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Who´s the Real Impostor? A Meta- Analysis of Gender Differences in the Impostor Phenomenon

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1 Abstract

This master thesis is a meta-analysis of research examining gender differences in the Impostor Phenomenon (IP), which is defined as a tendency of high-achieving individuals to feel like “frauds” and undeserving of their success. This phenomenon is often accompanied with low self-worth, psychological distress, anxiety, depression, and emotional burnout. While early theories suggested that women experience IP more frequently and intensely than men, empirical findings have been inconsistent, with conflicting claims in the literature. The present meta-analysis supports the original hypothesis of women being more affected by IP than men, showing that females scored significantly higher on IP than males across 32 effect sizes and a total of over 9340 participants, with a mean effect size (Hedges´ *g*) of 0.4042. While women demonstrate higher susceptibility to IP, men also report impostor feelings to a considerable degree. The variables “Culture” (coded as North America, Europe, and Asia), “Profession” (students versus working professionals), and the mean age were tested for as potential moderators between gender and levels of IP, however, no significant moderating effects were found. To provide effective support for individuals experiencing IP, it is crucial to examine and address the underlying causes and contributing factors that may heighten their vulnerability to this experience.

Keywords: Impostor Phenomenon, Impostor Syndrome, IP, gender, gender differences, sex differences, meta-analysis

2 Introduction

The term *Impostor Phenomenon (IP)* was first described by clinical psychologists Clance and Imes (Clance & Imes, 1978) to describe the experience of high-achieving individuals who perceive themselves as unintelligent or incompetent despite clear evidence of their success. These individuals typically credit their achievements to external factors, such as luck, rather than their abilities and live in constant fear of being revealed as intellectual impostors (Bernuy et al., 2022). Consequently, they suffer from adverse mental health effects, including anxiety, depression, burnout, and a diminished capacity to enjoy their achievements (Jöstl et al., 2012).
Clance and Imes studied highly successful women who, despite earning PhDs, scholastic honors, and professional recognition, considered themselves “impostors”. Women experiencing IP often hold a firm belief that they lack intelligence and are convinced that they have deceived anyone who views them otherwise. For instance, students may imagine that their admission to graduate school was a mistake or the result of an error by the admissions committee. Clance and Imes (1978) support their observations by the experimental findings from attribution theorists, highlighting differences in how women and men attribute their successes.
Tabassum and Nayak (2021) presented substantial evidence that women generally have lower expectations than men regarding their ability to perform successfully across a range of tasks. In line with the different attributions of success between men and women suggested by Deaux (1976), Clance and Imes (1978) initially suggested IP to mainly occur in women, ascribing this to stereotypical expectations in society that show men as naturally more capable, leading women to attribute their success to external factors such as luck or temporary internal factors like hard work, while men internalize it as a reflection of their abilities . However, later research on gender differences has produced mixed results. While some studies found no significant difference in the prevalence of IP between men and women (e.g. Cowman & Ferrari, 2002; Awinashe et al., 2023), others provided evidence supporting the hypothesis that women are more frequently affected by IP than men (e.g. Jöstl et al., 2012; Cristea & Babajide, 2022). A systematic review by Bravata et al. (2020), who

analyzed 62 studies, 33 of which assessed gender differences in IP, highlighted these inconsistencies. Approximately half of the studies reported gender differences, with women being more affected, while the other half found no such differences. To address these conflicting findings, the present quantitative meta-analysis aims to examine gender differences in IP by synthesizing results from existing studies, including primary studies from Bravata´s (2020) systematic review that assessed gender differences.

2.1 The Impostor Phenomenon (IP)

1. Definition

The *Impostor Phenomenon (IP),* which is also known as *Impostor Syndrome, Fraud Syndrome, Perceived Fraudulence,* or *Impostor Experience*, describes a feeling of inadequacy or incompetence in individuals, leaving them feeling like “phonies”, despite evidence of their successes in work or academia (Bravata et al., 2020). People suffering from IP typically attribute their successes to mere luck, coincidence, extremely hard work, or other circumstances instead of acknowledging their obvious competence (Clance & Imes, 1978). These negative self-perceptions can lead to low self-worth, psychological distress, anxiety, depression, and emotional burnout. IP has also been associated with missing affective commitment, a lack of career planning, low job satisfaction, and unsatisfactory subjective productivity (Kumar et al., 2022). IP has been found to be especially common among academics, with a significant body of research focusing on students and professionals in the healthcare sector (Huecker et al., 2024). Although IP is not a clinical diagnosis with formal diagnostic criteria, Huecker et al. (2024) summarized the main criteria that may (but do not have to) be present in individuals experiencing IP: *the impostor cycle*, *perfectionism* (the need to be the best), *super-heroism*, *atychiphobia* (fear of failure), *denial of competence and capability*, and *achievemephobia* (fear of success) (Huecker et al., 2024). The impostor cycle occurs when individuals experiencing IP encounter a task related to achievement. These individuals typically respond to such tasks with either overpreparation or procrastination. In case of overpreparation, they believe they need to work much harder than others to reach the same goal. This mistaken belief reinforces their perception that they are impostors. On the other

hand, when they procrastinate, they feel like impostors because their rushed, last-minute efforts lead them to fear that they will be exposed as frauds. After completing the task, they briefly feel successful and accomplished. However, this sense of accomplishment quickly fades, and they fail to internalize their success. As a result, they continue to feel fear, anxiety, fraudulence, and other related emotions leading to the next task, and the cycle repeats itself (Huecker et al., 2024). Impostors might also suffer from perfectionism, described by Clance and Imes as "the need to be the best" (Clance & Imes, 1978a) and they tend to reach for sometimes unrealistic, unattainable goals. Closely related to perfectionism is *super-heroism,* a tendency to overprepare for tasks to appear more competent. This additional workload can increase stress- levels and may enhance the likelihood of burnout. Impostors typically also suffer from an intense fear of failure (*atychiphobia*), which they try to counteract through overpreparation and hard work. A key component of the concept of IP is the denial of competence, where affected individuals attribute success to external factors such as luck, the benevolence of a boss, or simply working harder than others. Lastly, impostors often suffer from a fear of success (*achievemephobia*). They worry that success will raise others´ expectations of them and increase the likelihood of being exposed as "frauds" (Huecker et al., 2024).
Despite the serious symptoms concomitant with IP, it is not a clinical diagnosis listed in the *American Psychiatric Association's Diagnostic and Statistical Manual (DSM- 5*, or in the *ICD-11* (*World Health Organization*, WHO, 2019), but rather an individual psychological difference that can vary widely among people. In recent years, the concept of IP has received increased attention in popular culture, usually referred to as *Impostor Syndrome* rather than *Impostor Phenomenon.* The terminology "*Impostor Syndrome*" was criticized by Clance, as it is conceptually misleading by implying a clinical disorder that needs medical intervention and may make IP prone to stigma. Therefore, she recommended the use of the more neutral term "*Impostor Phenomenon*".

2. Assessing the Impostor Phenomenon

Even though Clance (Clance & Imes, 1978a) were the pioneers in describing IP in 1978, the first assessment to measure characteristics of IP was the *Harvey Imposter Phenomenon Scale (HIPS),* which was designed by Harvey in 1981 and included 14 items (Mak et al., 2019). Only in 1985 did Clance create the *Clance Imposter Phenomenon Scale (CIPS)* (Clance, 1985), which remains one of the most frequently cited and most commonly used –albeit heavily criticized– measurements to assess IP (Mak et al., 2019). Over the decades, various tools to assess the prevalence and severity of IP have emerged, including the *Perceived Fraudulence Scale (PFS)* (Kolligian Jr. & Sternberg, 1991), the *Leary Imposter Scale (LIS*) (Leary et al., 2000), the *Young Impostor Phenomenon Scale (YIS)* (Young, 2011), or the *Impostor Profile 30 (IPP)* (Ibrahim et al., 2020). However, there is no "gold standard" for assessing IP (Mak et al., 2019), allowing researchers to select from a variety of instruments based on their preferences. This heterogeneity complicates the comparison of studies on the topic.

The original CIPS was specifically developed to address issues of the HIPS (Harvey, 1981) which was criticized for using negative language and for primarily relying on a binary classification (impostors vs. non-impostors) using a median split technique. This simplistic approach lacked the nuances required to capture the complexity and variability of impostor experiences (Walker & Saklofske, 2023). The CIPS is a self-report questionnaire with 20 items, where respondents rate the accuracy of statements on a 5- point Likert scale (1- "not at all true", 2- "rarely", 3- sometimes, 4- often, 5- very true). Examples of items are "I'm afraid people important to me may find out that I'm not as capable as they think I am." (Item 6) and "Sometimes I feel or believe that my success in my life or in my job has been the result of some kind of error." (Item 9). In contrast to the simplified dichotomous categorization of the HIPS, Clance (1984) grouped the resulting scores into four groups: low, moderate, frequent, and intense IP experiences. A low level of IP experiences is defined as scores below 40, scores ranging between 41 and 60 indicate moderate IP experiences, scores between 61 and 80 correspond to frequent IP experiences, and scores above 81 equal intense IP experiences. The higher the score, the more serious the effect of IP on a person´s life and the more frequently and intensely symptoms of IP occur (Clance, 1985). Despite its widespread use, the CIPS has been criticized for its limitations (Mak et al., 2019). While it measures a complex, multidimensional phenomenon, it reduces the assessment to a single total score, failing to account for the multidimensional nature of IP (Freeman et al., 2022).

2.2 The Impostor Phenomenon in Academia

IP, as described by Clance and Imes (1978), encompasses several interconnected aspects, including the impostor cycle, perfectionism, super-heroism, fear of failure, denial of competence, and fear of success– all of which significantly influence educational trajectories (Huecker et al., 2024). IP has increasingly been recognized as a critical psychological factor in career development, and it has been identified as a relevant psychological barrier, especially for young academics (Parkman, 2016). By nature, the university environment is likely to fuel impostor feelings as it is a challenging chapter for most individuals with high stressors like ongoing examinations and competition between students, where feelings of insecurity are often not communicated (Patzak et al., 2017). IP has been associated with a variety of psychological and academic factors, such as self- perceptions of inadequacy (Craddock et al., 2011), low self- esteem (Thompson et al., 1998), lower academic self- concept (Leary et al., 2000), lower research self- efficacy (Jöstl et al., 2012), lower achievement goals (Kumar & Jagacinski, 2006), higher fear of success (Fried-Buchalter, 1992), increased fear of failure (Thompson et al., 1998) and impaired mental health (Jöstl et al., 2012).

Numerous studies show that poor mental health can hinder students´ academic progress, prolong their study time or even lead to university dropout (Chu et al., 2023; Zhang et al., 2024). Eisenberg et al. (2013) studied American university students and found that female students were significantly more affected by mental health issues than male students. Previous research indicates that IP exacerbates mental health problems, contributing to higher levels of anxiety, depression, self-doubt, and burnout (Huecker et al., 2024). Thus, if IP negatively affects mental health which in turn impairs academic success, addressing impostor feelings is critical to prevent students from experiencing serious mental health challenges or jeopardizing their academic careers.

Knights and Clarke (2014) conducted a study with 52 UK-based business school faculty affected by IP and found that participants exhibited heightened self-doubt and insecurity, interpreting academic failures as evidence of professional incompetence. These feelings hindered the development of their academic identity, thereby obstructing their career advancement. Similarly, Hutchins et al. (2015) revealed that

IP among 61 faculty members was linked to reduced research productivity, difficulties in securing external funding, lower effectiveness in teaching and administrative roles, emotional burnout, and anxiety about future prospects. Furthermore, Sims and Cassidy (2019) found that early career university- level music educators experienced impostor feelings more acutely regarding their research as opposed to teaching.

Gender-specific differences in the IP are particularly pronounced during late adolescence– a period when females often exhibit lower self-esteem than males (Zuckerman et al., 2016)– potentially increasing their susceptibility to impostor feelings. As low self-esteem is a key correlate of the IP (Schubert & Bowker, 2019), it may play a role in shaping these gender disparities (Fleischhauer et al., 2021).

2.3 Gender Differences in Career Trajectories

In Europe in 2022, 48% of individuals aged between 25 and 34 with tertiary education were women, compared to 37% for men (Eurostat, 2024). Overall, more women than men graduate with a Bachelor's degree. In the EU, in 2019, nearly equal numbers of women and men attained a doctorate degree (48.1%). However, women remain underrepresented in higher-paid fields, such as Information and Communication Technologies (ICT) and Engineering, and are overrepresented in lower-paid fields, such as Education (Comisión Europea: Dirección General de Investigación e Innovación, 2021). Despite the significant increase in women in tertiary education, they continue to occupy a minority of high-ranking positions in academia (Greska, 2023). European data indicate that only 26.2% of full professorship positions are held by women (Comisión Europea: Dirección General de Investigación e Innovación, 2021). This trend, where the proportion of women decreases with higher career levels, is known as the *Leaky Pipeline* (Blickenstaff, 2005; Huyer, 2018). It is particularly pronounced in STEM fields and economics but is evident across all disciplines (INOMICS Salary Report, 2023). Even in disciplines where the majority of students are female, such as Education, women hold a minority of professorships (Greska, 2023).

Several factors contribute to the leaky pipeline, including workplace discrimination and sexism (Ollrogge et al., 2022), persistent gender stereotypes (Begeny et al., 2020), and insufficient institutional support for women (Horton, 2018). Other studies

suggest the IP as a potential explanation for the leaky pipeline, or at least one among others (Patzak et al., 2017).
Clance and O´Toole (1987) argued that while both men and women experience IP, women are more likely to suffer its adverse effects. Men tend to employ coping strategies, such as seeking support networks or mentorship, which are often less accessible to women. After the postdoc- period, support from academic mentors becomes crucial for career progression.
Shen et al. (2021) conducted a systematic review linking mentorship to both objective and subjective career success indicators. Armstrong and Shulman (2019) also highlighted the importance of mentorship in addressing IP. Women, in particular, valued mentorship for career advancement but were more likely to report its absence. Women also reported lower research productivity, diminished career satisfaction, and greater barriers to promotion (Shen et al., 2021).

It is crucial to collect all existing evidence about IP and its prevalence in men and women and assess this matter once more. If women were more affected by IP than men, this could exacerbate their disadvantages in both academia and the corporate world, further hindering their career success.

2.4 Differences in Gender Stereotypes across Cultures

The Cambridge dictionary´s definition of culture is the following:

> “[Culture is] the way of life, especially the general customs and beliefs, of a particular group of people at a particular time.” (Cambridge Dictionary, 2025)

The prevalence of gender stereotypes and biases can amplify feelings of self-doubt and inadequacy in women (Bravata et al., 2020). Gender stereotypes tend to be more pronounced in collectivistic cultures compared to individualistic cultures (Cuddy et al., 2015). In collectivistic societies, where group harmony, social roles, and traditional norms are highly valued, adherence to prescribed gender roles is often emphasized. These cultures may uphold more rigid expectations for men and women, reinforcing stereotypical behaviors and limiting deviation from societal norms (Eagly & Wood, 2012). Unlike individualistic societies, collectivist cultures often do not regard women as having the same autonomy or equal rights as men. Instead, they tend to prioritize collective responsibilities, such as household and caregiving roles, over women’s personal goals, often disregarding their preferences or abilities (Ribeiro et al., 2023).

In contrast, individualistic cultures prioritize personal autonomy and self-expression, which can allow for greater flexibility in challenging traditional gender roles. While stereotypes still exist in individualistic societies, the emphasis on individual rights and equality may reduce their impact compared to collectivistic settings.

Individualism is strongly linked to increased support for gender equality across crucial areas such as employment and education. It is also tied to lower endorsement of traditional gender roles that confine women primarily to domestic responsibilities (Davis & Williamson, 2019).

Maji and Dixit (2023) found that *Gender Stigma Consciousness (GSC)* has a positive association with IP, meaning that higher levels of GSC among women heighten their susceptibility to experiencing IP (Cokley et al., 2015; Maji & Dixit, 2023). GSC refers to the extent to which an individual is aware of her/his gender’s stigmatized status (Pinel, 1999).

Based on the differences in gender equality between individualistic cultures such as Europe and North America, and collectivistic cultures such as Asian and African countries, I was interested if the variable “Culture” acts as a moderator between gender and IP. Therefore, “Culture” was included as a moderator variable in the present meta-analysis. I hypothesized that gender differences in IP are more profound in collectivistic cultures as opposed to individualistic cultures.

2.5 IP in Students versus in Working Professionals

Literature points in the direction that students might be more prone to experience IP than working professionals. Hutchins (2015) compared impostor feelings between students and working professionals and found that students, especially those studying in competitive fields, experience higher levels of IP than faculty members. Similarly, Vaughn et al. (2020) reported that junior academics, such as graduate students and postdoctoral candidates, experience more intense impostor feelings compared to university working professionals.

One possible explanation for this trend is that these feelings of impostorism tend to diminish over time as individuals develop greater clarity about the origins of their accomplishments and grow more confident in their potential for future success. However, Vergauwe et al (2015) compared working professionals with students and found that while students often experience IP due to academic pressures, professionals frequently continue to struggle with IP as their responsibilities and the stakes of their work increase. This is particularly true for highly competitive professions such as academics, medicine, and law.

The meta-analysis by Bravata et al. (2020) aligns with these findings, indicating a higher prevalence of IP among professionals in highly competitive fields. However, to date, no study has specifically examined whether gender differences in IP are more pronounced in students compared to working professionals or vice versa, or if there are no differences at all.

2.6 Age and Gender Differences in IP

Studies found IP to be particularly prevalent among younger adults, such as university students and early-career professionals, who often report heightened levels of impostor feelings. This tendency is largely attributed to their limited experience, which can foster doubts about their competence, and the significant external expectations they face during transitional life stages, such as entering the workforce or navigating academic challenges (McElwee & Yurak, 2010; Parkman, 2016).

In contrast, middle-aged individuals generally report lower levels of IP. This reduction may stem from increased confidence, a sense of mastery in their careers, and a greater alignment between self-perception and external validation. However, those who take on new roles or transition into unfamiliar career paths later in life may experience a resurgence of IP, often due to feelings of inadequacy in their new contexts (Sakulku & Alexander, 2010).

Among older adults, IP tends to diminish further as individuals develop stronger self-concepts and a greater acceptance of their accomplishments. With age, there is typically a reduced reliance on external validation, which contributes to a decline in impostor feelings over time (Clance & Imes, 1978b).

Although research suggests a negative correlation between age and the level of impostor feelings, it has not yet been examined whether age acts as a potential moderator between gender and IP. Based on previous studies that identified a pronounced gender disparity in IP scores, indicating that girls are disproportionately affected (e.g. McElwee & Yurak, 2010; Parkman, 2016), and considering research demonstrating a negative relationship between age and IP (Sakulku & Alexander, 2010), I hypothesized that the gender gap in IP scores diminishes as age increases.

2.7 Why a Meta- Analysis?

The term Impostor Phenomenon was first introduced in the late 1970´s by psychologists Clance & Imes (1978), who observed this pattern of impostor-like thinking and feeling among female patients. Since then, interest in IP has grown immensely leading to substantial research on the phenomenon. The majority of studies on IP, however, have been published only within the last 20 years, with the body of literature growing more rapidly each year (Mak et al., 2019). Not only in the scientific community but also in mainstream media has IP been attracting more and more attention.

A considerable amount of research has been done about the nature of IP, its prevalence, contributing factors, comorbidities, the effects that IP can have on an individual, and its disproportionate impact on minorities (Kolligian Jr. & Sternberg, 1991; Badawy et al., 2018; Muradoglu et al., 2022). Mainstream media often provide advice on how to overcome impostor feelings and recommend strategies to break free from IP.

When an area of research provides a reasonable amount of studies, as is the case with IP, summarizing the results becomes crucial for gaining an overarching understanding. A common approach is the *literature review* where studies on a certain topic are conglomerated and summarized in a verbal way. This approach is often prone to being unsystematic, incomplete, and biased (Schulze, 2004). An alternative is the *meta-analysis*– a powerful, quantitative method that synthesizes the results of existing studies by calculating an overall summary effect. It is an optimal tool to gain a comprehensive overview of the current state of knowledge of a certain topic. By combining data from multiple primary studies, meta-analyses often have greater statistical power to detect effects that might be missed in smaller individual studies. The pooled data lead to more precise estimates of the overall effect, reducing the margin of error. They can identify patterns, such as moderators or mediators of the effect, that may not be obvious when looking at individual studies. Meta-analyses can help resolve conflicting findings from individual studies by providing an overall summary of the evidence.

A relatively recent systematic review of IP was conducted by Bravata et al. (2020) to provide a comprehensive overview of its prevalence, predictors, comorbidities, and available treatments. The review included 62 peer-reviewed studies published between January 1990 and May 2018, half of which were published within the last six years before the publication of the study, which is congruent with the exploding interest in IP in recent years. Around one third of the included studies were conducted in the USA and Canada, while the rest evaluated populations in Europe, and only one study took place in Asia, in Korea. Half of the included studies assessed students, while 19 studies included only employed people. Notably, Bravata et al. (2020) did not distinguish between elementary, high school, and university students, which might limit the interpretation of their findings.

Despite the growing body of research on IP, no comprehensive synthesis currently exists that consolidates the findings from numerous studies into a unified analysis. Conducting a meta-analysis fills this gap by systematically organizing and interpreting the data, thus creating a clearer understanding of the research landscape.

Even though there are numerous studies on gender and IP, different studies yielded different results, ranging from detecting higher IP in women (Hutchins, 2015), higher IP in men (Paladugu et al., 2021), or no differences whatsoever (Cowman & Ferrari, 2002). What has remained unclear is why the direction of the difference is not consistent. This meta-analysis aims to merge the present evidence and to present a clearer picture of the subject.

A meta-analysis is particularly well-suited to the research question at hand. Unlike systematic reviews, which primarily offer qualitative summaries, meta-analyses employ statistical methods to synthesize data, presenting results in a more neutral and objective manner. This quantitative approach minimizes subjective bias and provides a clear, cohesive representation of the findings. Additionally, such a synthesis lays a solid foundation for future research by identifying trends, gaps, and areas of consensus or divergence. It ensures that subsequent investigations can build on this comprehensive understanding in a targeted and informed way. By integrating the existing knowledge into a unified and accessible format, a meta-analysis transforms a large body of fragmented research into actionable insights. Addressing the question of gender differences in IP is crucial as it has the potential to shape interventions aimed at promoting greater equity and well-being. If a gender-related influence is identified, it could provide critical insights into how societal or systemic factors contribute to disparities. This understanding could guide targeted interventions to counteract these effects, fostering a more inclusive and equitable framework.

In Bravata et al.´s (2020) systematic review, 33 studies investigated gender differences in IP, yielding mixed results. 17 studies reported no gender differences (e.g. Fried-Buchalter, 1992; Cowman & Ferrari, 2002) while 16 studies found that women reported significantly higher IP levels than men (e.g. Hayes & Davis, 1993; Jöstl et al., 2012; Hutchins, 2015).

Given the conflicting evidence in Bravata et al.´s (2020) review, a meta-analysis that incorporates more recent studies was necessary. This meta-analysis includes the primary studies of Bravata´s systematic review that investigated gender differences in IP and reported statistical information allowing the calculation of the *Standard mean difference (SMD)* of gender differences in IP, as measured by the CIPS. Only 10 of the 33 studies in Bravata´s review met these criteria.

An additional literature search for studies on gender differences in IP published after 2018 yielded 22 more studies suitable for this meta-analysis. Ultimately, 32 studies were included, providing a robust dataset to address the research questions.

3 Method

3.1 Hypotheses

Based on the systematic review by Bravata et al. (2020), which yielded inconclusive results regarding the role of gender in IP, this meta-analysis aimed to test this evidence quantitatively It included not only the studies on gender differences cited by Bravata et al. (2020) but also additional literature published after Bravata´s review. The central research question was whether gender differences in IP exist, leading to the main hypothesis that women score higher on IP measures than men. The null-hypothesis assumed no significant differences.

Hypothesis 1: Women score significantly higher on measures of the IP compared to men.

3.2 Moderator Analyses

Beyond investigating gender distribution in IP, this study also explored other variables that could potentially moderate the relationship between gender and IP. Building on previous research that identified possible connections, the variables “Culture”, ”Profession”, and “Age” of participants were selected as potential moderators (e.g., Barr-Walker et al., 2019; Ribeiro et al., 2023; Zuckerman et al., 2016).

Culture:

To assess the first potential moderator, the countries where each study was conducted were coded into three subcategories:

- North America (USA and Canada)
- Europe
- Asia

Hypothesis 2: Gender differences in IP differ significantly among North America, Europe, and Asia.

Profession:

The second moderator investigated was the professional status of participants– whether they were students or working professionals– acts as a moderator between gender and IP. The variable “Profession” was categorized as follows:

- Students: This group included university students from various disciplines.
- Professionals: This group comprised working professionals from diverse fields, predominantly healthcare and medicine.

Studies that included both working professionals and students were omitted in this category. While this moderator variable was dichotomous, excluding additional information about fields of study or types of profession limits the interpretability of the results.

Hypothesis 3: Gender differences in IP are significantly higher among students compared to working professionals.

Age:

While it might seem intuitive to assume that IP symptoms decrease with age as individuals gains experience, expertise and knowledge, the meta-analysis by Bravata et al. (2020) yielded contradictory evidence. Only half of the studies examining age-related effects observed a decline in impostor symptoms with age, while the other half found no such trend. However, some evidence suggests that younger individuals report higher levels of IP. For example, Barr-Walker et al. (2019) found an inverse correlation between age and IP levels among health science librarians, with younger and less experienced librarians scoring higher on IP scales. Findings of numerous studies support this negative correlation between age and CIP scores (Landry et al, 2022; Carroll & Griech, 2023), although not all studies agree on this matter (Vergauwe et al., 2015). It remains unclear whether gender differences in IP diminish with age. As a third potential moderator, the mean age was recorded. However, the exclusion of age range and standard deviation data in the calculation process may have reduced the impact of the mean age variable, especially since many studies include populations with wide age ranges (e.g., Mioara Cristea, 2022, p. 24–68; Fleischhauer et al., 2021, p. 18–72).

Hypothesis 4: Age significantly moderates the effect of gender differences in IP.

3.3 Inclusion and Exclusion Criteria

Given that this meta-analysis is based on the systematic review by Bravata et al. (2020), the inclusion and exclusion criteria for the research were somehow oriented at Bravata´s work. The inclusion and exclusion criteria for the present meta- analysis were the following: Only quantitative primary studies written in English were included. Qualitative studies and case- studies were excluded. Systematic reviews, meta- analysis, books or dissertations were also excluded. Studies must include both male and female participants and report the absolute numbers of participants of each gender as well as the mean CIPS- score and standard deviations for men and women. Given that the scope of this meta- analysis was to detect gender differences in CIPS- means, it was essential for all included studies to use the CIPS as the assessment instrument. To enable a proper assessment of an overall effect size in the meta-analysis, an essential inclusion criterion was that the study included the administration of the CIPS. Studies that used other assessments than the original CIPS or an adapted version of the CIPS to assess IP (e.g. Leary Impostorism Scale, LIS; Leary et al., 2000) were not included in the study. Therefore, it was possible to compute the overall effect size of all included studies.

3.4 Literature Research

A comprehensive systematic literature search was conducted between November 2023 and March 2024 using the databases PsycINFO, ERIC, Pubmed, and Google Scholar.
The following search string was used: “Imposter Phenomenon” OR “Imposter Syndrome” OR “Impostor Phenomenon” OR “Impostor Syndrome” AND “Gender” OR “Sex” OR “Gender Differences” OR “Sex Differences”. As the systematic review of Bravata et al. (2020) included studies that were published up until April 2018, and the presented meta- analysis was based on Bravata´s research, I restricted the search to studies published after April 2018 up until the end of the research period, which was March 2024.

3.5 Study Selection and Inclusion

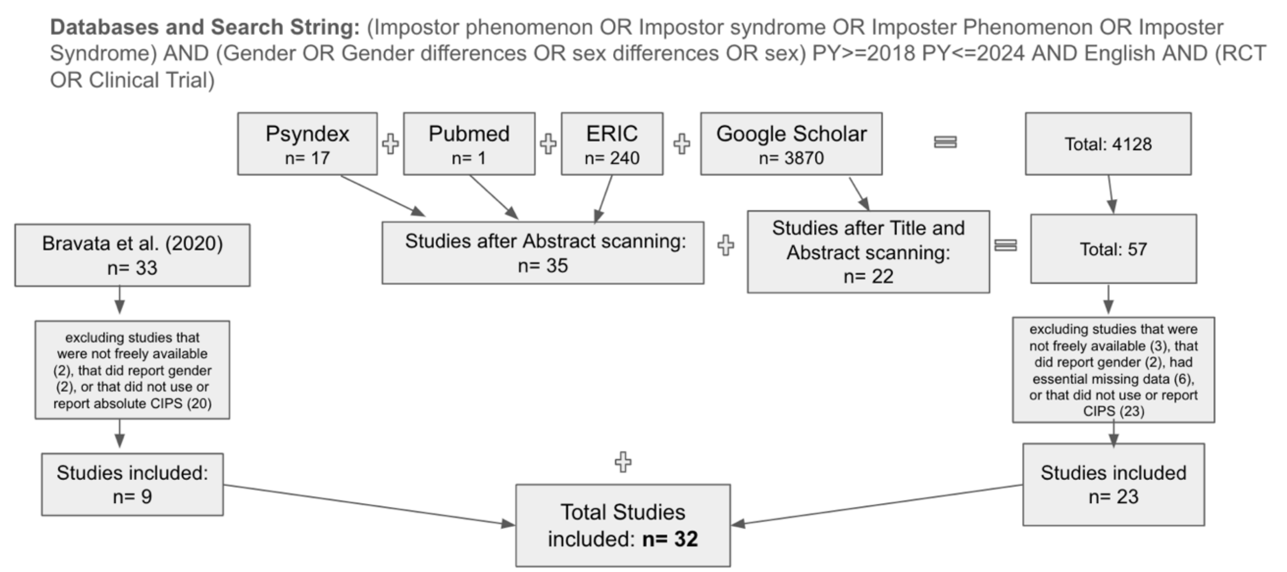

Figure 1. Databases and Search String.

After screening a total number of 4,128 studies based on their titles and abstracts, and removing duplicates, 57 studies were identified for further review. Among these, 23 studies were excluded because they either did not use the CIPS- scale as the assessment instrument for IP or did not report the CIPS score of male and female participants separately. Nine studies were not accessible. Upon contacting the authors, six of these studies were retrieved. Among these, two–kindly provided by

Prof. Brian Harrington (Bernuy et al., 2022) and by Prof. Mioara Cristea (Cristea & Babajide, 2022)– met the inclusion criteria and were incorporated into the meta-analysis. Notably, the study by Bernuy et al. (2022) consisted of two separate investigations, which were treated as distinct entries in the analysis.

Many studies identified in the literature reported the number of participants by gender (male/female) exhibiting low, moderate, high, or intense levels of IP, based on the thresholds recommended by Clance (1985). However, they did not provide absolute mean scores. In cases where authors were contacted to obtain the total CIPS scores of men and women, response were either unavailable or insufficient, rendering these studies ineligible for inclusion in further calculations.

Six studies were excluded because either did they not report the absolute CIPS-scores of men and women or lacked other statistical information critical for computing the unadjusted standardized mean difference (Cohen´s *d*) of the CIPS-scores between men and women. Two studies did not report participant gender and were therefore excluded of further analysis. Attempts to obtain missing data from authors were unsuccessful in these cases. Ultimately, 32 studies met the inclusion criteria and were included in the final meta-analysis.

3.6 Coding Process

Coding was conducted in Microsoft Excel. Each study was systematically coded for the following variables: Authors, publication year, title, country, mean age, age standard deviation, age range, and participants status (professional or student). Statistical information necessary for computing Cohen´s *d*, the common effect size used to compare means, was recorded. Studies that lacked this statistical information and whose authors could not provide it, had to be excluded.

For each study, the total sample size (n), as well as the absolute number of male and female participants, were recorded. To examine gender differences in IP, the mean CIPS scores and corresponding standard deviations for male and female participants were documented. All additional statistical information required to calculate Cohen´s *d*, the effect size for the Standard Mean Difference (*SMD*), between the CIPS- scores of female and male participants was also collected.

3.7 Effect Size Calculation

Harrer et al. (2022) define an effect size as:

> “A metric quantifying the relationship between two entities. It captures the direction and magnitude of this relationship. If relationships are expressed as the same effect size measure, it is possible to compare them.” (Harrer et al., 2022, p. 54).

The standardized between-group mean difference ($SMD_{between}$) quantifies the difference in means between two independent groups (in this case, the mean CIPS scores of men and women), standardized by the pooled standard deviation (S_{pooled}). This measure is commonly calculated as *Cohen's d*, named after psychologist and statistician Jacob Cohen (Cohen, 1988).

Unlike unstandardized mean differences, which represent raw differences between group means, the $SMD_{between}$, or Cohen´s *d*, expresses the differences between two groups in terms of standard deviation units. This standardization is achieved by dividing the raw mean difference $M_1 - M_2$ between the two groups, by the pooled standard deviation S_{pooled} of both groups (Harrer et al, 2022, p. 65).

$$d = \frac{M1 - M2}{Spooled}$$

Where:

$$S_{pooled} = \sqrt{\frac{s1^2 + s2^2}{2}}$$

Here:

- M_1 and M_2 are the means of the two groups (e.g. women and men)
- s_1 and s_2 are the standard deviations of the two groups
- S_{pooled} is the pooled standard deviation., which combines the variability of both groups while accounting for their respective sample sizes.

The pooled standard deviation provides an overall estimate of variability across two or more groups.

Using standardized mean differences is preferable in meta- analyses because $SMD_{between}$= 1 always indicates that the means of two groups differ by one standard deviation. Similarly, $SMD_{between}$ = 2 indicates a difference of two standard deviations, and so on (Harrer et al., 2022, p. 66).

In this meta-analysis, the two groups under comparison were the mean CIPS- scores of men and women.

When authors of the original studies reported the means and standard deviations of the CIPS scores for female and male participants, this information was utilized to calculate the effect size, Cohen´s *d*. Three studies did not report the CIPS means of female and male participants (Hayes & Davis, 1993; Cowman & Ferrari, 2002; Pákozdy et al., 2024), but it was possible to derive Cohen´s *d* by using other provided statistical information such as the- *t*-statistic and the *F*-statistic.
In case of a report of the *t*-statistic, the following formula was applied to retrieve Cohen´s *d* manually:

$$d = \sqrt{\frac{(n1+n2)}{(n1\times n2)}}$$

Where:

- *t* is the *t*-value of the independent *t*-test
- *n1* is the number of women
- *n2* refers to the number of men in the sample.

If authors provided the *F*- statistic, the following formula was used to compute Cohen´s *d:*

$$d = 2 \times \sqrt{\frac{F}{df}}$$

Where:

- *F* is the *F* statistic
- *df* are the degrees of freedom associated with the *F*- statistic.

Hayes and Davis (1993) and Cowman and Ferrari (2002) reported the direction of the effect along with the *t*-statistic, the degrees of freedom, and the *p*-value. Pákozdy et al. (2024) reported the *F*- statistic and its degrees of freedom, as well as the *p*-value and the direction of the effect.
For this analysis, Hedges´ *g* was defined as positive when the average CIPS scores

of women exceeded those of men and negative when the average CIPS scores of men were higher. This approach was adopted to ensure consistent interpretation of effect sizes.

3.8 Meta- Analytic Procedures

Generally, by specifying a metanalytic statistical model, we aim to find an approximate representation of the "reality" underlying our data. The goal is to identify a mathematical formula that explains how to estimate the true effect size underlying all included studies based on their observed results. One of the main objectives of meta-analysis is to determine a single numerical value that characterizes all included studies, even though the observed effect sizes vary from study to study. In this meta-analysis, specifically, we are interested in the standard mean difference of the CIPS-scores between men and women.

A meta-analysis model must explain the reasons for and extent of variability in the observed study results, despite existence of only one overall effect. Two models attempt to account for these differences. The *fixed-effect model* and the *random-effects model*, which are based on different assumptions (Cooper, 2016; Harrer et al., 2022).

The *fixed-effect model (FEM)* assumes that all included studies are part of a homogeneous population, and the only reason observed effect sizes will differ between studies is due to sampling error. In this model, the true effect sizes are considered to be the same (fixed). If sampling error were eliminated, all true effect sizes would be identical. However, the assumption of complete homogeneity among studies is often unrealistic, and studies are likely to differ, even if these differences are subtle.

In contrast, the *random-effects model (REM)* posits the existence of a distribution of true effect sizes rather than a single true effect size. Thus, the goal of the REM is not to identify one true effect size across all studies but to estimate the mean of the distribution of true effects. (Harrer et al., 2022, p. 94-101). Due to the suspected heterogeneity of the primary studies, a REM was chosen for this meta-analysis.

To conduct the present meta-analysis, R-studio version 2024.04.2+764 was utilized. In order to execute the necessary analysis (e.g. main meta- analysis, heterogeneity assessment, meta- regression, sensitivity analysis, tables) I made use of the following packages: meta (Balduzzi et al., 2019), tidyverse (Wickham et al., 2019), metafor (Viechtbauer, 2010), dplyr (Wickham et al., 2023), naniar (2023), robvis(Luke A McGuinness, 2019), readxl (Wickham & Bryan, 2023), PerformanceAnalytics (Peterson & Carl, 2020), tidyr (Wickham et al., 2024), ggplot2 (Wickham, 2016), mosaic (Pruim et al., 2017), epiDisplay (Chongsuvivatwong, 2022), flextable (Gohel & Skintzos, 2024), janitor (Firke, S, 2023), esc (Lüdecke, 2019), openxlsx (Schauberger & Walker, 2023), reprex (Bryan et al., 2024), and rmarkdown (Allaire et al, 2024).

The REM was implemented using the *Hartung-Knapp Adjustment*, a statistical correction applied in random-effects models to adjust the confidence intervals around the pooled effect size. REM*s* assume random variations in effect sizes across studies due to differences in study populations, methods, or other parameters. The traditional methods can sometimes underestimate the variability in these models, leading to overly narrow confidence intervals. The *Hartung-Knapp method* corrects for this by making the confidence intervals more accurate, particularly when the number of studies is small or when there is significant heterogeneity (Harrer et al, 2022, p.103). The statistical procedure involved the *Inverse Variance method*, where studies with larger sample sizes or more precise estimates (smaller variance) are given more weight in calculating the combined effect size. The assumption is that studies with more data (and thus lower variance) provide more reliable estimates.

As an effect size, Hedges´ *g*– a more precise representation of Cohen´s *d*, adjusted for small sample sizes–along with its 95% confidence interval, was calculated. Cohen's *d*, calculated using sample means, tends to provide a biased estimate of the population effect size, especially in small samples (n < 20) (Hedges & Olkin, 1985). For this reason, Cohen's *d* is often referred to as the *uncorrected effect size*. The unbiased alternative is known as the *corrected effect size* or *Hedges' g* (Cumming, 2012). Hedges´ *g* can never exceed the uncorrected SMD, or Cohen´s *d.*

The formula to convert Cohen´s *d* into Hedges´ *g* is as follows (Harrer et al, 2022, p.80):

$$g = d \times 1 - \frac{3}{4n-9}$$

Where:

- *d* is Cohen´s *d*

- *n* is the total sample size
- *g* is Hedges´ *g*.

It should be noted that in research reports, the terms SMD and Hedges' *g* are occasionally used interchangeably. Consequently, when a study presents findings as the SMD, it is important to verify whether the authors are referring to the uncorrected SMD, or Cohen´s *d*, or if a correction for small-sample bias has been applied, indicating the use of Hedges' *g.*

According to Cohen´s guidelines, a Cohen´s *d* of 0.2 is considered a small effect, 0.5 a moderate effect, and 0.8 a large effect (Harrer et al., 2022, p.66). This convention also applies for Hedges´ *g.*

Next, tests were conducted to assess heterogeneity, followed by meta-regression analysis for culture (North America, Europe, and Asia), profession (working professionals and students), and mean age.

Since the *dependent variable (DV)* in the meta-regression is the effect size (Cohen´s *d)*–representing the difference in CIPS- scores between men and women–the regression assesses which culture has a greater or smaller prevalence of IP as measured in the included studies, as well as the extent of differences among cultural categories.

Moderation is an interaction effect, meaning the product of two *independent variables (IV).* Typically, the equation is: *DV ~ IV1 + IV2 + IV1*IV2.* However, we do not have a second *IV* and cannot include gender because we have already accounted for gender differences in Cohen’s *d*. Therefore, it is not possible to calculate a moderation in the usual sense. However, a moderation would ultimately tell us whether the difference between men and women varies in different cultures – which is essentially what the result already indicates. The same applies to the other two potential moderators- profession and mean age.

To ensure robustness and reliability, two critical methodological aspects were addressed: *publication bias* and *heterogeneity.* Publication bias, a common issue in meta-analyses, can occur when studies with significant results are more likely to be published than those reporting null or non-significant findings. This can lead to an overestimation of the true effect size and misrepresentation of the underlying evidence. This bias was addresses using *funnel plot* symmetry and *Egger’s regression test*.

Identifying potential biases helps ensure that the conclusions are not skewed by selective inclusion of studies (Borenstein et al., 2021).

Heterogeneity, which refers to variability in effect sizes across studies, was explored through subgroup analyses and meta-regression. High heterogeneity can complicate the interpretation of pooled effect sizes and limit generalizability. Exploring sources of heterogeneity clarifies the role of study-specific factors in influencing results (Harrer et al., 2022).

By addressing these methodological considerations, this meta-analysis aimed to provide a comprehensive and unbiased synthesis of the available evidence, ensuring that the findings are both statistically robust and practically useful.

4 Results

This meta-analysis included data from a total of 31 articles (*k* = 31). Only one article (Bernuy et al., 2022) provided two independent studies, whose samples were treated as two separate studies named Bernuy et al. (2022) Group A and Bernuy et al. (2022) Group B in the meta- analysis. This resulted in a final total of 32 included studies with a total sample size of *n*= 9340 with 55,3 % (total number 5165) being women and 44,6 % (total number 4172) being men. The smallest sample consisted of 40 participants, of which 20 were women and 20 were men (Kaur & Jain, 2022), while the biggest sample included 548 participants, consisting of 157 women and 391 men (Domínguez-Soto et al., 2023).

4.1 Main Findings

As the overall effect size, the REM produced a $SMD_{pooled,}$ specifically Hedges' *g,* to correct for small sample bias, of 0.4042. This indicates that the average level of IP in women is 0.4042 standard deviations higher than in men. The 95% Confidence Interval (*CI*) for the SMD ranged from 0.2956 to 0.5128. This suggests a small to moderate effect size, indicating that females, on average, experience significantly higher levels of IP compared to males.

This effect size is consistent with the hypothesis that gender plays a role in levels of IP, with females scoring higher on the CIPS. The confidence interval does not include zero, reinforcing the significance of this gender difference. The effect size was statistically significant (t= 7.59, p <.0001), meaning the observed gender difference is unlikely to be due to random chance. This finding supports the hypothesis that gender plays a role in IP levels, with women scoring higher. These results provide compelling evidence, drawn from a recent body of studies, that women are more affected by IP.

4.2 Study Level Analysis

Although a significant effect has been found in overall differences in CIPS- scores between men and women, when looking at individual studies, the picture is more scattered. The reported SMDs ranged from -0.1989 (Paladugu et al., 2021) to 1.3490 (Jöstl et al., 2012), reflecting substantial variability in how different studies measured and reported the effect of gender on IP. Most studies contributed between 2% and 4% to the overall effect size, ensuring that no single study dominated the meta-analysis. This balance indicates that the overall effect size is a comprehensive reflection of evidence across all studies rather than being overly influenced by one or two studies.

The majority of studies reported positive SMDs, supporting the hypothesis that women score higher on IP than men. Only one study (Paladugu et al., 2021) reported a negative SMD, suggesting that males had higher IP levels, though this

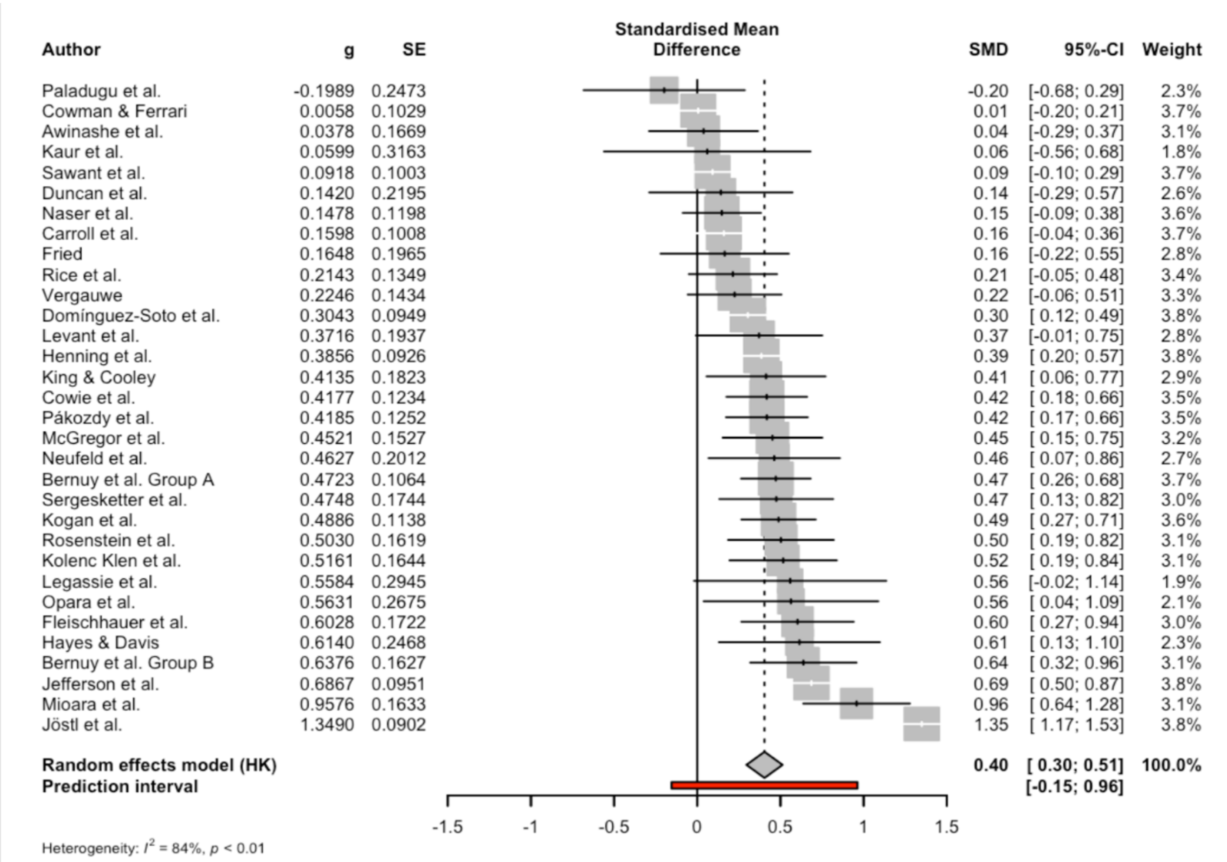

Figure 2. Forest plot of Studies included in the meta-analysis.

result was not statistically significant. The variance of each study's effect size was a critical factor in determining its weight in the analysis. Studies with smaller variances– indicating more precise effect size estimates and smaller standard errors– are weighted more heavily. For example, Jefferson et al. (2024) and Bernuy et al. Group A (Bernuy et al., 2022) likely had smaller variances, which explains their relatively higher weights in the meta- analysis (3.8% and 3.7%, respectively).

The forest plot in *Figure 2* provides an overview of the meta-analysis results, presenting the findings of the individual studies. In a forest plot, the small black vertical line shows the effect size of the individual study, the grey squares around it indicate the study weight and the horizontal lines represent the confidence interval of each study. For example, the study by Paladugu et al. (2021) has a small negative effect size (-0.20) with a wide confidence interval (-0.68 to 0.29), indicating a high level of uncertainty. In contrast, Jöstl et al. (2012) reports the largest effect size (1.35) with a narrower confidence interval (1.17 to 1.53), indicating a more precise estimate.

The dotted vertical line marks the overall effect size, in this case, g= 0.4, and puts the SMD of the rest of the studies visually in perspective to the overall effect. If a study´s horizontal line (CI) crosses the vertical line at zero, its result is not statistically significant.

Nineteen studies have CIs that do not cross zero, indicating significant findings, such as Bernuy et al. (2022) Group B and Jefferson et al. (2024). The diamond at the bottom of the graphic indicates a combined observed effect size of 0.40 of all studies, with a 95% CI of 0.30 to 0.51. This suggests a small to moderate positive effect that is statistically significant, as the CI does not include zero. The prediction interval [-0.18; 0.97] around the pooled effect at the bottom provides an estimate of the range in which the true effect sizes of future studies are expected to fall. However, since this interval includes zero, it suggests that future studies might find no effect or even an effect in the opposite direction.

The high I^2 value of 84% indicates substantial heterogeneity among the included studies (Higgins & Thompson, 2002). The significant p-value ($p < .01$) for the test of heterogeneity confirms that the observed variation in effect sizes is greater than what would be expected by chance. Measures of heterogeneity will be discussed in detail in chapter 4.4.

4.3 Publication Bias

Publication bias refers to the selective publication of research results based on the nature and the significance of the findings. Although a meta-analysis provides a mathematically precise synthesis of the studies it includes, its results can be compromised if these studies represent a biased subset of all relevant research. The main concern is that studies reporting larger or more significant effects are more likely to be published than those with smaller or non- significant effects. This bias can undermine the validity and generalizability of the outcomes of the meta-analysis (Borenstein et al., 2021, p. 314). Meta-analyses are especially vulnerable to publication bias due to its potential to undermine the precision and reliability of the combined results. Unlike single studies, the cumulative approach of meta-analyses magnifies the effect of publication bias by merging multiple studies to produce an overall effect estimate. There are various ways to test for publication bias in a meta-analysis.

To visually assess for publication bias, either a forest plot, as depicted in the previous chapter, or a *funnel plot* are the methods of choice.

Funnel plots display the relationship between a study´s effect size(x-axis) and its *standard error* (SE; y-axis). These scatterplots help assess the symmetry of the data around the overall effect size. Publication bias generally occurs when studies with significant or positive results are more likely to be published than studies with non-significant or negative results. In the absence of publication bias, studies should be symmetrically distributed around the overall effect size, forming a funnel shape.

On the other hand, asymmetry (e.g., missing studies on one side), could indicate the presence of publication bias. Typically, smaller studies scatter widely at the bottom of the plot due to greater variability and a presumed larger SE, while larger studies cluster more narrowly at the top due to higher precision and a smaller SE.

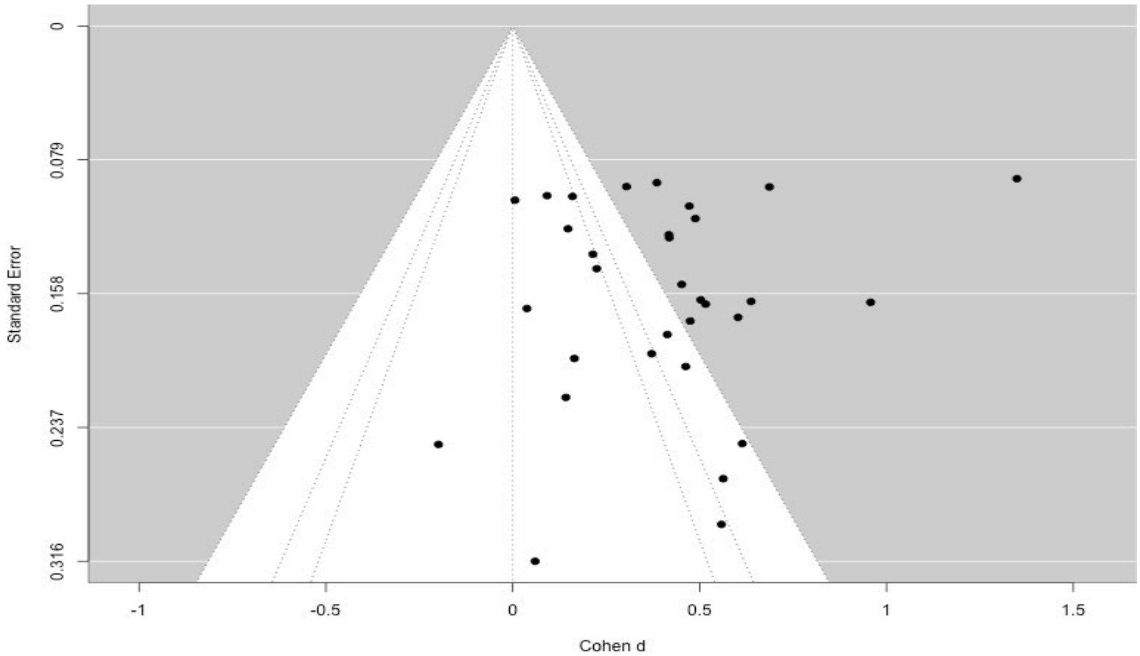

Figure 3. Funnel plot of studies included in the meta- analysis.

In the funnel plot we see in *Figure 3*, the effect size, Cohen´s *d*, is depicted on the x-axis, while the SE is presented on the y- axis. We have seen in the data that the effect size Hedges´ *g* is 0.4042. To convert Hedges´ *g* into Cohen´s *d* the following formula is used:

$$d = g \times \sqrt{\frac{N}{df}}$$

Where:

- *d* is Cohen´s *d*
- *g* is Hedges´ *g*
- *N* is the total sample size
- *df* are the degrees of freedom.

By inserting the data we get the following equation:

$$d = 0.4042 \times \sqrt{\frac{32}{31}} = 0.411$$

In this funnel plot, an effect size of *d*= 0 marks the midline of the x-axis, which makes the data points appear to be distributed slightly more towards the right side and almost all of them in a positive range, except for one study– the one by Paladugu et al. (2021). To make the study results visually more comprehensible, the x-axis is shifted so that the overall SMD (in this meta- analysis, a Cohen´s *d* of 0.411) marks the midline of the x-axis, as is depicted in *Figure 4.* According to this contour-enhanced funnel plot, because almost all the studies appear inside the funnel and are distributed in a somewhat symmetric manner, publication bias is unlikely. Studies with low standard error are displayed closer to the top of the funnel and tend to have larger sample sizes and are more precise. In contrast, those with high standard errors are distributed lower in the plot and are less precise and typically have smaller sample sizes.

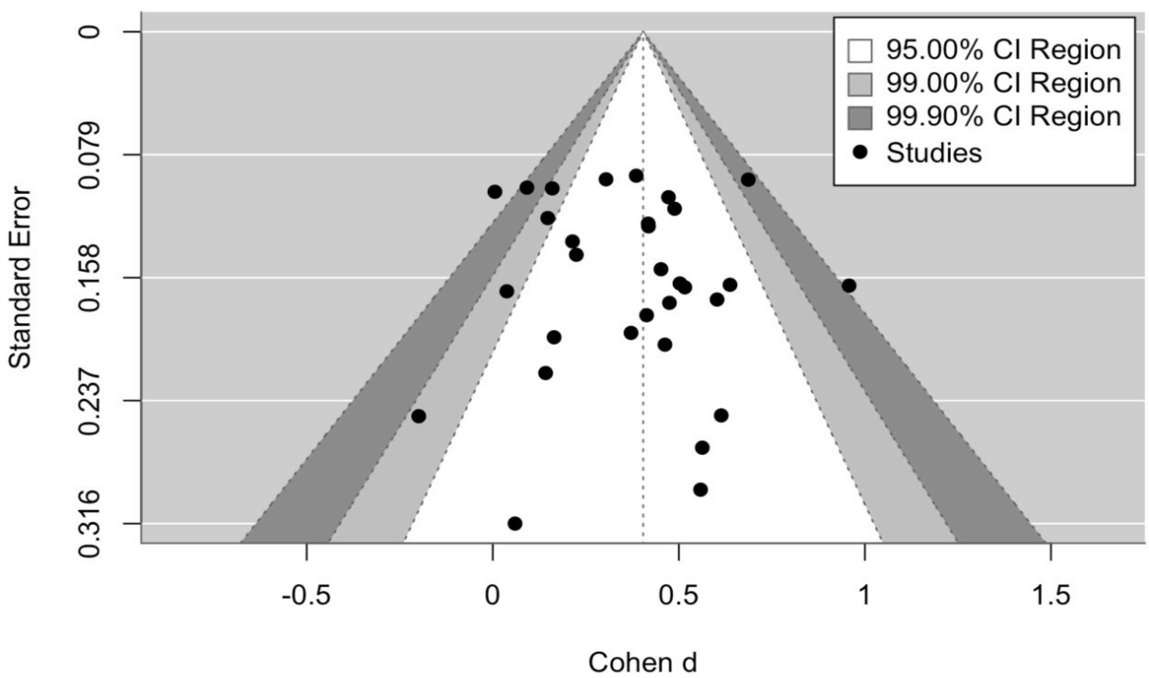

Figure 4. Contour- enhanced funnel plot of studies included in the meta-analysis.

The x-axis of the funnel plot represents the SMD of every study and ranges from -0.5 to 1.5. Each point on the plot corresponds to an individual study included in the meta-analysis, with its position reflecting both the study's effect size and *p*-value. To also statistically test for funnel plot asymmetry and therefore, publication bias, *Egger´s test* (Egger et al., 1997) was conducted. Egger's test is a statistical tool to quantify a funnel plot asymmetry. It performs weighted regression analysis of the effect size estimates on their precision measures (i.e., standard errors). Egger's test checks whether small, less reliable studies systematically report different effect sizes compared to larger, more reliable studies. If smaller studies consistently show different, often larger, effect sizes, it might indicate publication bias. The test statistic yielded $t=-0.7175$, with $df= 30$, and a corresponding *p*-value of 0.4786. These results indicate no significant evidence of funnel plot asymmetry, suggesting that publication bias or other small-study effects are unlikely to be present.

4.4 Heterogeneity Analyses

Rücker et al. (2008) differentiate between *baseline or design-related heterogeneity*, and *statistical heterogeneity*. *Baseline* or *design-related heterogeneity* occurs when differences exist across studies in terms of population or research design. This issue can be addressed by carefully defining research questions and specifying the populations and study designs eligible for inclusion. In contrast, *statistical heterogeneity* is a measurable characteristic, driven by the variation and precision in effect size estimates across studies in a meta-analysis.

Although baseline heterogeneity can lead to statistical heterogeneity (e.g., when different populations produce varying effects), it is not a prerequisite. A meta-analysis may exhibit high statistical heterogeneity even when the included studies are nearly identical in design. In most meta-analysis literature, "between-study heterogeneity" refers exclusively to statistical heterogeneity (Harrer et al., 2022, p. 140). Since the studies in this meta-analysis varied in several aspects, a heterogeneity analysis was conducted to evaluate these differences. The results are presented in *Table 3.*

Heterogeneity analysis examines how likely the variance in effect sizes could have been found from sampling error alone (Cooper, 2016, p.240). Testing for heterogeneity is crucial to assess the consistency of findings across studies and the confidence we can have in the overall summary effect. For an accurate interpretation of a meta- analysis, evaluating heterogeneity is indispensable. Heterogeneity can be visually inspected using a forest plot and statistically tested using the c*hi-square test* based on the *Q-statistic*, and the *I^2 index*. The magnitude of heterogeneity is assessed by *Tau-squared* (τ^2) and *Tau* (τ).

The *Q*-statistic is a standardized chi-square statistic with degrees of freedom (*df*) equal to the number of studies minus one (*k*-1). It assesses whether the observed heterogeneity exceeds what would be expected by chance. The *Q*-statistic in this meta-analysis was 190.74 with 31 *df*, accompanied by a *p*-value of less than .0001. The general guidelines for the interpretation of the *Q*-statistic are as follows:

- If the *Q* equals the number of degrees of freedom (or *Q/df* ratio ≈ 1), this suggests little to no heterogeneity, so practically homogeneity. This would imply that the observed variance could be explained through the within-study error.

- If *Q* is bigger than the number of the degrees of freedom, but not by a large amount, this points to moderate heterogeneity.
- A *Q* much larger than the number of degrees of freedom suggests high heterogeneity, meaning the within- study error cannot explain the observed variance of the studies (Cochrane, 1954).

In this meta-analysis, the *Q*-statistic of 190.74 is much larger than the degrees of freedom (31), with a *p*- value of .0001, confirming the presence of significant heterogeneity.

The I^2 *index* quantifies the proportion of observed variance that is due to actual differences in effect size rather than random variation. It is calculated as described by Borenstein et al. (2009, p.117- 119) and is expressed as a percentage, ranging from 0% to 100%. It is the relation between the variance between the individual studies (the variance of the "true effect") and the total variance. The formula to calculate the I^2 index is the following (Harrer et al., 2022, p. 146):

$$I^2 = \frac{(Q - k - 1)}{Q}$$

Where:

- *Q* is the *Q* statistic
- *k* is the total numbers of studies (*k*-1 are the degrees of freedom).

The larger I^2, the larger is the percentage of the variance of the true effect in relation to the total variance and the smaller is the percentage of the within- study error. However, I^2 does not give any information about the *total magnitude* of the variation of the true effect. The conventions for the interpretation of the I^2 statistic are the following:

- An I^2 of lower than 25% indicates low heterogeneity
- An I^2 between 25% and 50% indicates moderate heterogeneity
- An I^2 larger than 75% is interpreted as a high level of heterogeneity (Higgins & Thompson, 2002).

In the present meta-analysis, the I^2 statistic was calculated at 83.7% with a 95%

confidence interval (CI) ranging from 78.0% to 88.0%, indicating a high level of heterogeneity. This suggests that a substantial portion of the variability in effect sizes is due to genuine differences between studies, rather than random variation (Higgins & Thompson, 2002).

The H^2 -statistic was calculated to further address heterogeneity. It represents the ratio between the observed variation, as measured by Q, and the expected variation due to sampling error. It is calculated by the following formula (Harrer et al., 2022):

$$H^2 = \frac{Q}{k-1}$$

Where:

- Q is the Q statistic
- k is the total numbers of studies.

The H^2- statistic represents the ratio of the observed variance to the expected variance if all studies shared a common effect size. The H- value of 2.48 in this meta- analysis indicates that the variance observed across studies is about 2.48 times bigger than what would be expected by chance. When there is no between-study heterogeneity, H^2 equals one (or smaller). Values larger than one indicate the presence of between-study heterogeneity.

The τ^2 value represents the variance of the true effect sizes across studies, while τ (its square root) indicates the standard deviation of the true effect sizes (Harrer et al., 2022, p. 151). The τ^2 value was 0.0718 which suggests that there is some variability in the true effect sizes beyond what would be expected by chance. The confidence interval [0.0357; 0.1304] does not include zero, which indicates some between-study heterogeneity in the data. The τ- value, which represents the standard deviation of the true effect size, was 0.2679, which means that the true effect sizes have a standard deviation about SD=0.2679 across studies, which is about two thirds (or 66%) of the mean effect size (0.4238). This suggests moderate heterogeneity because the variability between studies is large relative to the mean effect size. Some studies report smaller effects than 0.4238 (e.g. Duncan et al., 2023), and some report larger ones (e.g. Fleischhauer et al., 2021). This is visually depicted in the forest plot (see *Figure 2*).

The prediction interval for the effect size (Hedges' *g*) ranged from -0.1544 to 0.9629. This wide interval suggests variability in expected outcomes, including the possibility of future studies reporting negative effects.

4.5 Outlier Analysis

To further investigate the moderate heterogeneity, Viechtbauer (2010) recommends removing outliers from the analysis. The *find-outliers function* detected five outliers: Sawant et al. (2023), Mioara et al. (2022), Paladugu et al. (2021), Jöstl et al. (2012), and (Cowman & Ferrari, 2002).

After excluding these outliers, the SMD decreased slightly (g= 0.3879), still indicating a small effect. The prediction interval narrowed significantly, indicating increased confidence in the stability of the overall effect and excluding the possibility of negative effects in future studies.

The I^2 dropped from 83.7% in the previous analysis to 34.2% in the analysis without outliers. This suggests a less pronounced variability between study effect sizes after exclusion of the outliers. The confidence interval for τ^2 now includes zero, implying that the remaining heterogeneity may not be significant. However, the *Q*-statistic, while reduced, remains slightly significant (p=.0437), indicating that some heterogeneity persists.

In summary, the removal of outliers improved the reliability and interpretability of the findings, reduced heterogeneity, and confirmed the presence of a small but consistent positive effect size.

4.6 Moderator analysis

The impact of moderating variables (i.e., predictors) was assessed by conducting a series of meta-regressions in RStudio, version 2023.06.0+421. Moderating variables that were tested for were “culture “(North America, Europe, Asia), “profession” (dichotomous variable with professionals vs. students), and “mean age”.

1. **Moderator: Culture**

To explore whether the cultural context moderates the relationship between gender and IP scores, a meta-regression analysis was conducted. The model was fitted

using *Restricted Maximum Likelihood (REML) estimation*, and included 30 studies after excluding two studies that did not report the country (Fried-Buchalter, 1992; Sawant et al., 2023). Of these 30 studies, 20 were conducted in North America, eight in Europe and only two in Asia. Initially, the analysis aimed to compare individualistic cultures (North America and Europe) to collectivistic cultures (Asia and Africa). However, the literature search– guided by the main research question of whether gender differences in IP exist or not– yielded only two studies from collectivistic cultures, both from Asia (Awinashe et al., 2023; Kaur & Jain, 2022). Therefore, studies were coded into three categories: “North America”, “Europe”, and “Asia”.
The results of the meta-regression model estimated residual heterogeneity (τ^2) of 0.0631 (SE= 0.0238) with the corresponding τ- value (the square root of τ^2) being 0.2513. This suggests a moderate level of unexplained variation in effect sizes across studies.
The I^2 statistic indicated that 76.63% of the variability in effect sizes could not be attributed to sampling error alone, pointing to substantial residual heterogeneity. Furthermore, the H^2 statistic was 4.28, confirming significant heterogeneity between studies.
The test for residual heterogeneity produced a highly significant result (Q= 147.4236, df = 27, p < .0001), indicating that the observed differences in effect sizes across studies are unlikely to be due solely to random sampling error. This underscores the importance of identifying factors that contribute to the observed variability.
To assess whether cultural context moderates the relationship between gender and the IP, "culture" was included as a covariate in the meta-regression model.

Table 1.

Meta-Regression Results: Effect of Culture on Gender Differences in Impostor Phenomenon

	Meta-Regression Results				
Parameter	Estimate	SE	X95..CI	t.value	p.value
Intercept (North America)	0.3857	0.0633	[0.2558, 0.5156]	6.0936	<.0001
Asia	-0.3400	0.2384	[-0.8291, 0.1491]	-1.4261	0.1653
Europe	0.2025	0.1171	[-0.0378, 0.4428]	1.7291	0.0952

Table 1 presents the results of a meta-regression analysis assessing whether the cultural context acts as a moderator between gender and IP scores. In this analysis, the intercept represents the reference category, which in this context is represented by "Intercept (North America)”. The table reports estimated coefficients (Estimate), standard errors (SE), 95% confidence intervals (95% CI), t-values, and *p*-values for the intercept (North America), Asia, and Europe.

The intercept, representing the American cultural context, has an estimated coefficient of 0.3857 (SE= 0.0633), which means that in North America, men and women differ significantly in their IP scores, with an estimated effect of 03857. The 95% confidence interval ranges from 0.2558 to 0.5156, indicating that the effect is significantly different from zero and therefore statistically significant. The t-value of 6.0936 and a *p*-value of <.0001 suggest that the American cultural context significantly moderates gender and IP, serving as the baseline for comparison with other cultures.

The coefficient for Asia is -0.3400, (SE= 0.2384), with a 95% confidence interval ranging from -0.8291 to 0.1491, which includes zero, and a *p*-value of 0.1653. This indicates that the effect of the Asian cultural context on gender and IP is not statistically significant. Notably, only two studies were included in the “Asia” category, drastically limiting the interpretation of these results.

The coefficient for Europe is 0.2025 (SE= 0.1171). The 95% confidence interval ranges from -0.0378 to 0.4428, slightly crossing zero, indicating a marginally non-significant result. The t-value of 1.7291 and the *p*-value of .0952 suggest a non-significant trend where women in European cultures may exhibit slightly higher levels of IP compared to men, however, this difference does not reach the threshold for statistical significance. Compared to the North America baseline, gender difference in IP scores in Europe are slightly smaller than in North America**,** yet not significant (p = 0.0952).

In summary, the meta-regression results indicate that gender differences in IP are significantly present in the American cultural context (as reflected by the intercept). However, neither the Asian nor the European cultural contexts serve as statistically significant moderators of gender differences in IP when compared to the American baseline.

2. Moderator: Profession

Next, another meta-regression analysis was conducted to determine whether "Profession" moderates gender differences in IP. Based on previous research, it was hypothesized that the gender gap in IP (i.e., women scoring higher than men) would be less pronounced among working professionals compared to students (e.g. Vaughn et al., 2020). Nine of the original 32 studies were excluded due to missing data (they did not report the profession of the participants), leaving 23 studies in the final meta-regression model.

A heterogeneity analysis for this meta-regression yielded the following results: Residual heterogeneity (τ^2) was estimated at 0.0871 (SE= 0.0349), with the corresponding τ (the square root of τ^2) being 0.2951. The I^2 value, representing the percentage of variability in effect size estimates due to heterogeneity rather than sampling error, was 81.76%. This high I^2 value indicates substantial heterogeneity among the studies, suggesting significant variation in true effect sizes across the included studies.

The *F*- test was not significant ($F(1, 21) = 0.5380$, $p = .4714$), indicating that the variable “Profession “(students versus working professionals) does not moderate gender differences in IP across the analyzed studies. The intercept estimate of 0.3857 (SE = .0633, 95% CI = [0.2558, 0.5156]) reflects the average effect size for gender differences in IP in students. This effect is statistically significant, with a *t*-value of 6.0936 ($p < .0001$), indicating that in the student population, females are scoring higher on IP than males. The estimated coefficient for working professionals is -0.3400 (SE = .2384, 95% CI = [-0.8291, 0.1491]) compared to the intercept (students). This value represents the differences between working professionals and students in terms of the gender differences in IP scores. The negative coefficient suggests that gender differences in IP scores are smaller among working professionals compared to students, possibly indicating that gender differences even out as people enter the workforce. However, the p- value (0.1653) is about 0.05, which makes these findings not statistically significant. Overall, profession does not appear to be a strong moderator, as gender differences do not significantly change between students and working professionals. The results are depicted in Table 2.

Table 2.

Meta-Regression Results: Effect of Profession on Gender Differences in Impostor Phenomenon

	Meta-Regression Results				
Parameter	**Estimate**	**Standard Error**	**95% Confidence Interval**	**t-value**	**p-value**
Intercept (Students)	0.3857	0.0633	[0.2558, 0.5156]	6.0936	<0.0001
Profession (Working Professionals)	-0.3400	0.2384	[-0.8291, 0.1491]	-1.4261	0.1653

3. Moderator: Age

The final meta- regression aimed to investigate whether age acts as a moderator in the relationship between gender and IP scores. Previous studies on the correlation between IP and age have yielded inconsistent findings, suggesting that IP is a phenomenon independent of biological age and occurs across all age groups. My initial hypothesis was based on evidence indicating that female students suffer more from IP than male students (e.g. Patzak et al., 2017) and that the longer professionals are active in their career field, the less they suffer from IP due to increased expertise over time. This is a logical deduction from the previous study results that found that IP is especially prevalent in novices and tends to decrease when individuals proceed in their career (Hutchins, 2015). Given that generally (but not always), students are younger in age than working professionals, and that age and career level often correlate positively, I tested earlier findings which claim that IP is inversely correlated with age (Landry et al, 2022; Carroll & Griech, 2023) and I hypothesized that gender differences in IP become less pronounced with increasing age. To test this hypothesis, a meta- regression was conducted using the age mean as a potential moderator between gender and IP.

Table 3.

Meta-Regression Results: Effect of Age on Gender Differences in Imposter Syndrome

Parameter	Estimate	SE	t_value	df	p_value
	Meta-Regression Results				
Intercept	0.0157	0.3085	0.0510	15	**0.9600**
Average Age	0.0155	0.0109	1.4151	15	**0.1775**

Table 3 shows the results of the meta- regression. Age does not significantly moderate the relationship between gender and IP scores. The coefficient for average age is 0.0155, however, this effect of age on gender differences in IP is not statistically significant. This means that age does not appear to be a strong moderator of gender differences in IP across the analyzed studies.

5 Discussion

In recent years, research on the IP has expanded considerably, resulting in a substantial body of studies on the subject. This large volume of research offers a robust basis for analysis, reducing the urgency for new primary studies. However, despite this wealth of material, a comprehensive synthesis that consolidates findings from these studies is still lacking. A meta-analysis helps to address this gap by systematically organizing and quantitatively interpreting the available data, thereby providing a more coherent understanding of the research landscape.

While there is substantial research on gender differences in IP, the findings have been inconsistent. Some studies report higher IP levels in women (Hutchins, 2015), others find higher levels in men (Paladugu et al., 2021), and some detect no differences at all (Cowman & Ferrari, 2002). The reasons for these conflicting results remain unclear. This meta-analysis integrates the existing evidence to offer a more definitive perspective on the subject and provides a structured, systematic overview of current evidence on gender differences in IP. Additionally, potential moderator variables such as culture, profession, and age were investigated.

This analysis provides robust evidence supporting the hypothesis that females are

more likely to experience IP than males.
In this meta- analysis, no potential biases could be found that would have distorted the results. However, these findings still must be taken with caution as biases can never be completely ruled out. For example, *citation bias* occurs when studies with negative or inconclusive results are cited less often, making them harder to identify through reference searches. Similarly, *time-lag bias* arises because studies with positive outcomes are typically published sooner, ensuring their early availability, while studies with unfavorable findings are often delayed. Another concern is *multiple publication bias*, where "successful" studies are more likely to appear in multiple articles—making them disproportionately easier to find. *Language bias* further compounds the issue, as most research is published in English, sidelining studies in other languages.
Moderate heterogeneity was observed among the studies, which suggests that the overall effect is not uniform across all contexts. To address this heterogeneity, five outliers were identified, and the analysis was run again. After excluding the outliers form the analysis, there was still a small overall effect, which shows the robustness of the meta-analysis.
These findings are in line with the thesis by Clance and Imes (1978) who initially attributed the IP to high achieving women. While in the meantime, the IP has been expanded to also affect men, according to our findings, women are still more prone to experience feelings of impostorism. Given the adverse effects of IP on mental health and its significant consequences for both professional and personal life, this issue requires urgent attention.
Numerous studies highlight the detrimental impact of IP on academic trajectories and career advancement, particularly for early-career academics. For instance, while women accounted for nearly half of doctorate recipients in the European Union as of 2019, only about one-quarter of full professorships are held by women. This discrepancy, known as the "leaky pipeline" (Blickenstaff, 2005; Huyer, 2018), is influenced by multiple complex factors. However, the higher prevalence of IP among women, coupled with their underrepresentation in senior academic positions, warrants further investigation into a potential relationship between IP and career progression. Although definitive conclusions cannot yet be drawn, the possible correlation between these phenomena merits further exploration.
Given the connection between IP and career disadvantages, as well as the emotional burden of IP on individuals, it is crucial to identify strategies to support

those affected, regardless of gender. In academic contexts, mentorship and coaching programs could play a pivotal role. Research indicates that consistent engagement with mentoring significantly reduces impostorism among students (Clance & O'Toole, 1987).

Beyond academia, the gender differences observed in IP provide valuable insights into broader issues of workplace equality and inclusion. A stronger impact of IP on women may indicate underlying structural inequalities that warrant closer examination and intervention. For example, the persistence of gender stereotypes and biases in professional environments can exacerbate feelings of inadequacy among women (Bravata et al., 2020). Acknowledging these factors is essential for developing policies and practices that foster more equitable and supportive work environments for all.

In addition to supporting individuals already experiencing IP, addressing the prevention of its onset may prove even more beneficial. If women are indeed more susceptible to IP, understanding its underlying causes becomes crucial. Further exploration of these causes may provide valuable insights into the root causes of gender differences in IP and their implications for career trajectories and overall well-being.

5.1 Moderators

Beyond the examination of gender distribution in IP, the additional variables that could potentially moderate the relationship between gender and IP– "Culture," "Profession," and "Age"– were a-priori defined, based on prior research indicating possible associations (e.g. Vaughn et al., 2020; Vergauwe et al., 2015). Gender differences in IP were found to be particularly prominent in the American cultural context (e.g. Jefferson et al., 2024; Kogan et al., 2020), with females scoring higher on IP. However, in Asian and European contexts, no significant differences were observed.

The meta-regression result on the potential moderator “Profession” (“Students” versus “Professionals”) was not statistically significant. While gender differences in IP may tend to be less profound in working professionals compared to students, the difference is not statistically significant, indicating that profession does not significantly moderate the relationship between gender differences and IP.

Unlike implied by previous research (Carroll & Griech, 2023; Landry et al, 2022), age

does not act as a moderator between gender differences and IP.
It is essential to differentiate between biological age and academic age (i.e., the length of time an individual has spent in academia or in their professional field). This distinction could be particularly relevant in the context of IP. For example, a person entering a new academic or professional domain later in life might experience IP more acutely than younger colleagues with comparable professional tenure. Similarly, early-career professionals or students, regardless of their biological age, may share impostor-related challenges due to their relative inexperience within their field. Recognizing and accounting for these nuances could lead to a more accurate understanding of how age and professional status interact with IP. Future studies should therefore strive to disentangle these dynamics by considering both biological and academic age as distinct constructs.

5.2 Limitations and Future Directions

It is necessary to point out that this meta- analysis, though conducted diligently and with the best of the author´s knowledge, also has some limitations.
First, this meta-analysis was fully conducted by only one person. Literature on meta-analysis suggests that the coding of studies should be done by a minimum of two people, as not only the literature research but also the data extraction process may be subject to conscious or unconscious biases (Cooper, 2016, p. 133). On the other hand, the coding of the present meta-analysis was quite straight- forward (mean of CIPS, number of female and male participants, country, profession, and mean age) which reduced the likelihood of errors in the coding process.

Another important limitation is that this meta-analysis compared only men and women and how they differ in experiencing IP. Even though some of the included studies also gave the option to choose “other” or “prefer not to say” in the gender category, these categories were not included in the final analysis (e.g. Bernuy et al., 2022). The main reason for this was that there was simply not enough data that would have justified including these variables and a great number of studies did not report this category at all. This excludes a mentionable group of people outside of the gender binary which may be subject to criticism. However, as this study is a meta-analysis, it was limited to exiting data. Unfortunately, so far, studies on differences of IP in binary and non-binary individuals are scarce and including these into this meta-analysis would have gone beyond the capacities of this work. Future research should be more inclusive and investigate differences in IP in non-binary persons. This is especially important as research shows that marginalized groups (such as ethnic minorities) are particularly vulnerable to IP. The studies included in this meta-analysis exclusively examined the biological gender of participants. Future research should consider gender-role orientation—defined as the degree to which individuals identify with traditionally masculine or feminine traits (Bem, 1974)—when investigating gender differences in IP. This broader approach would provide a more nuanced understanding of how gender identity and societal norms interact to influence the experience of IP.

Exploring gender-role orientation in future research about IP could also help address variability in IP experiences within the same biological gender. For instance, individuals identifying strongly with traditionally feminine traits may be more susceptible to IP, regardless of biological gender. Including gender-role orientation in future studies can clarify how these internalized societal norms influence IP and reveal patterns that might otherwise remain obscured in biological gender comparisons alone.

There are other limitations regarding the retrieved data for this meta-analysis. Numerous studies on IP did not report the raw data of CIPS means of men and women or other statistical data that would have made it possible to compute the SMD (Cohen´s *d*/ Hedges´ *g*) which was necessary to test my hypothesis. This is particularly unfortunate, as I could not add these studies to my meta-analysis and ended up with only 32 studies, even though the amount of existing studies on gender differences in IP exceeds this number. Researchers should be transparent in their analysis and report raw data to ensure the inclusion of their study results in future meta-analysis.
Further limitations include the omission of grey literature, which highly increases the risk of publication bias, because studies that did not yield significant results would not been considered, possibly skewing the results of this meta- analysis into the direction of a significant finding (compare the “File Drawer Problem”, Harris, 2022, p. 10). Even though publication bias was tested to be unlikely in this meta- analysis, it can never be completely ruled out. To reduce publication bias, also null findings in IP research should be shared in open-access platforms or journals. This could

ensure a more balanced representation of the research landscape on IP.

It is also important to bear in mind that only WEIRD populations (Western, Educated, Industrial, Rich, Democracies (Henrich, 2020)) were included as participants in the individual studies, which makes the results only transferrable to a limited number of persons, which restricts the generalizability of results to a broader, more diverse global context. Future research should include underrepresented or non-WEIRD populations (i.e., populations that are non-Western, non-educated, non- industrialized, non-rich, and non-democratic).
This meta-analysis found significant gender differences in IP in North America, but none in European or Asian countries. Future research could explore why North America shows strong gender differences in IP**,** while Asia and Europe do not. Possible explanations include different cultural attitudes toward success, failure, and gender roles. Given the small sample, especially in the Asian category, possible findings in future studies with a bigger data pool might still find significant gender differences in IP in these countries. Cross- cultural studies are essential to understanding how cultural norms, values, and societal expectations influence the prevalence and manifestation of IP. For instance, collectivist cultures may experience IP differently than individualist cultures.

6 Conclusion

The results of this meta-analysis indicate that there are gender differences IP, with women typically scoring higher than men on the CIPS. The observed differences are generally small to moderate, with variability across studies. All but one study indicated that women experience higher levels of IP than men. These findings are especially profound in the North American cultural context, with women scoring significantly higher in IP than men. No significant differences in IP were found between students and working professionals in the sample of this meta-analysis, though students may exhibit a slightly higher susceptibility to impostor feelings, although not statistically significant. Age, as a variable, did not significantly moderate gender differences in IP in the analyzed studies.

Overall, the findings of the present meta-analysis clearly show, just as Dr. Clance suggested in her initial research, that women are still more affected by IP than their male counterpart. Given the substantial impact of IP on mental health, career advancement, and overall quality of life, addressing this phenomenon remains an urgent priority. Notably, the persistent underrepresentation of women in leadership positions and the fact that they occupy only a quarter of professorships may not be entirely unrelated to impostor experiences. While definitive conclusions cannot yet be drawn, it is essential that future research further investigates the relationship between this issue and IP in women. Moreover, structural reforms are necessary to guarantee that women have equitable opportunities comparable to those of their male counterparts.

While the present meta-analysis clearly demonstrated that women are more affected by IP than men, further research is necessary to validate these findings and to explore the underlying factors contributing to IP in greater depth.
All individuals experiencing IP, regardless of their gender identity, should have equitable access to support systems and resources that help them address and overcome their challenges.

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8 Appendix

8.1 List of Figures

8.2 List of Tables

8.3 List of Abbreviations

CIPS	Clance Impostor Phenomenon Scale
df	Degrees of Freedom
DV	Dependent Variable
FEM	Fixed Effects Model
GSC	Gender Stigma Consciousness

HIPS	Harvey Impostor Phenomenon Scale
IP	Impostor Phenomenon
IPP	Impostor Profile
IV	Independent Variable
LIS	Leary Impostor Scale
PFS	Perceived Fraudulence Scale
REM	Random Effects Model
SE	Standard Error
SMD	Standard Mean Difference
S_{pooled}	Pooled Standard Deviation
YIS	Young Impostor Phenomenon Scale

8.4 English Abstract

This master thesis is a meta-analysis of research examining gender differences in the Impostor Phenomenon (IP), which is defined as a tendency of high-achieving individuals to feel like “frauds” and undeserving of their success. While early theories suggested that women experience IP more frequently and intensely than men, empirical findings have been inconsistent, with conflicting claims in the literature. This meta-analysis supports the original hypothesis, showing that women scored significantly higher on IP than men across 32 effect sizes and a total of over 9340 participants, with a mean effect size (Hedges´ *g*) of 0.4042. While women demonstrate higher susceptibility to IP, men also report impostor feelings to a considerable degree. The variables “culture” (coded as North America, Europe, and Asia), “profession” (students versus working professionals), and the mean age were tested for as potential moderators between gender and levels of IP, however, no significant moderating effects were found. To provide effective support for individuals experiencing IP, it is crucial to examine and address the underlying causes and contributing factors that may heighten their vulnerability to this experience.

Keywords: Impostor Phenomenon, Impostor Syndrome, IP, gender, gender differences, sex differences, meta-analysis

8.5 German Abstract

Diese Masterarbeit präsentiert eine Meta-Analyse von Studien, die geschlechtsspezifische Unterschiede im Imposter-Phänomen (IP) untersuchen – ein psychologisches Muster, bei dem leistungsstarke Personen das Gefühl haben, „Betrüger*innen" zu sein und ihren Erfolg nicht zu verdienen. Frühere Theorien gingen davon aus, dass Frauen IP häufiger und intensiver erleben als Männer, doch die empirischen Ergebnisse in der Literatur waren bislang uneinheitlich. Diese Meta-Analyse stützt jedoch die ursprüngliche Annahme: Frauen erzielten signifikant höhere IP-Werte als Männer. Die Analyse basiert auf 32 Effektstärken und insgesamt 9.340 Teilnehmenden und ergab eine mittlere Effektstärke (Hedges' g) von 0,4042. Obwohl Frauen eine stärkere Neigung zu IP zeigen, erleben auch Männer dieses Phänomen in beachtlichem Maße. Variablen wie „Kultur" (Nordamerika, Europa, Asien), „Beruf" (Studierende vs. Berufstätige) und das Durchschnittsalter wurden als potenzielle Moderatoren zwischen Geschlecht und IP untersucht; es konnten jedoch keine signifikanten moderierenden Effekte festgestellt werden. Um Betroffene des IP gezielt zu unterstützen, ist es essenziell, die zugrunde liegenden Ursachen und Faktoren zu erforschen, die die Anfälligkeit für dieses Phänomen erhöhen.

MA Included Studies

Authors (Year of publication)	Title	Country (Kultur)	Main Findings	Type of Study	n	CIPS	Age	Profession
Jefferson et al. (2024)	The prevalence of impostor phenomenon and its association with burnout amongst urologists	USA (Amerika)	Authors reported on the prevalence of IP and its association with burnout in the urological community. Important findings included higher IP in females compared to males, lower IP with increasing career experience, and a strong association between burnout and IP severity. 40% (n = 213) of urologists reported either 'frequent' or 'intense' impostorism (CIPS scores of 61–100).	Online survey	n: 614 %_f: 25.08 %_m: 74.92	mean_f: 64 sd_f: 16 mean_m: 53 sd_m: 17	mean: N/A range: N/A sd: N/A	professional
Sergesketter et al. (2024)	Defining the Incidence of the Impostor Phenomenon in Academic Plastic Surgery: A Multi-Institutional Survey Study	USA (Amerika)	Objective: to define the incidence and severity of the IP in academic plastic surgery. Findings: From a total of 136 resident and faculty respondents, the mean impostor score was 64 (SD 14), indicating frequent impostor phenomenon characteristics. Mean impostor scores varied by gender and academic position, but did not vary by race or ethnicity; postgraduate year of training among residents; or academic rank, or years in practice.	Cross-sectional online survey (Qualtrics)	n: 136 %_f: 46.32 %_m: 53.68	mean_f: 67.3 sd_f: 11.1 mean_m: 62 sd_m: 15.3	mean: 34 range: 29–44 sd: N/A	N/A
Awinashe et al. (2023)	Self-doubt masked in success: Identifying the prevalence of impostor phenomenon among undergraduate dental students at Qassim University	Saudi-Arabia (Asien)	Objective: To investigate the prevalence of impostor phenomenon (IP) among undergraduate dental students and explore its relationship with gender and academic year. The results indicated that 8.8% of the participants had mild IP experiences, 84.1% had moderate to severe IP experiences, and 7.05% exhibited intense IP experiences. The mean IP score was highest and lowest in the third and fourth-year dental students, respectively. A statistically significant relationship was identified between year wise IP scores,	Observational and cross-sectional study	n: 155 %_f: 49.03 %_m: 43.87	mean_f: 59.76 sd_f: 15.25 mean_m: 59.18 sd_m: 14.86	mean: N/A range: N/A sd: N/A	students

Authors (Year of publication)	Title	Country (Kultur)	Main Findings	Type of Study	n	CIPS	Age	Profession
			while no significant difference was observed based on gender.					
Carroll et al. (2023)	Impostor phenomenon and ambiguity tolerance in practicing physical therapists: an exploratory correlational study	USA (Amerika)	Objectives: Investigate the prevalence and contextualize the relationship of impostor phenomenon (IP) and ambiguity tolerance (AT) in practicing physical therapists (PTs). Conclusions: Practicing PTs experience moderate to frequent IP and are ambiguity tolerant. Clinical experience is inversely related to IP and AT. Almost half of early-career PTs feel like impostors. There were no differences in IP due to gender or ethnicity.	Exploratory correlational study to describe the levels of IP and AT in practicing PTs, and to contextualize the relationship between each psychological construct	n: 422 %_f: 61.85 %_m: 37.68	mean_f: 56.54 sd_f: 15.8 mean_m: 54.01 sd_m: 14.1	mean: 42.12 range: N/A sd: 12.34	N/A
Duncan et al. (2023)	An Evaluation of Impostor Phenomenon in Data Science Students.	USA (Amerika)	Aim: To evaluate the presence of IP among data science students and to evaluate several variables linked to IP and to evaluate the extent to which gender identification is linked to IP. There were no significant differences in IP by gender or race		n: 86 %_f: 44.19 %_m: 53.49	mean_f: 61.49 sd_f: 15.63 mean_m: 59.25 sd_m: 11.67	mean: N/A range: N/A sd: N/A	students
Kolenc Klen et al. (2023)	The Prevalence of Impostor Phenomenon in Medical Students in Slovenia: Effects of Gender, Year of Study, and Clinical Work Experience	Slovenia (Europa)	Findings: Women exhibited higher CIPS scores compared to men. Neither age nor year of study was correlated with CIPS score.	Cross-sectional survey-based study	n: 207 %_f: 75.85 %_m: 24.15	mean_f: 66 sd_f: 13.9 mean_m: 58.8 sd_m: 15.1	mean: 23.2 range: N/A sd: 2.6	students
Opara et al. (2023)	Impostor Syndrome in Physiotherapy Students Effects of Gender Year of Study and Clinical Work Experience	Slovenia (Europa)	Authors found that IS occurs in the majority of physiotherapy students. Females achieve higher overall CIPS scores compared with males	Cross-sectional survey-based study	n: 106 %_f: 83.96 %_m: 16.04	mean_f: 56.4 sd_f: 13.4 mean_m: 48.8 sd_m: 13.3	mean: 24.5 range: N/A sd: 4	N/A

Authors (Year of publication)	Title	Country (Kultur)	Main Findings	Type of Study	n	CIPS	Age	Profession
Pákozdy et al. (2023)	The imposter phenomenon and its relationship with self-efficacy perfectionism and happiness in university students	USA (Amerika)	Findings: Females scored higher than males on the CIPS	Cross-sectional survey-based study	n: 261 %_f: 49.04 %_m: 50.96	mean_f: N/A sd_f: N/A mean_m: N/A sd_m: N/A	mean: N/A range: 18-40 sd: N/A	60% STEM students, rest non-STEM students
Rice et al. (2023)	Impostor syndrome among minority medical students who are underrepresented in medicine	USA (Amerika)	Objective: To compare IP Scores of medical students of 2 different universities. Findings: 97% of students reported moderate to intense feelings of IS, and women were 1.7 times more likely than men to report frequent or intense feelings of IS	Online survey	n: 278 %_f: 72.66 %_m: 27.34	mean_f: 64.5 sd_f: 12.1 mean_m: 61.9 sd_m: 12.1	mean: N/A range: N/A sd: N/A	students
Sawant et al. (2023)	A study on impostor phenomenon personality and self-esteem of medical undergraduates and interns	N/A (N/A)	Objective: Measure IP in medical undergraduate students. Findings: Significant gender differences were seen in females on agreeableness, conscientiousness, and neuroticism as compared to the males. IP negatively correlated with self-esteem, extraversion, agreeableness, and conscientiousness and positively with neuroticism.	Cross-sectional study	n: 416 %_f: 39.66 %_m: 60.34	mean_f: 64.15 sd_f: 14.78 mean_m: 62.79 sd_m: 14.22	mean: 20.48 range: N/A sd: 1.45	students
Bernuy et al. Group A (2022)	Additional Evidence for the Prevalence of the Impostor Phenomenon in Computing Group A	Canada (Amerika)	Objective: Identifying the Prevalence of IP among Computer Science Students. Findings: Students in computing programs experience the IP at higher rates than in other fields and that woman, in particular, report high rates of IP experiences.	Cross-sectional study	n: 519 %_f: 23.7 %_m: 65.13	mean_f: 77 sd_f: 14.8 mean_m: 70 sd_m: 17	mean: N/A range: N/A sd: N/A	N/A
Bernuy et al. Group B (2022)	Additional Evidence for the Prevalence of the Impostor Phenomenon in Computing Group B	Canada (Amerika)	Objective: Identifying the Prevalence of IP among Computer Science Students. Findings: Students in computing programs experience the IP at higher rates than in	Cross-sectional study	n: 235 %_f: 22.55 %_m: 64.26	mean_f: 76 sd_f: 14.07 mean_m: 67 sd_m: 16.3	mean: N/A range: N/A sd: N/A	N/A

Authors (Year of publication)	Title	Country (Kultur)	Main Findings	Type of Study	n	CIPS	Age	Profession
			other fields and that woman, in particular, report high rates of IP experiences.					
Kaur et al. (2022)	Relationship Between Impostor Phenomenon and Personality Traits A Study on Undergraduate Students	India (Asien)	Findings: there was no gender difference found among undergraduate students.	Online survey	n: 40 %_f: 50 %_m: 50	mean_f: 59.15 sd_f: 12.274 mean_m: 58.4 sd_m: 9.046	mean: N/A range: 18 - 21 sd: N/A	students
Mioara et al. (2022)	Impostor Phenomenon: Its Prevalence Among Academics and the Need for a Diverse and Inclusive Working Environment in British Higher Education	Scotland (Europa)	Objective: to examine the IP variations in relation to gender, age, and academic role and the relations between IP and components of psychological wellbeing, authenticity, and job satisfaction. Findings: Female academics scored higher in IP than male academics. Young academics expressed higher levels in IP than middle aged and older academics.	Online survey	n: 168 %_f: 53.57 %_m: 46.43	mean_f: 72.86 sd_f: 15.49 mean_m: 57.96 sd_m: 16.26	mean: 41.98 range: 24-68 sd: 9.75	professional
Naser et al. (2022)	Impostor Phenomenon and Its Relationship to Self Esteem Among Students at an International Medical College in the Middle East A Cross Sectional Study	Europe (Europa)	Objective: This study explored the relationship between IP and self-esteem amongst medical students. Findings: No significant gender differences were found in IP.	Cross-sectional descriptive study	n: 290 %_f: 58.28 %_m: 41.03	mean_f: 61 sd_f: 13.5 mean_m: 59 sd_m: 13.4	mean: 19 range: 16-39 sd: N/A	students
Neufeld et al. (2022)	Why Do We Feel Like Intellectual Frauds? A Self-Determination Theory Perspective on the Impostor Phenomenon in Medical Stu	Canada (Amerika)	Objective: To find out how Self-Determination- Theory (SDT) impacts the severity of IP among medical students and to assess the prevalence of IP among the students and whether its intensity varies by gender and ethnic minority status. Findings: females scored significantly higher than males on overall IP severity	Online survey	n: 277 %_f: 25.99 %_m: 14.08	mean_f: 72.1 sd_f: 12.5 mean_m: 66.3 sd_m: 14.8	mean: N/A range: N/A sd: N/A	students

Authors (Year of publication)	Title	Country (Kultur)	Main Findings	Type of Study	n	CIPS	Age	Profession
Domínguez-Soto et al. (2021)	The relationship between impostor phenomenon and transformational leadership among students in STEM	Spain (Europa)	Objective: To examine the relationship between IP and transformational leadership in STEM- students. Findings: IP relates negatively to the transformational style and positively to the transactional and passive leadership styles. IP occurs more frequently among female engineering students than in their male counterparts.	Cross- sectional study	n: 548 %_f: 28.65 %_m: 71.35	mean_f: 58.7 sd_f: 10.5 mean_m: 55.5 sd_m: 11.2	mean: 20.8 range: 18-29 sd: 2.5	students
Fleischhauer et al. (2021)	The Impostor Phenomenon: Toward a Better Understanding of the Nomological Network and Gender Differences.	Germany (Europa)	Objective: This study aimed to contribute to open questions regarding gender differences in the IP and the nomological network of the IP. Findings: female participants reported higher impostor feelings than males	Online survey	n: 209 %_f: 78.95 %_m: 21.05	mean_f: 57.15 sd_f: 14 mean_m: 48.68 sd_m: 14.6	mean: 26.99 range: 18-72 sd: N/A	N/A
Paladugu et al. (2021)	Impostor syndrome in hospitalists - a cross-sectional study	USA (Amerika)	Objective: To assess the prevalence of IP in practicing hospitalists is and the impact of mentoring programs on IP. Findings: The mean CIPS score was 53.82 (±17.1). Of the 71 participants, 24 had IS scores greater than 60, indicating a 33.8% prevalence of moderate or greater Impostor tendencies. Hospitalists with mentors as compared to those without mentors had no statistical difference in raw impostor scores or prevalence of impostor syndrome. There was no difference in IP score for men and women	Cross-sectional descriptive study	n: 71 %_f: 38.03 %_m: 59.15	mean_f: 53.02 sd_f: 18.3 mean_m: 56.7 sd_m: 14.5	mean: N/A range: N/A sd: N/A	professional
Kogan et al. (2020)	Veterinarians and impostor syndrome an exploratory study	USA (Amerika)	Objective: To explore the prevalence and severity of IP in practicing veterinarians. Findings: males were only half as likely to score the same score or higher on the CIPS as females.	Cross- sectional study	n: 941 %_f: 88.95 %_m: 9.14	mean_f: 70.08 sd_f: 14.99 mean_m: 62.75 sd_m: 16.88	mean: N/A range: N/A sd: N/A	professional

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Levant et al. (2020)	Impostorism in American medical students during early clinical training gender differences and intercorrelating factors	USA (Amerika)	Objective: To examine the incidence and severity of IP in third-year medical students. Findings: No statistically significant differences were found in IP severity between men and women	Cross-sectional study	n: 112 %_f: 58.93 %_m: 41.07	mean_f: 65.4 sd_f: 14.7 mean_m: 59.9 sd_m: 14	mean: 25.8 range: N/A sd: 3	students
Rosenstein et al. (2020)	Identifying the Prevalence of the Impostor Phenomenon Among Computer Science Students	USA (Amerika)	Objective: Identifying the Prevalence of the Impostor Phenomenon Among Computer Science Students. Findings: female students had significantly higher levels of impostor feelings than the male students.	Cross- sectional study	n: 203 %_f: 26.11 %_m: 73.40	mean_f: 68.34 sd_f: 11.27 mean_m: 62.65 sd_m: 12.81	mean: N/A range: N/A sd: N/A	students
Cowie et al. (2018)	Perfectionism and academic difficulties in graduate students: Testing incremental prediction and gender moderation	Canada (Amerika)	Objective: To test incremental prediction of perfectionistic self-presentation on intrapersonal and interpersonal academic problems. Findings: Women showed greater imposter syndrome and academic stress, but results did not support gender moderation.	Cross- sectional study	n: 269 %_f: 52.42 %_m: 47.58	mean_f: 57.79 sd_f: 15.16 mean_m: 51.44 sd_m: 12.81	mean: 30.7 range: N/A sd: 7.5	students
Vergauwe (2015)	Fear of being exposed: The trait-relatedness of the impostor phenomenon and its relevance in the work context	Belgium (Europa)	Objective: to (1) examine the trait-relatedness of the IP; (2) investigate the potential impact of impostor tendencies on work attitudes and organizational citizenship behavior (OCB); and (3) explore whether workplace social support can buffer the potential harmful effects of impostor tendencies. Findings: Big Five personality traits, core self-evaluations, and maladaptive perfectionism explain large proportions of the variance in impostor tendencies ($\Delta R^2 = .59$). No significant sex differences in mean impostor tendencies	Cross- sectional study	n: 201 %_f: 58.21 %_m: 41.79	mean_f: 40.21 sd_f: 11.62 mean_m: 37.59 sd_m: 13.47	mean: N/A range: 20-61 sd: N/A	N/A

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Jöstl et al. (2012)	When will they blow my cover? The impostor phenomenon among Austrian doctoral students.	Austria (Europa)	Objective: To examine the relation between the IP and research self-efficacy in the university context. Findings: Faculty members reported higher levels of both the IP and research self-efficacy. Women reported higher scores on the IP Scale and lower levels of research self-efficacy than men did.	Cross- sectional study	n: 631 %_f: 61.65 %_m: 38.35	mean_f: 45.28 sd_f: 3.08 mean_m: 41.12 sd_m: 2.6	mean: 31.5 range: N/A sd: 7.8	students
Legassie et al. (2008)	Measuring resident well-being: Impostorism and burnout syndrome in residency	Canada (Amerika)	Objective: To explore the prevalence and association between impostorism and burnout syndrome in a sample of internal medicine residents. Findings: female residents had higher scores on the impostor scale	Cross-sectional study	n: 48 %_f: 52.08 %_m: 47.92	mean_f: 65.2 sd_f: 15.5 mean_m: 56.4 sd_m: 11.5	mean: N/A range: 20-39 sd: N/A	students
McGregor et al. (2008)	I feel like a fraud and it depresses me: The relation between the imposter phenomenon and depression.	USA (Amerika)	Objective: To examine the relation between depression and IP in college students. Findings: the data suggest that although there is an interaction between the IP and depression, men and women did not differ significantly from each other on the BDI (Beck Depression Inventory). Women had a higher IP score than men.	Cross- sectional study	n: 186 %_f: 61.83 %_m: 38.17	mean_f: 58.3 sd_f: 11.367 mean_m: 53.14 sd_m: 11.375	mean: N/A range: N/A sd: N/A	students
Cowman & Ferrari (2002)	Am I for real? Predicting impostor tendencies from self-handicapping and affective components.	USA (Amerika)	Objective: The relationship between impostor tendencies and different behavioral and affective variables was examined. Findings: impostor tendencies were significantly correlated with behavioral self-handicapping and with shame-proneness.	Cross- sectional study	n: 436 %_f: 67.43 %_m: 31.88	mean_f: N/A sd_f: N/A mean_m: N/A sd_m: N/A	mean: 19.5 range: N/A sd: 2.66	N/A
Henning et al. (1998)	Perfectionism, the impostor phenomenon and psychological adjustment in medical,	USA (Amerika)	Objective: To examine the severity of perfectionism and the IP in health profession students. Findings: The mean total CIPS score for women was also	Online survey	n: 477 %_f: 53.04 %_m: 46.96	mean_f: 57.83 sd_f: 14.89 mean_m: 52.08 sd_m: 13.03	mean: 26.2 range: 20-54 sd: 5	students

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	dental, nursing and pharmacy students.		significantly higher than that observed with men					
Fried (1997)	Fear of success, fear of failure, and the imposter phenomenon among male and female marketing managers	N/A (N/A)	Objective: to clarify the relationships between gender, in relation to FOS (Fear of Success), FOE (Fear of Failure) and the IP, among marketing managers. Findings: Female managers were significantly higher than males on FOS, but there were no significant gender differences on FOF or the IP.	Cross- sectional study	n: 104 %_f: 49.04 %_m: 50.96	mean_f: 43.16 sd_f: 12.53 mean_m: 41.08 sd_m: 10.1	mean: 35 range: 20-60 sd: 8.3	N/A
King & Cooley (1995)	Achievement orientation and the impostor phenomenon among college students.	USA (Amerika)	Objective: To investigate the relation between IP and family achievement orientation and achievement related behaviors. Findings: Greater family achievement orientation was associated with higher levels of IP. Higher levels of IP were associated with higher GPA and more time spent on academic endeavors for females, but not for males. Females had significantly higher IP Scale scores than males.	Cross- sectional study	n: 127 %_f: 59.06 %_m: 40.94	mean_f: 59.47 sd_f: 14.59 mean_m: 53.4 sd_m: 11.15	mean: 19.31 range: 17-26 sd: 1.67	students
Hayes & Davis (1993)	Interpersonal flexibility, Type A individuals, and the impostor phenomenon.	USA (Amerika)	Objective: to investigate the relationships between interpersonal flexibility, Type A behavior, and impostor characteristics in college students. Findings: Type A and impostor characteristics were negatively related for men, they were positively related for women. Women had significantly higher scores on the impostor test than men.	Cross- sectional study	n: 83 %_f: 71.08 %_m: 28.92	mean_f: N/A sd_f: N/A mean_m: N/A sd_m: N/A	mean: 21.72 range: N/A sd: N/A	students