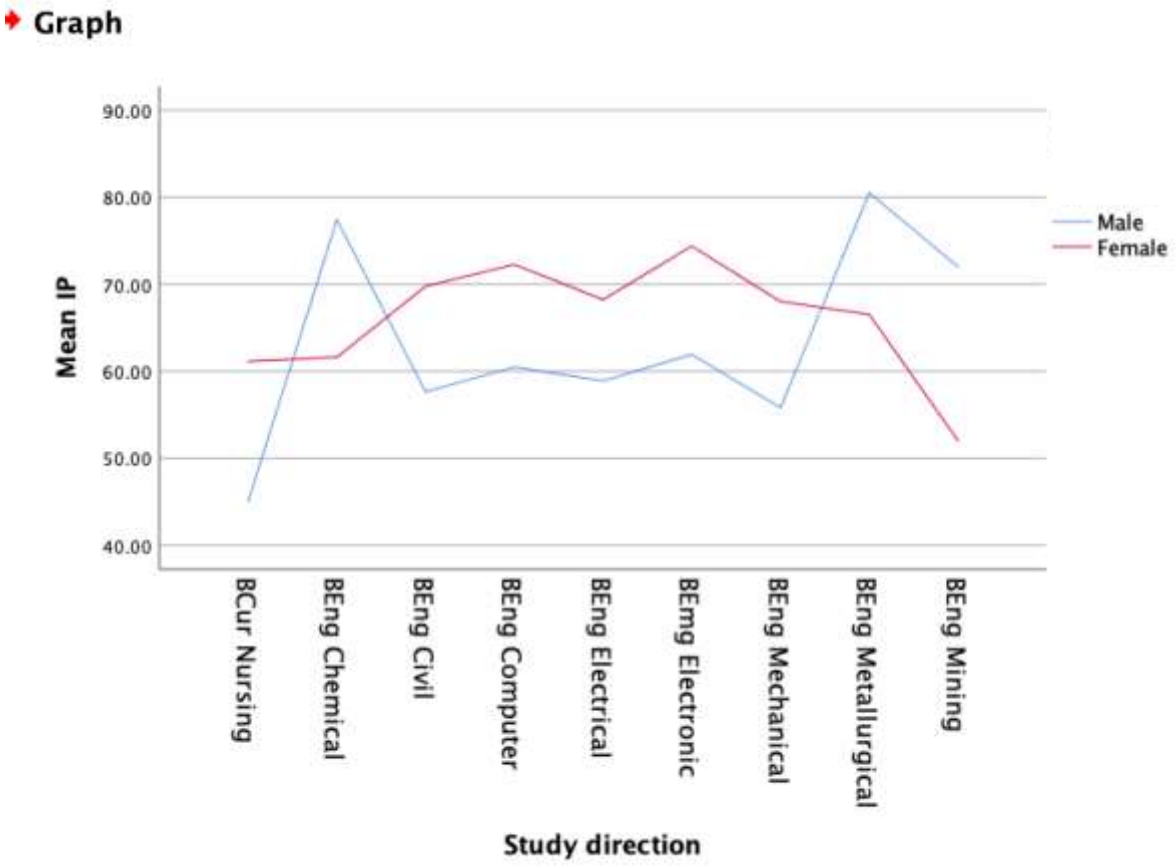


Figure 3 shows the mean CIPS scores in relation to the participants' gender and study directions. It shows a sharp increase in IP scores for men enrolled in Chemical and Metallurgical engineering. It also shows that the lone male nursing student indicated low IP scores. Regarding the women's IP scores, those enrolled in Electronic engineering recorded the highest IP scores.

Figure 4

Mean Self-efficacy Scores in Relation to Gender and Study Direction

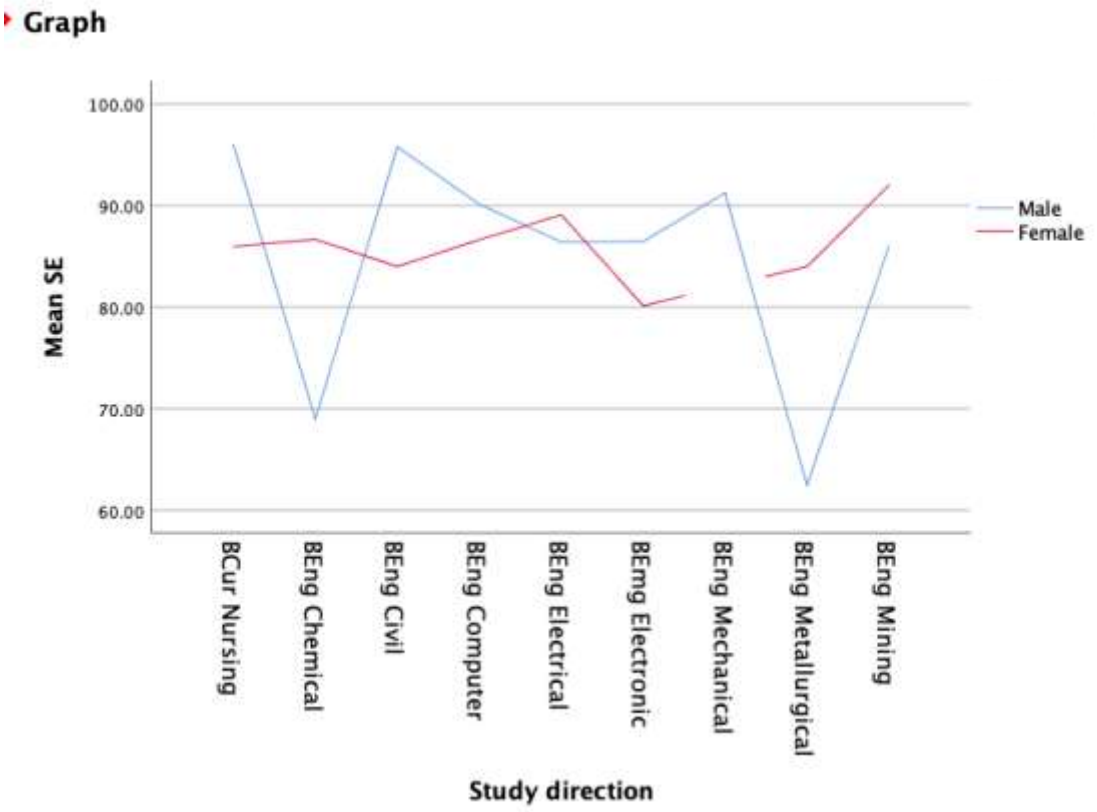


Figure 4 shows the mean self-efficacy scores in relation to the gender and study directions of the participants. It shows a sharp decrease in the self-efficacy scores of males enrolled in Chemical and Metallurgical engineering, which corresponds with the findings of Figure 2. These scores seem to indicate a strong negative correlation between IP and self-efficacy, and a decrease in one results in an increase of the other. Here, the lone male nursing student scored highly on the Self-Efficacy Scale, which again shows how high scores on one scale is related to low scores on the other. Concerning the women's scores, Figure 4 shows that women enrolled in Electronic engineering obtained the lowest self-efficacy scores, again indicating a relationship.

Table 10

Descriptive Statistics for IP and Self-efficacy Scale for Engineering Students

	Males			Females			Group differences		
	N	Mean	Std. deviation	N	Mean	Std. deviation	t-value	df	p
CIPS	115	61.21	12.9	54	68.3	15	-2.99	91.09	.004
CDSES-SF	112	87.27	14.03	49	85.88	14.76	.570	159	.570

Table 10 shows the descriptive statistics for the engineering sample. It shows that the mean IP scores for women were slightly higher than those of the men; however, this difference is significant. While both the men and women fall within the *frequent* impostor experiences category, according to Holmes et al. (1993), a score of 62 or greater indicates an individual with impostor phenomenon; this cut-off score was determined in order to reduce the rate of false negatives and false positives. With a mean score of 61.21, the men in engineering thus just missed the cut-off point, while the women, with a mean score of 68.3, found themselves more firmly in that category. According to these cut-off points, the women in engineering are currently suffering from frequent IP experiences while the men in engineering can be described as non-impostors. Interestingly, despite suffering more from IP, the women tended to have consistently high self-efficacy scores. This might suggest that the correlation between IP and self-efficacy is gendered and only applies to men.

Table 11

Descriptive Statistics of Women in Engineering and Women in Nursing

	Women in Engineering			Women in Nursing			Group differences		
	N	Mean	Std. deviation	N	Mean	Std. deviation	t-value	df	p
CIPS	54	69	15	29	61.10	14.95	2.09	81	.040
CDSES-SF	49	85.89	14.76	28	85.96	16.96	-.023	50.14	.982

Table 11 compares the measurement scores of the two female groups. It shows that the women enrolled in engineering courses had a mean CIPS score of 69 while women enrolled in nursing courses scored a mean of 61.10. According to the cut-off point of 62 established by

Holmes et al. (1993), the women in nursing are considered non-impostors while the women in engineering are considered to be suffering from frequent IP experiences. However, while these findings are significant according to Holmes et al.'s (1993) cut-off point, they are not significant statistically as with the Bonferroni adjustment (i.e. $p <= 0.025$) the null hypothesis cannot be rejected. Both groups of women had high self-efficacy scores.

4.3.1 Progression of IP and Self-Efficacy Scores over Years of Study

The researcher questioned whether the IP and self-efficacy scores the participants obtained showed any progress or decline over the course of the four years. Unfortunately, as Table 7 indicates, there are no female respondents enrolled in the fourth year of engineering and there is only a single male nursing respondent. This year level analysis allows comparison between year groups where sub-sample numbers are sufficient to provide a snapshot of IP and self-efficacy between genders per year level because a total IP and self-efficacy score for gender groups may disguise trends per year level. Over and above gender, year level and a variable like study direction might reveal different patterns. The eventual distinction of both study direction and year level provides clarification of how IP and self-efficacy appear in the sample and it might be indicative of certain dynamics.

Figure 5

The Progression of IP Scores across the Four Years for Participants Enrolled in Engineering

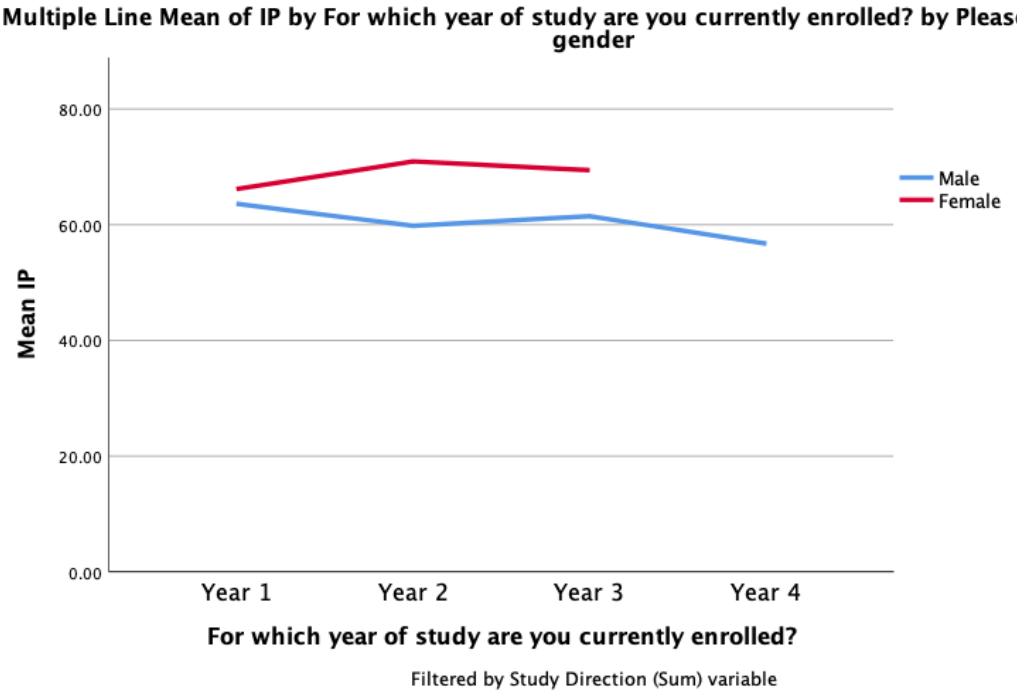


Figure 5 shows how the male and female engineers started their first year with very similar IP scores; however, over the course of the years these scores diverged. The men's IP scores started with a slight decline in the second year, followed by a slight increase in the third year and another subsequent decline, reaching a low point in the fourth year, while the women's scores showed a slight increase from the first to the third year. With a cut-off score of 62 (Holmes et al., 1993), the female engineers found themselves firmly within the frequent IP experiences category across all three years, while the men fluctuated slightly around the cut-off score and were considered to be non-impostors by their fourth year. However, it is essential to keep in mind that comparisons between groups are based on the assumption that the groups are equal, thus these statements are tentative and further research will need to be conducted.

Figure 6

The Progression of the Self-efficacy Scores over the Course of the Four Years for Participants Enrolled in Engineering

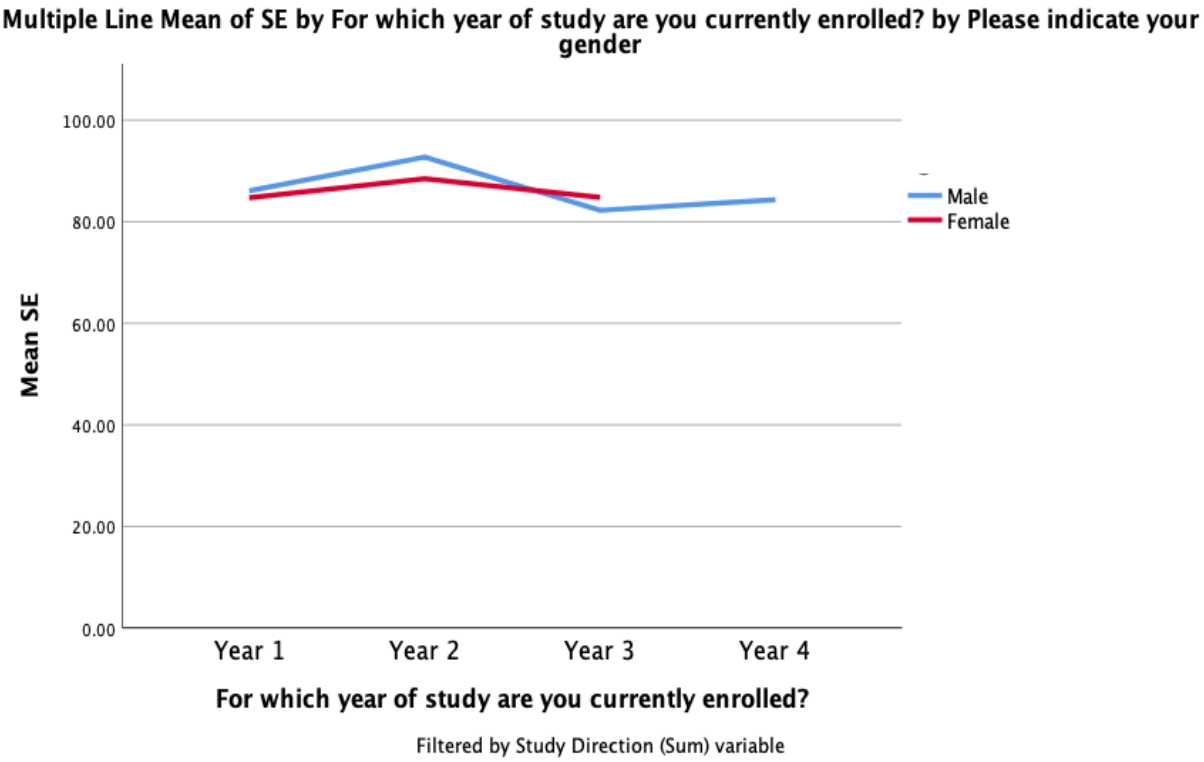


Figure 6 illustrates the engineering sample's self-efficacy scores across the four years. It shows how the men's career-decision self-efficacy scores increased from year 1 to year 2, followed by a decline in year 3 and another incline in year 4. These fluctuations illustrate the opposite of what happens to the IP scores in Figure 5. Comparatively, the women's scores were more or less stable across the three years.

Figure 7

The Progression of the Female Nursing Sample's IP Scores over the Four Years of Study

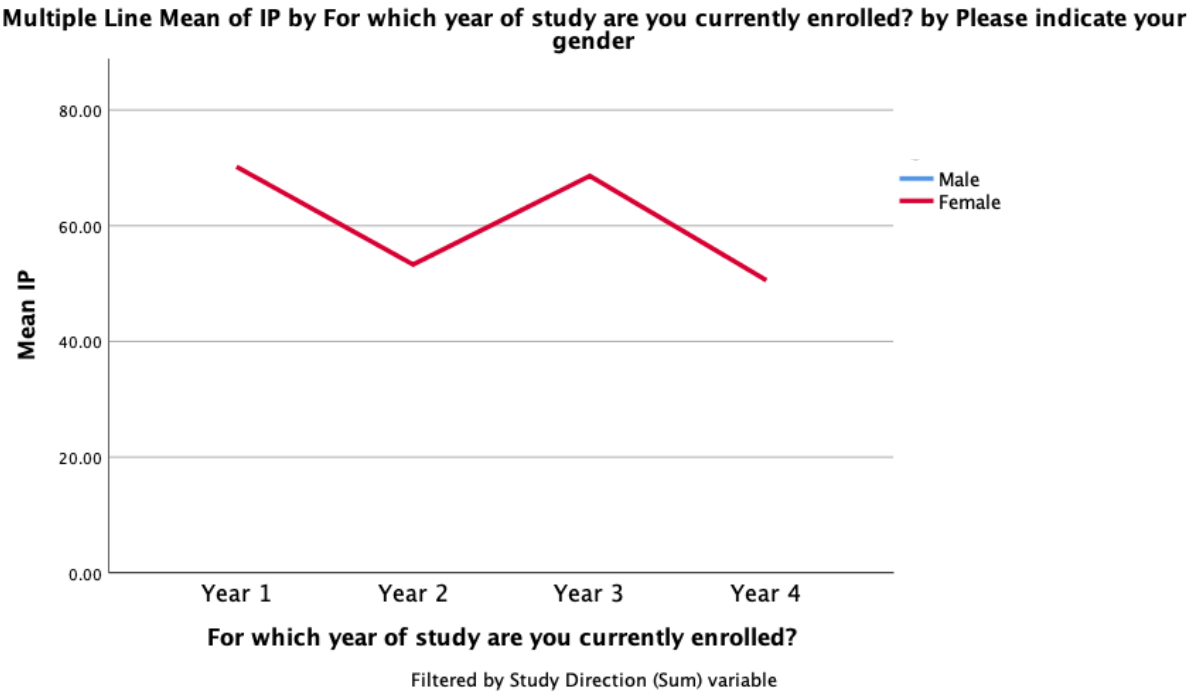


Figure 7 shows the progression of the nursing sample's IP scores. Due to the size of the realised male nursing sample, comparisons between the genders could not be drawn. However, Figure 7 shows that the women in nursing experienced a sharp decline in their IP scores in the second year, followed by a subsequent increase in the third year and another decrease in the fourth year. Since the cut-off point for the impostor phenomenon is 62 (Holmes et al., 1993), Figure 7 shows how the participants fluctuated between having IP in the first and third years, and not having IP in the second and fourth years.

Figure 8

The Self-efficacy Scores over Four Years for the Nursing Sample

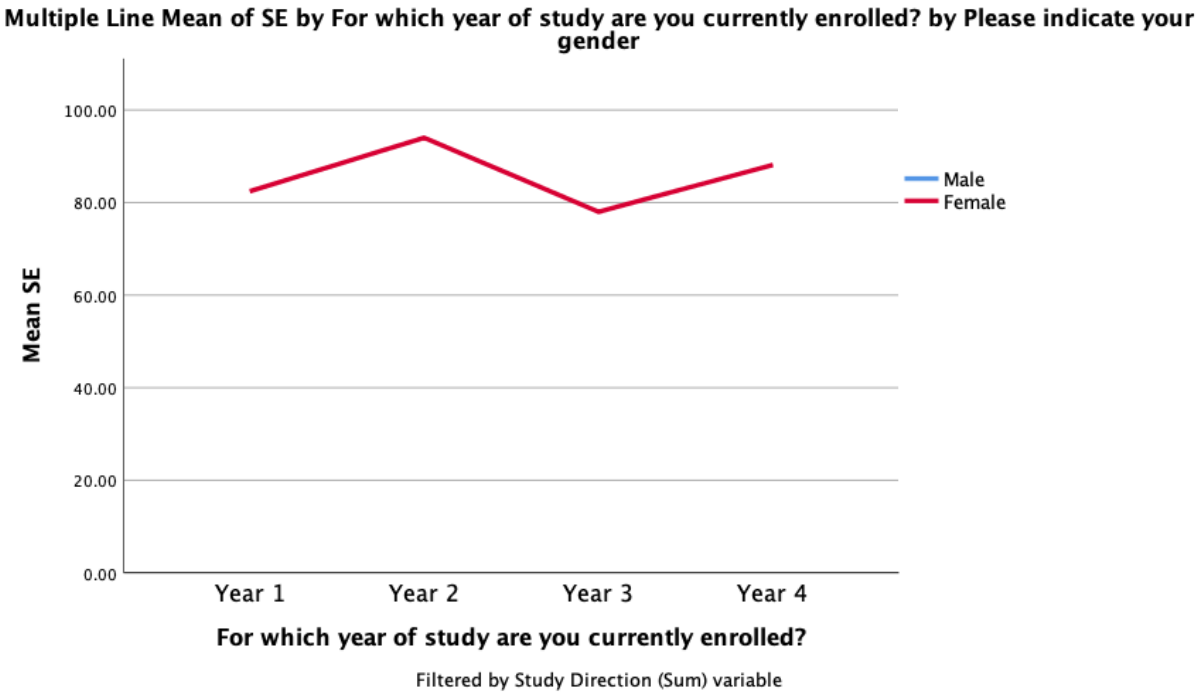


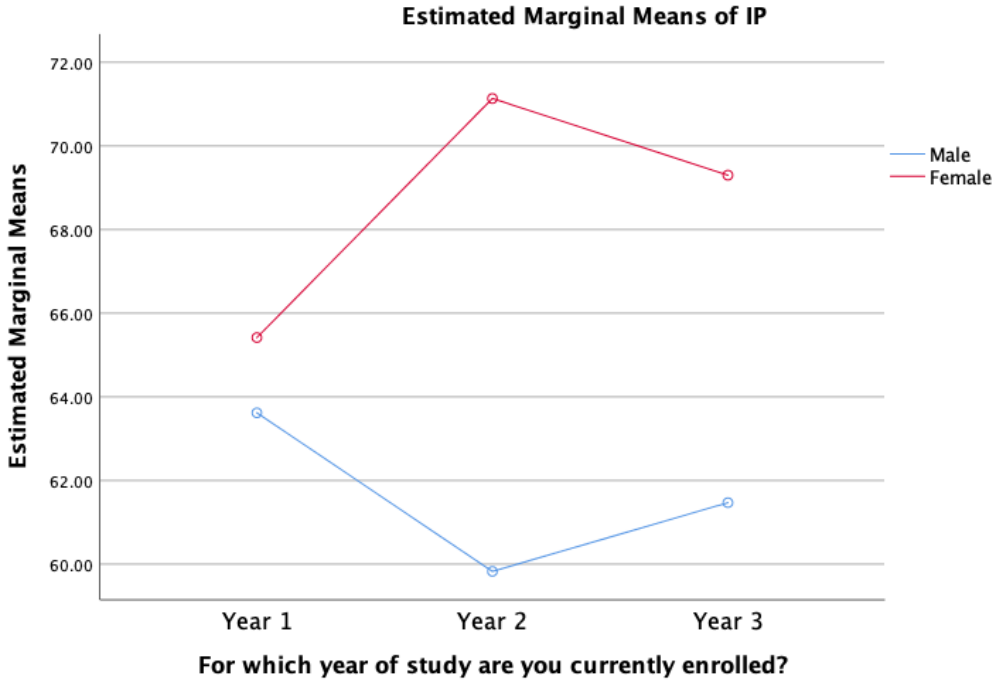
Figure 8 shows an interesting converse of Figure 7 in which the female nurses' self-efficacy scores showed a sharp increase in the second year, followed by a subsequent decrease in the third year and another increase in the fourth year. These inverse fluctuations may again be suggesting the existence of an inverse relationship between IP and self-efficacy scores, as an increase in one is met with a decrease in the other, and vice versa.

A 2x3 ANOVA was conducted; concerning IP, there was a significant main effect for gender and IP, F (1,149) = 7.68, p = .006. The main effect between year of study for IP was not significant F (2,149) =.071, p = .93. The interaction between gender and year of study for IP was not significant F (2,149) =1.48, p = .230. The male and female engineers started their first years with similar IP scores. However, from the second year onwards, there are significant differences as the female sample scored significantly higher on the CIPS. For year 1, gender did not differ significantly, t(58) = .67, p = .506, as seen in Table 12. For year 2, gender did differ significantly, t(56) = 2.86. p = 006. For year 3, gender did not differ significantly, t(42) = 1.77. p = .083.

The women engineering students therefore started their studies in the first year without IP and with high self-esteem; however, after their first year of study their CIPS scores indicated that they are now experiencing IP. It must, however, be noted that this difference may simply be a sample characteristic or a function of the particular cohort of students rather than a gender temporal trend. Since there were only two levels for gender, a post-hoc test was not needed. The post-hoc test for IP's level of years with Bonferroni adjustment showed that no level differed significantly from the other. The plot of IP and gender x year of study can be seen in Figure 9.

Figure 9

Plot of IP Gender and Year of Study



Regarding self-efficacy (SE), the main effect for gender and SE was not significant, F (1,149) = .165, p = .685. The main effect for year of study and SE was also not significant, F (2,149) = 2.71, p = .070. The interaction between gender and year of study was not significant, F (2,149) = .529, p = .590. Since there were only two levels for gender, a post-hoc test was not necessary. The post-hoc test for SE's level of years with Bonferroni adjustment showed a significant difference between year 2 and year 3. The plot for SE and gender x year of study can be seen in Figure 10.

Figure 10

Plot for SE and Gender x Year of Study

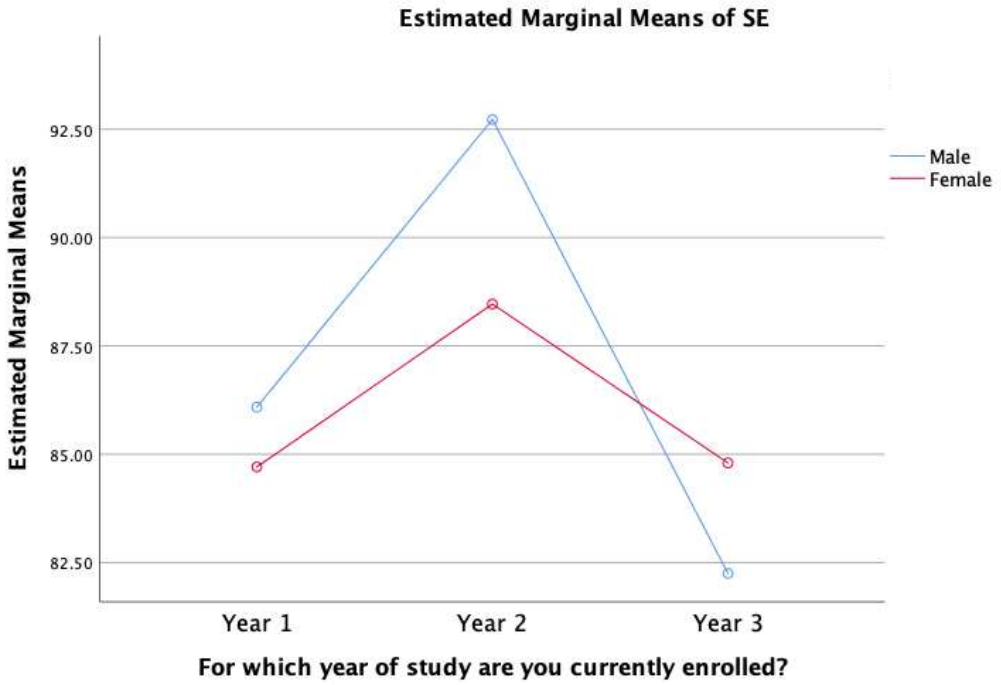


Table 12

Descriptive Statistics for Engineering Students in Year One to Three for IP

		Males			Females			Group differences		
		N	Mean	Std. deviation	N	Mean	Std. deviation	t-value	df	p
CIPS	Year 1	34	63.62	13.83	29	66.15	15.43	.67	58	.506
	Year 2	47	59.81	13.05	16	70.94	13.7	2.86	56	.006
	Year 3	34	61.47	11.99	12	69.42	16.26	1.77	42	.083

4.4 Conclusion

In this chapter, the researcher discussed the analysis of the data in three parts. First, the researcher made use of descriptive statistics to describe the sample's characteristics, then the researcher described the instruments used, and finally, the researcher compared the groups.

Chapter 5: Discussion

5.1 Introduction

In this chapter the researcher will discuss the results depicted in Chapter 4 in more detail and in light of recent literature. This chapter started with an exploration of the recent literature, citing gender differences in IP. Thereafter the researcher explored gender differences in self-efficacy levels by looking at literature which confirms the findings of this study, as well as literature that differs.

5.2 Gender Differences in IP

The purpose of this study was to examine whether there is an interaction between gender and study direction on the occurrence of IP and level of career-decisions self-efficacy. This study found that women in engineering reported higher levels of IP when compared to men in engineering and women in nursing. Whether there are significant gender differences in IP is often debated; however, many studies confirm these findings.

Rosenstein, Raghu, and Porter (2020) found a significant difference between the responses of men and women while investigating the prevalence of IP among computer science students (N = 203). Their male sample scored an average of 62, while their female sample scored an average of 68 on the CIPS. They hypothesised that this difference may be due to preconceived notions as to what type of person becomes a computer scientist, which lead members of underrepresented groups to feel as if they do not belong. In another study, while investigating *gender stigma consciousness* (GSC) and IP, Cokley et al. (2015) found that individuals with high levels of GSC were more likely to internalise feelings of being an intellectual fraud (N = 490). Gender stigma consciousness refers to the extent to which individuals are aware of their gender's stigmatised status (Pinel, 1999). The researchers postulate that this may be because those with high GSC are more likely to believe that members of the outgroup judge their actions by using social stereotypes. This causes these individuals to worry that stereotypes about their gender are being used to judge their intellectual competencies, which in turn leads to increased IP feelings. The researchers found that the size of these effects was greater among women than men in this study. Moreover, these experiences may also influence the career choices individuals make, as those with strong gender-typed attitudes are more likely to pursue gender-typed courses and careers.

Cusack, Hughes, and Nuhu (2013) found a significant difference between gender and IP scores, as women were more likely to have IP beliefs than men (N = 506). They argued that these results were caused by women having more roles which they are expected to excel at each equally than men, leading to impostor feelings. Since women are more likely to have overwhelming demands from multiple roles in their lives, they develop a *superwoman* attitude, which makes them feel as if they must excel at all aspects of their lives. This high level of pressure then leads to IP feelings.

However, the extent to which individuals identify with their gender-roles must also be taken into account. Patzak et al. (2017) investigated the relationship between gender-role orientation and IP and found that gender and gender-role orientation were both statistically detectably associated with IP (N = 459). Not only did they find that male students suffered less intensely from IP than female students, but that masculine and androgynous students also suffered less intensely from IP than feminine or undifferentiated students.

Table 13

Level of Impostor Experiences per Gender-role Orientation

		Impostor experiences			
	N	Few	Moderate	Frequent	Intense
Undifferentiated	110	8%	44%	36%	15%
Feminine	120	7%	50%	36%	8%
Masculine	120	21%	55%	31%	8%
Androgynous	109	17%	46%	29%	8%

Table 13 shows Patzak et al.'s (2017) findings that 36% of individuals with undifferentiated or feminine gender-role expectations had frequent impostor experiences. Furthermore, 15% of individuals with undifferentiated gender-role expectations had intense IP experiences compared to 8% of masculine, feminine or androgynous individuals.

In contrast, numerous studies did not find differences in the rates of IP between men and women (Austin, Clark, Ross, & Taylor, 2009; Cokley et al., 2013; Kamarzarrin, Khaledian, Shooshtari, Yousefi, & Ahrami, 2013; Leonhardt, Bechtoldt, & Rohrmann, 2017; McClain et

al., 2016; Rohrmann, Bechtoldt, & Leonhardt, 2016). The samples of these studies included university students, managers and individuals in leadership positions and physicians.

5.3 No Gender Differences in Self-Efficacy

Regarding self-efficacy, the researcher expected to find that the women enrolled in engineering courses would have lower self-efficacy compared to the men and women in traditional courses. However, the self-efficacy scores across the groups were very similar, as the men in engineering scored an average of 87 on the CDSES-SF, while the women in engineering and the women in nursing both scored an average of 85 on the Self-Efficacy Scale. Women in nursing and men in engineering are surrounded by peers and mentors who are very similar to them, and this type of vicarious experience is a valuable source of self-efficacy. The students enrolled in traditional careers probably receive verbal messages from influential others, such as teachers and parents, which further boost their self-efficacy. It seems that women in atypical courses or careers are incredibly determined to succeed despite the obstacles they are facing. It seems as if there are underlying differences in the motivational structures for women in typical and atypical courses.

Perhaps these differences are between men and women, as Hutchins and Rainbolt (2017) report differences in coping mechanisms between the two genders. They report gender differences in the coping mechanisms employed by individuals to deal with their IP experiences. The coping mechanisms of concern here are active and avoidant, in which active coping refers to taking direct actions to eliminate stressors, while avoidant coping refers to behavioural or mental disengagement. Active coping mechanisms are the desired approach as avoidant coping mechanisms are psychologically harmful and maladaptive. Hutchins and Rainbolt (2017) found that women were more likely to employ active coping mechanisms through seeking instrumental and emotional support which aids in the normalisation of IP experiences and serves to modify their cognitive distortions concerning their performance attributions. In other words, the female participants utilised more productive ways to address their distress than their male counterparts. On the other hand, the male participants put their efforts into ignoring their IP feelings, which may bring temporary relief but leads to depression and burnout in the long run.

Fallan and Opstad (2016) argue that dividing participants along gender lines does not create equal and homogenous groups. They investigated self-efficacy in relation to gender-personality interactions among a group of students enrolled in an Economics course (N = 798). Using the Meyer-Briggs Type Indicator along with measures of self-efficacy, these researchers found that the female sample had significantly lower self-efficacy levels and self-efficacy strengths than their male counterparts. However, these findings did not hold across all gender-personality types and only applied to female intuition and feeling, and intuition and thinking students. These findings did not apply to sensing and perceiving female students. Additionally, higher self-efficacy levels among the male students only applied to intuition and thinking students and not to intuition and feeling or sensing and perceiving students. Furthermore, Fallan and Opstad (2016) found that the female students had significantly lower self-efficacy strengths than the male students. However, once again these findings do not hold up across all personality types and only apply to female intuition and thinking and sensing and perceiving students, while not applying to intuition and feeling students. Only male intuition and thinking students showed higher self-efficacy strength, as these findings did not apply to male sensing and perceiving or intuition and feeling students. Thus, according to Fallan and Opstad (2016), self-efficacy differences among genders do not apply to all individual participants. Unfortunately, since we do not have access to the participants' personality compositions, we do not know how these factors may influence the results obtained in this study. However, these findings were illustrated to show that individuals are complex and multifaceted, and categories such as male or female are too simple to capture their true essence accurately. While we must keep this in mind, the scope of this study must be adhered to, which limits further exploration of these factors.

According to Shapcott, Nelson, and Husman (2012), given the connection between self-efficacy, motivation and persistence, it would be natural to assume that high STEM attrition rates among women are caused by their lower self-efficacy. Surprisingly, many studies such as this one do not find significant gender differences in men's and women's levels of self-efficacy. Therefore, if women have comparable self-efficacy scores, why do they choose not to persist in STEM careers? An American study by Borrego, Padilla, Zhang, Ohland, and Anderson (2005) investigating STEM attrition found that women leaving STEM courses do not only have passible grade point averages, but significantly higher averages than their male counterparts. Perhaps the self-efficacy of women in engineering courses contributes less to their attrition than other variables.

Perhaps the women in engineering's surprisingly high self-efficacy can be explained by another factor. Jiang (2014) investigated the relationship between career decision-making self-efficacy and emotional intelligence between men and women (N = 367). He argues that emotional intelligence (EI) is an essential part of making career decisions, as those with higher EIs are better at identifying and communicating their interests and values. Furthermore, increasing an individual's EI can lead to an increase in their career decisions self-efficacy. These findings are supported by Brown, George-Curran, and Smith (2003), who found that university students with higher EI scored higher on a Career Decision-Making Self-Efficacy Scale, and Di Fabio, Palazzeschi, Asulin-Peretz, and Gati (2013), who reported a positive correlation between career decision-making self-efficacy and EI. According to these findings, individuals who can understand, manage and control their emotions successfully have more positive attitudes towards tasks regarding making career decisions. Since several studies have confirmed that women tend to have higher EI than men (Hall & Mast, 2008; Hertel, Schutz, & Lammers, 2009; Palmer, Gignac, Manocha, & Stough, 2005), this can perhaps explain why the female engineering sample of this study had such surprisingly high self-efficacy scores.

5.4 The Relationship between IP and Self-Efficacy

The researcher found a negative relationship between IP and self-efficacy (Figure 2), indicating that an increase in one of these factors will be followed by a decrease in the other or vice versa. While this relationship may or may not represent causation, it clearly shows a pattern. This pattern is further illustrated in Figures 3 and 4, which show inverse peaks and valleys but only for the male sample. Figure 3 shows a sharp increase in IP scores for men enrolled in Chemical and Metallurgical engineering, as well as a low IP score for the single male nursing participant, while Figure 4 shows sharp decreases in self-efficacy scores for men enrolled in Chemical and Metallurgical engineering, as well as a high self-efficacy score for the male nursing participant. This negative correlation does not seem to hold for the female sample indicating that it might be gendered. The women were shown to have relatively high self-efficacy scores regardless of their high self-efficacy scores. Unfortunately, there is not a lot of literature available on this specific mix of factors, thus indicating the need to investigate this relationship further.

5.5 Conclusion

In this chapter, the researcher discussed the results contained in Chapter 4 in light of recent literature. This chapter started with a review of literature regarding IP and thereafter a review of the literature regarding self-efficacy was explored.

Chapter 6: Conclusion, Recommendations and Limitations

6.1 Introduction

In this chapter the researcher will discuss the conclusion of this study as well as its limitations. The researcher also provides recommendations for further research from these findings.

6.2 Limitations

The sample of this study poses a limitation for two reasons, firstly because of its small size and secondly because of its uneven nature. When it comes to the sample of quantitative studies, larger samples are regarded as better. When a sample is too small, the correlation coefficients among the variables are less reliable (Pallant, 2013). According to Tabachnick and Fidell (2013), the desired sample size for a factorial analysis is to have at least 300 cases. With regard to the uneven nature of the sample, this study only had a single response from a male nurse, making the planned data analysis and comparisons between groups unavailable.

Another possible limitation to this study is its use of self-report measures. While using self-report measures is easy to implement and cost-effective, they also come with some disadvantages. Self-report measures could be problematic as they depend on the participants' honesty. Some participants may want to manage the way in which they appear by giving responses they deem as more socially acceptable. Furthermore, even when participants are being honest, they may lack the introspective ability to respond accurately to questions, especially when the questions are concerned with more abstract concepts such as participants' thoughts and perceptions. Participants' subjective interpretations of such questions may also differ (Hoskin, 2012). Likert-type scales, such as the ones used in this study, may fall victim to response biases. Response biases occur when respondents do not complete rating scales accurately (Smith, 2014). For instance, when a participant is asked about a personal experience, some participants may be biased towards answering positively even if that experience has only occurred once, while other participants may answer more conservatively and only answer positively to experiences that have occurred regularly. This can be especially problematic when evaluating the relationship between different scales, as a correlation between the measures may simply be reflecting the consistency of a participant's response bias across different measurement instruments (Hoskin, 2012).

While the emergence of the Covid-19 pandemic affected the collection of data negatively, the researcher must also consider the fact that the data collection method used in this study was not able to adequately reach the small cohorts of students in atypical courses needed for this study. This issue was especially noted in the recruiting of male nursing participants. Since the Nursing Science degree consists of 90% women and 10% men, the researcher would have had to reach the majority of those male participants in order to collect enough data to run the planned data analysis. The researcher collected data by sending out mass communications to the entire group; however, in retrospect, more care should have been taken to recruit male nursing participants and female engineering participants.

6.3 Recommendations

Regarding recommendations for future studies, the researcher recommends the replication of this study with an adequate male nursing sample so that comparisons between the genders can be drawn. Future studies could also consider exploring whether women end up being successful in their chosen careers; do their high IP scores make it more difficult for them to adjust to their environment, achieve success or experience job satisfaction despite their high self-efficacy scores?

The researcher also recommends involving a qualitative aspect to this study; by using mixed methods the study could be strengthened and the data more detailed, painting a more complete picture of this phenomenon. This will allow us to further our understanding of the phenomenon and its effects.

6.4 Conclusion

The purpose of this study was to explore the occurrence of IP and the level of self-efficacy among university students who are enrolled in courses which are dominated by the opposite gender, namely nursing and engineering. This study found that women who are enrolled in male dominated engineering courses do score higher on the IP Scale than both men and women in traditional courses. However, this study did not find differences in the level of career-decisions self-efficacy between the male and female samples, regardless of the gender composition of their specific courses.

With regard to the relationship between IP and self-efficacy, this study suggests the existence of an inverse non-linear relationship between the two variables, indicating that as IP increases, self-efficacy decreases, and vice versa. However, despite the women in engineering's high IP scores, they do not have low self-efficacy scores, and the researcher suspects that this is due to the sheer determination of these women to persist and succeed in their studies. The female sample may be employing more active coping strategies to deal with their IP feelings or perhaps the female sample's high self-efficacy scores are due to their high emotional intelligence.

References

Austin, C. C., Clark, E. M., Ross, M. J., & Taylor, M. J. (2009). Impostorism as a mediator between survivors guilt and depression in a sample of African American college students. *College Student Journal, 43*(4), 1094-1109. doi:10.1037/e566962012-425

Badawy, R. L., Gazdag, B. A., Bentley, J. R., & Brouer, R. L. (2018). Are all impostors created equal? Exploring gender differences in the impostor phenomenon-performance link. *Personality and Individual Differences, 131,* 156–163. doi.org/10.1016/j.paid.2018.04.044

Bandura, A. (1986). *Social foundations of thought and action: A social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: W. H. Freeman and Company.

Betz, N. E. (2000). Self-efficacy theory as a basis for career assessment. *Journal of Career Assessment, 8*(3), 3-11.

Betz, N. E., Hammond, M. S., & Multon, K. D. (2005). Reliability and validity of five-level response continuua for the Career-Decisions Self-Efficacy Scale. *Journal of Career Assessment, 13,* 131-149.

Betz, N. E., Klein, K. L., & Taylor, K. M. (1996). Evaluation of a short form of the Career Decision-making Self-Efficacy Scale. *Journal of Career Assessment, 4,* 47-57.

Betz, N. E., & Luzzo, D. A. (1996). Career assessment and the Career Decision-Making Self Efficacy Scale. *Journal of Career Assessment 4*(4), 413-428.

Bian, L., Leslie, S. J., & Cimpian, A. (2017). Gender stereotypes about intellectual ability emerge early and influence children's interests. *Science, 355,* 389-391. doi:10.1126/science.aah6524

Borrego, M. J., Padilla, M. A., Zhang, G., Ohland, M. W., & Anderson, T. J. (2005). Graduation rates, grade-point average, and changes of major of female and minority students entering engineering. *Proceedings Frontiers in Education 35th Annual Conference.* doi:10.1109/FIE.2005.1611931

Bosch, E. (2020). *Qualtrics: What is Qualtrics?* Retrieved from https://csulb.libguides.com/qualtrics

Brown, C., George-Curran, R., & Smith, M. L. (2003). The role of emotional intelligence in the career commitment and decision-making process. *Journal of Career Assessment, 11*, 379-392. doi:10.1177/1069072703255834

Bui, K. T. (2002). First-generation college students at a four-year university: Background characteristics, reasons for pursuing higher education, and first-year experiences. *College Student Journal, 36*(1), 3-11.

Burke, B. A., & Sunal, D. W. (2010). *Teaching science with Hispanic ELLs in K-16 classrooms.* Greenwich, CT: Information Age Publishing.

Cech, E. A., Rubineau, B., Silbey, S., & Seron, C. (2011). Professional role confidence and gendered persistence in engineering. *American Sociological Review, 76,* 641– 666. http://dx.doi.org/10.1177/00031 22411420815

Chakraverty, D. (2019). Impostor phenomenon in STEM: Occurrence, attribution, and identity. *Studies in Graduate and Postdoctoral Education*, *10*(1), 2-20. https://doi.org/10.1108/SGPE-D-18-00014

Chapman, A. (2017). Using the assessment process to overome Impostor Syndrome in mature students. *Journal of Further and Higher Education, 41*(2), 112-119. https://doi.org/10.1080/0309877X.2015.1062851

Chen, J. A., & Usher, E. L. (2013). Profiles of the sources of science self-efficacy. *Learning and Individual Differences, 24*, 11-21. https://doi.org/10.1016/j.lindif.2012.11.002

Chen, X., & Soldner, M. (2013). *STEM attrition: College students' path into and out of STEM fields*. Retrieved from http://nces.ed.gov/pubs2014/2014001rev.pdf

Cheryan, S., Plaut, V. C., Davies, P. G., & Steele, C. M. (2009). Ambient belonging: How stereotypical cues impact gender participation in computer science. *Journal of Personality and Social Psychology, 97*, 1045-1060. doi:10.1037/a0016239

Chrisman, S. M., Pieper, W. A., Clance, P. R., Holland, C. L., & Glickauf-Hughes, C. (1995). Validation of the Clance Imposter Phenomenon Scale. *Journal of Perosnality Asssessment 65*(3), 456-467. doi:10.1207/s15327752jpa6503_6

Clance, P. R. (1985). *The Impostor Phenomenon: When success makes you feel like a fake.* Atlanta, GA: Peachtree Publishers.

Clance, P. R. (2013). *Impostor Phenomenon*. Retrieved from http://paulineroseclance.com/impostor_phenomenon.html

Clance, P. R., Dingman, D., Reviere, S. L., & Stober, D. R. (1995). Impostor Phenomenon in an interpersonal/social context: Origins and treatment. *Women & Therapy, 16*(4), 79-96. doi.org/10.1300/J015v16n04_07

Clance, P. R., & Imes, S. A. (1978). The Impostor Phenomenon in high-achieving women: Dynamics and theraputic intervention. *Psychotherapy: Theory, Research and Practice, 15*(3), 241-247.

Clancey, K. (2013). *I pretend to know everything: The impostor phenomenon in male psychology graduate students.* (Doctoral dissertation). The Chicago School of Professional Psychology, UMI.

Clark, M., Vardeman, K., & Barba, S. (2014). Perceived inadequacy: A study of the Imposter Phenomenon among college and research librarians. *College & Research Libraries, 75*(3), 255–271. https://doi.org/10.5860/crl12-423

Cokley, K., Awad, G., Smith, L., Jackson, S., Awosogba, O., Hurst, A., & Roberts, D. (2015). The roles of gender stigma consciousness, impostor phenomenon and academic self-concept in the academic outcomes of women and men. *Sex Roles, 73*(9–10), 414–426. https://doi.org/10.1007/s11199-015-0516-7

Cokley, K., McClain, S., Enciso, A., & Martinez, M. (2013). An examination of the impact of minority status stress and impostor feelings on the mental health of diverse ethnic minority college students. *Journal of Multicultural Counselling and Development, 41*, 82-95. doi:10.1002/j.2161-1912.2013.00029.x

Cowman, S. E., & Ferrari, J. R. (2002). 'Am I for real?' Predicting impostor tendencies from self- handicapping and affective components. *Social Behavior and Personality, 30*, 119–126. doi:10.2224/sbp.2002.30.2.119.

Creed, P. A., Patton, W., & Watson, M. B. (2002). Cross-cultural equivalence of the Career Decision-making Self-Efficacy Scale-short form: An Australian and South African comparison. *Journal of Career Assessment, 10*(3), 327-342. doi:10.1177/1067270201003004

Cusack, C. E., Hughes, J. L., & Nuhu, N. (2013). Connecting gender and mental health to Impostor Phenomenon feelings. *Psi Chi Journal of Psychological Research, 18*(2), 74-81.

DeLuca, D., Gallivan, M. J., & Kock, N. (2008). Furthering information systems action research: A post-positivist synthesis of four dialectics. *Journal of the Association for Information Systems, 9*(2). doi:10.17705/1jais.00150

Di Fabio, A., Palazzeschi, L., Asulin-Peretz, L., & Gati, I. (2013). Career indecision versus indecisiveness: Associations with personality traits and emotional intelligence. *Journal of Career Assessment, 21,* 42-56. doi:10.1177/1069072712454698

Dompe, P. (2010). *The impostor phenomenon in psychology graduate students: A measure of the prevalence, in which year it is most prevalent, and the psychological symptoms involved.* (Doctoral dissertation). California School of Professional Psychology, UMI.

Eagly, A., & Wood, W. (2012). *Social role theory: Handbook of theories in social psychology.* (pp. 458-476). Thousand Oaks, CA: Sage Publications.

Eccles, J. S., Arberton, A., Buchanan, C. M., Jacobs, J., Flanagan, C., Harold, R., Maclver, D., Midgley, C., & Reuman, D. (1993). School and family effecrs on the ontogeny of children's interests, self-perceptions, and activity choices. *Current Theory and Research in Motivation, 40,* 145-208.

Ertl, B., Luttenberger, S., & Paechter, M. (2017). The impact of gender stereotypes on the self-concept of female students in STEM subjects with an under-representation of females. *Frontiers in Psychology, 8*(703), 1-11. https://doi.org/10.3389/fpsyg.2017.00703

Fallan, L., & Opstad, L. (2016). Student self-efficacy and gender-personality interactions. *International Journal of Higher Education, 5*(3), 32-44. doi:10.5430/ijhe.v5n3p32

Faulkner, S., & Faulkner, A. (2014). *Research methods for social workers: A practice-based approach.* Chicago, IL: Lyceum Books.

Felder, R. (1988). Imposters everywhere. *Chemical Engineering Education, 22*(4), 168-169.

Ferrari, J. R., & Thompson, T. (2006). Impostor fears: Links with self-presentational concerns and self- handicapping behaviours. *Personality and Individual Differences, 40*(2), 341-352.

Field, A. (2017). *Discovering statistics using IBM SPSS statistics.* (5th ed.). London, UK: Sage Publications.

Fox, N. J. (2008). *Post-postivism. The SAGE encyclopaedia of qualitative research methods.* London, UK: Sage.

Fraenza, C. B. (2016). The role of social influence in anxiety and the imposter phenomenon, *Online Learning, 20*(2), 230–243. Retrieved from https://files.eric.ed.gov/fulltext/EJ1105971.pdf

French, B. F., Ullrich-French, S. C., & Follman, D. (2008). The psychometric properties of the Clance Impostor Scale. *Personality and Individual Differences, 44,* 1270-1278.

Gaiman, N. (2017). *The Neil story*. Retrieved from https://journal.neilgaiman.com/2017/05/the-neil-story-with-additional-footnote.html

Goodman, L. (2017). Mental health on university campuses and the needs of students they seek to serve. *Building Healthy Academic Communities Journal, 1*(2), 31-44. doi:10.18061/bhac.vli2.6056

Grady, C. A., Stewardson, G. A., & Hall, J. L. (2008). Faculty notions regarding caring in male nursing students. *Journal of Nursing Education, 47*(7), 314-323.

Gravetter, F. J., & Forzano, L. B. (2016). *Research methods for the behavioural sciences*. Belmont, CA: Wadsworth Cengage Learning.

Gravois, J. (2007). You're not fooling anyone. *The Chronicle of Higher Education*. Retrieved from http://www.chronicle.com/article/youre-not-fooling-anyone/28069

Greig, E., & Pell, K. (2017). *Engineering UK 2017: The state of engineering*. Retrieved from https://www.engineeringuk.com/media/1355/enguk-report-2017.pdf

Haggard, S. (2019). *The impostor phenomenon in first-generation undergraduate students.* (Unpublished honours dissertation). Ball State University, Muncie, Indiana.

Hall, J. A., & Mast, M. S. (2008). Are women always more interpersonally sensitive than men? Impact of goals and content domain. *Personality and Social Psychology Bulletin, 34*(1), 144-155. doi:10.1177/0146167207309192

Halvorson, H. G. (2010). *The cure for loneliness*. Retrieved from https://www.psychologytoday.com/us/blog/the-science-success/201010/the-cure-loneliness

Harvey, J. C. (1981). The impostor phenomenon an achievement: A failure to internalize success. (Doctoral dissertation, Temple University). *Dissertation Abstracts International, 42*, 4969B.

Harvey, J. C., & Katz, C. (1985). *If I'm so successful, why do I feel like a fake?* New York, NY: Random House.

Henning, K., Ey, S., & Shaw, D. (1998). Perfectionism, the impostor phenomenon and psychological adjustment in medical, dental, nursing and pharmacy students. *Medical Education, (32)*, 456–464.

Hertel, J., Schutz, A., & Lammers, C. (2009). Emotional intelligence and mental disorder. *Journal of Clinical Psychology, 65*(9), 942-954. https://doi.org/10.1002/jclp.20597

Holmes, S. W., Kertay, L., Adamson, L. B., Holland, C. L., & Clance, P. R. (1993). Measuring the Impostor Phenomenon: A comparison of Clance's IP scale and Harvey's IP scale. *Journal of Personality Assessment, 60*(1), 48-59. doi:10.1207/s15327752jpa6001_3

Hoskin, R. (2012). *The dangers of self-report*. Retrieved from https://www.sciencebrainwaves.com/the-dangers-of-self-report/

Hottinger, J. A., & Rose, J. P. (2006). First generation college students. In Gohn, L. B., & Albin, G. R. (Eds.). *Understanding College Student Subpopulations: A Guide for Student Affairs Professionals* (pp. 115-134). Pennsylvania: National Association of Student Personnel Administrators, Inc.

Huang, P. M., & Brainnard, S. G. (2001). Identifying determinants of academic self-confidence among science, math, engineering and technology students. *Journal of Women and Minorities in Science and Engineering, 7*(4), 40. doi:10.1615/JWomenMinorScienEng.v7.i4.40

Hutchins, H. M., & Rainbolt, H. (2017). What triggers impostor phenomenon among academic faculty? A critical incident study exploring antecedents, coping, and development opportunities. *Human Resources Development International, 20*(3), 194-214.

Hutchison, M., Follman, D., & Antoine, D. (2006). The undergraduate research experience as it relates to research efficacy beliefs and impostor phenomenon. *School of Engineering Education Graduate Student Series, 14*, 1-11.

Inzlicht, M., & Ben-Zeev, T. (2000). A threatening intellectual environment: Why females are susceptible to experiencing problem-solving deficits in the presence of males. *Psychological Science, 11*(5), 365-371.

Ishitani, T. T. (2006). Studying attrition and degree completion behavior among first-generation college students in the United States. *The Journal of Higher Education, 77*(5), 861-885.

Jiang, Z. (2014). Emotional intelligence and career decision-making self-efficacy: National and gender differences. *Journal of Employment Counselling, 51*, 112-124. doi:10.1002/j.2161-1920.2014.00046.x

Kaiser, S. (2005). *The impostor phenomenon. When laurels taste sour.* (Unpublished diploma theses). University of Vienna, Austria.

Kamarzarrin, H., Khaledian, M., Shooshtari, M., Yousefi, E., & Ahrami, R. (2013). A study of the relationship between self-esteem and the impostor phenomenon in the physicians of Rasht City (Iran). *European Journal of Experimental Biology, 3*(2), 363-366. Retrieved from https://www.imedpub.com/articles/a-study-of-the-relationship-between-selfesteem-and-the-imposter-phenomenon-in-the-physicians-of-rasht-city.pdf

Keller, D. K. (2006). Two types descriptive and inferential. In Keller, D. K. *The Tao of statistics: A path to understanding (with no math)* (pp. 48-51). Thousand Oaks, CA: Sage Publications. doi:10.4135/9781452226637

Klinkhammer, M., & Saul-Soprun, G. (2009). The impostor phenomenon in science. *Supervision, Coaching, 16*, 165–182.

Kolligian, J., & Sternberg, R. J. (1991). Perceived fraudulence in young adults: Is there an 'Impostor Syndrome'? *Journal of Personality Assessment, 56*(2), 308-326.

Kumar, S., & Jagacinski, C. M. (2006). Imposters have goals too: The imposter phenomenon and its relationship to achievement goal theory. *Personality and Individual Differences, 40*, 147-157. doi:10.1016/j.paid.2005.05.014

Leonhardt, M., Bechtoldt, M. N., & Rohrmann, S. (2017). All impostors aren't alike - Differentiating the impostor phenomenon. *Frontiers in Psychology, 8*(1505), 1-10. https://doi.org/10.3389/fpsyg.2017.01505

Lo Presti, A., Pace, F., Mondo, M., Nota, L., Casarubia, P., Ferarri, L., & Betz, N. E. (2013). An examination of the structure of the Career-Decision Self-Efficacy Scale (short form) among Italian high school students. *Journal of Career Assessment, 21*(2), 337-347. doi:10.1177/1069072712471506

Lord, C. G., & Saenz, D. S. (1985). Memory deficits and memory surfeits: Differential cognitive consequences of tokenism for tokens and observers. *Journal of Personality and Social Psychology, 49*(4), 918-926. https://doi.org/10.1037/0022-3514.49.4.918

Lou, J., Yu, H., Hsu, H., & Dai, H. (2007). A study of role stress, organizational commitment and intention to quit among male nurses in southern Taiwan. *Journal of Nursing Research, 15*(1), 43-53.

Macha, H. (1992). *Female academics in Germany: Women's Everyday Life and Lifestyle in both Parts of Germany* (pp. 189–214). Köln, Germany: Bund-Verlag.

Management Association Information Resources. (2011). Organizational learning and knowledge: Concepts, methodologies, tools and applications. *IGI Global*. Retrieved from https://books.google.co.za/books?id=bkQSRweOBzsC&dq=men+rely+more+on+mastery+experience+self+efficacy&source=gbs_navlinks_s

McBeath, M. L., Drysdale, M. T. B., & Bohn, N. (2017). Pathways to mental health and wellbeing: Understanding and supporting students during critical school-to-work transitions. *International Perspectives on Education and Society, 32*, 177-191. doi:10.1108/S1479-367920170000032012

McClain, S., Beasley, S. T., Jones, B., Awosogba, O., Jackson, S., & Cokley, K. (2016). An examination of the impact of racial and ethnic identity, impostor feelings, and minority status stress on the mental health of Black college students. *Journal of Multicultural Counselling and Development, 44*(2), 101-117. doi:10.1002/jmcd.12040

McElwee, R. O., & Yurak, T. J. (2010). The phenomenology of the impostor phenomenon. *Individual Differences Research, 8*(3), 184-197.

McGregor, L. N., Gee, D. E., & Posey, K. E. (2008). I feel like a fraud and it depresses me: The relation between the imposter phenomenon and depression. *Social Behavior and Personality*, *36*(1), 43-48.

Metz, C. J., Ballard, E., & Metz, M. J. (2020). The stress of success: An online module to help first-year dental students cope with the Impostor Phenomenon. *Journal of Dental Education*, 1-9. doi:10.1002/jdd.12181

Nelson, K. L., & McDaniel, J. R. (2019). Majoring in STEM: How the factors of fear of failure, impostor phenomenon, and self-efficacy impact decision-making. *National Social Science Journal 52*(1), 76.

Nelson, K. L., Newman, D. N., McDaniel, J. R., & Buboltz, W. C. (2013). Gender differences in fear of failure amongst engineering students. *International Journal of Humanities and Social Science*, *3*(16), 10-16.

Neureiter, M., & Traut-Mattausch, E. (2016). An inner barrier to career development: Preconditions of the impostor phenomenon and consequences for career development. *Frontiers in Psychology, 7*(48), 1-15. https://doi.org/10.3389/fpsyg.2016.00048

Neureiter, M., & Traut-Mattausch, E. (2017). Two sides of the career resources coin: Career adaptability resources and the impostor phenomenon. *Journal of Vocational Behavior, 98*, 56-59. doi:10.1016/j.jvb.2016.10.002

O'Lynn, C. E., & Tranbarger, R. E. (2007). *Men in nursing: History, challenges and opportunities.* New York, NY: Springer.

Oriel, K., Plane, M. B., & Mundt, M. (2004). Family medicine residents and the imposter phenomenon. *Family Medicine*, *36*(4), 248-252.

Pajares, F., & Zeldin, A. L. (2000). Against the odds: Self-efficacy beliefs of women in mathematical, scientific, and technological careers. *American Educational Research Journal 37*(1), 215–246. doi:10.2307/1163477

Pallant, J. (2013). *SPSS survival manual: A step by step guide to data analysis using SPSS.* Maidenhead, UK: McGraw Hill.

Palmer, B. R., Gignac, G., Manocha, R., & Stough, C. (2005). A psychometric evaluation of the Mayer-Salovey-Caruso emotional intelligence test version 2.0. *Intelligence, 33*(3), 285-305. https://doi.org/10.1016/j.intell.2004.11.003

Parkman, A., & Beard, R. (2009). Succession planning and the impostor phenomenon in higher education. *CUPA-HR Journal, 59*(2), 29-36.

Patzak, A., Kollmayer, M., & Schober, B. (2017). Buffering impostor feelings with kindness: The mediating role of self-compassion between gender-role orientation and the Impostor Phenomenon. *Frontiers in Psychology, 8*(1289), 1-15. https://doi.org/10.3389/fpsyg.2017.01289

Pinel, E. C. (1999). Stigma consciousness: The psychological legacy of social stereotypes. *Journal of Personality and Social Psychology, 76*, 114-128. doi:10.1037/0022-3514.76.1.114

Prata, J., & Gietzen, J. W. (2007). The imposter phenomenon in physician assistant graduates. *The Journal of Physician Assistant Education*, *18*(4), 33-36.

Pratt, T. M. (2020). *Effects of the Impostor Phenomenon, stress, and belonging on perfectionism in freshman undergraduate students.* Brescia Psychology Honours Theses, Ontario. Retrieved from https://ir.lib.uwo.ca/cgi/viewcontent.cgi?article=1033&context=brescia_psych_uht#:~:text=The%20study%20found%20that%20students,of%20belonging%20to%20their%20university.&text=In%20that%2C%20as%20the%20students,form%20of%20perfection%20also%20increased

Reddan, G. (2015). Enhancing students' self-efficacy in making positive career decisions. *Asia-Pacific Journal of Cooperative Education, 16*(4), 291-300. Retrieved from https://www.ijwil.org/files/APJCE_16_4_291_300.pdf

Rittmayer, M. A., & Beier, M. E. (2009). Self-efficacy in STEM. In B. Bogue & E. Cady (Eds.), *Applying Research to Practice (ARP) Resources*. Retrieved from http://www.engr.psu.edu/AWE/ARPresources.aspx

Rohrmann, S., Bechtoldt, M. N., & Leonhardt, M. (2016). Validation of the impostor phenomenon among managers. *Frontiers in Psychology, 7.* doi:10.3389/fpsyg.2016.00821

Rosenstein, A., Raghu, A., & Porter, L. (2020). Identifying the prevalence of the impostor phenomenon among computer science students. *SIGCSE', 20,* 30-36.

Sakulku, J., & Alexander, J. (2011). The impostor phenomenon. *International Journal of Behavioral Science, 6*(1), 75-97.

Seltman, H. J. (2013). *Experimental design and analysis*. Available online at: http://www.stat.cmu,edu/,hseltman/309/Book/Book

Shapcott, S., Nelson, K. G., & Husman, J. (2012). Changing the face of engineering: Can photovoltaic engineering lead the charge? *ASEE Annual Conference and Exposition.* Retrieved from https://www.researchgate.net/publication/288185656_Changing_the_face_of_engineering_Can_photovoltaic_engineering_lead_the_charge/citation/download

Simon, M., & Choi, Y. J. (2018). Using factor analysis to validate the Clance Impostor Phenomenon Scale in sample of science, technology, engineering and mathematics doctoral students. *Personality and Individual Differences, 121* (September 2017), 173–175. https://doi.org/10.1016/j.paid.2017.09.039

Smith, P. B. (2014). *Encyclopedia of quality of life and well-being research.* Dordrecht, The Netherlands: Springer. https://doi.org/10.1007/978-94-007-0753-5_2503

Stout, J. G., Dasgupta, N., Hunsinger, M., & McManus, M. A. (2011). STEMing the tide: Using ingroup experts to inoculate women's self-concept in science, technology, engineering, and mathematics (STEM). *Journal of Personality and Social Psychology, 100*(2), 255-270.

Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics.* (6th ed.). Boston, MA: Pearson Education.

Taylor, K. M., & Betz, N. E. (1983). Applications of self-efficacy theory to the understanding and treatment of career indecision. *Journal of Vocational Behaviour, 22,* 63-81.

Vancouver, J. B., & Kendall, L. N. (2006). When self-efficacy negatively relates to motivation and performance in a learning context. *Journal of Applied Psychology, 91,* 1146–1153.

Vergauwe, J., Wille, B., Feys, M., De Fruyt, F., & Anseel, F. (2015). Fear of being exposed: The trait-relatedness of the impostor phenomenon and its relevance in the work context. *Journal of Business and Psychology, 30*(3), 565-581.

Villwock, J., Sobin, L. B., Koester, L. A., & Harris, T. M. (2016). Impostor syndrome and burnout among American medical students: A pilot study. *International Journal of Medical Education, 7*, 364-369. doi:10.511/ijme.5801.eac4

Wierzchowski, K. (2019). *The role of stereotype threat and impostor phenomenon in predicting female undergraduate students' persistence in STEM.* (Unpublished doctorate dissertation). Purdue University: Indiana.

Appendix A: Measurement Instruments

- **Clance IP Scale**

For each question, please circle the number that best indicates how true the statement is of you. It is best to give the first response that enters your mind rather than dwelling on each statement and thinking about it over and over.

1. **I have often succeeded on a test or task even though I was afraid that I would not do well before I undertook the task.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

2. **I can give the impression that I'm more competent than I really am.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

3. **I avoid evaluations if possible and have a dread of others evaluating me.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

4. **When people praise me for something I've accomplished, I'm afraid I won't be able to live up to their expectations of me in the future.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

5. **I sometimes think I obtained my present position or gained my present success because I happened to be in the right place at the right time or knew the right people.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

6. **I'm afraid people important to me may find out that I'm not as capable as they think I am.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

7. **I tend to remember the incidents in which I have not done my best more than those times I have done my best**.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

8. **I rarely do a project or task as well as I'd like to do it.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

9. **Sometimes I feel or believe that my success in my life or in my job has been the result of some kind of error.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

10. **It's hard for me to accept compliments or praise about my intelligence or accomplishments.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

11. **At times, I feel my success has been due to some kind of luck.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

12. **I'm disappointed at times in my present accomplishments and think I should have accomplished much more.**

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

13. Sometimes I'm afraid others will discover how much knowledge or ability I really lack.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

14. I'm often afraid that I may fail at a new assignment or undertaking even though I generally do well at what I attempt.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

15. When I've succeeded at something and received recognition for my accomplishments, I have doubts that I can keep repeating that success.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

16. If I receive a great deal of praise and recognition for something I've accomplished, I tend to discount the importance of what I've done.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

17. I often compare my ability to those around me and think they may be more intelligent than I am.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

18. I often worry about not succeeding with a project or examination, even though others around me have considerable confidence that I will do well.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

19. If I'm going to receive a promotion or gain recognition of some kind, I hesitate to tell others until it is an accomplished fact.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

20. I feel bad and discouraged if I'm not "the best" or at least "very special" in situations that involve achievement.

1	2	3	4	5
(not at all true)	(rarely)	(sometimes)	(often)	(very true)

- **Career Decisions Self-Efficacy Scale**

For each question, please select the appropriate response

	How much confidence do you have that you could:	**No confidence at all**	**Very little confidence**	**Moderate confidence**	**Much confidence**	**Complete confidence**
1	Find information in the library about occupations you are interested in	1	2	3	4	5
2	Select one major from a list of potential majors you are considering	1	2	3	4	5
3	Make a plan of your goals for the next 5 years	1	2	3	4	5
4	Determine the steps to take if you are having academic trouble with an aspect of your chosen major	1	2	3	4	5
5	Accurately assess your abilities	1	2	3	4	5
6	Select one occupation from a list of potential occupations you are considering	1	2	3	4	5
7	Determine the steps you need to take to successfully complete your chosen major	1	2	3	4	5
8	Persistently work at your major or career goal even when you are frustrated	1	2	3	4	5
9	Determine what your ideal job would be	1	2	3	4	5

10	Find out the employment trends for an occupation over the next ten years	1	2	3	4	5
11	Choose a career that will fit your preferred lifestyle	1	2	3	4	5
12	Prepare a good resume	1	2	3	4	5
13	Change majors if you did not like your first choice	1	2	3	4	5
14	Decide what you value most in an occupation	1	2	3	4	5
15	Find out about the average yearly earnings of people in an occupation	1	2	3	4	5
16	Make a career decision and then not worry about whether it was right or wrong	1	2	3	4	5
17	Change occupations if you are not satisfied with the one you enter	1	2	3	4	5
18	Figure out what you are and are not ready to sacrifice to achieve your career goals	1	2	3	4	5
19	Talk with a person already employed in the field you are interested in	1	2	3	4	5
20	Choose a major or career that will fit your interests	1	2	3	4	5
21	Identify employers, forms, institutions relevant to your career possibilities	1	2	3	4	5
22	Define the type of lifestyle you would like to live	1	2	3	4	5

23	Find information about graduate or professional schools	1	2	3	4	5
24	Successfully manage the job interview process	1	2	3	4	5
25	Identify some reasonable major or career alternatives if you are unable to get your first choice	1	2	3	4	5

Appendix B: Invitation to Participate

Informed consent obtain on Qualtrics

My name is Matilde van Niekerk and I am a MA research psychology student investigating Engineering and Nursing students' perceptions of their chosen careers. Specifically I would like to understand whether you are comfortable with your chosen career, whether your gender influences these perceptions and whether you feel high or low levels of self-efficacy in your studies. Self-efficacy is the belief that you can do things such as master your chosen career path.

This questionnaire takes approximately 15-30 minutes to complete.

Please note that participation in this study is completely voluntary and whether you decide to participate or not will in no way influence your results in any module at the University of Pretoria. Your information will remain confidential and you will remain anonymous; you may also decide to end the questionnaire at any time.

By completing your biographical information in the next section you confirm consent to participate in this study (consent information can be read in the next section).

You are welcome to contact me, (matildevniekerk@gmail.com) or my supervisor Prof David Maree (david.maree@up.ac.za) at any stage.

I have obtained ethical clearance from the ethics committees of Humanities and Health Sciences (Hum045/0519) and Faculty permission from the Deans of the Faculty of Engineering, Built Environment and Information Technology and the Faculty of Health Sciences to invite students to participate.

Appendix C: Ethical Clearance

3 July 2019

Dear Miss M van Niekerk

Project Title:	Exploring the occurrence of the impostor phenomenon and level of self-efficacy amongst students in university courses dominated by the opposite gender
Researcher:	Miss M van Niekerk
Supervisor:	Prof CJF Maree
Department:	Psychology
Reference number:	12119009 (HUM045/0519)
Degree:	Masters

I have pleasure in informing you that the above application was **approved** by the Research Ethics Committee on 27 June 2019. Data collection may therefore commence.

Please note that this approval is based on the assumption that the research will be carried out along the lines laid out in the proposal. Should the actual research depart significantly from the proposed research, it will be necessary to apply for a new research approval and ethical clearance.

We wish you success with the project.

Sincerely

Prof Maxi Schoeman
Deputy Dean: Postgraduate and Research Ethics
Faculty of Humanities
UNIVERSITY OF PRETORIA
e-mail. PGHumanities@up.ac.za

Fakulteit Geesteswetenskappe
Lefapha a Dibeetšo

Research Ethics Committee Members: **Prof MME Schoeman (Deputy Dean)**; Prof KL Harris; Mr A Bizos; Dr L Blokland; Dr K Booyens; Dr A-M de Beer; Ms A Dos Santos; Dr R Fasselt; Ms KT Govinder Andrew; Dr E Johnson; Dr W Kelleher; Mr A Mohamed; Dr C Puttergill; Dr D Reyburn; Dr M Soer; Prof E Taljaard; Prof V Thebe; Ms B Tsebe; Ms D Mokalapa

Note: This document was edited electronically to remove the mark-up of words not recognised as correctly spelled.

Appendix D: Faculty of Health Sciences Approval Certificate

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences

The Research Ethics Committee, Faculty Health Sciences, University of Pretoria complies with ICH-GCP guidelines and the US Federal wide Assurance.

- FWA 00002567. Approved dd 22 May 2002 and Expires 03/20/2022.
- IRB 0000 2235 IORG0001762 Approved dd 22/04/2014 and Expires 03/14/2020.

14 February 2020

Approval Certificate
New Application

Ethics Reference No.: HUM045/0519
Title: Exploring the occurrence of the impostor phenomenon and level of self-efficacy amongst students in university courses dominated by the opposite gender

Dear Miss M van Niekerk

The **New Application** as supported by documents received between 2019-10-01 and 2020-02-12 for your research, was approved by the Faculty of Health Sciences Research Ethics Committee on its quorate meeting of 2020-02-12.

Please note the following about your ethics approval:

- Ethics Approval is valid for 1 year and needs to be renewed annually by 2021-02-14.
- Please remember to use your protocol number (HUM045/0519) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, monitor the conduct of your research, or suspend or withdraw ethics approval.

Ethics approval is subject to the following:

- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

Dr R Sommers
MBChB MMed (Int) MPharmMed PhD
Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 46 and 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes, Second Edition 2016 (Department of Health)

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Fakulteit Gesondheidswetenskappe
Lefapha la Disaense tša Maphelo