‘Is it me or … ?’. A multimethod study to explore the impact of personal and contextual factors on PhD students’ well-being

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Abstract

As PhD students' well-being gathers relevance, exploring what factors influence it and how is crucial. Therefore, this study quantitatively examined the joint effect of personal and contextual variables on PhD students' well-being and qualitatively assessed their perceptions about the main issues they faced during their doctoral course. Through a multimethod study, we collected quantitative data from 216 Italian PhD students, 123 of whom responded to an open-ended question. We tested a moderating mediation model to understand whether 1) there was an indirect relationship between self-efficacy and exhaustion, mediated by the perceptions of impostor syndrome; 2) supervisor instrumental support moderated the self-efficacy – impostor syndrome relationship and the indirect relationship abovementioned. Quantitative findings showed that self-efficacy was negatively associated with exhaustion via perceptions of impostor syndrome. Concerning the moderation effect, when self-efficacy was high, the higher the supervisor support, the lower the perceptions of impostor syndrome. When self-efficacy was low, the higher the supervisor support, the higher the perceptions of impostor syndrome. Qualitative findings reported various personal and contextual aspects PhD students perceived as problematic, which may jeopardise their well-being. These results may inform policymakers and academic staff interventions for promoting PhD students' well-being.

Keywords: PhD Students, Well-being, Exhaustion, Self-efficacy, Impostor Syndrome, Supervisor support

Introduction

Growing evidence of the widespread experience of psychological distress, anxiety, and depression among PhD students and academic staff (Satinsky et al. 2021; Tommasi et al. 2022) seems to substantiate the worry of what some have termed a "mental health crisis in academia" (Lau and Pretorious 2019, p. 38). For instance, Evans et al. (2018) showed that PhD students more frequently experience moderate-to-severe levels of anxiety and depression when compared to peers from the general population (41% vs 6% in the general population and 39% vs 6% in the general population, respectively). PhD students' well-being levels impact their professional development and the quality of their academic outputs (Levecque et al. 2017); thus, it is pivotal to understand what factors may affect their well-being.

A robust body of quantitative studies has insightfully contributed to detecting potential risk and protective factors that may affect PhD students' well-being, and qualitative research helped to delve into the complexity of the personal and contextual factors influencing the PhD experience (e.g., Schmidt and Hansson 2018). As Jackman and colleagues (2022a) remarked, – approaching the issue through the ecological system theory lens – the discourse around factors that may influence PhD students' well-being reveals a system of actors at multiple levels. However, previous quantitative studies lack a multifactorial approach, and more empirical studies are necessary to understand how personal and contextual factors might influence PhD students' well-being (Jackman and Sisson 2022; for recent exceptions, see Tontodimamma et al. 2023). Furthermore, qualitative research can provide rich, detailed insights into phenomena within specific contexts, and this is useful in this case because of the specificity of the PhD programmes due to the organisation of the various education systems and the discrepancies in their programmes of study across contexts (Schmidt and Hansson, 2018).

Therefore, the overall research goal of the present study was to shed light on factors influencing PhD students' well-being by analysing quantitative and qualitative data from a sample of students enrolled in an Italian University. The quantitative data tested a psychological process involving personal and contextual factors impacting PhD students' well-being, while the qualitative inquiry delved into the specific experience of Italian PhD students. Broad, comprehensive evidence collected via multiple methods may offer empirical insights to inform interventions at different levels of analysis, improving the quality of the doctoral experience and fostering PhD students' psychological well-being.

Background and Aims

Scholars have investigated factors influencing doctoral students' well-being (Hazell et al. 2020; Schmidt and Hansson 2018; Sverdlik et al. 2018), broadly dividing them into contextual (related to social, cultural, and relational facets of the PhD experience), and personal (tied to individual psychological experiences) factors. Contextual factors like financial concerns, time pressure, workload, and the impact of COVID-19 have been linked to increased stress and anxiety (Cornwall et al. 2019; Falk et al. 2019; Frydman et al. 2019; Jackman et al. 2022b). Notably, the quality of supervision and relationship with the supervisor are the most influential factors in PhD students' experience and well-being (Makhamreh and Stockley 2019). The supervisor is expected to be responsive, give feedback and create a good atmosphere. When the supervision is perceived as inadequate, it is likely that the overall PhD experience quality decreases, with possible negative consequences on students' well-being (Falk et al. 2019; Makhamer and Sotckey 2019; Virtanen et al. 2017).

Contextual risk factors side with personal risk factors. Previous qualitative research has observed that PhD students commonly report low self-efficacy (henceforth, SE) and high levels of perceived impostor syndrome (henceforth, IS) as aspects that impair their well-being (see Lau and Pretorius 2019; Cornwall et al. 2019). They often report feeling "not good

enough" (Prendergast, Usher, and Hunt 2023, p. 6) for their doctoral path and doubting their capability to pursue the PhD title (e.g., Sverdlik et al. 2018). These feelings connect to decreased motivation and increased loneliness (Jackman et al. 2022a; Cornwall et al. 2019). Intrinsic motivation and academic self-concept, rooted in SE, are crucial (Sverdlik et al. 2018). Internal struggles related to self-identity, authenticity, and reflection are highlighted, along with chronic stress as a significant risk factor (Hazell et al. 2020).

Although, as reported, a robust body of research portrays the contextual and personal factors that influence PhD students' well-being, more inquiry is needed to understand the mechanism through which this influence is exerted. Moreover, to date, no studies have provided in-depth insights into possible factors influencing the well-being of Italian doctoral students. More evidence from the Italian context is needed to provide information for creating tailored interventions to promote PhD students' well-being. Therefore, to fill these gaps in the literature and fulfil our purpose of progressing knowledge on the factors and dynamics involved in PhD students' well-being, we implemented a multimethod design, namely an approach where complementary data collection and analysis methods address two different research questions related to an overall research goal (Anguera et al. 2018).

The first research question of the present study (RQ1) was: what are the relationships between personal (i.e., SE and perceptions of IS) and contextual (i.e., perceived supervisor instrumental support; henceforth, SIS) factors which impact emotional exhaustion[1] (the core component of burnout stress syndrome and a sign of impaired well-being; Bakker and Demerouti 2017)? Informed by previous evidence on the relationships between these variables, we framed these relationships within the Conservation of Resources Theory (COR theory; Hobfoll et al. 2018), which provides a theoretical explanation of the dynamics and

[1] The terms "Emotional Exhaustion" and "Exhaustion" have been used interchangeably to conceptualise one of the three dimensions of Burnout, both in early and more recent scholarly work (Bakker and Demerouti 2017; Maslach et al., 2001). From now on, we use the term exhaustion as it encompasses the energetic component of burnout at a general level.

factors involved in the onset of work-related stress. Specifically, we depicted a moderated mediation model linking SE, perceptions of IS, SIS and exhaustion. Although exhaustion has been well-documented to affect PhD students (Devine and Hunter 2016; Stubb, Pyhältö, and Lonka 2011), the relationship between SE and exhaustion has not been explored empirically. Furthermore, we examined whether IS–a relatively understudied risk to mental health during the doctoral experience (Sverdlik, Hall, and McAlpine 2020)–mediates this relationship. In addition, we sought to progress the empirical literature on the contextual influence on PhD students' well-being dynamics, specifically by exploring the moderating role of perceived SIS on the SE-IS and the indirect SE-exhaustion relationships mentioned above. Testing such a comprehensive model involving contextual and personal factors can provide novel insights into understanding the psychological process influencing PhD students' well-being.

The second research question of the study (RQ2) was: What are the main challenges of the doctoral path perceived by the Italian PhD students? We answered this research question using a qualitative method. Understanding problematic aspects of their experience allowed us to detect risk factors that may negatively affect their well-being and perform context-specific inquiry to provide unique insights into the Italian PhD students' perceptions. This is the first study to apply a qualitative approach to these issues in the Italian context, representing a unique opportunity to delve into Italian PhD students' experience.

Hypotheses Development

Framing PhD Students' Self-Efficacy, Perceptions of Impostor Syndrome and Exhaustion within the Conservation of Resources Theory

COR theory asserts that individuals strive to obtain and retain social, personal, and material resources to support achieving their goals, preserve themselves from harm, and enhance the quality of their lives (Hobfoll et al. 2018). This framework advocates that stressful conditions stem from actual or threatened loss of resources (Halbesleben et al.

2014) and that people can mobilise the resources they have to prevent or cope more effectively with the stress caused by resource loss (Hobfoll et al. 2018). In this regard, personal resources (i.e., self-evaluations about individuals' sense of their ability to control and impact their environment successfully) are particularly relevant, and SE (i.e., individuals' beliefs in their ability to perform tasks effectively; Bandura 1997) represents a prominent personal resource. SE sustains cognitive (e.g., elaborating mindful plans), motivational (e.g., eliciting positive expectations), affective (e.g., managing anxiety) and selective (e.g., choosing rewarding behaviours) processes. In academic contexts, SE determines commitment to academic careers and self-regulation in task completion (Major and Dolly 2004). Previous research has corroborated that SE positively correlates with PhD students' performance and well-being (e.g., Haider and Dasti 2022).

IS is a relevant concern for PhD students' well-being (Byrom et al., 2022; Jackman et al. 2022c). It is a mindset typical of high-achieving individuals who fail to internalise their accomplishments (e.g. attributing them to luck instead), have persistent self-doubt about their capability, and fear being exposed as impostors despite their objective merits (Clance and Imes 1978). Within COR, IS can be considered a personal demand (i.e., an individual aspect that requires sustained physical and/or psychological effort) associated with resource loss mechanisms (Crawford et al. 2016) and mental health problems (Bravata et al. 2020). The academic environment is a fertile ground for IS to develop and thrive. Its competitive and performance-focused culture, when combined with unclear performance expectations (Byrom et al. 2022) or the sense of not belonging to the academic community (Sverdlik et al. 2020), may encourage self-doubts in PhD students (Nori and Vanttaja 2022). Research has shown the association between IS and impaired well-being among PhD students (e.g., Byrom et al. 2022; Jackman et al. 2022c; Sverdlik et al. 2020).

Exhaustion, the core component of burnout (Bakker and Demerouti 2017), implies feeling drained of energy, fatigued and unable to face demands from one's job and/or organisation or engage with people (Maslach and Leiter 2016). Exhaustion results from prolonged exposure to job and personal demands without personal or social resources to counteract their detrimental effects, leading to impaired mental health (Bakker and Demerouti 2017). Within the COR model, exhaustion can thus be viewed as a sign of low levels of well-being.

In this study, we hypothesised that PhD students who feel efficacious undertake their tasks more confidently and perceive stressful situations as challenging rather than threatening. The processes activated by self-efficacy trigger self-regulation strategies, making individuals more confident in undertaking tasks using their skills and resources (Bandura 1997). Therefore, SE can offset resource drain in stressful circumstances, inhibiting the stress process (Schwarzer and Hallum 2008) and protecting from exhaustion. Previous studies have shown a negative direct relationship between SE and exhaustion across many professional fields (Shoji et al. 2016). We, therefore, advanced that SE has a protective role in the doctoral experience domain as well, so positing that:

Hypothesis 1. SE has a negative direct relationship with exhaustion in PhD students.

People with low SE may be more vulnerable to stress factors, increasing the odds of experiencing IS (Hobfoll et al. 2018). Indeed, low SE brings feelings of inadequacy, which may breed IS (Vergauwe et al. 2015). On the contrary, the self-regulative and affective processes induced by SE facilitate self-confidence in tasks expected from PhD students (e.g., Lambie and Vaccaro 2011) and a positive adaptation to the academic experience by reducing task-related anxieties (e.g., Huerta et al. 2017). Schwinger and Stiensmeier-Pelster (2011) showed that SE mitigates the same self-undermining cognitive and behavioural

patterns associated with IS. Hence, we posited that SE may prevent cognitive distortions leading to IS, deactivating the resource loss spiral and decreasing PhD students' vulnerability to such demand. We hypothesised that:

Hypothesis 2. SE is negatively related to IS in PhD students.

IS may trigger an initial loss of personal resources because of the fear of taking action and the inability to recognise achievements (Crawford et al. 2016). This initial loss requires preserving the remaining resources or replenishing lost ones (Holmgreen et al. 2017). However, under such initial energetic deprivation, people who feel like impostors may decide to prevent further intrusive and self-undermining thoughts and become unwilling to invest resources (e.g., seeking support) to restore the lost ones. Such processes may reiterate resource depletion and leave unequipped against demands, thus leading to exhaustion (Holmgreen et al. 2017). Accordingly, we posited that**:**

Hypothesis 3. IS has a positive relationship with exhaustion among PhD students.

Considering the above, we advanced that SE enhances cognitive and affective strategies to counteract the emergence of IS, ultimately decreasing exhaustion. While extant scholarly work has shown how SE influences exhaustion via reduced job demands (e.g., Skaalvik 2020), we further advocated that this indirect relationship also occurs by reducing personal demands. Moreover, we tested this relationship among PhD students, which, to our knowledge, has not been done previously. Thus, we posited that:

Hypothesis 4. A negative indirect effect exists between SE and exhaustion through IS in PhD students.

The Role of Supervisor Support

Since we endorsed a multifactor perspective on PhD students' well-being (Jackman et al. 2022a), we included the perceived support provided by the supervisor in our analysis. Supervisor support is a key aspect of PhD students' health and performance (Cornér,

Löfström, and Pyhältö 2017; Jackman et al. 2022a; Wollast et al. 2023), and it is effective against IS (Pervez et al. 2021). In line with the COR theory, one resource may bolster the protective effect of another related resource (Halbesleben et al. 2014). Arguably, we assumed that SE and perceived social support interact so that the latter magnifies the effect of SE. Following recommendations to match the contents of social support and specific work-related demands (i.e., Matching Hypothesis; Jolly, Kong, and Kim 2020), we measured SIS. SIS refers to tangible and practical help during the doctoral experience (i.e., providing instructions and feedback to solve challenging tasks; Jolly, Kong, and Kim 2020).

SIS may enhance SE effects in several ways. First, SIS helps develop a more realistic self-estimation of academic skills (Posselt 2018) and formulate reasonable goals, expectations, and plans (Janssen, Van Vuuren, and Junger 2021). This strengthens SE's cognitive effects (i.e., favourable consideration of skills and more conscious planning and expectations; Bandura 1997). Second, SIS leads to the belief that one's performance can be attributed to one's capabilities rather than exceptional circumstances (Khuram et al. 2021). This can reinforce the SE-regulated process of positive causal attribution (Bandura 1997). Third, SIS helps PhD students keep a grip on their work even against episodic difficulties (e.g., a rejection) by confirming their competencies (Janssen, Van Vuuren, and Junger, 2021), thus enhancing SE power against worries and anxiety (Bandura 1997). Accordingly, we posited that:

Hypothesis 5. SIS moderates the relationship between SE and IS, thereby boosting the negative effect of SE on IS among PhD students.

Hypothesis 6. SIS boosts the negative indirect effect of SE on exhaustion through IS; thereby, the indirect effect is stronger at increasing levels of SIS.

To sum up, the quantitative part of this multimethod study aimed to test the joint effect of personal and contextual factors on PhD students' exhaustion. The hypothesised moderated mediation model is shown in Figure 1.

Figure 1 here

Method

Procedure and Sample

The data collection complied with the Ethical Guidelines of the Helsinki Declaration (World Medical Association 2013) and lasted from May to October 2021. We recruited PhD students from several doctoral programmes of a leading Italian university. We adopted a purposive sampling strategy through an invitation e-mail that redirected to an online survey on the Qualtrics platform (https://www.qualtrics.com). Participants were informed about the anonymity and confidentiality in the data treatment process, and they could give their informed consent to participate voluntarily, with the right to withdraw at any time.

A total of 216 PhD students (around 7% of the total number of PhD students enrolled in the investigated University; M_{age} = 29.25 years; *SD* = 4.95; 52.80% women; 44.00% men; 3.20% chose not to indicate their gender) completed the questionnaire. Most participants were in the third year of the doctoral program (34.26%) compared to those in the first (25.00%) and second year (33.80%) and those who were waiting to defend their dissertation (6.94%).

Context of the Study

It is worth noting that this study was conducted between the end of the second semester of the 2020/2021 academic year and the first semester of the 2021/2022 academic year. During this period, the Italian higher education system was still strongly impacted by the COVID-19 pandemic. Specifically, at the time of data collection, the university implemented blended teaching activities and partially re-opened research structures after

the emergency closure in March 2020 (Agasisti and Soncin 2021). This period severely affected PhD students, who saw their training and research activities halted abruptly (Paucsik et al. 2022). Supervisors, too, saw their job demands and pressure increase (e.g., Kulikowsky, Przytuła, and Sułkowski 2021). Both groups had to deal with negative health outcomes during that period (Pyhältö, Tikkanen, and Anttila 2023).

Measures

Quantitative Part

Self-Efficacy. We used the Italian version of the General Self-efficacy scale (Sibilia, Schwarzer, and Jerusalem 1995). The scale consisted of 10 items (e.g., "I can usually handle whatever comes my way.") with a Likert scale ranging from 1 = *Not at all true* to 4 = *Exactly true*.

Perceived Supervisor Instrumental Support. We used five items to investigate perceived task-related support developed by Overall, Deane, and Peterson (2011), translated into Italian through a forward-backward procedure. The items (e.g., "My supervisor teaches me the technical knowledge and skills that I need to complete my research") had a Likert scale ranging from 1 = *Strongly disagree* to 5 = *Strongly agree*.

Perceived Impostor Syndrome. We employed the Impostor syndrome scale (Clance 1985), which was used under copyright and with the permission of its author. We translated the scale into Italian through a forward-backward translation procedure. The ten items (e.g., "I'm afraid people important to me may find out that I'm not as capable as they think I am") presented a Likert scale ranging from 1 = *Strongly disagree* to 5 = *Strongly agree*.

Exhaustion. We used the Italian-validated version of the Maslach Burnout Inventory (Sirigatti, Stefanile, and Menoni 1988). The nine items (e.g., "I feel tired as soon as I get up in the morning and see a new working day stretched out in front of me") presented a Likert scale ranging from 1 = *Never* to 5 = *Always*.

Control Variables. Age, gender, and year of enrolment were used as control variables, given their impact on early researchers' experience and self-reported health (e.g., Paucsik et al. 2022). We also considered the abovementioned COVID-19 pandemic impact on the doctoral path and psychological health (see Pyhältö, Tikkanen, and Anttila 2023). We controlled for the perceived COVID-19-related impact and concerns through the creation of six items based on an internal discussion within the research group and the literature produced until early 2021 about the pandemic effect on PhD students' life and work (e.g. Eigege and Kennedy 2020; Paula 2020). The items (e.g., "Coronavirus emergency has affected the quality and quantity of my work") presented a Likert scale ranging from 1 = *Never* to 5 = *Always*.

Qualitative Part

To collect qualitative data, we asked participants to describe the major problems they faced during their PhD course at the end of the questionnaire ("Here, you can write the biggest problems you encountered or are encountering during your PhD"). Participants could write a short paragraph (without a word limit) or make a list of words. Using broad, open-ended questions in a survey is strategic to collect spontaneous responses from participants without suggesting possible response options (Reja et al. 2003), as well as prioritising what is relevant for them and accessing their language (Frith 2000). Several authors have already shown the strengths of open-ended questions in surveys (e.g., Braun et al. 2021) and used them with PhD students (e.g., Jackman et al. 2022b).

Data Analysis

This Study adopted a multimethod approach that is useful to provide both quantitative and qualitative evidence on factors that may influence PhD students' well-being. The quantitative part aimed to study the influence of personal and contextual variables within a psychological process underlying PhD students' well-being, and the qualitative part aimed to gain a complex understanding of the Italian PhD students'

perceptions of the main problems related to their doctoral path. Qualitative and quantitative data were collected simultaneously through an online survey and analysed separately by different researchers of the same research team.

For quantitative data analysis, we tested the measurement model using AMOS software. Cronbach's alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) were used to evaluate the internal consistency and convergent validity of the scales (Hair et al., 2019). We used the Fornell-Larcker criterion for assessing discriminant validity (each variable's AVE square root should be greater than the correlation coefficients between that specific variable and other variables; Hair et al. 2019). Given the use of self-report measures and a cross-sectional design, we performed Harman's one-factor test to evaluate the severity of the common method bias (Podsakoff et al. 2003). We employed the PROCESS macro ver. 25 (Hayes 2018) for hypothesis testing. We tested the moderated mediation model (model 7 in the PROCESS macro) using 5000 bootstrapped samples with a 95% confidence interval for model testing and effects estimation.

Qualitative data were analysed using qualitative content analysis, a method "for describing qualitative material in a systematic way" (Schreier 2012, p. 2). The basic idea of this analysis is to reduce the complexity of qualitative data by systematising them using a coding frame to describe the meanings of the data. In line with this, the analysis was underpinned philosophically by post-positivism. The analytical strategy adopted was based on deductive and inductive methods. Initially, the coding frame was applied for systematic organisation. Then, the analysis took on a partially data-driven dimension, wherein the authors introduced additional codes and modified the coding frame to align with the nuances of the data.

The coding frame used for the analysis was created after the analysis of the findings of a pilot study conducted by the research team. The author who conducted the pilot study–

a Postdoc fellow who had already implemented qualitative research–created the first set of codes to analyse the present study's data and flexibly used the coding frame. After the first coding phase, the author developed overreaching categories by grouping the codes according to similarity. Then, the categories were further organised following a hierarchical pattern (Schreier 2012). Finally, to check the reliability of the coding frame, the other two researchers of the research team–PhD students who work with qualitative data and methods–used the same coding frame to analyse the data and assess the adherence between quotes, codes and categories. The final outlook of the categories was discussed and agreed upon among the three researchers.

Results

Quantitative Results

Preliminary Results

We tested different measurement models to identify which one fitted the data better. The results showed that a five-factor model that encompassed all variables tested as separate latent variables had the best fit since they were within the widely known thresholds (Akaike's information criterion = 1296.641; Bayesian information criterion = 1607.167; Chi-square/degrees of freedom ratio = 1.53; Root Mean Square Error of Approximation = 0.05; Standardised Root Mean Square Residual = 0.06; Comparative Fit Index = 0.92; Non-Normed Fit Index = 0.92; Hair et al., 2019; Table S1 in Supplementary online materials).

Then, we created a composite score for each variable and treated them as observed variables in the following analyses. Table 1 shows descriptive statistics and the AVE and CR test results, which supported divergent and discriminant validity (Hair et al. 2019). Harman's single-factor test corroborated the low impact of common method bias since the single factor explained only 25.28% of the variance.

Table 1 around here

Hypotheses Test Results

Concerning the hypotheses test, we mean-centred SE and SIS and included the control variables in the analysis. An overview of the results is shown in Table 2. Supporting H1, SE was negatively related to exhaustion. In addition, we observed a significant negative relationship between SE and IS and a significant positive relationship between IS and exhaustion, supporting H2 and H3, respectively. Consequently, the indirect effect of SE on exhaustion via IS (H4) was supported. Concerning H5, we found a significant interaction between SE and SIS on IS. Thereby, the negative relationship between SE and IS is always significant at any level of SIS. By decomposing the interaction and considering the conditional effect of SE at different levels of SIS (-1SD, Mean and +1SD), it emerged that the higher the SIS, the stronger the effect of SE on IS. However, looking at Figure 2, it can also be noted that when participants reported low SE, the higher the SIS, the higher the perceptions of IS. In other words, PhD students with low levels of SE reported higher perceptions of IS when perceiving high supervisor support than low supervisor support. Therefore, H5 was not completely supported: although the interaction effect was significant, the joint effect of SE and SIS did not always decrease IS.

Finally, the overall moderated mediation model (H6) was significant at any level of the SIS (Table 2). Indeed, the conditional indirect effect reported in Table 2 is significant regardless of the level of SIS. The higher the perceived instrumental support, the higher the indirect effect of SE on exhaustion.

Table 2 around here

Figure 2 around here

Qualitative Results

Among the total sample, 123 participants (56.9%) replied to the open-ended question describing or listing the major problems faced during the doctoral path. The dataset comprised

responses ranging from 1 word to a few lines (the most extended responses counted 120 words). One author identified 206 meaningful parts in the responses, and the final coding frame encompasses 25 codes divided into five categories plus two categories without codes. The inter-rater reliability, namely the degree of agreement between the first author who created the coding frame and the other two authors who checked its accuracy, was excellent (κ = .86, $p < .001$; κ = .91, $p < .001$, respectively; McHugh, 2012). The final complete coding frame–including categories, codes and quotes is presented in Table 3. The seven categories represented contextual (5 categories) and personal (2 categories) aspects perceived as problematic by the PhD students.

Table 3 here

Contextual Factors

The categories referring to contextual aspects reflected structural and cultural problems (i.e., *Negative organisational culture*, *Demanding job-related aspects*, *Difficulties related to the pandemic*) and relational problems (i.e., *Supervisor relationships*, *Relationships with others*). As far as cultural and structural problems are concerned, some participants described the organisational culture, namely the shared values and underlying assumptions of a group of people in an organisation regarding the norms of that organisation (Schneider et al., 2017), as characterised by "Strong pressure to publish in leading journals and participate in conferences from the very first year of the PhD, although the thesis work was in its early stages." (Participant #204, female, 35 years, 3rd year), and by "closed-minded and elitist" environment (Part. #206, female, 27 years, 2nd year).

Among the *Demanding job-related aspects* participants cited the role conflict characterising PhD students, the life-work interference and career insecurity. As for role conflict, PhD candidates are simultaneously students, meaning they are still in education and

learning; teaching assistants, meaning they have to carry out teaching activities; and researchers, who are expected to be responsible for their research. One participant reported, "I had to supervise exams for several professors from the very beginning, with too much mental and energy absorption during the exam months, without having any time left over for my research." (Part. #122, male, 27 years, 3rd year), highlighting the difficult in managing different tasks. The life-work interference is described as the sense that the PhD path is very pervasive, and some participants reported difficulties in stopping thinking about the PhD even when their working hours have finished, sacrificing time for their family and private life. Finally, some participants described career insecurity as another relevant issue. Career insecurity is defined as the fear of not being able to maintain a continuous career and reach an individual career goal already found in PhD students and researchers (e.g., Alisic and Wiese, 2020). In line with that, this category encompasses all the excerpts that refer to the anxiety and the stress due to the precarious academic career and the challenge of pursuing this career that affects both the professional life and the personal life, as this participant reported, "The greatest difficulty I am going through these years is not being able to plan my personal life because of the uncertainty about my university career." (Part. #146, female, 31 years, 3rd year). These job-related demanding characteristics are linked to the structure of the academic environment in general as they concern how the role of doctoral students is defined in this working environment and the precarity of the academic career.

Zooming on the national context, participants mentioned other job-related demanding structural issues, such as the lack of a clear employment contract and associated work-related rights (e.g., the lack of sick leave), the lack of research funding, the inadequate salary, and the devaluation of the PhD title within the national labour market. For example, one PhD student wrote, "It is frustrating that I cannot maintain total economic independence due to the low amount of the PhD scholarship." (Part. #66, male, 25 years, 2nd year), whereas another

emphasised consequences of the absence of an employment contract, as follows "Total lack of contract regulations means no timetables, no holidays, no duties." (Part. #141, male, 26 years, 1st year). In contrast to the previous ones, all these issues are closely linked to the characteristics of the national higher education system, which influences the doctoral experience indirectly.

Narrowing the focus to the local context, some PhD students mentioned *Demanding job-related aspects* linked to the specific features of the Italian university they were attending as possible problematic external factors. More precisely, some of them pointed out the barriers related to the department organisation, the lack of adequate training in doctoral courses (provided by each department), the inadequate tools and structures to carry out their research activities provided by the department, the excessive workload and a large number of administrative duties to finalise. For instance, one participant reported: "Training offered for doctoral students has a little focus on developing specific research skills and does not offer really useful tools for this career." (Part. #91, female, 47 years, 2nd year), highlighting that the training provided to the PhD students is perceived as not satisfactory. As for the inadequate tools and structures some participants complained about the "Lack of equipment, difficulties in organising with colleagues due to poor management of available tools." (Part. #202, female, 25 years, 2nd year).

Since the data collection was carried out during the second year of the COVID-19 pandemic, participants mentioned challenges related to this external aspect. They reported heightened stress levels due to disruptions in data collection or laboratory attendance for extended periods, as this participant said: "My biggest problem was during the lockdowns due to the COVID-19 pandemic that did not allow me to collect the data, which greatly affected the quality of my research." (Part. #82, female, 33 years, 3rd year). Another consequence of the pandemic situation was more related to the difficulty of starting the PhD online, which

promotes a sense of loneliness, as this participant described: "Following all teaching activities online has been emotionally taxing for me as well as not being able to share this new experience (The PhD, *ed.*) with my colleagues." (Part. #200, gender not indicated, 25 years, 1st year).

As far as the relational challenges are concerned, participants mentioned problems related to the *Supervisor relationship* and *Relationship with others.* More precisely, they reported a sense of difficulty in getting clear task-related support from the supervisor, as well as a lack of sufficient feedback and supervision. For instance, one participant reported that she felt a "Lack of a shared project with the tutor regarding the goals of my research" (Part. #33, female, 30 years, 3rd year), and another one described the supervisor as "Absent, who responds to e-mails/messages after whole days showing that they have not even read the content of the request" (Part. #185, male, 26 years, 2nd year). This absence and lack of supervision may provoke negative feelings and frustration, as expressed by this student "I do feel unprotected, I feel forgotten, with no guidance and no idea what I'm doing. It's frustrating." (Part. #63, female, 26 years, 1st year). Furthermore, some participants reported the perception that the supervisor was not competent concerning their research project. One PhD student said, "My supervisor is incompetent and they don't care about anything we do. They have only taught me what kind of researcher I do not want to be." (Part. #84, male, 27 years, 2nd year). The relationship with the supervisor is one of the most important aspects determining the doctoral course and the well-being of doctoral students. Not receiving adequate support (one of the most frequently cited codes) leads to difficulties in continuing the doctoral course and carrying out the research project, and can create a negative interpersonal relationship with the tutor.

As for relationships with others, some respondents reported problems with their colleagues (e.g., being victims of bullying or mobbing) or described a sense of loneliness

reflecting the lack of cooperation and social relationships during the PhD period. Some participants simply reported the word "Loneliness", whereas others elaborated a little more on this feeling by saying, for instance, "Personally, one of the worst things about my PhD course concerns the difficulty of sharing with other colleagues and other people at the university, both on a work and human level." (Part. #107, female, 28 years, 2nd year).

Personal Factors

Besides contextual factors, participants mentioned other challenges influencing their well-being that refer to two main internal experiences: *Negative psychological experiences* and *Problems related to being a foreign PhD student*. The first one includes several codes, such as the fear of disappointing expectations and feeling great inadequacy concerning their role. Participants expressed these feelings by saying: "I feel a strong sense of inadequacy" (Part. #69, female, 28 years, 3rd year), or "I am afraid of disappointing my expectations and the expectations of those who have shown trust in me." (Part. #114, female, 37 years, 1st year). Both aspects are linked to the IS described by Clance and Imes (1978): persistent self-doubt about one's capability and the fear of disappointing others.

Other adverse experiences were reported by participants, encompassing the loss of motivation, articulated by a participant who expressed, "I am about to finish my PhD: I have no enthusiasm, I feel passive" (Part. #195, female, 27 years, 3rd year), and also the identified necessity for structured psychological support, as one participant emphasised, "I feel more and more the need for psychological support, and I think the University should take it on." (Part. #145, male, 30 years, 1st year). Furthermore, a subset of participants (only three) pointed out the manifestation of psychological symptoms, including depressive states and panic attacks, arising during their PhD.

Finally, the last category related to personal factors refers to challenges experienced by international students intertwined with external circumstances related to their specific

status. They reported negative states associated with the difficulty of engaging in social relationships due to language and cultural differences, the challenges due to the scarcity of services offered to international students, and the major demands caused by the distance from family and loved ones.

To sum up, the responses to the open-ended questions provide an overview of the challenges and main problems perceived by Italian PhD students. These challenges are mainly related to the working environment and the social relationships established at work (contextual factors). Besides that, participants also mentioned internal negative psychological experiences (personal factors) that may add complexity to the already demanding general working environment where PhD students work.

Discussion

This study aimed to enrich the literature about the personal and contextual factors that impact PhD students' well-being. To do so, we leveraged quantitative and qualitative data to gain a deeper insight into how these factors influence PhD students' well-being and what kind of problems and challenges Italian PhD students experience. We explained a mechanism underpinning PhD students' well-being through the quantitative approach and drawing upon the COR theory (Hobfoll et al. 2018). Specifically, we explored the relationship between SE and exhaustion among Italian PhD students (H1). We tested a mechanism of onset, precisely through the mediation of reduced IS (H2, H3, H4). Moreover, we aimed to understand whether SIS moderated SE's impact on IS (H5) and the indirect relationship (H6).

We found a negative relationship between SE and exhaustion (H1). Our results align with the existing literature (Haider and Dasti 2022; Sverdlik et al. 2018): SE is a crucial personal resource that prevents resource depletion and exhaustion, ultimately fostering adaptation to the academic experience (Huerta et al. 2017). Then, we observed a negative

relationship between SE and IS (H2). This finding further corroborates the beneficial effects of SE, as its cognitive and self-regulative power overcomes cognitive distortions about one's capacity to do their job. These results enrich empirical research that has scarcely included SE and IS in the same conceptual model (Sverdlik, Hall, and McAlpine 2020; Vergauwe et al. 2015). The positive relationship between IS and exhaustion (H3) aligns with the idea that feeling like an impostor may trigger an initial loss of personal resources that could develop into exhaustion (Hobfoll et al. 2018; Holmgreen et al. 2017). Overall, the indirect relationship between SE and IS (H4) supports the idea that personal resources (i.e., SE) reduce vulnerability against demands and defuse the loss spiral leading to adverse health outcomes. The results of H2-H4, while explaining a COR-rooted mechanism through which SE can benefit PhD students, provide novel insights into the well-being dynamics within the doctoral experience from the COR theory perspective. On the one hand, we demonstrated that IS marks a situation of resource loss, which may reiterate and lead to impaired well-being (i.e., exhaustion). Thus, by empirically showing that IS is a factor triggering resource-loss mechanism, we progress the literature about personal demands, which is far from being exhausted (Bakker and Demerouti 2017; Chen and Fellenz 2020), confirming empirical evidence about IS being a personal demand related to the doctoral experience (e.g., Byrom et al. 2022). On the other hand, from the COR perspective, our results generate novel insights into the role of personal resources and their relationship with personal demands. Indeed, we found that SE reduces IS (H2), defusing the loss spiral leading to exhaustion (H3-H4). This suggests that personal resources contribute to well-being not only by counteracting the effect of demands related to one's job or work tasks but also by preventing the cognitive distortions on which personal demands root. This contributes to the existing research conducted so far (Chen and Fellenz 2020) and

encourages further explorations of the connection between personal resources and personal demands.

The finding concerning the moderating effect of SIS on the SE-IS relationship (H5-H6) brought some interesting insights that deserve to be discussed. In line with the COR theory, SIS can amplify the impact of SE on IS, sustaining the assumption that resources can amplify the impact of other resources in the same environment. This finding also portrays a specific relationship between multi-level factors affecting PhD students' well-being (e.g., Schmidt and Hannson 2018). Indeed, we integrated personal factors (i.e., SE and IS) with contextual factors from a micro-level (i.e., SIS) into a single model. As for the interaction, it is important to note that the boosting effect of SIS that we found was relatively small. An explanation can be attributed to the strong relationship between SE and IS, which may have downplayed the relationship of SIS with IS. Moreover, it is also worth remarking that, contrary to our expectations, SIS increases IS when SE is low (see Figure 2). This flags that, to be beneficial, support in the doctoral programme should reflect the recipient's needs and expectations, or else it might be ineffective (e.g., Beehr, Bowling, and Bennet 2010; Yun and Beehr 2023). Perceiving SIS as more than required or expected can instil in doctoral students the belief that they need support because of their inadequacy (i.e., low SE). This can even worsen their self-doubts and further undermine self-esteem (Beehr, Bowling, and Bennet 2010), amplifying IS (Pervez et al. 2021), especially when combined with low SE, as in our case. Borrowing from recent literature about SIS (e.g., Yun and Beehr 2023), a COR-theory explanation for this result is that, within a highly competitive and performance-focused environment such as the academic one, receiving social support while having unfavourable self-judgements (i.e., low SE) may be interpreted as a threat (i.e., being seen as incompetent). Such a threat may be resource-consuming because it

triggers further loss of personal resources such as self-esteem, exacerbating IS perceptions instead of alleviating them.

While this finding is unexpected, it helps refine our understanding of the role of social support and its patterns of interaction with other resources within the doctoral ecosystem. From a COR theory standpoint, this intriguing result warns about what and how resources should be invested to be effective. That is, resources such as SIS should be adequate, proportionate, timely and congruent with the need that those resources are required to address (Halbesleben et al. 2014) and with the interpretation that the recipients have of the environment (Yun and Beehr 2023). Hence, we invite further COR theory-based investigation to determine the cost and benefits of investing in social support, carefully analysing the type, content, and timing of support provision and the quality of relationships in the PhD domain (Jolly, Kong, and Kim 2020).

The results of the qualitative analysis conducted on the open-ended responses paint a comprehensive picture of challenges faced by Italian PhD students', once again affirming that the doctoral experience is influenced by factors operating at various levels. Informed by previous research and literature reviews (e.g., Sverdlik et al. 2018), we divided the categories developed through the qualitative analysis into two overarching levels: contextual factors, encompassing cultural, structural, and relational aspects, and internal factors, tied to the individual's psychological experience.

Some contextual challenges expressed by the Italian sample have already been described as factors that largely influence the PhD students' experience. Among others, the role of the supervisor and the quality of the supervision have been described as factors that largely determine the PhD experience and may affect PhD students' well-being (Falk et al. 2019; Makhamer and Sotckey 2019; Sverdlik et al. 2018; Virtanen et al. 2017). Along the same line, more structural aspects, such as financial constraints, workload, the socialisation

in the research group and the precarity of the academic career have already been found in other cohorts of PhD students (e.g., Cornwall et al. 2019; Falk et al. 2019; Frydman et al. 2019). These common results point out that these challenges are perceived at a general level by students attending different universities around the world, thus defining several aspects that are common in academia. At the same time, participants named other challenges related to the national context and university features, such as the lack of research funding and adequate facilities and tools. These findings enrich the picture of the possible risk factors that may particularly influence Italian PhD students even more.

Our qualitative findings align with recent works on the same topic (Beasy, Emery, and Crawford 2021; Jackmann et al. 2022a) that framed potential external risk factors for PhD students' well-being within the ecological system theory framework, thus reinforcing such an interpretation with novel insights into the Italian context. In this vein, since the ecological system theory sees individuals situated at the core of a system composed of interconnected and interdependent factors operating at different levels (see Jackman et al. 2022a), we could assert that relational aspects belong to the microsystem, as the relationships with supervisors and colleagues can be considered the most immediate influence on well-being. The work-life interference could be placed in the mesosystem, as two microsystems (e.g., private and working life) mutually interact to affect the individual (see also Jackman et al. 2022a). The exosystem encompasses all the links and connections between microsystems that the individual does not directly influence. It is thus possible to place all the features of the higher education system we categorised as demanding job-related aspects (e.g., lack of funding, career insecurity, department organisation). The macrosystem, reflecting cultural values and norms, may manifest in the negative academic culture and the devaluation of the PhD title reported by participants. Lastly, our data may also represent the chronosystem since the challenges stemming from the COVID-19

pandemic represented a non-normative life transition that significantly impacted individual lives.

All these contextual factors, distributed across different levels, were reported to influence internal factors described by PhD students. Specifically, personal experiences are characterised by negative feelings about one's abilities, fear of disappointing expectations, and a lack of motivation. These experiences align closely with the description of IS previously identified within the doctoral community. Furthermore, the expressed need for structured psychological support indicates a demand for personal assistance in navigating the challenges posed by a complex and demanding work environment.

Categorising these potential contextual risk factors across different levels allows for discerning where interventions can be most effective and propose tailored training for PhD students and supervisors. Additionally, it permits a nuanced understanding of which aspects may require policy changes and informed engagement with higher education stakeholders. Consistent with Jackman et al.'s (2022a) perspective, separating external from internal factors prevents an exclusive focus on the psychological characteristics of PhD students through a person-centred approach. Instead, it encourages a consideration of the diverse influences exerted by various factors.

Limitations of the Study

This study has some limitations that should be noted. First, only about 7% of the PhD students enrolled in the selected university replied to the questionnaire. It may mean that only PhD students unsatisfied with the doctoral path may have completed the survey, with the risk of biased results owing to self-selection and limited generalisation of the results to the entire population of PhD students at that university and in the Italian context. Second, we used a general measure of SE rather than a specific research-related SE scale, and we only measured perceived instrumental support. Third, we proposed a broad, open-

ended qualitative question to collect data instead of implementing other methods, like interviews, which may provide more elaborated results. Furthermore, we emphasised the negative aspects and outcomes of the doctoral path, and further extensions of our study may also focus on the positive aspects pointed out by previous research (e.g., Jackman et al. 2022d) adopting a positive psychology lens. Fourth, although a cross-sectional approach offers a valid and efficient way to provide exploratory and foundational knowledge about presumed relationships between variables (Cain, Zhang, and Bergeman 2018; Spector 2019), it does not allow for inferring a causal relationship between variables or capture the impact of resources changes over a specific time frame (e.g. perceived social support could fluctuate; Walsh and Kabat-Farr 2022). Multi-wave, longitudinal, and experimental designs are required to corroborate our results further. Also, the latent profile analysis approach may be considered to explore various profiles of the variables under study within the PhD students' population and offer additional insights into the relationships we have tested. Fifth, although we accounted for the pandemic impact in our analyses, we did not examine whether the heightened pressure on supervisors during the pandemic may have impacted the support supervisees reported receiving (Pyhältö, Tikkanen, and Anttila 2023). Employing an ecological system approach, we invite future researchers to explore how the ecosystem influences the supervisory style and, in turn, the PhD students' experience.

Practical Implications

Our study's results highlight the importance of jointly developing personal and contextual resources. We call for interventions to be placed at different levels of the PhD students' ecosystem so that changes at any level can be generative of improvements in the others and mutually reinforce their effects (Jackman et al. 2022a). At the individual level, the importance of SE requires interventions addressing those areas where PhD students experience IS (e.g., conducting research, writing, teaching). For instance, adopting

strategies like the experience of skills mastery or role modelling has been shown to positively alter PhD students' SE (e.g. Suddeath, Baltrinic, and Dugger 2020). Developing SE is also recommended because it may stimulate the emergence of other beneficial personal resources in line with the COR Theory's Resource Caravan principle (Hobfoll et al. 2018).

Broadening the focus and considering contextual factors, at the microsystem level, developing positive forms of supervisor support for PhD students, and proposing training for supervisors and initiatives to foster socialisation among PhD students and the research team might be necessary. Supervisors who are prepared with communication skills and competencies for negotiating students' goals and expectations (e.g., Jackman et al. 2022a) can provide students with the most appropriate forms of support. Considering our unexpected findings about the impact of SIS, we encourage training supervisors' communication and negotiation skills to provide support after it has been agreed upon with PhD students. Supervisors and supervisees may discuss and compare their respective perceptions of support given/received to identify the proper level of support (Beehr et al. 2010). Also, raising supervisors' self-awareness would help them realise their supervisees' needs and perform adequate helping behaviours (Yun & Beehr 2023). Finally, at the exosystem level, higher education institutions should prioritise PhD students' access to programmes for increasing resources or preventing mental health issues (Waight and Giordano 2018) and lessen the pressure of the culture of long work hours and productivity (Jackman et al. 2022a).

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Table 1

Descriptive Statistics, Internal Consistency Indices and Bivariate Correlations of the Main Variables

Variable	M	SD	α	CR	AVE	1.	2.	3.	4.
1. Self-Efficacy	2.74	.53	.91	.90	.49	***.69***			
2. Supervisor Instrumental support	3.00	1.26	.94	.94	.75	.26**	***.86***		
3. Impostor Syndrome	3.31	.95	.88	.89	.46	-.47**	-.11	***.67***	
4. Exhaustion	2.98	.87	.91	.91	.55	-.41**	-.41**	.36**	***.74***

Note. N = 216; * p < .05; ** p < .01; α = Cronbach's Alpha; CR = Composite reliability; AVE = Average Variance Extracted; Numbers in italicised bold are the square root of each variable's AVE.

Table 2

Conditional Indirect Effects of Self-efficacy on Exhaustion at Different Levels of Supervisor Instrumental Support

Variable	**Impostor syndrome (mediator)**				**Exhaustion (Dependent Variable)**			
Control Variable	B	SE	*t*-value	*p*-value	B	SE	*t*-value	*p*-value
Gender[a]	.05	.09	.61	.54	.11	.08	1.36	.18
Age	-.01	.01	-.93	.35	-.01	.01	-.83	.41
Year of enrolment	-.07	.06	-1.17	.24	.04	.06	.65	.52
Covid-19 worries	.05	.06	.86	.39	.15	.06	2.53	.01
Independent Variables								
Self-Efficacy	-.88	.12	-7.53	.000	-.46	.11	-3.99	.000
Instrumental Support	.03	.05	.54	.59				
Impostor Syndrome					.19	.06	2.88	.004
Self-Efficacy*Instrumental Support	-.16	.08	-2.07	.04				
R^2	.26				.24			
F	10.26				11.09			
Index of Moderated Mediation	Index	SE	LL	UL				
	-.03	.02	-.08	-.001				
Conditional Indirect effects	B	SE	LL	UL				
Low Instrumental Support	-.13	.05	-.22	-.04				
Medium Instrumental Support	-.16	.06	-.29	-.05				
High Instrumental Support	-.20	.08	-.37	-.06				

Note. N = 216. LL = Lower Limit of the 95% Confidence Interval; UL = Upper Limit of the 95% Confidence Interval.

Table 3

Final Coding Frame Elaborated through the Qualitative Content Analysis Including, Categories, Codes and Example Quotes

Type of factors (contextual/ personal)	Categories	Codes	Examples
Contextual factors	**Negative organisational culture (9)**	Competition and pressure (5)	"Everything in the environment is really performative, including the exchange with colleagues." (Part. #172, female, 29 years, 2nd year).
		Elitist and closed environment (4)	"The working environment is a bit depressing and close-minded; you can feel the difference with the department in other countries." (Part. #72, prefer not to reply, 32 years, 3rd year).
	Demanding job-related aspects (89)	Role conflict (17)	"The fact that I have to take part in activities that do not concern my research." (Part. #76, male, 26 years, 3rd year).
		Life-work interference (6)	"Learning to balance academic and personal aspirations and striving for the balance between the former and the latter. This I think has been my biggest battle." (Part. #219, female, 27 years, waiting for thesis defence).
		Career insecurity (18)	"One issue is the uncertainty of my professional and career life post-doctorate" (Part. #70, Female, 32 years, 3rd year).
		Lack of clear employment contract and rights (7)	"Difficulties in accessing illness (I had to go through a period of treatment) and consequently in organising work." (Part. #178, female, 28 years, 3rd year).
		Lack of research funding (2)	"Lack of funds to adequately carry out research activities." (Part. #34, male, 28 years, 2nd year).
		Inadequate salary (3)	"I cannot be economically independent due to the amount of the PhD scholarship. It is too low." (Part. #132, preferred not to reply, 27 years, 3rd year)
		Devaluation of the PhD title (2)	"Devaluation of the title of doctor in the external society." (Part. #134, female, 29 years, 3rd year).

	Barriers related to the department organisation (7)	"Strong internal tensions within the department." (Part. #204, female, 35 years, 3rd year).
	Lack of adequate training (9)	"Doctoral training is often not related to the research carried out by doctoral students." (Part. #127, male, 32 years, waiting for thesis defence)
	Inadequate tools and structures to carry out research activities (5)	"Seven months since I started, I have not yet received enough hardware support for my research project. I do not know how long it will take to prepare the needed sources for my research." (Part. #64, female, 29 years, 2nd year).
	Excessive workload (9)	"Too many job tasks to fulfil in only three years of doctoral course. This is too intense in terms of workload." (Part. #209, male, 24 years, 2nd year).
	Too administrative duties to finalise (4)	"Dealing with the administrative sector is always very difficult, with direct consequences on the actual possibility of carrying out research." (Part. #18, male, 29 years, 3rd year).
Difficulties related to the pandemic (15)	/	"Because of the pandemic, I not only lost almost a year's work (that of the material collection and the period abroad) but it also made my work very discontinuous, messy and difficult to carry on (if only because of the emotional stress related to the uncertainty of the situation and future prospects)." (Part. #16, Female, 29 years, 3rd year).
Supervisor Relationship (44)	Low task clarity (6)	"Lack of clear indications regarding short- and medium-term objectives." (Part. #192, female, 27 years, 3rd year).
	Lack of feedback, support and presence (21)	"I was totally left on my own. No guidance, no advice, not even of a technical or bibliographical nature, no help, no interest in what I do or study from my tutors." (Part. #194, female, 26 years, 1st year).
	Supervisor perceived as incompetent (8)	"A supervisor who is incapable of doing her duty, who never meets a deadline, who does not correct papers, who is not prepared in my field of research, who wastes my time by making me do useless things, who never gives me good ideas to proceed in my studies." (Part. #218, female, 29 years, 3rd year).
	Negative interpersonal relationship (9)	"Inability of tutors to convey passion and understanding of my work, being judged negatively and demoralised by tutors." (Part. #140, female, 28 years, 3rd year).
Relationships with others (22)	Problems with the work team/research group (7)	"The climate in the research group can sometimes be burdensome. Colleagues want to know too much personal information and there tends to be a competitive climate similar to organisations and companies' environment." (Part. #73, female, 24 years, 1st year).

		Isolation (15)	"Ad hoc social activities for doctoral students are not frequent and very low, and the consequence is that is really difficult to create a community with colleagues." (Part. #111, male, 28 years, waiting for thesis defence).
Personal Factors	**Negative psychological experiences (24)**	Fear of disappointing expectations (3)	"I feel the anxiety of constantly having to prove yourself to not disappointing anyone." (Part. #9, female, 29 years, 3rd year).
		Feeling inadequate (9)	"I do not feel able to perform the tasks I will have to undertake in the coming years." (Part. #66, male, 25 years, 2nd year).
		Losing motivation (4)	"The biggest problem for me is my loss of motivation. I regret every day that I chose to leave a job with a permanent contract to start the PhD." (Part. #176, male, 28 years, 1st year).
		Need of structured psychological support (5)	"I would open a psychological support service within each department, not just giving a generic possibility of access through the university. The support must be user-friendly." (Part. #106, female, 29 years, waiting for thesis defence).
		Development of psychological symptoms (3)	"I have not resumed working on my thesis, and I go in and out of depressive states." (Part. #58, male, 33 years, 3rd year).
	Problems of international students (3)		"I am a foreign student, and to stay in Italy, I will have to find a postdoc as soon as possible, and although my performance has been quite good in general, the fear of not finding a post haunts me." (Part. #197, male, 27 years, 3rd year).

Note. The numbers in the brackets represent the number of excerpts coded with a specific code, which also corresponds to the number of participants who reported that specific challenge.

Figure 1

Hypothesised Moderated Mediation Model

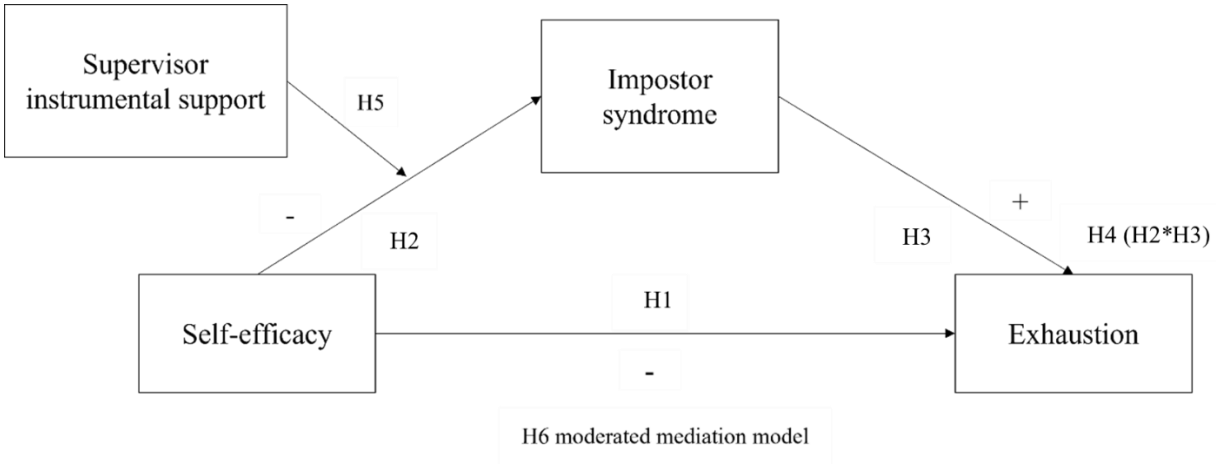

Figure 2

Conditional Effect of Self-efficacy on Impostor Syndrome at Different Levels of Supervisor Instrumental Support