Quality of life in academia: new perspectives for assessing and promoting wellbeing in university population

Edited by
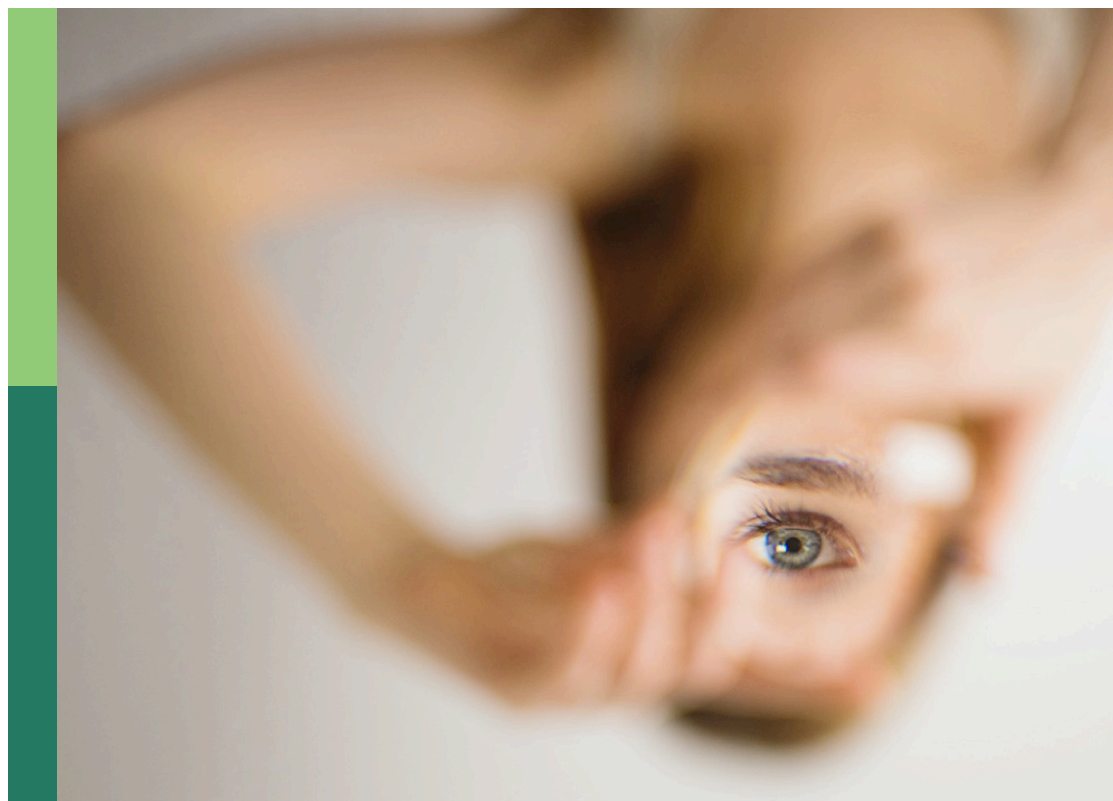Barbara Loera, Andreina Bruno, Sara Viotti and
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Quality of life in academia: new perspectives for assessing and promoting wellbeing in university population

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Editorial: Quality of life in academia: new perspectives for assessing and promoting wellbeing in university population

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Editorial on the Research Topic
Quality of life in academia: new perspectives for assessing and promoting wellbeing in university population

In recent decades, significant changes have transformed academic organizations, reshaping the objectives, roles, and social image of university staff. The growing emphasis on performance accountability, now extending to public universities, has intensified the focus on internationalization, competition, fundraising, and the managerial aspects of academic work. Professors and researchers are now expected to excel not only in teaching and research but also in securing funding, patenting research outcomes, transferring knowledge to local contexts, engaging in public outreach, and fulfilling institutional responsibilities.

These changes have also impacted technical and administrative staff, who are responsible for implementing various projects and accountability policies. Students have also been affected by these shifts, and although many changes have been designed to improve their education and employability, it is undeniable that they now face increased demands for efficiency and adaptability in an often uncertain and complex labor market.

In essence, today's academic organizations are highly dynamic and challenging environments. While motivating and rewarding, they are becoming increasingly demanding and pose significant risks to psychological wellbeing and, more broadly, the quality of academic life. The COVID-19 pandemic has introduced additional challenges, further increasing the psychosocial demands of academic work and study.

Research on the quality of life in academia has often borrowed from the broader occupational health literature, without fully addressing the unique complexities of

the evolving academic context. Existing policies and interventions also fall short in considering contemporary factors influencing wellbeing in universities.

There is a growing awareness and interest among academics in how these risks can be addressed or, better still, prevented in this unique professional and educational setting.

Various working groups and initiatives across Europe, such as Healthy Universities (https://healthyuniversities.ac.uk/), the ARK Intervention Programme (https://www.ntnu.edu/ark/the-ark-intervention-programme), REMO (Research Mental Health Observatory, https://projects.tib.eu/remo/), and the QoL@W network (Quality of Life at Work in academia, https://aipass.org/gruppi-tematici/qolwork-quality-of-life-at-work/) in Italy aim to foster a culture of wellbeing in academia.

These initiatives show that it is crucial to better assess the quality of life in academia, to facilitate comparative studies, and to inform the development of appropriate policies and interventions that promote the wellbeing of the university population.

The Research Topic on the Quality of Life in Academia represents a valuable contribution in this desirable direction, accounting for the specificities of the academic organizational context as well as the unique characteristics of the population involved in Europe, Asia, and Latin America.

The articles in this Research Topic reflect the current focus on wellbeing in academia, with much attention paid to students. Of the 12 accepted articles, six are dedicated to students at different educational levels, from undergraduates to doctoral students.

Two papers focus on assessing the psychometric properties of tools used to evaluate various aspects of students' wellbeing. Menardo et al. introduce the Perceived Restorativeness Scale (Rest@US), confirming the importance of university physical environments in enhancing student wellbeing. Matavovszky et al. aim to validate the Outcome Questionnaire, useful for assessing mental health, in a sample of Hungarian university students, using a toolkit that includes measures of depression, resilience, social support, and burnout.

Quiroga-Castañeda et al. examine the potential long-term health consequences for students reporting stress, particularly in relation to the irritable bowel syndrome. Their study of 403 Peruvian medical students highlights the need for preventive measures against academic stress and its adverse effects on physical health.

The qualitative study by Mikhaylova et al. explores students' life choices and finds that educational decisions are considered by Russian university students to be the most crucial in shaping their future. This study suggests the importance of vocational guidance programs to support students' wellbeing and improve quality of life in academia.

Two further contributions focus on a specific group: doctoral students and postdoctoral researchers. These individuals are in a transitional phase between students and academic workers, dedicating much of their time to training and learning while also taking on significant research and teaching responsibilities. These studies, conducted by Vilser et al. in Germany and Bacci et al. in Italy, explore the challenges faced by this group, including job insecurity, effort-reward imbalance,

and workload, and how these factors impair their quality of life.

Overall, while it is commendable that researchers and professors are concerned about the wellbeing of their students, it is also essential to place greater emphasis on the quality of working life for other university populations: professors, researchers, and technical-administrative staff. This is the focus of the remaining articles.

Starting with professors, psychological malaise in teaching is demonstrated by Pei et al., who show that intentions to leave among Chinese university professors, especially those with low self-efficacy, are intensified under stress.

The impact of the coronavirus on academic life is given special attention. Díaz et al. examine the psychosocial factors affecting both professors and students working or studying from home during the COVID-19 lockdown in Mexico. They found that students were more vulnerable, highlighting not only the pandemic-related factors, but also issues relevant to remote working and studying in general.

Capone et al. also emphasize the importance of learning from remote working during the pandemic and integrating these lessons into the post-pandemic "new normal" in Italian universities. They also focus on technical-administrative staff (TAS), a frequently overlooked group and stress the importance of social support for this category of workers.

Bruno, Buono et al. address this group as well by validating the "Technical and Administrative Staff Quality of Life At Work" (TASQ@work) tool, developed by the QoL@Work, the Italian network of academic Work and Organizational Psychologists. The tool combines various measures to assess TAS quality of life, in order to inform better organizational policies.

Attention to the social dimension is also present in the study by Signore et al. in Southern Italy, which emphasizes social relationships, both within and outside the university, as a key factor in enhancing wellbeing in the academic setting, both for academics and administrative staff. Indeed, academic institutions serve as a bridge between society, the world of work, and the local community.

Finally, the Research Topic addresses the gap between risk assessment and intervention management in academia. In many cases, little attention is paid to how identified risks are managed once they have been assessed. By examining the factors that facilitate the transition from assessment to implementation of interventions in the academic context, Bruno, Dell'Aversana et al. suggest that creating organizational scaffolding and participatory processes in the risk assessment-management pathway can prevent data from being underutilized and increase the chances of implementing interventions to create healthier academic conditions. Without these interventions, the focus on wellbeing in academia risks becoming merely rhetorical, with data rarely influencing management decisions. This could lead to an individualistic approach to wellbeing, placing the burden on individuals to manage their health and stress, while ignoring systemic issues within university structures and programs.

In conclusion, while significant strides have been made in addressing wellbeing in academia, particularly

in relation to students, more attention needs to be paid to the working conditions and the quality of life at work of academic staff and technical-administrative staff. The development and implementation of policies that address these challenges are essential for fostering a healthier and more supportive academic environment for all members of the university community.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Development of an instrument to assess the mental health of university students: validation of the *Outcome Questionnaire-45* in a Hungarian sample

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The Outcome Questionnaire is a self-report questionnaire developed mainly for treatment impact assessment and monitoring of status change because it can measure the cross-sectional condition very accurately by being sensitive to small changes. The present study aimed to psychometrically evaluate and validate the instrument on a sample of Hungarian university students. 7,695 higher education students (28.6% male, 68.8% female, 1% other, $M = 23.7$, SD = 6.78) participated in the study and completed a questionnaire package (OQ-45, Beck Depression Inventory, WHO Well-being Questionnaire-5, Connor-Davidson Resilience Scale, MOS-Social Support Survey, Maslach Burnout Inventory-SS) online, developed to measure general and more specific mental health conditions. The Hungarian version of the questionnaire has a high internal consistency (Cronbach's alpha = 0.951). Based on the confirmatory factor analysis, the original three-factor version of the instrument (due to inadequate fit indicators) did not gain support in our sample. Five subscales were identified and subjected to content analysis in the exploratory factor analysis. Our final questionnaire consists of 39 items. The full scale and the subscales show a high correlation with other questionnaires measuring similar constructs. The psychometric indicators of the questionnaire are adequate and, therefore, considered reliable. The separation of the five factors was confirmed by construct and convergent validation. The questionnaire's psychometric properties may be worth testing in the future on a clinical sample and a sample of adults from a wider age range. The use of the measurement tool has important implications in research areas beyond therapeutic impact assessment, as it may offer a bridging solution to the methodological problems encountered in the construction of complex questionnaire packages consisting of several instruments. International findings suggest that some items in the questionnaire are particularly sensitive to cultural context, so it is crucial to use a measure adapted to the region of the study sample. Other strengths of the questionnaire include its ability to address subclinical and clinical symptoms in one dimension and provide a comprehensive cross-sectional picture of the bio-psycho-social status of individuals, which allows systematic monitoring of a large and heterogeneous population (higher education students).

1 The *Outcome Questionnaire-45*

Positive or negative changes in psychotherapy and psychological counseling are very difficult to quantify, and it is not easy to identify the factors that determine effective treatment. Nevertheless, there is a strong demand from professionals, clients and the health care system to monitor the impact of a given intervention and to measure the effectiveness of therapies (Goss and Rose, 2002). For this reason, impact evaluations are becoming increasingly unavoidable and, in parallel with the spread of psychotherapies, they are also an important part of psychological research (Papp and Péley, 2015).

Measuring the effectiveness of therapies has a long history, dating back to the 1950s. Eysenck (1952), one of the first researchers on the subject, expressed a very skeptical view of positive effects. This was repeatedly refuted in later studies in the 1970s using a more sophisticated methodology (Bergin, 1971). With the spread of cognitive and behavioral trends, more and more factors (e.g., therapist role, client characteristics, etc.) were included in impact studies (Lambert, 2013). Although the research methodology was very heterogeneous, the effectiveness of the therapies was clearly demonstrated in about two-thirds of the cases. At the same time, however, 10–15% of clients experienced deterioration as a result of the interventions (Lambert and Ogles, 2004), creating a need for professionals to focus on preventing and reducing potential negative outcomes in addition to achieving positive change (Lambert et al., 2005). A self-report questionnaire, designed to consistently monitor the therapeutic process, can be used to eliminate potential biases in the assessment of treatment effectiveness due to therapist bias.

The *Outcome Questionnaire-45* (OQ-45; Lambert et al., 1996) primarily supports the work of therapists and helping professionals by providing a systematic picture of the client's functioning and by allowing the measurement of therapeutic effectiveness by monitoring the client's condition and assessing changes in the process (by identifying improvement and deterioration). Accordingly, the instrument can be used repeatedly at the beginning, during, and at the end of treatment.

The questionnaire consists of 45 items (9 of which are reversed) all of which cover the spectrum of mental disorders, symptoms, and stress disorders. The respondent is asked to rate each item on a 5-point Likert scale (1: never, 5: almost always) based on their experience over the past week. The total score calculated from the responses gives an indication of the client's overall health, and the subscale scores give an indication of functioning in different areas. Of the 45 items, 4 items have a signaling function (of which item 8 indicates suicidal tendencies, items 11 and 32 indicate substance abuse, and item 44 indicates aggression). The strengths of the measure are that it is able to discriminate (but not diagnose) clinical from subclinical symptoms, it is inexpensive, easy and quick to administer, and sensitive to small changes (Lambert and Ogles, 2004). As it uses a common measure of mental health, the results obtained may also be suitable for describing cross-sectional conditions.

These advantages of the questionnaire can be further exploited in the case of higher education students, as the mental health of this large and heterogeneous target group can be measured easily and quickly. A comprehensive study of this population is of particular importance and relevance in several respects. The high prevalence of anxiety and depressive symptoms among young people (e.g., Kessler and Wang, 2008; Gallagher, 2016) the life management problems and chronic diseases that develop during this period clearly indicate an increasingly vulnerable period both physically and psychologically (e.g.: Benczúr et al., 2014; Zhang et al., 2019). This may be due, among other things, to normative crises caused by the life tasks to be tackled in young adulthood, e.g.: formation of intimate relationships, separation from parents (Erikson, 1959). Social changes in recent decades (e.g., expanded and unpredictable opportunities for learning, work and mobility) present new mental challenges to which adaptation requires additional mental energy (Arnett, 2004). In addition, those involved in higher education are also exposed to external and internal sources of stress associated with studying (e.g., academic performance, financial resources, student work (e.g., Bewick et al., 2010). Overall, therefore, there are a number of risk factors for mental health that warrant screening and early detection of mental and physical illness. This calls for systematic studies that can measure both the developmental and psychological characteristics of emerging adulthood (e.g., identity exploration, feeling in between) and coping responses to stressors created by the university environment. Effective and timely intervention not only reduces the burden on the university counselor and the healthcare system, but can also have a positive impact at a socio-economic level (Urbán, 2017).

The questionnaire has the following three subscales: (1) *Symptom Distress* (SD) (2) *Interpersonal Relationships* (IR) (3) *Social Roles* (SR). Lambert argues for the existence of these factors and their distinction from each other even before the development of the OQ-45, referring to Strupp and Hadley's (1977) three-factor theoretical model of mental health (Lambert, 1983).

The *Symptom Distress* factor includes various aspects of intrapsychic functioning. Its items measure symptoms of depression and anxiety, the levels of subjective distress, emotion management and emotion regulation, other somatic complaints and concentration problems. The *Interpersonal Relationships* dimension examines relationships with others, family conflicts, and feelings of loneliness. The *Social Roles* subscale explores difficulties, identification problems, or role conflicts related to different social roles, e.g., employee, student. For each of the three factors, a high score indicates a problem in that given area, while a low score per subscale indicates less subjective distress, harmony in interpersonal relationships or appropriate role management.

The instrument has been widely used in several countries, and translated into more than 20 languages, with psychometric analyses conducted in Germany, the Netherlands, Italy, Sweden, China and other countries (Amble et al., 2014). Replicated US studies have demonstrated the high internal consistency of the questionnaire (Lambert and Ogles, 2004), with the highest reliability values for the total score and the Symptom Distress subscales in both academic (OQ-45$_{total}$ = 0.93; SD = 0.92; IR = 0.74; SR = 0.7) and clinical (OQ-45$_{total}$ = 0.93; SD = 0.91; IR = 0.74; SR = 0.71) samples. For the full scale, as in the original, the translated versions have good reliability (Cronbach's alpha = 0.91–0.96) and test–retest indices (Pearson's r = 0.84–0.91) and show strong correlations with questionnaires measuring similar constructs (e.g., Lambert et al., 1996; Umphress et al., 1997). However, other psychometric properties of the instrument vary considerably across countries, including variability in mean scores in clinical (78.7–83.1) and non-clinical (38.7–61) samples, cut-offs for indicating treatment change (Amble et al., 2014), and variability in the number of factor structures. Subsequent studies in the US (e.g., Mueller et al., 1998; Chapman, 2003; Bludworth et al.,

2010) and in other countries (e.g., Lo Coco et al., 2008; Tabet et al., 2020) have not confirmed the existence of the previously hypothesized three dimensions. The non-reproducibility of the original structure has led researchers to construct alternative models (e.g., de Jong et al., 2007; Rice et al., 2014; Simon et al., 2015). Exploratory analyses have shown considerable variation in the structure of the factors, with four (Lo Coco et al., 2008) five (de Jong et al., 2007), nine (Chapman, 2003) and ten (Wennberg et al., 2010) factor solutions were obtained (cited in Amble et al., 2014). Beyond these, we also find single-level (e.g., de Jong et al., 2007) and multi-level structures (e.g., Bludworth et al., 2010; Tabet et al., 2020). The variation in the results of international research findings draw attention to the differences and cultural embeddedness of health services. A sample of university students is often used for international validity testing of the OQ-45 (e.g., Beretvas et al., 2003; Chapman, 2003) partly because the questionnaire, originally designed to measure treatment effect, is able to accurately detect change at the subclinical level. This means that it can be used as a measure in university counseling centers [where well-functioning individuals are also cared for Erickson Cornish et al. (2000)] and the heterogeneous subclinical university population can be considered a good control group compared to the clinical sample.

The aim of our study was to validate the Outcome Questionnaire (OQ-45; Lambert et al., 1996) in a Hungarian sample, contributing to the validation work done in other countries. The questionnaire could have a wide range of applications in Hungary. On the one hand, we hope that the use of this change-sensitive measure will facilitate the work of psychological centers, healthcare institutions with limited financial and human resources, and university counselors in terms of screening and intervention. In addition, we feel it is important to emphasize that, in addition to its practical use, the validated questionnaire can also play a niche role in research. The OQ-45 instrument provides a comprehensive cross-sectional picture of the individual's bio-psycho-social status. The main goal of our research group is to conduct systematic large-scale annual surveys among Hungarian university students in order to better understand the relationship between the factors determining the mental state of the population (e.g.: developmental and psychological processes, social changes, characteristics of social relationships) and to react to changes and results that occur in the meantime. To do this, however, we need a large sample. Because of the shortness of the OQ-45 questionnaire, participants are more likely to be motivated to complete it, thus limiting the difficulties associated with drop-out. The Hungarian adaptation of the questionnaire therefore aims to meet both these practical and scientific needs.

Although the high reliability of the original questionnaire has been confirmed by several international studies (e.g., Qin and Hu, 2008; Wennberg et al., 2010), the subscales have been characterized by much weaker internal consistency scores (e.g., Lambert et al., 2002; Lo Coco et al., 2008). These cross-country variations, combined with the heterogeneity in the number of factors, lead us to investigate the behavior of the measure in the Hungarian context. With the results obtained, we would like to further nuance the academic discourse on the cultural and geographical determinants of the questionnaire. In addition to examining general psychometric indicators, we also aim to gain insight into the factor structure of the instrument during validation.

From the outset, the evaluation of the OQ-45 questionnaire has been heavily influenced by the comparison of the scale with the depression construct, with the *Symptom Checklist-90-Revised* (Lambert et al., 1996) and the *Depressive, Anxious, and Somatoform Disorders Measuring Scale* (Alvarado et al., 1991) confirming the hypothesized convergence ($r = 0.72$; $r = 0.83$;). In addition, questionnaires measuring interpersonal relationships have been used extensively for the external validation of the OQ-45 scale, including the *Inventory and Interpersonal Problem (IIP)* and *The Social Adjustment Rating Scale (SAS)* (e.g., Lambert et al., 2002; de Jong et al., 2007; Wennberg et al., 2010) The correlations with the full scale are smaller than for depression ($r_{IIP} = 0.59–0.63$; $r_{SAS} = 0.58–0.67$) but strong enough to consider these questionnaires as convergent with the OQ-45 scale.

Our hypothesis for convergent validity, based on the literature, is that the *Outcome Questionnaire-45* (OQ-45) will show (1) positive correlations with *depression,* (2) negative correlations with *resilience*, (3) negative correlations with *well-being,* and (4) negative correlations with *social support.*

2 Method

2.1 Procedure and sample presentation

The data for validation were provided by the 2021 survey organized by the Hungarian Association for Counseling in Higher Education (FETA), which aimed to investigate the mental well-being of active-status university students in Hungary through a questionnaire. The translation into the Hungarian language was carried out by two independent, bilingual translators using back-translation (Brislin, 1970). The investigation was approved by the Research Ethics Committee of the Faculty of Education and Psychology of Eötvös Loránd University (ethic approval number: 2021/357).

The data collection started in October 2021, when the questionnaire package was sent by e-mail to the rectors and chancellors of all Hungarian higher education institutions, the staff of the institutional higher education student advisors, the members of FETA and the HÖOK (the democratic representation of the student self-governments of Hungarian higher education institutions). The university managers and staff of the organizations contacted were asked to post the link and the invitation to the online questionnaire on their institutional mailing lists and electronic study systems, or on any other channel they use. At the same time, students were encouraged to complete the questionnaire on the FETA website and social media pages (Facebook). Before completing the online questionnaire package, subjects declare that they have read the information statement, understand its contents (they are participating in the research voluntarily, they can stop completing the questionnaire at any time without giving any reason), and agree to the use of the collected data in an anonymous manner. Several institutions requested an extension of the data collection period, which ended on December 6 instead of the planned November 30, 2021.

More than 10,000 students (10,196) from 47 Hungarian higher education institutions completed the online questionnaire. The response rate was over 75%, and data analysis was conducted exclusively on the complete responses received ($N = 7,695$), without any attempt to fill in missing data. The gender distribution of the sample was as follows: 68% female; 28.6% male; 1% other; 2.4% did

not wish to specify their gender identity. According to the latest data from the Hungarian Central Statistical Office, the proportion of women in higher education (54%) is only a few percentage points higher than that of men (46%), but in our sample the difference seems to be much more pronounced in favor of women. The gender distribution of the respondents, like other variables such as educational levels (e.g., Bachelor's, Master's, or Ph.D.) does not aim to represent the entirety of the Hungarian higher education population. The mean age of the respondents was 23, 7 years (SD = 6.78). The vast majority of students (96.8%) had a single major or program, 3% of the sample had two, and 0.2% had more than two majors/programs. Of the students, 84.8% are full-time students and 13.9% are part-time and distance learners (together representing just over 1% of the sample). Inclusion criteria for the sample were active student status and age over 18. Although the university sample can be considered heterogeneous along demographic, gender, and college variables, our study does not include the clinical population, which is a limitation of our research.

2.2 Measuring instruments

The most important part of the questionnaire package was the *Outcome Questionnaire-45 (OQ-45)* to be validated, which was also licensed to us by the test developer (Lambert). In selecting the additional questionnaires to be included in our research, we aimed to use scales that were suitable for testing convergent validity and for conducting regression analyses, i.e., scales that measure constructs related to the *OQ-45*. Another consideration was that these questionnaires are widely used abroad, are reliable and have been adapted into Hungarian. Their advantages lie in their brevity, comprehensibility and ease of scoring. All these factors facilitated both the preparation and the data collection phases of the research.

Outcome Questionnaire-45 (OQ-45) (Lambert et al., 1996), originally a 3-factor instrument measuring symptom distress, interpersonal relationships and social roles, was described in detail in the theoretical introduction.

- In the *demographic data* block, questions about gender, age, place of residence, institution of higher education, and educational background were formulated for the descriptive statistical analysis of our sample.
- *The Beck Depression Inventory (BDI)* (Beck, 1972) is a widely used instrument for measuring the level of mood, especially the severity of depressive symptoms. The 9-item, 4-point (Likert scale) version of the scale (Kopp et al., 1990), adapted to the Hungarian language, has reliable standards in terms of psychometric indicators (Rózsa et al., 2001).
- *Resilience* is a flexible adaptability of one's personality that facilitates successful adaptation to difficult life circumstances, enables coping with adversity, and mitigates the negative effects of stress (Connor and Davidson, 2003). In our research, we used the 10-item shortened Hungarian version (Járai et al., 2015) of the 25-item *Connor-Davidson Resilience Scale (CDRISC)* (2003) to measure the student sample It was completed by rating the frequency of statements on a 5-point Likert scale (1: not at all true, 5: almost always true) for the past month.

- The *WHO Wellbeing Questionnaire* (Bech et al., 1996) is a widely used measure of psychological well-being (e.g., cheerfulness and happiness) experienced by the respondent in the past two weeks. The questions are answered on a 4-point Likert scale. A shortened version of the Hungarian adaptation (*WBI-5*) of the 5 statements was developed in a national population health survey (Susánszky et al., 2006) and we use this version in the present study.
- *Social support* is the ability of an individual to rely on his or her peer environment in times of difficulty. Empirical evidence shows a strong association between perceived social support and physical and psychosocial health and psychological well-being (Caldwell et al., 1987; Giangrasso and Casale, 2014). The *MOS SSS-H – Medical Outcomes Study* (Sherbourne and Stewart, 1991) *Social Support Survey* was chosen to investigate this construct. It can be used to assess the extent to which a participant feels that there is a person they can rely on in difficult life situations (e.g., illness, depression). The instructions for completion asked participants to indicate how much they could rely on different forms of support on a 5-scale (1-not at all, 5-totally). The Hungarian version was adapted by Szentiványi-Makó et al. (2016), but it was less adaptable to our sample of university students, so we reverted to the original version in the present study. To translate it into English, here too, we used the back-translation method (Brislin, 1970).
- The phenomenon of *burnout* was first observed in health care workers (Freudenberger, 1974) and has since been studied in a variety of populations. Since burnout in students can contribute to a deterioration in academic performance and can also lead to psychological problems (anxiety, depression), it is considered content relevant to several constructs measured by the *OQ-45* instrument. Its conceptualization for students is attributed to Schaufeli et al. (2002), and the Hungarian adapted version (Hazag et al., 2010) of his questionnaire (*Maslach Burnout Inventory-Student Version; MBI-SS*) has reliable and valid standards, so we chose this instrument for convergent validation in the context of burnout. The 15 items are based on three factors: 1. *Exhaustion* (physical, emotional, and mental due to the demands of studying); 2. *Cynicism* (and the detachment from one's studies and the profession); 3. *Loss of performance and efficiency.*

2.3 Data analysis

Data were processed using IBM SPSS Statistics (RRID:SCR_016479) and the JASP (RRID: SCR_015823) statistical software package. The internal consistency of the instrument was interpreted using the Cronbach's alpha coefficient (correlation between mean scores). Confirmatory factor analysis, principal component analysis and exploratory factor analysis were performed on our entire sample to find the factor structure that best fit the sample. To describe the models, we used fit indicators (e.g.: CMIN/df; CFI; TLI; RMSEA) commonly accepted in the literature. In addition to using the full scale of the *OQ45* questionnaire package for convergent and divergent validation, subscale and full scale scores were calculated and included in the analysis, as well as scale and total scores from the *Beck Depression Inventory (BDI), Connor-Davidson*

Resilience Scale (CDRISC), WHO-Well-being Inventory-5 (WHO-WBI-5), Social Support Survey (MOS-SSS-H). Pearson correlation and multiple linear regression analyses were used to compare the scales and the different factors.

3 Results

3.1 Features of the OQ-45

Table 1 shows the respondents' mean scores on the OQ total scale and subscales, as well as the internal consistency of each scale. The Cronbach's alpha (α_{total}) for the 45-item full scale in our sample is 0.95. Along the same indicator, the SD subscale is 0.94, the IR subscale is 0.76 and the SR subscale is 0.67. These results show a similar pattern to the original questionnaire developed by Lambert ($\alpha_{SD} = 0.91$; $\alpha_{IR} = 0.74$; $\alpha_{SR} = 0.71$).

In terms of item behavior, the fit of 4 items to the scale is not considered adequate due to low CITC values (<0.3) ($OQ11_{CITC} = 0.156$; $OQ14_{CITC} = 0.062$; $OQ19_{CITC} = 0.288$; $OQ32_{CITC} = 0.153$; (Table 1). Poor fits for OQ11 (*After heavy drinking, I need a drink the next morning to get going*) and OQ32 (*I have trouble at work/school because of drinking or drug use*) have also been described in the international literature (de Jong et al., 2007; Lo Coco et al., 2008). Despite the statistical arguments, the authors consider it justified to retain both items because of their indicative function (alcohol and substance abuse). For the same reason, we also included these items in our final questionnaire (referred to as critical items), but separated them from the subscales. Item OQ14 (*I work/study too much*) is also considered a culturally embedded item in the international literature (e.g., de Jong et al., 2007), but in our study the low item-total correlation may be explained by the specific student sample. In the case of the OQ19 (*I have frequent arguments*) there may also be a biasing effect of the university sample. It is conceivable that for this population, "arguing" does not necessarily imply conflict or a tense relationship, so that when interpreting the statement, respondents may think of frequent clashes of arguments or intellectual discourse.

3.2 Factor structure of the questionnaire

3.2.1 Confirmatory factor analysis (CFA)

The international literature reports very heterogeneous results in terms of factor structure (different subscales ranging from 1 to 10 were found). In order to understand the factor structure of our sample, we first performed a confirmatory factor analysis to examine the structure of the original questionnaire (three-factor).

To check the prerequisites, we tested the significance level of the correlation matrix and calculated a KMO value, all of which were found to be sufficient for further analysis (KMO = 0.969; $p < 0.001$). However, as shown in Table 2 more details, since none of the goodness-of-fit indicators were found to be sufficient (CFI = 0.773, TLI = 0.761, RMSEA = 0.073) we could not confirm the applicability of the three-factor model to our sample. Another statistical argument for rejecting the three-factor models is the high correlation between the factors ($r = 0.69$–0.91), which may represent an insufficient separation of the subscales from each other.

The results obtained are in line with the experience of international studies, which show that the original structure could be confirmed with no or only moderate goodness of fit (e.g., Mueller et al., 1998; de Jong et al., 2007). The results of the CFA analyses in the same study warranted further exploratory analyses to identify alternative models that better fit the sample. We conducted our data analysis along these lines using exploratory factor analysis (EFA).

3.2.2 Principal component analysis (PCA) and exploratory factor analysis (EFA)

To determine the number of factors, a Principal Component Analysis (PCA) was first performed, which revealed 8 factors with eigenvalues greater than 1. Since the factor loadings indicated that the factors contained items with different item numbers, the internal consistency of the factors was first examined. Cronbach's alpha reached the required value (>0.75) for the first 5 factors to be considered reliable ($F1_\alpha = 0.9$; $F2_\alpha = 0.92$; $F3_\alpha = 0.87$; $F4_\alpha = 0.73$, $F5_\alpha = 0.75$) and the fit of the items was found to be sufficient in all cases (CITC >0.4). Due to the low consistency of the additional factors ($F6_\alpha = 0.63$; $F7_\alpha = 0.19$, $F8_\alpha = 0.4$), an attempt was also made to explore an alternative factor structure (EFA). Items that did not fit into any of the factors (OQ6, OQ16) were not included in this analysis. Due to low Cronbach's alpha values (< 0.75) further items were also dropped (OQ4, OQ11, OQ14, OQ26, OQ32). On the 38 items remaining in the analysis, 6 components were identified by PCA and EFA analysis. The reliability of the first 5 factors still exceeded the required threshold (>0.75), but the internal consistency of factor 6 was found to be weak ($\alpha = 0.56$) and the items loading here (OQ19, OQ39, OQ44) were also dropped.

Thus, the item reduction process reduced the original 45-item instrument was narrowed down to 35 items, all of which fit perfectly into the 5 factors identified in the EFA (Table 3) [Of the dropped items, four items (OQ11, OQ26, OQ32, OQ44) were later reinserted into the final item list after data analysis because of their signaling function, and these items are not included in further data analysis, but are an important subset of the instrument].

TABLE 1　Descriptive statistics and internal consistency of the OQ scale.

Scale	Mean	SD	Cronbach's-alfa	Items that do not fit on the scale because of the low CITC index
OQ Symptom Distress (SD)	73,038	29,089	0,94	OQ-11
OQ Interpersonal Relations (IR)	15,4	7,64	0,76	OQ-19
OQ Social Role (SR)	11,5	4,43	0,67	OQ-14, OQ-32
OQ Total score	73,04	29,089	0,95	OQ-11, OQ-14, OQ-19, OQ-32

TABLE 2 Indicators of the CFA fit the sample.

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
3 factor solution	169654.48	990	171.36	0.773	0.761	0.073	0.061

TABLE 3 Factor loadings in a five-factor model; after deletion of non-matching items.

Item No. OQ-45	Item No. OQ-39	Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
OQ-10	8	I feel fearful	0.667				
OQ-15	12	I feel worthless	0.661				
OQ-5	4	I blame myself for things	0.653				
OQ-33	28	I feel that something bad is going to happen	0.623				
OQ-25	20	Disturbing thoughts come into my mind that I cannot get rid of	0.613				
OQ-40	34	I feel something is wrong with my mind	0.592				
OQ-8	6	I have thoughts of ending my life*	0.575				
OQ-23	18	I feel hopeless about the future	0.548		0.443		
OQ-9	7	I feel weak	0.54		0.430		
OQ-24	19	I like myself	0.521	0.489			
OQ-1	1	I get along well with others		0.73			
OQ-43	37	I am satisfied with my relationships with others		0.729			
OQ-20	15	I feel loved and wanted		0.661			
OQ-37	32	I feel my love relationships are full and complete		0.614			
OQ-30	25	I have trouble getting along with friends and close acquaintances		0.61			
OQ-31	26	I am satisfied with my life	0.418	0.591			
OQ-13	11	I am a happy person		0.588			
OQ-21	16	I enjoy my spare time		0.486			
OQ-22	17	I have difficulty concentrating			0.711		
OQ-28	23	I am not working/studying as well as I used to			0.692		
OQ-38	33	I feel that I am not doing well at work/school			0.66		
OQ-3	3	I feel no interest in things			0.632		
OQ-12	10	I find my work/school satisfying		0.417	0.567		
OQ-2	2	I tire quickly			0.546	0.437	
OQ-42	36	I feel blue			0.498	0.416	
OQ-34	29	I have sore muscles				0.678	
OQ-45	39	I have headaches				0.644	
OQ-27	22	I have an upset stomach				0.642	
OQ-29	24	My heart pounds too much				0.618	
OQ-35	30	I feel afraid of open spaces. of driving. or being on buses. Subways. and so forth				0.471	
OQ-36	31	I feel nervous	0.417			0.462	
OQ-41	35	I have trouble falling asleep or staying asleep				0.452	
OQ-17	13	I have an unfulfilling sex life					0.799
OQ-7	5	I feel unhappy in my marriage/significant relationship					0.659
OQ-18	14	I feel lonely					0.623

3.3 Cross-validation

The instrument was also cross-validated, allowing exploratory and confirmatory factor analysis to be conducted on two subsets of the same sample. We believed that this would provide further support for the questionnaire design described above by using a method that is considered reliable in the literature (de Rooij and Weeda, 2020). The sample was randomly divided into two groups, the first sub-sample

was subjected to PCA and EFA and the second sub-sample was subjected to CFA analysis. Based on the principal component analysis, the eigenvalues of 5 factors took values higher than 1. Since the last two factors (4 to 5) already contributed very little variance to the model (< 3.2%), the CFA analysis was performed for a 3-factor solution in addition to the 5-factor model, which is summarized in Table 4. Again, the final model was adopted based on the values of the goodness of fit indices that were found to be the most appropriate for the 5-factor structure (CFI = 0.887; TLI = 0.877, RMSEA = 0.062).

3.4 Content analysis

The statistical analysis was followed by a content analysis of the items. Based on their meanings, the fit of the 8 items that loaded highly on multiple factors to subscales was examined one by one, and a decision was made on their final ranking.

The OQ23 (*I feel hopeless about the future*) loaded on Factors 1 and 3 at almost the same rate (0.54, 0.44) that we assigned to list of items that included anxiety, as we felt it was closer in content. OQ9 (*I feel weak*) also loaded highly on Factor 1 and Factor 3 (0.54, 0.43), but in the content analysis we placed this item on Factor 1. The reason for our decision was that Factor 3 consists of very homogeneous items (work, performance) from which seemed better to separate this item. For OQ24 (*I like myself*) we had to choose between Factor 1 and Factor 2 (0.52, 0.48). We believe that the relationship with the inner world is better captured by Factor 1, so we placed this item here. Of Factors 1 and 2, we chose the latter (0.48, 0.59) for OQ31 (*I am satisfied with my life*) because the meaning of this scale better captures satisfaction, the cognitive evaluation of feelings. For OQ12, there was a cross-loading on factors 2 and 3 (0.41, 0.56). Factor 3 has already been mentioned above as a homogeneous scale, so we clearly place the item OQ12 (*I am satisfied with my work/school*) related to school performance on this factor. On the other hand, the item OQ2 (*I tire quickly*) (0.54, 0.43) and OQ42 (*I feel blue*) (0.49, 0.41), which load on factors 3 and 4, and OQ36 (*I feel nervous*) (0.42, 0.46), which load on factors 1 and 4, were also placed on subscale 4 (physical symptoms).

To compare the fit of our 5-factor model before and after the content reclassification, we again used the confirmatory factor analysis (CFA) method. Although in both cases the CFI values (CFI > 0.8; TLI > 0.85; RMSEA < 0.08) were considered satisfactory, the better fit of the model after content analysis (CFI = 0.89; TLI = 0.88; RMSEA = 0.062) also provides methodological justification for the placement of cross-loading items on our factors compared to the pre-reclassification structure (CFI = 0.88; TLI = 0.88; RMSEA = 0.064).

Thus, after statistical and content analysis, 35 items from the original 45 item questionnaire were placed into 5 subscales, which were given the following titles based on the meaning of the items to which they corresponded: *1. Anxiety, Relationship with the inner world, Hopelessness (ARH); 2. Congruence (authenticity, consistency of self-image and experiences) and Relationship with others (CR); 3. Lack*

of performance, Work, Interest, Burnout (LWIB); 4. Physical discomfort and Symptomatology (PS); 5. Intimacy (I). The subscales were supplemented by four critical items that did not fit the factors (OQ32, OQ11, OQ26 for substance abuse; OQ44 for aggression). Thus, our instrument, adapted to the final Hungarian model, thus consists of 39 items and is called OQ-39. Table 5 shows the items and scales of the original questionnaire and the Hungarian version, illustrating their differences and similarities, as well as the process of item reduction and content analysis.

Although the correlation between the factors remains high even with the omission of the items, the degree of cointegration shows a significant decrease (0.3–0.7). Beyond the statistical explanations, the factors modified and finalized in the content analyses form a well-defined group in their meaning. In terms of international results, this structure is closest to the Dutch sample study, as De Jong et al. (2007) also identified five factors. Similar to our findings, their questionnaire included anxiety and its physical, somatic symptoms, which were also included on a scale in the original instrument, as separate factors. An important difference, however, is that the *Social Roles (SR)* scale consists of only one item in the Dutch adaptation. This raises the question of the justification of separating or even keeping the whole factor. In our study, there is a greater balance in the number of items that make up the factors, with the *Intimacy (I)* subscale, which has the fewest items, also having three items.

3.5 Correlation of the questionnaire with other measures

3.5.1 Convergent validity

Convergent validity aimed to compare the results of the OQ-39 we developed with those of other widely used measures of similar constructs on the same sample. Our preliminary hypotheses were that the constructs of *depression, resilience, well-being, and social support* would be convergently related to the currently tested OQ-39 scale, and accordingly we used data from the *Beck Depression Inventory (BDI), Connor-Davidson Resilience Scale (CDRISC), WHO-Well-being Questionnaire (WHO-WBI-5), Social Support Survey* (*MOS-SSS-H*) questionnaires to test our hypotheses. (The correlations between the questionnaires used for convergent validity testing and the OQ-39 scale and its subscales are summarized in Table 6).

The *BDI* total score, which indicates the degree of depression, showed a rather high significant correlation (>0.49) with each of the OQ-39 factors, with the strongest correlation being with Factor *1, Anxiety, Relationship to the inner world, Hopelessness (ARH)* ($r = 0.834$) and the OQ-39 total score ($r = 0.863$). A very similar relationship can be observed for the *Resilience (CDRISC)* total score. This construct was also significantly correlated with the OQ-39 total scale ($r = -0.64$) and all its factors (although in the opposite direction to the previous depression variable), with the strongest correlation being with factor 1 ($r = -0.62$). The *WHO (WBI-5) well-being* score was also

TABLE 4 Indicators of the CFA fit on the subsample.

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
3 factor solution	72919.3	595	122.55	0.859	0.849	0.069	0.053
5 factor solution	68315.68	561	121.77	0.887	0.877	0.062	0.0050

TABLE 5 Original and final item list after statistical and content analysis.

Item	OQ-39 item No.	OQ-39 subscale	OQ-45 item No.	OQ-45 subscale
I get along well with others	1	CR	OQ-1	IR
I tire quickly	2	PS	OQ-2	SD
I feel no interest in things	3	LWIB	OQ-3	SD
I blame myself for things	4	ARH	OQ-5	SD
I feel unhappy in my marriage/significant relationship	5	I	OQ-7	IR
I have thoughts of ending my life*	6	ARH	OQ-8	SD
I feel weak	7	ARH	OQ-9	SD
I feel fearful	8	ARH	OQ-10	SD
After heavy drinking. I need a drink the next morning to get going. (If you do not drink. Mark "never")*	9	-	OQ-11	SD
10. I find my work/school satisfying	10	LWIB	OQ-12	SR
11. I am a happy person	11	CR	OQ-13	SD
I feel worthless	12	ARH	OQ-15	SD
I have an unfulfilling sex life	13	I	OQ-17	IR
I feel lonely	14	I	OQ-18	IR
I feel loved and wanted	15	CR	OQ-20	IR
I enjoy my spare time	16	CR	OQ-21	SR
I have difficulty concentrating	17	LWIB	OQ-22	SD
I feel hopeless about the future	18	ARH	OQ- 23	SD
I like myself	19	ARH	OQ- 24	SD
Disturbing thoughts come into my mind that I cannot get rid of	20	ARH	OQ-25	SD
I feel annoyed by people who criticize my drinking (or drug use) (If not applicable. Mark "never")*	21	-	OQ-26	IR
I have an upset stomach	22	PS	OQ-27	SD
I am not working/studying as well as I used to	23	LWIB	OQ-28	SR
My heart pounds too much	24	PS	OQ-29	SD
I have trouble getting along with friends and close acquaintances	25	CR	OQ-30	IR
I am satisfied with my life	26	CR	OQ-31	SD
I have trouble at work/school because of drinking or drug use*	27	-	OQ-32	SR
I feel that something bad is going to happen	28	ARH	OQ-33	SD
I have sore muscles	29	PS	OQ-34	SD
I feel afraid of open spaces. of driving. or being on buses. Subways. and so forth.	30	PS	OQ-35	SD
I feel nervous	31	PS	OQ-36	SD
I feel my love relationships are full and complete	32	CR	OQ-37	IR
I feel that I am not doing well at work/school	33	LWIB	OQ-38	SR
I feel something is wrong with my mind	34	ARH	OQ-40	SD
I have trouble falling asleep or staying asleep	35	PS	OQ-41	SD
I feel blue	36	PS	OQ-42	SD
I am satisfied with my relationships with others	37	CR	OQ-43	IR
I feel angry enough at work/school to do something I might regret*	38	-	OQ-44	SR
I have headaches	39	PS	OQ-45	SD
Deleted items				
I feel stress at work/school	–	–	OQ-4	SR
I feel irritated	–	–	OQ-6	SD
I work/study too much	–	–	OQ-14	SR
I am concerned about family troubles	–	–	OQ-16	IR

(Continued)

TABLE 5 (Continued)

Item	OQ-39 item No.	OQ-39 subscale	OQ-45 item No.	OQ-45 subscale
I have frequent arguments	–	–	OQ-19	IR
I have too many disagreements at work/school	–	–	OQ-39	SR

The stars indicate critical items that have a signaling function.

TABLE 6 Current validity estimates for the OQ-39 with BDI, DCRISC, WHO-WBI-5, MOS-SSS-H, and MBI-SS.

	BDI	DCRISC	WHO-WBI-5	MOS-SSS-H	MBI- SS
1. Anxiety, Relationship with the inner world, Hopelessness (ARH)	0.834	−0.622	−0.647	−0.39	0.63
2. Congruence and Relationship with others (CR)	0.703	−0.591	−0.68	−0.63	0.54
3. Lack of performance, Work, Interest, Burnout (LWIB)	0.73	−0.608	−0.637	−0.3	0.76
4. Physical discomfort and Symptomatology (PS)	0.707	−0.418	−0.591	−0.26	0.54
5. Intimacy (I)	0.487	−0.337	−0.439	−0.53	0.32
OQ-39 Total score	0.863	−0.637	−0.73	−0.493	0.684

All correlation is significant; BDI, Beck Depression Inventory; CDRISC, Connor-Davidson Resilience Scale; WHO-WBI-5, WHO-Well-being Questionnaire; MOS-SSS-H, Medical Outcome Study-Social Support Survey; MBI-SS, Maslach Burnout Inventory-Student Version.

significantly – and also negatively – correlated with both the OQ-39 scale (−0.0.73) and its subscales, with the strongest correlation (−0.68) for the *Congruence and Relationship with others (CR) subscale.*

The *MOS-SSS-H* score (measure of social support) showed a significant inverse relationship with each factor of the OQ39, with the strongest associations being with Factor 2 (*CR*) and Factor 5 (*I*) ($r_{CR} = -0.63$, $r_I = -0.53$, respectively).

According to the factor analysis and content analysis, the most homogeneous factor of the OQ39 scale is the third factor, each item of which captures a dominant aspect of work/school performance and motivation. For this reason, although we did not formulate a specific hypothesis, we considered it important to see how this subscale related to the *Maslach Burnout Inventory-Student Version (MBI-SS)* questionnaire, which was specifically designed and standardized to measure burnout among higher education students. Correlation analyses showed that the *MBI-SS* total score was correlated with all the factors of the OQ39, most strongly with Factor 3 (*LWIB*) ($r = 0.76$). In addition to the content argument, the obtained result can be considered as a methodological reference for the validation of the burnout subscale.

3.5.2 Regression

In the linear regression analysis, we wanted to see whether any of the variables (depression, resilience, well-being, social support) formulated in our hypothesis and already tested in the convergent validity test could predict OQ-39 scores beyond their interaction with the OQ scale. The close relationship between burnout and the OQ-39 scale revealed in the present work justified our inclusion of this construct in the regression model. The analysis was performed using the stepwise method, with the items included in the model in order of increasing explanatory power: *Beck Depression Inventory (BDI)* total score, *WHO-Well-Being Questionnaire (WHO-WBI-5)* total score, *Social Support (MOS-SSS-H)* total score, *Maslach Burnout Inventory-Student Version (MBI-SS)* total score, *Resilience Scale (CDRISC)* total score.

All 5 models are considered significant ($p < 0.05$) and the Durbin-Watson pretest value (1.97) is within the acceptable range (1.5–2.5).

Model 1 is 75% (*BDI* $_{total}$, R = 0.863), followed by Model 2 (*BDI* $_{total}$, *WHO-WBI-5* $_{total}$, R = 0.891) with 79.4%, Model 3 (*BDI* $_{total}$, WHO-WBI-5 $_{total}$, *MOS-SSS-H* $_{total}$; R = 0.897) with 80.5%, Model 4 (*BDI* $_{total}$, *WHO-WBI-5* $_{total}$, *MOS-SSS-H* $_{total}$ and *MBI-SS* $_{total}$, R = 0.905) with 81.8%, Model 5 (*BDI* $_{total}$, WHO $_{total}$, *MOS-SSS-H* $_{total}$ and *MBI-SS* $_{total}$, *CDRISC* $_{total}$, R = 0.906) explains 82.2% of the dependent variable (OQ-39 total).

4 Discussion

The aim of the present study was to psychometrically evaluate and validate the *Outcome Questionnaire-45* (OQ-45; Lambert et al., 1996) in a Hungarian sample. The relevance of the study was due, among other things, to the large sample size and the practical application of previous versions of the questionnaire (mainly for measuring therapeutic effects). However, it was felt that the advantages of the instrument (low cost, easy to administer) also allowed it to have a number of untapped potentials in the field of psychological research (e.g., cross-sectional state assessment). Previous studies have also drawn attention to the cultural determinants of the instrument, which provided us with an additional argument for exploring the behavior and factor structure of the instrument in an Eastern European context.

Based on the reliability analysis, the questionnaire was found to be reliable, with high internal consistency, similar to the original US and foreign adaptations. Confirmatory factor analysis failed to confirm the original 3-factor structure of the questionnaire in a similar way to international studies. Further exploratory analyses identified 5 distinct factors, and the results were supported by cross-validation. Items that did not fit into subscales were dropped, and the final placement of items that loaded equally on multiple factors was decided on the basis of content analysis. The factors were named after the corresponding items: *1. Anxiety, Relationship with the inner world, Hopelessness (ARH), Hopelessness; 2. Congruence (authenticity, consistency of self-image and experiences) and Relationship with others (CR); 3. Lack of performance, Work,*

Interest, Burnout (LWIB); 4. Physical discomfort and Symptomatology (PS); 5. Intimacy (I).

The final questionnaire consists of 39 items, 4 of which do not fit into any of the above subscales, but are a dominant part of the instrument because of their signaling function (Table 5).

A convergent validity test was also conducted to further define the psychometric properties of the questionnaire. Our hypotheses regarding the correlations were confirmed by the correlation and regression results, the shortened version of the *OQ-45 Questionnaire (OQ-39)* developed by us and adapted to the Hungarian sample is positively related to depression and burnout, and negatively related to the variables of social support, resilience and well-being. These associations are consistent with international research findings in several respects. The *Beck Depression Inventory (BDI),* most commonly used in *OQ-45* validation studies with the *State–Trait Anxiety Inventory (STAI)* and the *Symptom Checklist-90 -Revised (SCL) OQ-45* total score, showed convergence (0.71–0.84) when measured in different populations (e.g., Lambert et al., 1996; Umphress et al., 1997). The more nuanced correlations we found are also similar to those found in the literature, which found that Factor 1 (SD) of the original questionnaire correlated most strongly (0.65–0.84) with convergent measures (Chapman, 2003). In our study, the strongest relationship was also found between the *BDI* and the *Anxiety, Relationship to the inner world, Hopelessness (ARH)* factor. The regression model also confirms this finding, showing that in our data, depression seems to be strongest predictive variable in the OQ-39 scale. Overall, therefore, the full scale and subscales of the OQ-39 were highly correlated with similar constructs.

Perhaps the greatest strength of the study is its comprehensive description of psychometric characteristics. The results obtained are further strengthened by the large sample size, making them even more reliable. The results of the validation of the questionnaire may also be relevant in an Eastern European context. In this region, only one Polish-language adaptation (Simon et al., 2015) has been produced so far, which differs from our work both in terms of sample characteristics (number of items, population surveyed) and research focus. The construct validity of the questionnaire may make it unnecessary to include several convergent measures at the same time, thus eliminating many of the methodological limitations that arise when constructing larger questionnaire packages. As the OQ-39 appears to be able to provide a comprehensive cross-sectional picture of the bio-psycho-social status of individuals in a population that can be considered highly heterogeneous (university students), it is also suitable for systematic monitoring of mental health indicators. The emergence of student counseling centers in Hungarian higher education institutions has been on the rise in recent years, with some form of mental health service now available in most places. However, due to limited financial and human resources, there are often long waiting lists, meaning that students have to wait weeks or even months to access services. Capacity constraints also mean that the number of sessions is almost always limited. We believe that the use of this tool, which can be used to assess condition and measure change, can be a great help to professionals in working effectively when deciding on interventions.

In addition to being one of the largest populations at the national level, university students are also the future workforce, and the results of research on them can be very informative and useful from a public health, economic and policy perspective. It is hoped that the findings of these studies will not only raise awareness of the importance of studying the university population, but may even provide an argument for expanding (and resourcing) university mental health services at both the prevention and intervention levels.

Of course, if conclusions are to be drawn for the Hungarian population as a whole, it may be worthwhile in the future to extend the study to a more heterogeneous sample covering a wider age range. There are also further possibilities to compare clinical and subclinical groups.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by Research Ethics Committee, Faculty of Education and Psychology, ELTE Eötvös Loránd University, Budapest, Hungary. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Putting PhD students front and center: an empirical analysis using the Effort-Reward Imbalance Model

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Introduction: A doctorate is associated with numerous challenges for many PhD students, including financial insecurities, little support from supervisors, and time pressure. The present study explores well-being of PhD students via the Effort-Reward Imbalance (ERI) model as well as the potential protective factor resilience.

Method: A web-based questionnaire survey was conducted among 1,275 PhD students from Germany. Data was collected at two measurement points over a six-week follow-up period.

Results: As hypothesized, overcommitment was found to mediate the relationship between ERI and perceived stress while no mediation effect was found for work engagement. Resilience strengthened the relationship between ERI and overcommitment, especially for an increasing unfavorable ERI, and counterintuitively did not act as a protective factor.

Discussion: Theoretical and practical implications are discussed, providing a deeper understanding on the ERI model and the negative coping pattern overcommitment in the context of PhD students.

KEYWORDS

Effort-Reward Imbalance Model, overcommitment, PhD students, resilience, stress, well-being, work engagement

Introduction

Over the past decades, numerous studies have revealed unfavorable working conditions and high levels of stress for PhD students (Levecque et al., 2017; Sverdlik et al., 2018; Vilser et al., 2022). Hence, PhD students often face precarious working conditions, financial insecurities, lack of time, and challenges in balancing personal and academic commitments (Goller and Harteis, 2014; de Vries, 2020). Moreover, the lack of support from universities, low recognition from supervisors, and heavy workloads exacerbate the serious physical and mental health problems faced by doctoral students (Sverdlik et al., 2018; Hazell et al., 2020). The COVID-19 pandemic has drastically exacerbated the situation for PhD students due to several lockdowns and the increased feeling of loneliness, leading to an upsurge of depression, anxiety, and stress (i.e., Lokhtina et al., 2022; Paucsik et al., 2022; Pyhältö et al., 2023).

To understand the detrimental effects of these stressors on the well-being of PhD students, the Effort-Reward Imbalance (ERI) model provides a valuable framework (Siegrist, 1996). The ERI model states that work-related stress arises from an imbalance between the effort individuals invest in their work and the rewards they receive in return (Siegrist, 2017). Rewards include not only financial aspects but also career prospects and social recognition (Siegrist and

Li, 2016). When there is a lack of reciprocity, such as high effort and low reward, individuals experience negative emotions, increased stress, and long-term health consequences (Nguyen Van et al., 2018).

For many doctoral students, a perceived unfavourable ERI may be a critical factor in their well-being. In this context, the intrinsic component of the model, called "overcommitment" emerges as an important factor that plays a significant role as an adverse coping strategy (Siegrist and Li, 2016). Overcommitment refers to an excessive dedication to work, characterized by a willingness to work beyond expectations and difficulties in detaching oneself from job demands (Siegrist and Li, 2020; Kunz et al., 2021). Doctoral students, in particular, may be prone to overcommitment while facing high work demands and low rewards to continue pursuing their goal of earning a doctorate.

In addition to elucidating the process that leads to decreased well-being, it is necessary to understand how individual vs. organizational factors contribute to the well-being of doctoral students. In the following, we focus on the individual perspective, as we aim to investigate how individual characteristics influence the ability to cope with ERI. In recent years, the concept of resilience has gained attention as a potential protective factor in mitigating the negative effects of stress and adversity (Kearns et al., 2008; McCray and Joseph-Richard, 2020; Anders et al., 2022). Resilience is characterized as the process of adapting well in the face of adversity and recovering from difficult experiences (American Psychological Association, 2020). Not only is resilience an inherent trait but also a behavioral characteristic that can be developed through personal resources (Sinclair et al., 2016; Booth and Neill, 2017). In the context of doctoral students, resilience can be described as the acquisition of skills that enable students to cope with the challenges of their doctoral journey while maintaining a sense of assertiveness, confidence, and persistence (Mowbray and Halse, 2010).

With the present study, we contribute to research and practice in several ways. First, little scientific research exists analyzing the well-being of PhD students. Especially by applying the ERI model, we will get valuable insights on the origin of reduced well-being in PhD students. This will for instance make it possible to give recommendations to universities and supervisors of PhD students on how to prevent ERI. Second, in this study, we not only look at the connection between ERI and well-being in PhD students, but also explain the mechanism of deterioration in well-being. Third, with the investigation of the protective factor resilience, we aim to give valuable hints on how to diminish the consequences of ERI in PhD students. By investigating resilience, we will be able to draw practical implications on how to foster resilience in PhD students to help them deal with ERI.

Theoretical background

This study is based on the Effort-Reward Imbalance Model (Siegrist, 1996), which has been frequently used to address the imbalance between effort put into work and reward received, as well as its effects on health and well-being. The key assumption of the ERI model is that work-related stress is triggered by a lack of social reciprocity between effort and reward. Thus, employees expect to receive adequate rewards from their employer, including "salary or wage (financial reward), career promotion or job security (status-related reward), and esteem or recognition (socio-emotional reward)"

in return for performed work (Siegrist, 2017, p. 25). On the contrary, a lack of reciprocity, such as high effort and low reward, leads to negative emotions, increased stress, and ultimately long-term negative health effects (Siegrist and Li, 2016; Nguyen Van et al., 2018). The ERI model is a well-established framework for understanding work-related stress and its implications on people's health, especially in the context of school and university settings (e.g., Li et al., 2010; Wege et al., 2017; Kunz et al., 2021). It has been extensively tested and validated over the years, with numerous studies confirming its utility in explaining work-related stress and health outcomes (e.g., Kunz, 2019).

Siegrist (2015) identified three specific conditions in which people are willing to persist in high-effort/low-reward work situations while remaining highly committed, namely dependency (having no other choice, e.g., due to advanced age or low skills and knowledge), strategic reasons (e.g., prospect of a favorable career development) and overcommitment. Overcommitment, the intrinsic component of the ERI model, is defined as "a cognitive-motivational pattern of coping with demands characterized by excessive work-related striving" (Siegrist and Li, 2020, p. 7). Overcommitted employees are more likely to engage in additional demands at work, are extremely dedicated, and tend to work more than expected. The three conditions described can easily be applied to the majority of doctoral students, as they are bound to the 3 to 5-year PhD program and often choose it for strategic reasons. Furthermore, Hamilton (2019) found that academic employees have comparatively high scores in overcommitment, while a study from Kearns et al. (2008) lists overcommitment as one of the negative coping patterns applied by doctoral students. In addition, a general imbalance between effort and reward is to be expected during a doctoral program, as doctoral students face numerous challenges and often receive little support and recognition from faculty and supervisors (Beasy et al., 2021). This is supported by Kunz et al. (2021), indicating an unfavorable ERI for PhD students.

Over the last decades, the validity of the ERI model has been investigated by several empirical studies as well as meta-analyses and reviews (e.g., Dragano et al., 2017). Here, the focus was on testing the three central hypotheses formulated by Siegrist, predicting direct effects of each of the three scales: effort, reward, and overcommitment on health. Furthermore, the so-called effort-reward ratio (ERI ratio), quantifying the relationship between effort and reward, should have the strongest effect on health, while overcommitment is expected to moderate the relationship between effort, reward, ERI ratio, and health (Siegrist and Li, 2016). To comprehensively frame the theoretical and empirical foundation, it is worth acknowledging at this juncture that overcommitment may exacerbate the associations between ERI and health outcomes (Feuerhahn et al., 2012). However, the interaction hypothesis, containing overcommitment as the moderator and the ERI ratio as a predictor, could not be supported in several studies (Siegrist and Li, 2016). Rather, current research suggests that overcommitment, described as an individual coping pattern, might act as a mediator instead of a moderator (e.g., Theorell, 2017; Hinsch et al., 2019; Hodge et al., 2020). However, the role of overcommitment as a mediator in the ERI model remains an important area of research, specifically to explain the process that links ERI and decreased well-being (Theorell, 2017; Hinsch et al., 2019; Hodge et al., 2020; Vilser, 2021).

The mediator function is also described by Hinsch et al. (2019, p. 564) referring to Siegrist and Marmot (2004) and the psychological recovery resources by Sonnentag and Fritz (2015). Accordingly, overcommitment "can be understood […] as a reactive behavior aimed at overcoming certain stressors experienced by the individual.

[…] [This is supported by studies showing that] psychological detachment is meditating associations between job stressors and well-being" (Hinsch et al., 2019, p. 564). This assumption is further underpinned by Kunz et al. (2021), demonstrating the conceptual proximity between the ERI model and the stressor-detachment model. In this model, Sonnentag and Fritz (2015) describe psychological detachment as a mediator between job stressors, such as high workload, and employee well-being and strain. Psychological detachment is characterized by the ability to "mentally disengage from one's job while being away from work" (Sonnentag and Fritz, 2015, p. 72). Overcommitment in the ERI model describes an excessive commitment to work, which is connected to the willingness to work more than expected as well as the inability to distance oneself from job demands (Siegrist and Li, 2020; Kunz et al., 2021). In this study, the assumption is made that psychological detachment and overcommitment are comparable constructs. Furthermore, the assumption of a mediating effect of overcommitment is adapted.

Looking at the adverse working conditions, high pressure, and several challenges (e.g., publishing papers, raising research funding) within the doctorate, it brings into question how PhD students can handle the numerous hazards. One common protective factor discussed is resilience (Kearns et al., 2008; McCray and Joseph-Richard, 2020; Anders et al., 2022). Resilience results from an interplay of innate abilities and personal resources as well as learnable skills, including a variety of coping strategies, and other protective factors in the environment, and helps to adapt in the face of difficult experiences (American Psychological Association, 2020). Therefore, it is not only a rigid trait of individuals but also a behavioral characteristic that can be acquired by anyone (Sinclair et al., 2016; Booth and Neill, 2017). Resilience in PhD students can be described as the "acquisition of skills that enable students to become more assertive, confident, resilient, persistent and resolute in determining how to progress their PhD while balancing their other commitments" (Mowbray and Halse, 2010, p. 657). Thus, this study regards resilience as the result of successfully applied coping strategies, helping to recover from adversity and grow from it (Booth and Neill, 2017). Further, we assume that resilience acts as a moderator, between the stressor, the subjectively experienced and unfavorable ERI, and the intrinsic component overcommitment. It is expected that high psychological resilience is associated with the ability to apply favorable coping strategies when confronted with certain stressors. This is supported by the fact that although resilience and coping strategies continue to be seen as distinct constructs, current literature suggests that they are interdependent (Rice and Liu, 2016). Thus, Heckenberg et al. (2019) showed that an online mindfulness-based stress reduction program successfully reduced overcommitment by developing various coping strategies such as meditation or yoga. Many other studies have addressed the importance of developing appropriate coping strategies to successfully reduce overcommitment and ERI at work and ultimately improve employee health (Unterbrink et al., 2012; Li et al., 2017). Thus, the study of this issue is relevant because overcommitment is associated with both vital exhaustion and negative physical health outcomes (Siegrist and Li, 2016).

This study examines the experiences of PhD students in the light of the Effort-Reward Imbalance model. While many PhD students show great intrinsic motivation and enthusiasm for their doctoral studies (Guerin et al., 2015; Sverdlik et al., 2018), they also face numerous challenges, ranging from precarious working conditions,

financial insecurities, poor work-life balance, and high levels of stress (Goller and Harteis, 2014; Levecque et al., 2017; Sverdlik et al., 2018; de Vries, 2020). As indicated by Stubb et al. (2011), the source of stress of burnout is "[...] not simply an individual symptom, but instead a mismatch in the relationship between the individual and the environment [...]" (p. 34). Thus, it is conceivable that all these circumstances pave the way for an unfavorable ERI within PhD students, as also indicated in a recent study of PhD students by Kunz et al. (2021). Further, it has been shown that overcommitment is prevalent among doctoral students (Kearns et al., 2008; Hamilton, 2019).

To investigate the possible effects of an ERI imbalance on PhD students, the two outcome variables perceived stress and work engagement are chosen in this study. While experiencing stress at work is nearly ubiquitous, PhD students are especially endangered due to the unique working conditions as explained above. Further, prolonged periods of stress lead to physical and mental illnesses, including headaches, colds, back pain, sleep disorders as well as depression, and burnout (Techniker Krankenkasse, 2021). Moreover, work engagement, a construct stemming from positive psychology, and defined as "a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption" (Bakker and Demerouti, 2008, p. 209), is analyzed as organizational outcome variable. Hence, work engagement in employees is connected to high levels of energy (vigor), enthusiasm and happiness (dedication) as well as full immersion into work (absorption) (Bakker and Demerouti, 2008), often shown in PhD students (Guerin et al., 2015; Sverdlik et al., 2018).

In accordance with the reasoning above, we hypothesize that high effort is positively associated with perceived stress and negatively associated with work engagement (1a) and low reward (1b) as well as high overcommitment (1c) is positively associated with perceived stress and negatively associated with work engagement. Subsequently, we expect that the combined measure quantifying the imbalance between high effort and low reward (ERI ratio) is positively associated with perceived stress and negatively associated with work engagement, exceeding the effect sizes produced by the single scales (2). Further, we assume that overcommitment mediates the positive relationship between effort-reward imbalance and perceived stress (3a) and the negative relationship between effort-reward imbalance and work engagement (3b). Also, we hypothesize that the mediation between effort-reward imbalance, via overcommitment, on perceived stress (4a) and work engagement (4b) is moderated by resilience. All hypotheses were pre-registered (Gentele et al., 2022; Figure 1).

Methods

Sample

The data for this study was collected through online questionnaires at two measurement points with a six-week interval, ranging from April 2022 to June 2022 and thus during the COVID-19 pandemic. To assemble our study cohort, we initiated contact with all 156 German universities offering PhD programs, as listed in Hochschulkompass 2022, alongside the 13 primary scholarship providers affiliated with the German Federal Ministry of Education and Research. Of these, 100 universities and six scholarship providers agreed to share the
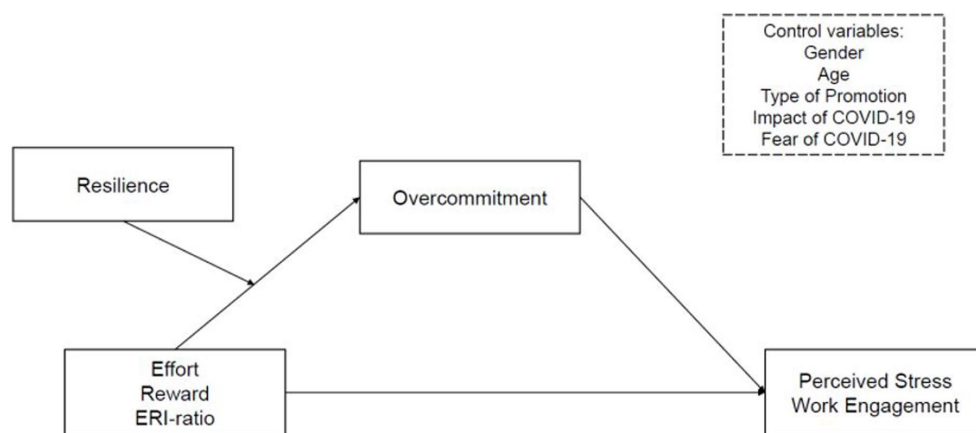
FIGURE 1
Research model of the study.

study. To create higher visibility, the study was also disseminated via LinkedIn and snowball systems in the author's direct environment. In general, no other rationale was applied for finding participants for this study than being an active PhD student in Germany.

In total, 1,275 PhD students completed the survey during the first measurement point while 705 people did so during the second (dropout rate: 54.48%). The primary characteristics of the study sample are displayed in Table 1.

Measurements

Below, the measures and control variables relevant to this paper are presented. For all scales, doctoral students were asked to refer only to their doctorate and not to other jobs when rating the statements. The survey was conducted in German.

Effort-Reward Imbalance

To measure the experienced Effort-Reward Imbalance of PhD students, the ERI questionnaire for doctoral students was used (ERI-PhD, Vilser et al., 2024). The questionnaire includes 18 items, with six items capturing the subscale effort ($\alpha = 0.78$; $\omega = 0.78$), eight items the subscale reward ($\alpha = 0.77$; $\omega = 0.75$) and four items the subscale overcommitment ($\alpha = 0.83$; $\omega = 0.83$). Therefore, the reliability of the three subscales can be considered high for overcommitment and acceptable for reward and effort (Blanz, 2015). The items were rated on a 4-point Likert scale (response scales ranged from 1 = *strongly disagree* to 4 = *strongly agree*). Regarding the effort subscale, the PhD students were asked, for example, whether they have constant time pressure due to the heavy workload in their PhD. Furthermore, the reward subscale included for example the item "I receive the respect I deserve from my supervisors or a respective relevant person," while "As soon as I get up in the morning, I start thinking about problems related to my PhD" was a sample item of the subscale overcommitment. The ERI ratio was calculated according to Siegrist's formula: effort/reward × correction factor (0.75). While an ERI ratio < 1 indicates favorable conditions with high reward and low effort, an ERI ratio > 1 indicates unfavorable conditions with high effort and low reward (Siegrist, 2002).

Work engagement

Work engagement was measured using the German short version of the Utrecht Work Engagement Scale with 9 items (UWES-9; Schaufeli et al., 2006) including the three subscales vigor ($\alpha = 0.87$; $\omega = 0.87$), dedication ($\alpha = 0.86$; $\omega = 0.86$) and absorption ($\alpha = 0.86$; $\omega = 0.86$). Cronbach's alpha for the entire scale, including all 9 items, was $\alpha = 0.95$. Thus, the internal consistency for all three subscales and the scale can be considered high (Blanz, 2015). Participants rated their work engagement on a 7-point Likert scale ranging from 1 (*never*) to 7 (*every day*). A sample item for the subscale vigor was: "At my work, I feel bursting with energy." The subscale dedication was measured, for example, by asking the PhD students to what extent their job inspires them and the subscale absorption included the item "I feel happy when I am working intensely."

Perceived stress

To assess the subjective stress perception of PhD students, the German short version of the Perceived Stress Scale (PSS-4) with 4 items was used (Schneider et al., 2020). The items were rated on a 5-point Likert scale ranging from 1 = *never* to 5 = *very often*. A sample item was: "In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?". The reliability of this scale using Cronbach's Alpha and McDonald's Omega was acceptable ($\alpha = 0.79$; $\omega = 0.79$).

Resilience

Resilience in PhD students was measured using the German Brief Resilience Scale with 6 items (Chmitorz et al., 2018). Participants were asked to rate the statements on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). A sample item of this scale was: "I tend to bounce back quickly after hard times." The reliability of this scale was high with a Cronbach's Alpha of $\alpha = 0.83$; and a McDonald's Omega of $\omega = 0.83$.

Control variables

Five control variables were included in this study. First, the sociodemographic control variables age and gender were included as these could possibly impact the doctoral experience (Kurtz-Costes et al., 2006). Thus, age was found to influence work

TABLE 1 Sociodemographic and PhD-related characteristics of participants.

	First measurement point		Second measurement point	
	n	*%*	*n*	*%*
Age	30.44 (5.98)		30.10 (6.11)	
Gender				
Male	445	34.9%	229	32.4%
Female	813	63.8%	473	67.0%
Non-binary	11	0.9%	3	0.4%
Field of research[1]				
Mathematics and natural science	395	31.0%	219	31.0%
Law, economics, social sciences	261	20.5%	137	19.4%
Humanities	224	17.6%	131	18.6%
Engineering	157	12.3%	84	11.9%
Human medicine, health science	77	6.0%	49	6.9%
Sports	32	2.5%	13	1.8%
Agricultural, forestry, nutrition	23	1.8%	13	1.8%
Veterinary medicine	16	1.3%	12	1.7%
Art	21	1.6%	10	1.4%
Others	46	3.6%	27	3.8%

[1]23 People did not reply regarding their study subject.

engagement, as older workers have more resources available to better cope with workplace stressors (Kim and Kang, 2017). Furthermore, the type of promotion was included to account for the different initial situations of the various promotion models (e.g., structured doctoral program, research assistant at university). Finally, two items were added to control for the impact and fear of COVID-19, as research work had to be interrupted, conferences canceled and contact restrictions had to be maintained during the pandemic (Anders et al., 2022).

Thus, the PhD students were asked to rate the impact of COVID-19 on their PhD project on a 7-point Likert scale (ranging from 1 = *strongly disagree* to 7 = *strongly agree*). The item "The COVID-19 pandemic has a negative impact on my PhD project" was formulated based on Van Der Feltz-Cornelis et al. (2020) and adapted to the PhD context.

Lastly, fear from COVID-19 was asked, using one item of the Fear of COVID-19 Scale (Fatfouta and Rogoza, 2021). There, participants were asked to rate their fear of COVID-19 on a 7-point Likert scale (ranging from 1 = *strongly disagree* to 7 = *strongly agree*).

Data analysis

Before analyzing the data, the revised items were recoded – specifically, 5 items of the ERI scale, 2 items of the Perceived Stress scale, and 3 items of the Resilience scale. Subsequently, the mean score for each scale mentioned above was calculated. Additionally, the sum score of the ERI scales and the ERI ratio were computed using Siegrist's formula (effort/reward × correction factor). Following this, we tested the requirements of our statistical analysis.

Two Confirmatory Factor Analyses (CFA) were conducted using Jamovi to examine the construct validity of the ERI questionnaire as well as the distinctiveness of the constructs overcommitment and work engagement due to their similarity in terms of content. Additionally, the statistic software IBM SPSS 25 was used to test the predicted hypotheses. For hypotheses 1a, 1b, and 1c, two separate multiple regression analyses were conducted using the single scales effort, reward, and overcommitment as independent variables (predictors). Perceived stress and work engagement acted as the two dependent variables. Furthermore, two separate linear regression analyses were performed to test hypothesis 2, with ERI ratio as an independent variable and perceived stress and work engagement as the outcome variables. The adjusted R-squared was used to assess the goodness-of-fit measure (Gordon, 2023).

Hypotheses 3a and 3b were tested via two mediation analyses using model 4 of the PROCESS macro for SPSS (Hayes, 2022). Here, the ERI ratio was the predictor, overcommitment the mediator and work engagement as well as perceived stress the dependent variables. For the analyses, PROCESS macro uses ordinary least square regressions. Moreover, the number of bootstrap samples was set to 5,000, the level of confidence for all confidence intervals was 95% and a heteroscedasticity consistent standard error was applied (Hayes, 2022).

Two moderated mediation analyses were conducted to test hypotheses 4a and 4b, using model 7 of the PROCESS macro for SPSS (Hayes, 2022). The level of confidence intervals was set to 95,000 and the number of bootstrap samples to 5,000. The ERI ratio was used as a predictor variable, overcommitment as the mediator and work engagement as well as perceived stress as the dependent variables. Additionally, resilience functioned as the moderator. Further we adjusted the settings of the model, so that the outcome included the data for visualizing the conditional effect of the focal predictor via simple slope (for details see step by step guide from Hayes, 2022).

Results

Confirmatory factor analyses

Below, the results of the CFA are displayed, testing the construct validity of the ERI questionnaire as well as the distinctiveness of overcommitment and work engagement.

Construct validity of ERI-questionnaire

To test the construct validity of the ERI Questionnaire, a CFA was performed using Jamovi (2021). Looking at the model fit indices, the results showed an acceptable fit [χ^2 ($N = 1.275$, $df = 132$) $= 1,154$, $CFI = 0.861$, $TLI = 0.838$, $RMSEA = 0.078$] according to Beauducel and Wittmann (2005) suggesting a CFI ≥ 0.90 and Hu and Bentler (1999) suggesting a RMSEA ≤ 0.08.

Distinctiveness of overcommitment and work engagement

To test for the distinctiveness of the constructs overcommitment and work engagement, due to their conceptual similarity, a second CFA was performed. Two nested models were tested against each other: a one-factor model combining the two constructs and a two-factor model differentiating between the two constructs. The results are displayed in Table 2, showing a better fit for the two-factor model based on the fit indices (Beauducel and Wittmann, 2005). It should be noted that the chi-square test was significant for both models, indicating poor fit. However, because the chi-square test is sensitive to large sample sizes, additional fit indices were used to evaluate the fit, indicating a better fit of the two-factor model (Hooper et al., 2008).

Descriptive statistics and correlations of variables

The correlations, means and standard deviations of all variables are shown in Table 3.

Hypotheses testing

The results of the regression, the mediation, and the moderated mediation analyses are presented below. After including the previously defined control variables in the model, no changes in the pattern of results were observed. Thus, non-controlled results are reported. However, it is worth mentioning that the negative impact of COVID-19 was positively associated with perceived stress for all analyses, while age was negatively associated with perceived stress for all regression analyses. For the outcome variable work engagement, COVID-19 was found to be negatively associated in all regression analyses, while age was positively associated with work engagement only in the multiple regression analyses including the single scales effort, reward, and overcommitment.

Regression analyses

Two separate multiple regression analyses were conducted to test the relationship between effort (H1a), reward (H1b), and overcommitment (H1c) and the dependent variables perceived stress and work engagement, respectively. For perceived stress, the overall regression model was significant [$F(3, 1,265) = 160.800$, $p < 0.001$]. Furthermore, 27.4% of the variance of perceived stress could be explained by the model ($R^2_{adjusted} = 0.274$). Regarding the three predictors (effort, reward, and overcommitment), all predictors had a significant relationship with perceived stress with overcommitment having the biggest effect size (see Table 4). Thus, reward was negatively associated with perceived stress, while overcommitment and effort were positively associated with perceived stress.

Looking at the results for the outcome variable work engagement, the overall regression model was significant [$F(3, 1,265) = 61.674$, $p < 0.001$], being able to explain 10.5% of the variance of work engagement ($R^2_{adjusted} = 0.105$). All predictors showed a significant relationship with work engagement (see Table 5). Thereby, reward had the biggest effect on work engagement, followed by overcommitment and effort. Consequently, effort and reward were positively associated with work engagement, while overcommitment was negatively associated with work engagement.

Moreover, two separate linear regression analyses were performed to test the relationship between ERI ratio and the two outcome variables perceived stress and work engagement, respectively. Also, it was determined whether the ERI ratio exceeds the effect sizes produced by the single scales on the outcome variables (H2). For perceived stress, the overall regression model was significant [$F(1, 1,267) = 146.261$, $p < 0.001$], being able to explain 19,1% of the variance of perceived stress ($R^2_{adjusted} = 0.191$). Further, ERI ratio showed a significant positive relationship with perceived stress ($\beta = 0.438$, $p < 0.001$; $r_{partial} = 0.438$). Comparing the adjusted R-squared, the model including all three predictors showed a higher goodness-of-fit than the model including ERI ratio only. Thus, hypothesis 2 could only partially be supported for the outcome variable perceived stress.

For the outcome variable work engagement, the overall regression model was significant [$F(1, 1,267) = 57.631$, $p < 0.001$], being able to explain 3.3% of the variance of work engagement ($R^2 = 0.033$). Further, ERI ratio showed a significant negative relationship with work engagement ($\beta = -0.182$, $p < 0.001$, $r_{partial} = -0.182$). As for the outcome variable perceived stress, hypothesis 2 could only be partially supported, as the goodness-of-fit, assessed by the adjusted R-squared was higher for the regression model including all three predictors than ERI ratio only.

TABLE 2 Results from the CFA testing the distinctiveness of overcommitment and work engagement.

Model	df	χ^2	CFI	TLI	RMSEA
One-factor model	65	2205***	0.806	0.768	0.161
Two-factor model	64	335***	0.975	0.970	0.052

$N = 1,275$. CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; RMSEA, Root Mean Square Error of Approximation. ***$p < 0.001$.

TABLE 3 Means, standard deviations, and correlations as well as asymmetry and kurtosis of main variables.

Variable	M	SD	1	2	3	4	5	6	Asymmetry	Kurtosis
1. Effort	2.62	0.61	–	–					−0.06	−0.42
2. Reward	2.74	0.52	–	−0.35**	–				−0.23	−0.21
3. Over-commitment	2.76	0.72	–	0.56**	−0.28**	–			−0.34	−0.47
4. Resilience	3.26	0.76	–	−0.10**	0.17**	−0.25**	–		−0.17	−0.38
5. Perceived Stress	2.80	0.77	–	0.31**	−0.44**	0.49**	−0.38**	–	0.08	−0.44
6. Work Engagement	4.47	1.17	–	0.03	0.33**	−0.11**	0.20**	−0.35**	−0.17	−0.41

$N = 1{,}275$. **$p < 0.01$.

TABLE 4 Regression analysis for the prediction of the dependent variable perceived stress.

Predictor	b	SE b	β	t	p	$r_{partial}$
1. Effort	0.139	0.038	0.110	3.709	<0.001	0.104
2. Reward	−0.389	0.038	−0.260	−10.126	<0.001	−0.274
3. Overcommitment	0.332	0.031	0.307	10.585	<0.001	0.285

$N = 1{,}275$.

TABLE 5 Regression analysis for the prediction of the dependent variable work engagement.

Predictor	b	SE b	β	t	p	$r_{partial}$
1. Effort	0.286	0.063	0.150	4.544	<0.001	0.127
2. Reward	0.745	0.064	0.330	11.583	<0.001	0.310
3. Overcommitment	−0.145	0.053	−0.089	−2.762	0.006	−0.077

$N = 1{,}275$.

Mediation analyses

Two separate mediation analyses were conducted to test whether overcommitment mediates the relationship between the ERI ratio and the two dependent variables, perceived stress (H3a) and work engagement (H3b). Regarding hypothesis 3a, using perceived stress as the dependent variable, a total effect of ERI ratio on perceived stress was found ($\beta = 0.5216$, $p < 0.001$). Furthermore, ERI ratio significantly predicted overcommitment ($\beta = 0.8941$, $p < 0.001$), which in turn predicted perceived stress ($\beta = 0.3004$, $p < 0.001$). Thus, hypothesis 3a was supported, showing that overcommitment mediates the relationship between ERI ratio and perceived stress. All results for the mediation analysis using perceived stress as the outcome variable can be found in Table 6.

For hypothesis 3b, using work engagement as the dependent variable, no mediating effect of overcommitment was found (n.s.). Therefore, no further results will be reported.

Moderated mediation analyses

Two separate moderated mediations were conducted to test hypotheses 4a and 4b with resilience as the moderator on path a, and perceived stress and work engagement as the dependent variables.

For hypothesis 4a, resilience was found to moderate the effect of ERI-ratio and perceived stress ($\beta = 1.25$, $SE = 0.54$, $t = 2.30$, $p = 0.02$). Higher overcommitment was associated with higher perceived stress ($\beta = 0.52$, SE = 0.06, $t = 9.24$, $p < 0.001$).

The overall moderated mediation model was supported with the index of moderated mediation = 0.4 (95% CI [0.01, 0.07]).

The conditional indirect effect was the strongest in individuals showing high resilience ($\beta = 0.29$, $SE = 0.03$, 95% CI [0.22, 0.36]) and the weakest in individuals showing low resilience ($\beta = 0.23$, $SE = 0.27$, 95% CI [0.18, 0.29]).

Tests of simple slopes (i.e., conditional effects on path a) found a weaker association between ERI ratio and overcommitment for those with low resilience ($\beta = 0.77$, $SE = 0.06$, $t = 12.64$, $p < 0.001$) relative to those with high resilience ($\beta = 0.96$, $SE = 0.06$, $t = 15.01$, $p < 0.001$). PhD students with higher resilience and higher ERI ratio had a higher overcommitment than those with low resilience (Figure 2).

Regarding the dependent variable work engagement, no moderated mediation effect was found (n.s.). Therefore, no further results will be presented.

Additional analyses to test lagged effects

To counteract the possible risk of over- or underestimation of possible longitudinal effects in our proposed mediation model (Maxwell and Cole, 2007), we extended our study by a second measurement point. This way, we temporarily separated our predictor variable from the mediator and outcome variables. By doing so, we not only reduced common method bias (Podsakoff et al., 2003), but also were able to test our proposed research model over a period of six weeks. The mediation analyses showed that overcommitment mediated the relationship between ERI and perceived stress over two measurement points ($\beta = 0.1782$, $SE = 0.0315$, 95% CI [0.12; 0.25]) (3a). For the moderated mediation analyses (4a) we found no significant effect over two measurement points (n.s.).

TABLE 6 Direct and indirect effects of ERI ratio on perceived stress mediated by overcommitment.

	T	β	SE	p	LLCI	ULCI
Total effect ERI ratio – Perceived Stress	15.2975	0.7902	0.0517	0.000	0.6889	0.8916
Direct effect ERI ratio – Perceived Stress	9.2437	0.5216	0.0564	0.000	0.4109	0.6323
Indirect effect ERI ratio – Overcommitment – Perceived Stress		0.2686	0.0302		0.2135	0.3314

N = 1.269. LLCI, lower limit confidence interval; ULCI, upper limit confidence interval.

FIGURE 2
Illustration of Moderated Mediation. *Note*. Overcommitment predicted by ERI-ratio moderated by resilience.
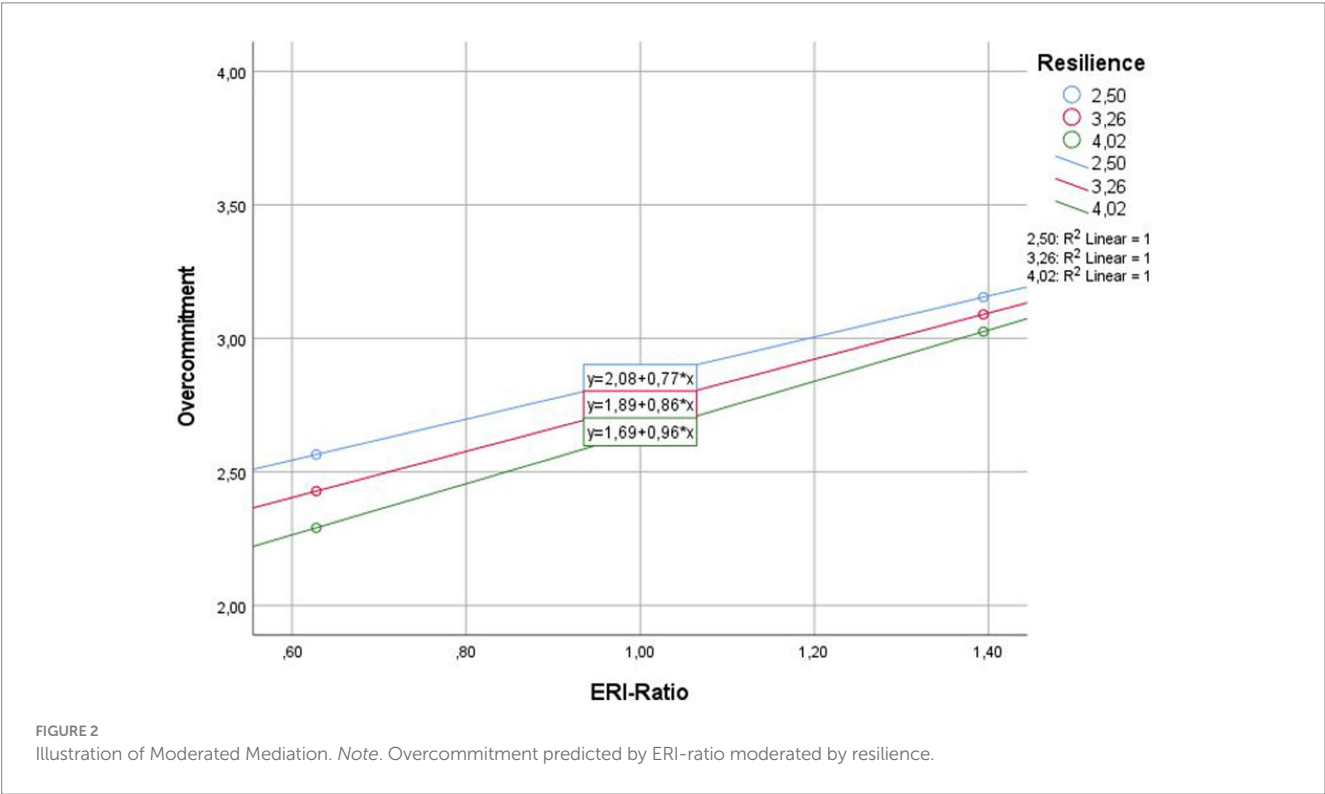
Discussion

The present study is one of the first to examine the original ERI model to explain well-being in PhD students, incorporating new research findings regarding a possible mediating effect of the negative coping pattern overcommitment. Thus, the relationship between ERI and perceived stress as well as work engagement, via overcommitment, was investigated. In addition, resilience was examined as a potential protective factor between ERI and overcommitment and therefore included as a moderator in the research model. Overall, 1,275 PhD students from across Germany participated in this study.

Summary of findings and theoretical implications

Before looking at the results of the main analyses, the average ERI ratio of 1.01 for the present sample should be discussed. As explained earlier, an ERI ratio > 1 indicates unfavorable working conditions with high effort and low reward (Siegrist, 2002). Even though an average ERI ratio of 1.01 does not indicate a high imbalance toward efforts, conclusions should not be drawn too quickly. First, it can be assumed that PhD students naturally make great efforts and investments during their doctoral studies, showing high intrinsic motivation (Guerin et al., 2015; Sverdlik et al., 2018). Second, Lehr et al. (2009) found an ERI ratio of 0.49 for healthy teachers and an ERI ratio of 1.03 for teachers with clinical depression, revealing a strong link between an unfavorable ERI and mental disorders. This is supported by Lehr et al. (2010), who propose an alternative cut-off value of 0.72 for the ERI ratio, implying that "a positive imbalance might be essential for healthy working conditions" (p. 258). Lastly, it should be noted that the ERI ratio of 1.01 represents the average value for the population used in this study. However, 590 PhD students showed an ERI ratio of 1.00 or more, with 2.79 being the highest value. Consequently, generally high burdens of PhD students should be acknowledged due to the ERI ratio found in this study.

Looking at the results of hypotheses 1a, 1b, and 1c, incorporating the single scales of the ERI questionnaire, most of the hypotheses

could be confirmed with respect to the two outcome variables perceived stress and work engagement. Thus, high effort, low reward, and high overcommitment were expected to be positively associated with perceived stress and negatively associated with work engagement. Regarding the outcome variable perceived stress, as predicted, reward showed a significant negative relationship with perceived stress (H1b), while effort and overcommitment were positively associated with perceived stress (H1c). With respect to the outcome variable work engagement, as expected, there was a positive association between reward and work engagement (H1b), whereas overcommitment was negatively associated with work engagement (H1c). Contrasting hypothesis 1a, effort showed a positive relationship with work engagement.

This positive association between effort and work engagement is noteworthy (H1a), showing that, contrary to assumptions, increasing effort in the doctorate was associated with higher work engagement. This illustrates that for doctoral students, a high level of effort is not necessarily perceived as burdensome but can rather promote work engagement. This is supported by Crawford et al. (2010), showing that while there was a positive relationship between demands and burnout, the relationship was conditioned by the nature of the demands. For example, demands perceived as challenges were positively associated with engagement, whereas demands perceived as barriers were negatively associated with engagement. This seems reasonable as PhD students often show great intrinsic motivation and enthusiasm for their doctoral studies and are therefore willing to invest a lot of time and effort in their doctorate (Guerin et al., 2015; Sverdlik et al., 2018). Thus, not the completion of the dissertation, but rather personal development, intellectual growth, and contribution to society may be the goal for many PhD students (Pretorius and Macaulay, 2021). Furthermore, the results show that the subscale reward exerts the biggest effect on work engagement. This is in line with research showing that work-related resources, such as feedback, social support from peers and leaders as well as development and opportunities for learning are positively related to work engagement (Bakker and Demerouti, 2008). Thus, rewards in the doctorate seem to influence work engagement more than efforts, further reinforcing the assumption of the influence of intrinsic motivation on the doctoral student experience.

Furthermore, hypothesis 2, assuming ERI ratio is positively associated with perceived stress and negatively associated with work engagement, exceeding the effect sizes produced by the single scales, could only be partially confirmed for both outcome variables. While a positive relationship between ERI ratio and perceived stress as well as a negative relationship between ERI ratio and work engagement was found as hypothesized, the models using the three single scales showed higher goodness-of-fit measures for both outcome variables rather than the model including ERI ratio only. In general, the found relationships are supported by other studies (e.g., Waszkowska et al., 2017; Ge et al., 2021; Kamal et al., 2022). However, further investigations need to take place in regard to the outcome variable work engagement as Wang et al. (2017) could also show positive correlations of ERI ratio with work engagement (i.e., vigor, dedication, and absorption).

Moreover, the results of the mediation analysis, including perceived stress as the outcome variable, showed a significant partial mediation between ERI ratio and perceived stress with

overcommitment acting as the mediator (H3a). Thus, this study supports current research underlying the belief that overcommitment acts as a mediator instead of a moderator in the ERI model (Theorell, 2017; Hinsch et al., 2019; Hodge et al., 2020; Vilser, 2021). This reinforces the discussion whether overcommitment is a stable personality trait, incorporating elements of the type A behavior pattern (TABP) as originally postulated by Siegrist (1996), or rather a reactive behavior that changes over time depending on the perceived ERI ratio at work. TABP can be described as aggressive, ambitious, and competitive behavior as individuals readily perceive their environment as threatening (Matschinger et al., 1986). Further, a *trait* is defined as a personality pattern that is relatively stable over time and therefore recurs in similar situations, while the term *state* refers to behavior and thoughts that change over time depending on the specific situation the individual is in (Schmitt and Blum, 2020). Acting as a mediator instead of moderator suggests that in the context of PhD students, overcommitment might be modifiable. Thus, if a doctoral student were to experience a better ERI ratio, through, e.g., a change in supervision or the overcoming obstacles, the individual level of overcommitment could change accordingly. The assumption of overcommitment acting as a mediator instead of moderator is further supported by du Prel et al. (2018) showing that changes in external ERI (work-related stress) were associated with a change in overcommitment over time.

Further, a new line of research that compares the overcommitment variable from the ERI model with the psychological detachment variable from the stressor-detachment model underpins this assumption (Kunz et al., 2021). The proximity to the stressor-detachment model becomes apparent when looking at the subscale overcommitment in the ERI questionnaire, which addresses, among other things, switching off from doctoral studies during leisure time. Thus, the subscale overcommitment includes items such as "As soon as I get up in the morning I start thinking about problems related to my PhD" or "I can easily relax and switch off from my PhD." Interestingly, the question of whether detachment acts as a mediator or a moderator is also debated in the context of the stressor-detachment model, with growing research supporting the former (Sonnentag and Fritz, 2015; Mette et al., 2018; Schulz et al., 2019; Clauss et al., 2020). Thus, psychological detachment was found to mediate the relationship between job demands and well-being indicators, such as exhaustion, fatigue at work, and the need for recovery (Sonnentag and Fritz, 2015). In addition, the temporal sequence of variables was theoretically supported, suggesting that the presence of workplace stressors influences the degree of psychological detachment, which in turn influences stress perception and well-being (Sonnentag and Fritz, 2015).

Regarding the outcome variable work engagement, no mediating effect of overcommitment was found (H3b). By including work engagement as an outcome variable, this study aimed to clarify the role of work engagement in the ERI model, as previous research showed ambivalent results (Kinnunen et al., 2008; Wolter et al., 2021). First, a negative relationship between the ERI ratio and work engagement was found in this study. This is in line with results from Wolter et al. (2021), while Kinnunen et al. (2008) only found a negative association between ERI and two subscales of work engagement, namely vigor and dedication. Furthermore, no mediating effect of overcommitment was detected, even when the three subscales

were entered independently into the mediation model in exploratory analyses in this study. This is surprising as the distinctiveness of the construct's work engagement and overcommitment was confirmed using a CFA. Consequently, the role of work engagement in the ERI model and, in particular, the relationship of work engagement and overcommitment should be further explored in light of the persistent ambivalent findings.

After including resilience as a moderator on path a (the relation of ERI ratio and overcommitment) in the model, a moderated mediation was found for the outcome variable perceived stress (H4a). Surprisingly, resilience moderated the relationship between ERI ratio, via overcommitment, on perceived stress, by further strengthening the association of ERI ratio and overcommitment as the ERI quotient increased. Thus, it appeared that resilience in addition to the perceived ERI was allowing PhD students to endure the adverse circumstances even better, while at the same time, the harmful coping strategy of overcommitment was applied even more. Consequently, the assumption of a protective factor of resilience could not be confirmed for the outcome variable perceived stress (H4a). No moderated mediation was found for the outcome variable work engagement (H4b).

But how can the amplified relationship between ERI ratio and overcommitment due to resilience be explained? First, it could be assumed that resilient individuals temporarily tolerate stressful situations, in this case, a higher ERI during their doctorate, more than their less resilient peers. Because their goal is to best adapt to the adverse environment, more resilient individuals may be more willing to adapt even harmful coping strategies, such as overcommitment, along with beneficial coping strategies to compensate for the perceived imbalance. The challenge of successfully completing the doctorate even under unfavorable conditions can supposedly be mastered with this additional invested time and effort. In the long run, however, the excessive demands might have serious negative consequences for their well-being. The assumption that resilient PhD students only adapt to the adverse environment during the limited time of the doctorate is supported by Chmitorz et al. (2018, p. 1), describing resilience as the "phenomenon that many people maintain mental health or only temporally become mentally ill despite significant adversity."

This is in line with the second explanatory approach. Even though the results of the study suggest that resilient individuals generally have lower overcommitment scores in the presence of a low ERI, this effect appears to reverse as the ERI ratio increases. Thus, resilience itself did not appear to be a protective factor, especially for high ERI ratios. Therefore, rather than focusing on resilience as a function or behavioral outcome (outcome perspective, e.g., Harvey and Delfabbro, 2004), single aspects of resilience like optimism or specific adaptive coping strategies included in the resilience construct, such as mindfulness, relaxation, and self-reflection, might be crucial to successfully reduce overcommitment (Heckenberg et al., 2019). In addition, Child and Medvedev (2023) postulated that a combination of short-term goal-oriented methods such as stress management, and long-lasting characteristics such as self-efficacy could be beneficial for strengthening resilience in the long term. As only a few studies have investigated adaptive coping strategies to reduce overcommitment, further research is needed on this topic, looking at resilience not only from an outcome, but also from a trait and process perspective, as well as the different elements of resilience.

Lastly, Williams et al. (2018) assume that resilience is more likely to buffer short-term stressful events, such as sexual assault, death, or any other traumatic event. In contrast, an ERI in the context of a doctoral degree is experienced over a longer period and rather unconsciously endured. Schetter and Dolbier (2011, p. 638) suggest that "[…] [f]or resilience to be relevant, a threat, challenge or loss (i.e., a stressor) must be of large enough magnitude to disrupt functioning for […] [an individual]." Thus, an ongoing ERI that slowly evolves over time may not be considered disruptive enough by PhD students for resilience to be triggered as a buffer. Rather, this study supports the notion that resilience appears to amplify the negative effect of chronic stress, such as an ERI at work, as individuals attempt to successfully navigate the negative imbalance they experience (Schetter and Dolbier, 2011). Resilience might therefore only have a cushioning effect within a reasonable ERI ratio, while having a negative effect as challenges increase.

Looking at the results of our additional analysis, our proposed mediation model, namely overcommitment being a mediator in the relationship between ERI and perceived stress, was supported over time. These findings are in line with Vilser (2021), who found overcommitment to mediate the relationship between ERI and perceived stress in judges over time. Our results are particularly relevant as they demonstrate that, in the context of ERI, the use of the harmful coping strategy overcommitment predicts actual changes in the well-being of PhD students over a period of time. Furthermore, with overcommitment as a mediator between ERI and perceived stress, our results underline the assumption that overcommitment is a crucial mechanism in the functioning of ERI and well-being.

Finally, including the control variables in the analyses, this study supports the assumption that the COVID-19 pandemic negatively influenced the overall doctoral experience of PhD students. This is reinforced by Anders et al. (2022) who demonstrated that contact restrictions, interruptions in research projects due to closed laboratories and libraries as well as canceled conferences due to the pandemic were a major burden for PhD students. Age, on the other hand, was found to positively influence the doctoral experience supporting the assumption that as age increases, so do resources, which in turn contribute to better coping with work stressors (Kim and Kang, 2017). Furthermore, the model of selection, optimization, and compensation (SOC) might be an explanation for the beneficial effect of age in PhD students. According to Baltes and Baltes (1990), as we age, while getting older we maximize gains and minimize losses associated through selection, optimization, and compensation strategies, meaning we are dealing more successfully with challenges over our lifespan. Therefore, older PhD students might be able to cope better with adverse circumstances. Also, it should be noted that far more women (64%) than men participated in this study, which may have several reasons. For instance, studies such as Sverdlik et al. (2023) found higher stress levels among female doctoral students, suggesting that women may be more susceptible to stress and anxiety than male PhD students. This may increase interest in understanding and addressing these challenges through engagement in research on well-being – as this topic was explicitly stated in the study's invitation. Also, several studies have consistently shown that women report higher stress levels compared to men across diverse samples (i.e., Misra and McKean, 2000; Matud, 2004; Graves et al., 2021). This could mean that women are more inclined to take part in a survey on the subject of stress, leading to a greater number of female respondents.

Practical implications

Although the protective role of resilience could not be demonstrated, this study provides important implications for practice, both for doctoral students and institutions (e.g., universities, non-university research institutes, funding organizations for promotion, and supervisors).

First, the results of this study support the assumption that the negative coping pattern overcommitment is not a rigid personality trait, but can rather be modified. Personal development workshops might help PhD students acquire positive coping strategies and successfully overcome self-sabotaging behavior, such as overcommitment. There, the goal should not only be to teach general project management skills such as time management or goal setting, but also to identify and change harmful behaviors and beliefs (Kearns et al., 2008). Furthermore, open conversations about the experienced imbalance with supervisors or relevant contacts could help to make the stress perception visible. High time pressure, working overtime, frequent interruptions, and fears about the future can thus be addressed in this way, helping supervisors and PhD students to openly communicate their needs and gradually align their working styles (Sverdlik et al., 2018). Also, as this study strengthens the conceptual proximity of overcommitment to psychological detachment, exercising and spending time with others in leisure time as well as switching off over a longer period of time, for example by taking vacations, is recommended (e.g., Martinez et al., 2013; Sonnentag and Fritz, 2015). Finally, critical self-reflection and questioning of supposedly helpful coping strategies could help doctoral students seek timely support and improve the overall doctoral experience, especially as the experienced ERI increases (Heckenberg et al., 2019; Ang et al., 2022).

At the same time, this is a call to supervisors and institutions (e.g., universities, funding organizations). This study suggests that resilience in PhD students seems to be rather harmful than helpful. However, the doctoral experience is fundamentally shaped by supervisors and institutions, which therefore need to take on a stronger role as active companions and supporters in the doctoral process (e.g., Kearns et al., 2008; Beasy et al., 2021). Thus, as doctoral students are likely to show high intrinsic motivation and a propensity for overcommitment (Sverdlik et al., 2018; Hamilton, 2019), supervisors should keep an eye on the workload of PhD students, such as additional teaching assignments and research projects. Additionally, supervisors are encouraged to model a healthy work-life balance to motivate PhD students to follow their lead as proposed by the social learning theory (Bandura, 1977). Since the results suggest that rewards are critical to both work engagement and perceived stress, rewards should be more strongly encouraged. While salary is often unchangeable due to external funding programs or scholarships, recognition, appreciation, and development depend on the supervisor and thus can be influenced. This includes for example the celebration of successes, regular communication, feedback, and goal setting as well as opportunities for PhD students to attend training or participate in conferences. Also, establishing long-term contracts to foster job security or mentoring discussions about future development possibilities are conceivable ways to increase the reward component (Sverdlik et al., 2018; de Vries, 2020).

Accordingly, supervisors are encouraged to envision themselves as leaders and mentors and should therefore be trained in employee-centered or transformational leadership styles to enhance doctoral students' well-being and job satisfaction. Passivity, *laissez-faire* leadership, or inadequate leadership skills, on the contrary, can be detrimental to the health and well-being of PhD students (Bauer and Kuschel, 2020; Anders et al., 2022).

At the institutional level, universities, and foundations should help to promote resources for PhD students by creating networking and exchange opportunities with peers and scholars (e.g., through peer mentoring programs, group coaching, or networking events). Like this, the integration of doctoral students into the scientific community could be improved (Stubb et al., 2011). Also, job security should be increased at the institutional level through long-term contracts, higher salaries, and continuing training opportunities (de Vries, 2020; Beasy et al., 2021). Furthermore, supportive infrastructures, such as career counseling, psychological advisory services, and bureaucratic support, are needed to help PhD students through difficult times in their doctorate (Anders et al., 2022). This is supported by a comprehensive error culture that normalizes setbacks in science and makes room for mistakes and experimentation, as doctoral students learn how to deal better with failures (Anders et al., 2022). Lastly, the digitalization and hygiene concepts of universities should be further advanced to ensure uninterrupted research processes during the pandemic (Anders et al., 2022).

It is assumed that by implementing these practical implications, the overall experience of doctoral students can be improved while reducing the negative health consequences of ERI and overcommitment.

Limitations and implications for future research

For this study, there are both limitations and implications for future research. First, even though this study supports the assumption that overcommitment acts as a mediator instead of a moderator, the question arises whether both mechanisms are plausible as proposed in the stressor-detachment model. According to state/trait models, this would mean that the individual trait overcommitment is triggered more or less depending on the specific situation (Schmitt and Blum, 2020). Future research could therefore focus on looking at overcommitment from a state/trait perspective, thus exploring a possible interaction as well as mediation at the same time.

Furthermore, it should be considered whether hypothesis 2, focusing on exceeding the effect sizes of ERI ratio on the effect sizes produced by the single scales, could also be measured using different statistical methods as "Siegrist does not specify whether the interaction hypothesis refers to additive main effects or to a synergistic effect […] most studies have tested for the interaction hypothesis on a variable level using regression analysis." (Lau, 2008, p. 2). However, also other methods could be used, such as multivariate regression analysis (testing if the combined measure has a significant impact, e.g., on health), a mediation analysis (testing if the mediation effect is bigger than individual effects), or a moderation (testing if specific variables influence the relationship between individual measures).

Another limitation concerns the investigated moderator resilience. As described above, different conceptualizations of resilience exist, namely trait-, process- and outcome-oriented viewpoints (Hu et al., 2015; Joyce et al., 2018). This study adopted an outcome-oriented approach as it was assumed that resilience acts as the result of successfully applied coping strategies. However, the results of this study showed no general protective effect of resilience, as resilience even strengthened the relationship between ERI ratio and overcommitment, especially with an increasingly unfavorable ERI ratio. This suggests that not resilience as an outcome, but rather individual components of resilience, such as problem-solving skills or optimism (Ang et al., 2022), could act as potential protective factors. This is also in line with research on the stressor-detachment model, which shows that individuals who have more personal and work-related resources, such as self-efficacy and social support, are better able to wind down after work than individuals who lack these resources. Furthermore, Soucek et al. (2016) stress that besides resilience, other personal resources such as optimism, self-efficacy, and hope are considered beneficial in the work context, as part of the theoretical construct of psychological capital (Luthans et al., 2015). It is therefore recommended for future research to concentrate on specific components of resilience as well as related constructs and thus systematically take possible moderators into account to better understand which coping styles are beneficial and which are rather detrimental.

As a fourth limitation, it should be noted that the study is not a laboratory study under controlled conditions, but a self-report questionnaire study. Possible biases due to confounding variables in the individual environment of the doctoral students when filling out the questionnaire or common method bias (Podsakoff et al., 2003) can therefore not be excluded. However, this format supported the wide range of this study across Germany and therefore outweighs possible methodological biases. Nevertheless, future research should investigate the ERI model using more objective outcome criteria such as work performance or physiological well-being, measured for example through blood pressure or cortisol levels. Furthermore, an experimental design could be applied using vignettes to manipulate the experienced ERI of participants. In these vignettes, supervisor behavior (e.g., transformational vs. non-transformational leadership) or frame conditions of the doctorate could be manipulated, for example by describing different levels of efforts (e.g., workload, need for overtime) and/or rewards (e.g., convention trip, permanent employment contract).

Additionally, further research is needed to investigate the role of work engagement and its subscales as well as other positive outcomes such as job satisfaction in the ERI model, as no clear picture has emerged yet from previous research (Wolter et al., 2021) nor this study.

Lastly, there is evidence that women experience more stress during their doctorate (Kurtz-Costes et al., 2006). The reasons for this are greater challenges of women due to additional responsibilities and conflicts in their personal lives as well as greater difficulty in obtaining equal chances and resources in the scientific environment as men (Hazell et al., 2020). However, in this study, no support for a gender effect regarding the outcome variable perceived stress was found. Accordingly, further research should examine possible gender effects, especially with respect to doctoral students in Germany.

Conclusion

A doctorate is associated with numerous challenges for many doctoral students. Besides financial insecurities, self-doubts, and time pressure, an experienced imbalance between effort and reward seems to play a major role in the well-being of PhD students. This study is one of the first to examine the original ERI model in PhD students, incorporating new research findings regarding a possible mediating effect of the negative coping pattern overcommitment. Thus, the relationship between ERI and perceived stress as well as work engagement, via overcommitment, was investigated.

It was found that overcommitment mediated the relationship between ERI and perceived stress, while no mediation was found for work engagement. In addition, resilience was examined as a potential protective factor between ERI and overcommitment. Here it could be shown that overcommitment increases with an increasing ERI ratio, while the relationship is moderated by resilience. Less resilient individuals consistently showed higher overcommitment scores than more resilient individuals, but contrary to expectations, resilience seemed to reinforce the relationship between ERI ratio and overcommitment with an increased ERI ratio. Thus, it appeared that with increasing ERI, resilient PhD students were even more likely to adopt the harmful coping strategy of overcommitment. Therefore, the expected buffering effect of resilience could not be supported. The authors discussed that resilient individuals could temporarily tolerate stressful situations because their goal is to best adapt to the adverse environment. In the long term, however, the excessive demands have serious negative consequences. Therefore, practical implications should be considered such as mindfulness interventions, personal development workshops, open conversations about the perceived stress as well as supervisor training and changes on the institutional level (e.g., regarding the salary).

To sum it up, this study adds value to empirical research not only by providing a deeper understanding of the ERI model and its mechanisms in PhD students, but also by triggering the investigation of possible protective factors of the negative coping pattern overcommitment.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Ethics statement

Our study strictly adhered to the Ethical Guidelines of the German Association of Psychologists (DGPs), the American Psychological Association (APA), and the Department of Psychology at Ludwig-Maximilians-University Munich (LMU). As it didn't involve sensitive personal data, impact vulnerable groups, or pose risks to participants, ethical approval wasn't necessary according to national and institutional guidelines. The study employed an anonymous questionnaire, without collecting any identifying information. All participants provided written informed consent, were comprehensively briefed on confidentiality, and had the freedom to withdraw without giving explanation.

Author contributions

MV: Conceptualization, Data curation, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. SG: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. IM: Conceptualization, Methodology, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The new normal of remote work: exploring individual and organizational factors affecting work-related outcomes and well-being in academia

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Background: Flexible work arrangements have become increasingly popular, driven by the widespread adoption of digital technologies in the workplace because of the pandemic. However, there is a scarcity of studies concerning remote work, especially related to technical-administrative staff (TAS) in academia. Therefore, the current study, adopting the Job Demands-Resources model, aimed to investigate the relationships between remote working self-efficacy, organizational support, techno-complexity, mental well-being, and job performance among TAS during remote working.

Methods: A total of 373 individuals from TAS of a large Italian university participated in this study by completing a self-report questionnaire.

Results: The findings showed positive and significant relationships between remote self-efficacy and job satisfaction as well as between such a perceived efficacy and mental well-being. Perceived support from supervisors acted as a protective factor against techno-complexity. In contrast, perceived support from colleagues emerged as able to promote well-being and job satisfaction. In addition, the latter was positively associated with well-being. Finally, individual job performance was positively affected by job satisfaction and negatively by techno-complexity.

Conclusion: This study highlights the need for interventions to support TAS in remote working environments by leveraging employees' self-efficacy as a key factor in reducing stress related to new technologies as well as enhancing well-being, job satisfaction, and, in turn, their performance.

KEYWORDS

post-pandemic, emerging psychosocial risks, psychosocial resources, university staff, well-being, remote working

1 Introduction

Flexible work practices, such as hybrid models combining remote work and in-person work, have gained popularity thanks to the recent pandemic, which accelerated the adoption of ICT (Information and Communication Technologies) in the workplace. In recent years, remote working has more than doubled in the Italian context: from 570.000 workers in 2019 to 1.8 million in 2020 (Eurofound and the International Labour Office, 2020; Observatory for Smart Working Italy, 2022). More broadly, public agencies have had to adapt their working environments to the unexpected challenges concerning COVID-19 (Athanasiadou and Theriou, 2021; Palumbo et al., 2023), fuelling a reconfiguration of work already underway and putting the accent on the ability of public sector organizations to manage human resources effectively (Boselie et al., 2021). More in detail, over the past decade, the public sector has undergone several changes, moving from a stable and predictable environment to one steeped in complexity and uncertainty (Pyun and Edey Gamassou, 2018), exacerbated by the pandemic. This has also led to a significant transformation in the content and structure of work (Brown, 1997) since they were often inadequate. This unprecedented event has impacted the balancing process between the demands of the organization and the resources available for individuals to address these new challenges effectively. The workload, particularly associated with technologies, has led to stress and, in turn, undermined organizational effectiveness and employees' well-being (Pace et al., 2021; Nguyen and Tuan, 2022). Morea et al. (2023) showed that these professionals were able to redefine space, time, organizational involvement, and a better work-life balance during the pandemic. Nevertheless, during this time, the widespread use of remote work in the public sector raised concerns about the impact on workers' well-being (Marino and Capone, 2021). These included excessive connectivity (where performance is evaluated more in terms of productivity rather than time spent), isolation from colleagues, and increased workload, as Bonacini et al. (2021) documented.

Scholars interested in the subject have highlighted the need to investigate how remote working has led to enduring changes in the work organization (Vyas et al., 2022). Following this aim, Todisco et al. (2023) conducted a study to examine the experiences of public sector employees with remote working, reporting that, after the pandemic, remote working significantly enhanced organizational flexibility and adaptability. However, issues still emerged regarding the right to disconnect and maintaining a healthy work-life balance.

Recent works showed similar findings by documenting that the rise in new technologies and changing organizational processes can be regarded as primary psychosocial risk factors in the working context (Sahut and Lissillour, 2023). The above-mentioned results can be explained by considering that remote work may make it more difficult to disconnect from work. On the other hand, remote work can also be plagued by distractions and interruptions, which are less likely to be experienced in a traditional office setting. Finally, isolation and limited social contacts linked to remote working can blur boundaries between work-related and personal activities to compensate for the lack of social ties (Prodanova and Kocarev, 2021).

Despite the relevance of this phenomenon, a paucity of studies has explored the experience of technical-administrative staff (TAS) with remote working (Burke and Pignata, 2020). To address this gap, we adopted the Job Demands-Resources (JD-R) model (Bakker et al.,

2014) as the theoretical framework for this study, aiming to investigate the conditions of this professional population in remote working during the post-pandemic period. This perspective suggests considering the interaction between individual and organizational factors affecting work-related outcomes and individuals' well-being. The following sections provide a description of the constructs evaluated in the research. These constructs, according to the JD-R model, were conceptualized as personal and organizational resources and demands, with potential outcomes related to job satisfaction, well-being and work performance.

1.1 Well-being and job satisfaction in remote working

Employees' well-being in the workplace has emerged as a relevant issue for researchers (Shamsi et al., 2021), aiming to better understand its relationships with performance and to ensure adequate working conditions. Literature in this field (Medina-Garrido et al., 2017) suggests that employees who experience higher levels of well-being tend to report better job performance. Indeed, well-being factors, such as positive emotions, optimism, and resilience, can enhance individuals' ability to perform well in their job (Bakker et al., 2014). It is well-established that *self-efficacy* beliefs can enhance performance across various domains (Bandura, 1986, 2001), including the working one. This reasoning is consistent with Mathis and Brown's (2008) study reporting that work-related self-efficacy positively predicted successful performance and higher levels of job satisfaction, an indicator of work-related well-being.

In this regard, it is worth noting that there are different ways of conceptualizing well-being, both within and outside work settings. Warr (1994) suggested that well-being at work incorporates the construct of job satisfaction. This factor can determine a spillover effect influencing contexts outside of the work, as proved by prior studies confirming significant associations between job satisfaction and satisfaction with life (Tadić et al., 2013) as well as the different dimensions of well-being (Capone and Petrillo, 2020). The latters contribute to a multifaceted well-being definition, aligning with Keyes's (2007) perspective, which regards it as a comprehensive state of emotional, psychological, and social health. In this vein, an individual experiencing well-being not only lacks psychopathological disorders but also enjoys positive emotions and shows effective functioning across diverse life domains (Westerhof and Keyes, 2010), including job. The two dimensions of occupational and mental well-being are conceptually different aspects (Wright and Cropanzano, 2000) that should be explored further in today's working world: as some recent studies point out (Tapas, 2022), an exploration of the relationship of the antecedents of these two variables is the first step in understanding the relationship between them.

Although the literature on remote working has not extensively adopted this perspective (Burke and Pignata, 2020), prior studies documented that job-related factors such as individual abilities, task complexity, and organizational support can play a pivotal role in employees' well-being. For instance, Di Tecco et al. (2021) examined work engagement and job satisfaction in flexible work settings, concluding that clarity in their professional role and the absence of conflicting roles positively affect individuals' work engagement and job satisfaction. Moreover, supervisor and peer support emerged as a

key factor in increasing workers' work engagement. The latter, in addition, has been identified as an antecedent of job performance (Rana et al., 2019).

Finally, when employees enjoy higher levels of flexibility in doing their job, they tend to report increased job satisfaction and, in turn, better well-being (Mohammed et al., 2022). In this regard, it can be argued that individuals who can tailor their job according to their needs – for example, by leveraging remote working features – are more able to balance work and life duties and, as such, experience improved job satisfaction (Hanglberger and Merz, 2011; Schall, 2019) and well-being (Charalampous et al., 2019).

Given the above, we expected that performance was positively predicted by job satisfaction and well-being. In addition, we expected that job satisfaction positively predicted well-being.

1.2 Examining remote working demands and resources through the JD-R model

In the Work and Organizational Psychology literature, the JD-R model has been widely adopted to investigate factors impacting individual and organizational outcomes (Zeike et al., 2019). More in detail, Bakker et al. (2007) focused on work-related variables defined as *job demands* and *job resources*. The formers are conceived as "physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological (cognitive and emotional) efforts or skills" (Van den Broeck et al., 2013, p. 85). The latters are regarded as "physical, psychological, social, or organizational aspects of the job that are either/or functional in achieving work goals, reducing job demands and the associated physiological and psychological costs, or in stimulating personal growth, learning, and development" (p. 85).

1.2.1 Technostress as an outcome of remote working challenges

Technostress and its relationships with remote working have been largely investigated (Oh and Park, 2016; Spagnoli et al., 2020) since it constitutes a pivotal stress manifestation in the context of digitalization processes about work activities. Literature has defined this construct as "a modern disease of adaptation" (Bondanini et al., 2020, p. 2), "the amount of stress that a person experiences and manifests when using a specific type of technology, or when he/she is in direct or indirect contact with it" (Castillo et al., 2020, p. 18).

A central dimension of technostress is *techno-complexity* (Schettino et al., 2022a,b), which occurs when employees perceive their skills are inadequate due to the difficulties associated with adopting new technologies required in their job (Tarafdar et al., 2015; Molino et al., 2020). In this vein, a lack of computer skills can lead employees to believe they cannot manage the complexity of technologies, requiring them to spend more time understanding how to use these technologies. With this regard, it is well-acknowledged that techno-complexity is higher among older individuals (Marchiori et al., 2019) and that Italian TAS in academia has an average age of about 52 years (ANVUR, 2023). Taken together, these considerations led us to focus on this dimension of technostress to evaluate which factors could affect such a kind of stress among Italian TAS. Regarding the organizational factors, in a prior study by Mudrak et al. (2018) on academic staff, the findings proved that job resources, such as

employees' control over work and support from colleagues/supervisors, were positively associated with work engagement and job satisfaction. Conversely, job demands, including job insecurity and work–family conflicts, were found to be positively related to experienced stress. These processes emerged relatively independent, suggesting that academics can remain committed to their work despite increased demands, especially when provided with adequate labor resources. The authors argued that flexible work arrangements can benefit staff as they can help reduce stress. A subsequent study conducted in the post-pandemic period (Mondo et al., 2023) examined the relationships between workload during remote work and technostress among Italian public administration employees who were working remotely. The results showed that techno-invasion and techno-complexity played as mediators between workload and well-being.

Thus, we expected that techno-complexity was a risk factor for well-being, job satisfaction and performance.

1.2.2 Self-efficacy and remote working

Self-efficacy is a factor that aids employees in effectively handling challenging job demands and bolsters their confidence in achieving their goals. In the JD-R model, self-efficacy is defined as a personal resource, a "belief in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura, 1997, p. 3). It can act as a mediator between job resources and engagement/exhaustion by affecting perceived job resources (Xanthopoulou et al., 2007). Therefore employees with high self-efficacy exhibit greater confidence, autonomy, and positive psychological outcomes than those with lower self-efficacy (Hackman and Oldham, 1975; Capone et al., 2021). This belief is shaped by repeated skilled experiences that influence one's perceptions of capability and task challenges (Bandura, 1986) as well as lower stress and technostress levels (Bandura, 2001; Capone et al., 2021; Yener et al., 2021), resulting in higher performance (Caprara et al., 2004). Therefore, it can be argued that work self-efficacy plays a buffer role against the detrimental impact of technostress on employees by reducing emotional exhaustion (Ma et al., 2021). As Bandura (1997) posited, efficacy beliefs can improve performances in different contexts. However, in order to enhance its predictiveness of individual behaviors, it is necessary to consider specific manifestations of such a belief (Bandura, 2000; Capone and Petrillo, 2020). In this vein, work self-efficacy proved its predictiveness of employees' performance (Stajkovic and Luthans, 1998). Following this line of reasoning, literature on remote working (Prodanova and Kocarev, 2021) has shown a strong association between the self-efficacy of individuals working remotely and the dimensions of technostress (Bahamondes-Rosado et al., 2023).

Consequently, we expected that remote working self-efficacy positively affected job satisfaction, well-being, and performance. In addition, we expected that job satisfaction and well-being positively affected performance. Lastly, we expected that techno-complexity was negatively influenced by remote working self-efficacy.

1.2.3 The role of organizational support in remote working

Social support is one of the possible resources that can help individuals in coping with stress (Hobfoll, 2001). In the work context, it manifests as *organizational support*, an essential job resource able to

counteract job strain (Bakker et al., 2007). It is conceptualized as a global construct (House et al., 1988), emerging from multiple sources, including supervisors and colleagues (Kossek et al., 2011).

The literature has highlighted several positive outcomes associated with adequate organizational support. Academic staff who perceive strong organizational support tend to experience higher job satisfaction, increased engagement, commitment and performance. Conversely, when academic staff perceive a lack of support, they may form turnover intentions and experience a reduction in their job effectiveness (Mazzetti et al., 2023).

It must be underlined that organizational support plays a pivotal role across various hierarchical levels. In support of such a thesis, Armstrong-Stassen (1998) documented that managers with higher perceived support reported greater job satisfaction than those with less support. This result may be understood by taking into account that support can enhance individuals' trust in the organization and the belief that their efforts will be recognized and rewarded. In the academic context, a study by Yaghi and Bates (2020) highlighted that organizational support from supervisors and peers improved the individuals' ability to transfer content learned in training into daily practices.

Furthermore, supervisor support can help academic staff by providing them with career advancement opportunities and feedback (Yang et al., 2018). The latter, in addition, is an antecedent of adequate levels of self-efficacy (Zhang and Wang, 2021) because it can promote a positive and healthy work environment through listening to concerns and helping members cope with the challenges associated with their roles. Consequently, effective supervisor support contributes to employees' satisfaction with work and better performance (Bak, 2020; Mazzetti et al., 2023). At the same time, peer support emerged as effective in enhancing collaboration, motivation, and job satisfaction. More in detail, when they perceive to be emotionally supported in their work, they are less likely to experience negative outcomes related to their well-being (Jawahar et al., 2007; Felstead and Henseke, 2017; Charalampous et al., 2019). Specifically, peer support emerged as a factor affecting the relationship between technostress and well-being (Timms et al., 2015; Di Tecco et al., 2021).

Net of the benefits associated with different manifestations of social support in the workplace, as stated by Cohen and Wills (1985), people who perceive high levels of support are more inclined to evaluate situations as less stressful since they perceive stressors as more manageable and less threatening. In other words, social support acts as a "buffer" against detrimental outcomes: employees who perceive support from their supervisors and colleagues tend to improve their psychological resources to deal with work-related stress and, in turn, experience higher well-being (Westman and Chen, 2017; Demerouti and Bakker, 2023). In other words, social support can reinforce workers' coping skills, allowing them to better deal with work-related challenges (e.g., adopting remote working practices) and relative stressors improving, thereby, job satisfaction and well-being. This thesis aligns with the literature on technostress, highlighting the role of social support in mitigating the impact of technostress on employees' well-being and performance (e.g., Weinert and El-Robrini, 2021).

In line with the above, we expected peer and supervisor support to affect job satisfaction and well-being positively. In addition, we expected that techno-complexity was negatively affected by these kinds of support.

2 The current study

Although prior studies (Burke and Pignata, 2020) have explored factors promoting academic well-being using the JD-R model (Demerouti and Bakker, 2023), a literature gap remains regarding the relationships between remote working and mental well-being in post-pandemic scenarios. In addition, while the literature (Yener et al., 2021) has investigated the relationships between self-efficacy and technology-related stress, to our knowledge, no previous study has considered the role of self-efficacy and techno-complexity in the context of remote working for Italian TAS, during the post-pandemic era. In the current study, we focused on a group of workers from a public administration. These professionals have begun to adopt remote working largely during the COVID-19 pandemic; however, the transition from "emergency" to "structural" flexible work practices necessitates research to effectively enhance working conditions and practices. Thus, addressing the aforementioned gap in the literature, we conducted the following study and discussed the potential and practical implications of our results.

More in detail, we hypothesized as follows (Figure 1):

Hypothesis 1 (*H1*). Techno-complexity was negatively predicted by remote working self-efficacy (Hypothesis *H1*a), peer (Hypothesis *H1*b), and supervisor support (Hypothesis *H1*c).

Hypothesis 2 (*H2*). Job satisfaction was positively predicted by remote working self-efficacy (Hypothesis *H2*a), peer support (Hypothesis *H2*b), supervisor support (Hypothesis *H2*c), and, negatively, by techno-complexity (Hypothesis *H2*d).

Hypothesis 3 (*H3*). Well-being was positively predicted by remote working self-efficacy (Hypothesis *H3*a), job satisfaction (Hypothesis *H3*b), peer support (Hypothesis *H3*c), supervisor support (Hypothesis *H3*d) and, negatively, by techno-complexity (Hypothesis *H3*e).

Hypothesis 4 (*H4*). Performance was positively predicted by job satisfaction (Hypothesis *H4*a), well-being (Hypothesis *H4*b), and remote working self-efficacy (Hypothesis *H4*c). Techno-complexity negatively predicted performance (Hypothesis *H4*d).

2.1 Procedure and participants

A convenience sample of TAS from a large Italian university participated in the study. Employers were invited through an e-mail to fill out a web-based self-report questionnaire of 15 min about their experience with remote working. The questionnaire was accessible only to the university employees by entering login data. In order to take part in this study, participants had to meet the following criteria: to be of legal age (1), (2) to be part of TAS (2), and to have worked in remote mode during the previous year (3). Before proceeding with the recruitment of participants, a pre-test was conducted to ascertain the usability and technical functionality of the questionnaire. Additionally,
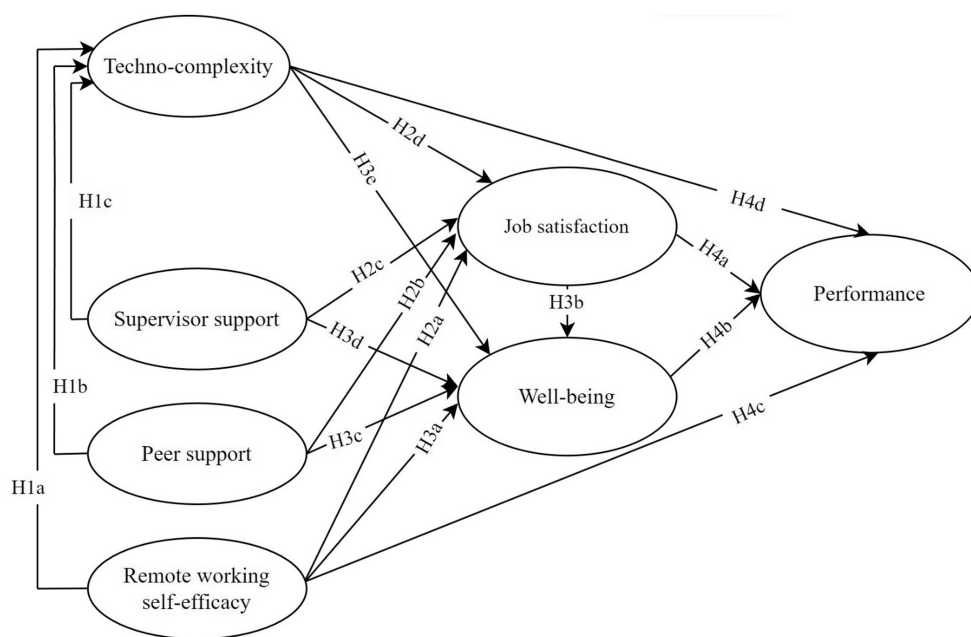
FIGURE 1
Hypothesized model.

an *a priori* power analysis was performed for Structural Equation Models (Soper, 2022) to determine the adequate sample size based on the number of observed variables (20) and latent (7) in the hypothesized model. Specifically, considering a medium-sized effect (E.S. = 0.30), alpha = 0.05, and a power of 0.80, the results indicated that a minimum number of 170 participants would have been appropriate to obtain the specified effect, given the considered structure of the model.

A total of 373 individuals took part in the study by signing the informed consent form and completing the questionnaire. Therefore, the sample size seemed appropriate for verifying the statistical hypotheses. Participation was voluntary and anonymous; no incentive was given, and respondents were allowed to withdraw from the study at any time. Data were exclusively used for the purposes of this study and were accessible solely to the research team. All procedures followed were in accordance with the Helsinki Declaration (World Medical Association, 2013) and the General Data Protection Regulation. Data were collected between February and March 2022.

2.2 Variables and measures

In the first section of the questionnaire, participants filled out the informed consent form. Subsequently, they were instructed to answer all questions by thinking specifically about remote working. Then, the following measures were administered in the same order to all the participants.

2.2.1 Remote working self-efficacy

The 6-item Work-Efficacy Scale (Borgogni et al., 2001) was used. The instrument measures workers' beliefs in their ability to effectively manage various tasks, commitments, and challenges related to their professional role (6 items, e.g., "I am always able to master the

emergencies and unexpected events related to my work"). Each item was rated on a 7-point scale ranging from "strongly disagree" (1) to "strongly agree" (7). The internal reliability of the scale in the current study was good (Cronbach's Alpha = 0.86; McDonald's Omega = 0.86).

2.2.2 Peer support

The 4-item Colleagues' support subscale of the Quality at Work Tool (AQ@workT; Brondino et al., 2022) was used. The Colleagues' support subscale evaluates individuals' perception of co-workers' support (e.g., "Colleagues give me the help and support I need"). Participants were asked to indicate their degree of agreement on a 7-point Likert scale ranging from "totally disagree" (1) to "totally agree" (7). The internal reliability of the scale in the current study was good (Cronbach's Alpha = 0.85; McDonald's Omega = 0.93).

2.2.3 Supervisor support

An item was used to measure the perceived supervisor support. Participants were asked: "How do you evaluate the support given by your supervisors?" The item was on a 6-point scale ranging from "poor" (1) to "excellent" (6).

2.2.4 Techno-complexity

The 4-item Techno-complexity subscale of the Italian version (Molino et al., 2020) of the Technostress Creators Scale (Ragu-Nathan et al., 2008) was used. The Techno-complexity subscale evaluates workers' perception of inadequacy due to the ICT features and complexity (e.g., "I do not know enough about technology to handle my job satisfactorily"). Participants were asked to indicate their degree of agreement on a 5-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). The internal reliability of the scale in the current study was good (Cronbach's Alpha = 0.88; McDonald's Omega = 0.88).

2.2.5 Job-satisfaction

An item was used to measure the participants' satisfaction regarding their job (i.e., "What is your level of satisfaction with your job?") by following indications of Cortese and Quaglino (2006). The item is rated on a 7-point Likert scale ranging from "I am extremely dissatisfied" (1) to "I am extremely satisfied" (7).

2.2.6 Well-being

Three items from the Mental Health Continuum-Short Form scale (MHC-SF; Petrillo et al., 2015) were used to measure individuals' mental well-being. Participants answered the items "In the past month, how often did you feel … satisfied with life, that the way our society works makes sense to you, that you had experiences that challenged you to grow and become a better person" by using a 6-point Likert scale ranging from "never" (0) to "always" (5). The internal reliability of the scale in the current study was good (Cronbach's alpha = 0.80; McDonald's omega = 0.80).

2.2.7 Performance

An item was used to measure participants' perceived performance in remote work (i.e., "How did individual performance change in remote working time?"). The item is rated on a 4-point Likert scale ranging from "decreased" (1) to "improved" (4).

2.2.8 Demographic information

The questionnaire included a socio-demographic section where participants were required to provide their age, marital status, education level, and professional role in the university.

2.3 Statistical analysis

Statistical analyses were conducted using the statistical software R version 4.3.2. In addition, descriptive statistics and reliability indices (Cronbach's Alpha and McDonald's Omega) were examined for all study variables. These indices are considered adequate when their values are ≥0.70 (Nunnally, 1978; Kalkbrenner, 2023). Moreover, Pearson's correlations were calculated to evaluate the association among the variables. In order to test the hypothesized model, we carried out a full structural equation model (SEM; Jöreskog, 1970). Since our data were not completely normally distributed, Skewness and Kurtosis values > |1| for remote working self-efficacy, peer support, job satisfaction, and peer support, parameters were estimated using the maximum likelihood estimation with robust standard errors and a Satorra-Bentler scaled test statistic ("MLM" estimator in R package lavaan; Rosseel, 2012). As Maydeu-Olivares (2017) suggested, MLM allows obtaining the goodness-of-fit statistics in situations where normality assumptions are violated. This involves calculating standard errors and a mean-adjusted chi-square test statistics that are robust to non-normality. Then, we estimated the hypothesized structural relationships. The goodness of fit was evaluated using the following indices: Chi-square test (χ^2), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). The fit can be considered adequate with a non-significant Chi-square, CFI and TLI values of at least 0.95, and RMSEA and SRMR values lower than 0.08 (Hu and Bentler, 1999). It must be underlined that the sample size influences the

Chi-square test, which tends to be significant with large samples (Bentler and Bonett, 1980). For this reason, it is appropriate to look at the other fit indices. The scaling method adopted to assign a scale to every latent variable consisted of fixing their variance to 1 (Barbaranelli and Ingoglia, 2013). All the answers to the questionnaire were mandatory, so there were no missing values. Effects of the considered predictors on the main dependent variable (i.e., performance) were estimated by controlling for non-psychological variables that, according to preliminary analysis, showed a significant correlation with individuals' performance. Specifically, participants' age showed a positive relationship with their performance $r = 0.14$, $p < 0.001$.

3 Results

3.1 Sample characteristics

Most participants were women (62.2%), mainly aged between 50 and 60 years ($n = 141$). Regarding marital status, 72.7% were cohabiting or married, and 27.3% declared single. Regarding education level, most participants had a degree (66.8%) and were not serving as supervisors (83.4%).

3.2 Descriptive statistics

Concerning psychological variables (Table 1), the findings showed that, on average, participants reported a very high level of self-efficacy related to remote working ($M = 6.13$; $SD = 0.80$), quite high levels of job satisfaction ($M = 5.68$; $SD = 1.34$), performance ($M = 2.99$; $SD = 0.99$), and perceived peer ($M = 5.50$; $SD = 1.26$) and supervisor support ($M = 5.30$; $SD = 0.90$), moderate levels of well-being ($M = 3.27$; $SD = 1.24$). Moreover, despite the large number of participants aged between 50 and 60 years, the analyses reported low techno-complexity levels ($M = 1.88$; $SD = 0.82$). Concerning the correlations between the variables, it emerged as follows: self-efficacy, perceived peer support, job satisfaction, well-being, and performance positively correlated with each other. In addition, techno-complexity related to remote working was negatively associated with well-being and performance. Lastly, based on the analyses of the correlations among the variables, we excluded serious multicollinearity concerns, as no correlation between the independent variables of the hypothesized model was >0.80 (Kline, 2005).

3.3 Structural equation model results

The findings indicated that, with the exception of the Chi-square ($\chi^2 = 316.250$, $df = 170$, $p < 0.001$), the model (Figure 2) provided a satisfactory fit to the data, with CFI = 0.950; TLI = 0.935; RMSEA = 0.056; SRMR = 0.053. The evaluation of the degree of freedom supports the consideration of the identifiability of the model, which explained 16% of the variance in job satisfaction, 17% in well-being, and 11% of the variance in performance. Results showed that almost all the hypotheses were confirmed. Concerning the measurement model, all factor loadings were statistically significant ($p < 0.001$), indicating that all items contributed to measuring the related constructs. Regarding the

TABLE 1 Descriptive statistics and Pearson's correlations among variables.

	Mean (SD)	1	2	3	4	5	6	7
1. Remote working self-efficacy	6.13 (0.80)	1						
2. Peer support	5.50 (1.26)	0.43**	1					
3. Supervisor support	5.30 (0.90)	0.30**	0.42**	1				
4. Techno-complexity	1.88 (0.82)	0.22**	−0.08	−0.13*	1			
5. Job satisfaction	5.68 (1.34)	0.30**	0.33**	0.35**	−0.09	1		
6. Well-being	3.27 (1.24)	0.29**	0.27**	0.27**	−0.14**	0.26**	1	
7. Performance	2.99 (0.99)	0.21**	0.16**	0.04	−0.16**	0.24**	0.19**	1

*$p < 0.05$; **$p < 0.01$. SD = standard deviation.

FIGURE 2
Structural equation model results. *$p < 0.05$; **$p < 0.01$. The dashed lines indicate not significant paths.
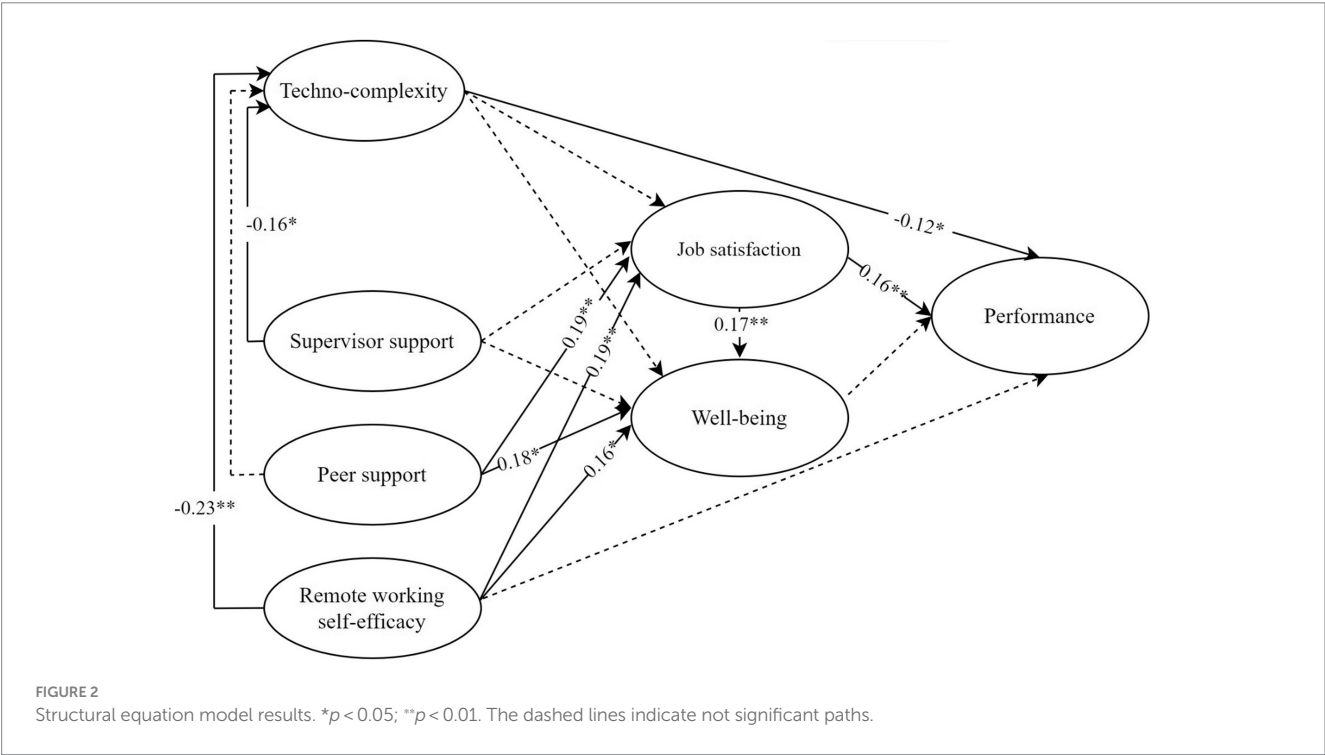
structural model, the findings showed that remote working self-efficacy ($\beta = -0.23$, $p < 0.01$) and supervisor support ($\beta = -0.16$, $p = 0.03$) negatively predicted techno-complexity, confirming $H1$a and $H1$c. Nevertheless, contrary to what was hypothesized ($H1$b), peer support did not significantly affect techno-complexity ($\beta = 0.12$, $p = 0.07$). However, such a support was positively associated with job satisfaction ($\beta = 0.19$, $p < 0.01$) and well-being ($\beta = 0.18$, $p < 0.05$), confirming $H2$b and $H3$c. In addition, well-being was not significantly associated with techno-complexity ($\beta = -0.09$, $p = 0.16$) and supervisor support ($\beta = -0.00$, $p = 0.97$), in contrast with H3e and $H3$d. However, consistent with our hypotheses ($H3$a, $H3$b), employees' well-being was positively predicted both by self-efficacy ($\beta = 0.16$, $p = 0.03$) and job satisfaction ($\beta = 0.17$, $p = 0.01$). Finally, in line with the hypotheses, techno-complexity ($H4$d; $\beta = -0.12$, $p = 0.03$), job satisfaction ($H4$a; $\beta = 0.16$, $p < 0.01$), were significantly associated with performance (control variable effect on performance: age: $\beta = -0.09$, $p = 0.07$), whereas remote self-efficacy ($H4$c; $\beta = 0.11$, $p = 0.06$) and well-being ($H4$b; $\beta = 0.11$, $p = 0.05$) were not.

4 Discussion and conclusion

Universities have undergone, and continue to undergo, internal changes that endanger the work-life balance of their employees. The recent pandemic has brought about structural changes in work, including a reorganization of processes and a sudden and massive recourse to technology. These elements have been identified as major psychosocial risk factors for lecturers and TAS. The pandemic has also given a strong impetus to remote work, in many cases without a planning/transition phase, or in any case by accelerating processes that were only in their initial stages. After the pandemic, the rise of technologies (e.g., smartphones, virtual meetings) has allowed alternative work arrangements, which have provided workers with enhanced flexibility in their job. However, this phenomenon has also led to unclear boundaries between individuals' work and private life.

Hence, despite the positive evaluation of remote working, a growing number of researchers have also begun to highlight some negative aspects of it (Riva et al., 2021). In particular, one of the most

significant risks is that of nurturing an "always-on" culture, with an unmanageable extension of work commitments (Dagnino et al., 2020), with detrimental consequences consisting of work-related fatigue and exhaustion (Rinaldi and Riyanto, 2021). With many universities reporting the use of remote working as a structured practice, it is important, as well as urgent, to identify what should be done to improve the implementation of these new ways of working both at an organizational and individual level. For these reasons, our research aimed to investigate the role of self-efficacy, techno-complexity and organizational support in remote working experience among TAS in Italy, primarily focusing on their well-being and job performance during the post-pandemic era.

Using the JD-R model as the theoretical framework for our study (Bakker et al., 2014), we have considered the techno-complexity as a new organizational demand (Molino et al., 2020) that can shape mental and job well-being (Pace et al., 2021), while remote working self-efficacy and organizational support as resources.

The results largely confirmed our hypotheses. In line with studies by Bandura (1997, 2000, 2001), self-efficacy emerged as a protective factor against techno-complexity and a promoter of both occupational and mental well-being. Self-efficacy is a specific belief that could, therefore, enable employees to mitigate the stressors linked with technologies, including those adopted with remote working and, in turn, to work sustainably and healthily from any location (Grant and Clarke, 2020). Similarly, our results are aligned with evidence from the literature highlighting that perceived social support is negatively associated with work-related stress (Macías et al., 2019). However, it is worth noting that not all perceived support has the same protective effect: after all, social support could act as an effective buffer when it is responsive to the demands arising from stressful situations (Azpíroz-Dorronsoro et al., 2023). The results of our work emphasize that supervisor support can act as a resource to counteract stress related to technologies in remote working, while peer support can promote job satisfaction and mental well-being. In this vein, these results highlight that techno-complexity is not only a consequence of job demands but also depends on the personal relationships in the workplace.

Besides, our results suggest that scholars and practitioners when referring to well-being, should make a clear distinction between "well-being at work" and "context-free well-being," with the aim of improving both of them. Moreover, the study highlights the crucial role of job satisfaction in employees' performance, strengthening the literature on the topic that reports ambiguous results (Bowling, 2007). The findings also support the thesis, assuming that the relationships with job-related antecedents are stronger for job-related well-being. As such, our study could provide a more comprehensive insight into how specific organizational factors can shape well-being.

Furthermore, these findings are part of a larger stream of studies that emphasize how important it is to analyze the antecedents of job satisfaction and to distinguish between factors that promote it and those that hinder it (Williams et al., 2023). Careless management of the work environment, especially with regard to negative emotions, can certainly create quite a few problems for job management, satisfaction, and ultimately performance.

Finally, in line with Keyes (2007) suggestion, it is important to investigate both well-being and malaise because the presence of one does not exclude the absence of the other. Although negatively correlated, techno-complexity had no significant relationship with well-being. At the same time, the former was related to performance. Hence, subsequent studies should better explore this relationship.

4.1 Limitations

It is essential to acknowledge some limitations of the present study.

First, sharing the invitation to complete the questionnaire via e-mail might have yielded self-selection bias. In particular, it is plausible to suppose that most participants were those who were already inclined towards remote working via a more frequent use of digital tools. Additionally, the findings are based on self-reported data, potentially subject to memory bias and respondents' fatigue.

A further issue regards the distribution of the participants, which is not representative of the Italian academic TAS population. Therefore, future studies should also consider comparisons between different universities located in different parts of Italy in terms of both the characteristics perceived by the local community and the resources and services objectively available. Furthermore, the well-being of academic TAS is affected not only by work-related issues but also by non-academic factors, such as the socio-cultural, environmental and psychological circumstances they experience.

Moreover, while the implementation of a single-item approach (e.g., job satisfaction) has been demonstrated to be adequate for assessing certain constructs (Wanous et al., 1997; Nagy, 2002; Chang et al., 2022), such measures may not fully capture the multifaceted nature of the inherent variables. Consequently, this could limit the ability to generalize our results across diverse contexts or populations.

Finally, since the study adopted a cross-sectional design, the relationships described should be considered carefully and cannot allow for causality inferences. Therefore, future research should adopt a longitudinal approach to address such a limitation and provide a clearer understanding of causal dynamics among considered variables.

4.2 Practical implications

Our work is part of the strand of studies that aim to understand how the use of remote work may have accelerated the digitization process and the consequences for well-being and work performance. The preferred setting was universities, with a focus on TAS on whom the literature is lacking.

From a research perspective, our results contribute to strengthening the literature that supports the easy and versatile implementation of the JD-R model in different contexts and situations (Bakker and de Vries, 2021).

Furthermore, by including occupational and mental well-being, the study reinforces the importance of considering these two dimensions as significant but different, emphasizing the need to analyze and capture the relationship with performance as well (Diedericks and Rothmann, 2014).

In addition, our findings contribute to the literature about remote working by adding evidence from a population heavily affected by post-pandemic digital transformation, such as TAS in universities.

From the standpoint of suggestions for stakeholders affected by the ongoing digital change, the study provides several operational suggestions.

First of all, conceptual models like the JD-R (Demerouti and Bakker, 2023) reinforce the hypothesis that the most effective approach in interventions is a context-targeted one. What the JD-R model offers is proof of the existence of a series of stronger relationships between certain variables. However, the specific influence of a given variable (for instance, remote working self-efficacy, in our case) on the considered outcome may vary. The added value of the model- and the small contribution we tried to offer- in terms of practical implications, was a sort of check-list of factors (work-related or person-related) that an organization should carefully consider and contextualize, in order to strive to maximize the beneficial effects of all existing resources, and minimize the detrimental effects of all existing demands.

Literature seems to suggest that such a process is similar to what happens in human resource management (HRM): recent research (Lepak et al., 2004) suggests that the real impact on desired outcomes comes more from an HRM System and depends less on the quality of single actions (e.g., recruitment, selection, onboarding etc.). Hence, the suggestion could be to answer the question: "What can we do to increase the probability that our employees (depending on the specific working situation), develop a stronger perception of being able enough to cope with the job-related challenges?

Therefore, universities need to gain awareness of how the intensive use of ICT can affect their employees' personal and professional well-being, as well as their performance. They also need to establish appropriate strategies to help them cope with job demands related to digital transformation, improving in such a way employees' productivity and well-being. This study, showing protective factors and charting the path of personal and organizational resources to be strengthened, provides important practical implications in the field of human resource management.

The results emphasize the importance of organizational support and efficacy beliefs for workers' well-being, highlighting the need for differentiated training (Schettino and Capone, 2022), also based on the requests of staff and the goals that the organization itself wants to pursue (e.g., improve stress management, enhance satisfaction). Hence, boosting individuals' confidence in their capability is essential for increasing their overall well-being and improving the organization's performance (Caprara et al., 2004). Of course, such a boosting strategy should not rely only on the spontaneous and personal engagement of employees but should be accompanied by specific and personalized supporting interventions on work goals and work skills to enhance effort and motivation: people confronted with a perceived "affordable" challenge are more likely to put effort on it.

Implementing effective development programs and their evaluation methods requires a more targeted approach, which entails considering factors such as social support as well as the perception of job satisfaction. This consideration means efforts to improve staff working conditions should be tailored to specific goals and values (Capone and Petrillo, 2020). Besides, when employees maintain positive relations with other organizational members, it can be improved the identification and mitigation of external and internal demands (Van Droogenbroeck et al., 2014). In addition, increased attention to specific support could also improve the overall effectiveness of human resource practices.

Finally, since techno-complexity can occur when individuals are forced to make efforts to understand how to use new technologies without the necessary skills, using new technologies in remote working needs acquiring new skills, which can significantly affect the relative perception of complexity in using them and, consequently, individuals' well-being. As suggested by our findings, this can happen mainly when employees are not supported in the adoption of these new technologies, for example, by adequate training (Mondo et al., 2023; Schettino et al., 2024) that, thereby, should be implemented to avoid such a stress and improve employees' well-being and performance.

The above-mentioned implications could be of great use in the post-pandemic era, especially in the context of a hybrid work model that blends remote work with in-office work, where the technological investments made can be leveraged.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

VC: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Supervision, Visualization, Writing – original draft, Writing – review & editing, Funding acquisition. GS: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. LM: Conceptualization, Data curation, Investigation, Validation, Visualization, Writing – original draft, Writing – review & editing. CC: Data curation, Investigation, Methodology, Project administration, Visualization, Writing – review & editing. AS: Software, Supervision, Validation, Visualization, Writing – review & editing. MD: Validation, Visualization, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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How work stress influence turnover intention among Chinese local undergraduate university teachers: the mediating effect of job burnout and the moderating effect of self-efficacy

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Background: Turnover intention is one of the common disturbances that affect the career development and management of university teachers. With an aim to solve this thorny issue, the study examined the associations between turnover intention and work stress among local undergraduate university teachers in China.

Methods: A questionnaire survey was carried out on 7,565 local university teachers. Initially, confirmatory factor analysis was employed to validate the reliability and validity of the scale. Subsequently, descriptive statistics and correlation analyses were conducted. Following this, a latent moderated structural equation (LMS) was used to explore the relationship among work stress, job burnout, self-efficacy, and turnover intention. Moreover, the bias-corrected Bootstrap method was applied to further examine the mediating effects, moderating effects, and moderated mediating effects in the model.

Results: The hypothesized moderated mediation model was verified significant. Work stress directly and positively predicted job burnout and turnover intention, with job burnout serving a partial mediating role between work stress and turnover intention. Additionally, self-efficacy negatively moderated the direct impact of work stress on job burnout, as well as the mediating effect of job burnout. As the self-efficacy of university teachers increased, the direct effect of work stress on job burnout and the mediating effect of job burnout decreased.

Conclusion: This study expanded the research on the antecedent variables of university teachers' turnover intention and revealed the individual contingency mechanism by which work stress affected turnover intention: the negative moderating effect of self-efficacy. Work stress induced university teachers' turnover intention, and this phenomenon was more obvious for faculties with low self-efficacy. Administrators of local undergraduate universities need to rationalize the allocation of teachers' job responsibilities and pay attention to the negative consequences of work stress in order to reduce turnover intentions. Particular attention should be paid to enhance teachers' self-efficacy. The findings of this study can provide in-depth recommendations for university faculty management and policy making, which can help shape a working atmosphere more conducive to teaching and research, thus enhancing the overall quality and competitiveness of faculty members within universities.

1 Introduction

The current academic discourse in China places significant emphasis on the work stress experienced by higher education faculty, particularly in the urgent and intricate task of mitigating teacher turnover intentions. Teacher turnover intentions serve as a crucial predictor of faculty departure behavior, and an in-depth analysis of the mechanisms underlying these intentions forms the bedrock for the formulation of targeted policies.

Local undergraduate universities in China constitute a crucial component of the country's higher education system, accounting for over 90% of the total number of higher education institutions nationwide. According to statistics from the Chinese Ministry of Education, there are 1,239 ordinary undergraduate institutions across the country, with an enrollment of over 4.67 million undergraduate students and a faculty consisting of 1.3158 million full-time teachers. These figures emphatically underscore the significant role played by local undergraduate institutions as the backbone of China's higher education, contributing indispensably to the high-quality development of the regional economic and social sectors.

The key to the advancement of educational endeavors lies in the establishment of a high-caliber and stable teaching faculty, serving as a fundamental element for local undergraduate universities to achieve high-quality development. However, the unprecedented challenges faced by faculty are apparent with the transformation of higher education functions and reforms in personnel systems. Shifts in teaching, research, and societal service responsibilities place multiple burdens on faculty, thereby augmenting overall work stress. Additionally, the profound reforms in personnel systems introduce mechanisms such as performance assessments, even title demotions, contributing to a more stringent evaluation framework for faculty. The cumulative impact of such pressures may detrimentally affect faculty job satisfaction and foster turnover intention, consequently influencing the ability of local undergraduate universities to attract and retain excellent talents. Therefore, an in-depth understanding of the impact of work stress on turnover intention of teachers in local undergraduate universities is crucial to the formulation of effective management strategies.

2 Literature review and research questions

The past research has extensively investigated the relationship between work stress and turnover intention among employees in various industries. For instance, Mochamad Soelton et al. (1) analyzed the factors affecting the turnover intention of waiters in chain restaurants. Tahira Nazir et al. (2) studied the moderating and mediating role of organizational cynicism and self-efficacy in the relationship between work stress and turnover intention of medical workers in Pakistan. Lijin Shao et al. (3)used the JDCS model to study the relationship between psychological contract, work stress, and turnover intention of employees in information service companies. Yu-Hui Hsieh et al. (4) explored the mediating role of self-efficacy between job bullying and turnover intention among nurses in Taiwan.

In the education sector, previous studies have shown that there are various explanatory variables for teacher turnover intention (5), such as low school management level, insufficient professional support, and teachers' lack of professional autonomy (6). Multi-track teaching in schools, overly tight teaching schedules, and daily teaching starting too early or ending too late are all indications of low levels of instructional management. Teachers working in schools with a low level of instructional management have a strong desire to leave and a high turnover rate. In addition, the lower the salary income, the stronger the teachers' turnover intention (7). These studies have played a positive role by providing insights into turnover intention. However, there is a relative scarcity of articles focusing on teachers in local universities in China in the existing literature.

Moreover, although previous studies have revealed many predictors of turnover intention, research on the role of work stress in inducing turnover intention is still limited. Excessive stress can have a series of negative impacts on teachers' professional lives, including reduced job satisfaction, organizational commitment, job performance (8), and increased burnout, absenteeism, turnover intention (9). The environmental factors that elicit an individual's stress can be referred to as stressors. External events become stressors only when people perceive them as threatening or challenging. The main sources of stress for university teachers include teaching and research conflicts, excessive workload, promotion difficulties, and lack of opportunities to participate in management. These stressors cause faculty to perceive stress, which in turn produces a range of emotional, attitudinal, and behavioral responses. Given the prevalence of work stress among university teachers, it is necessary to pay attention to whether this prevalence is an important trigger of turnover intention. Therefore, this study aims to investigate in depth the relationship between work stress and turnover intention among teachers in local universities in China, and to fill the research gap in the current literature.

The Conservation of Resources (COR) theory is employed to elucidate how individuals balance resource inputs and outputs when coping with stress and making decisions. In the realm of higher education, this theory can be applied to analyze the relationship between teachers' work stress and their turnover intention. Faculty members are required to invest substantial time and effort in fulfilling teaching, research, and service responsibilities. Meanwhile, factors such as educational policies and changes in school management may cause faculty members to feel pressure in various aspects, such as teaching pressure, research pressure, and administrative affairs pressure. If teachers perceive their workload as excessively stressful, and the corresponding outputs, such as salary and job satisfaction, are insufficient to compensate for these inputs, their turnover intention may increase. Resources, in this context, encompass not only economic aspects but also include time, emotions, and social support. The COR theory aids in analyzing the balance between different types of resource inputs and outputs. The theory also emphasizes the

adaptation of individual teachers to environmental changes. The COR theory allows us to understand how teachers adjust their resource inputs to change and to analyze the impact of this adaptation on their willingness to leave. Furthermore, the COR theory considers an individual's long-term development, emphasizing the balance in the accumulation and depletion of resources. In the field of higher education, faculty career development is closely related to work stress and turnover intention. Thus, the COR theory provides a robust theoretical framework for comprehending the intricate relationship between work stress and turnover intention among teachers in higher education.

Then how and when does the work stress of teachers in local undergraduate universities in China affect their turnover intention? Early theories regarded job burnout as a specific form of work stress, referring to a series of psychological and physiological syndromes manifested as stress responses to long-term emotional and interpersonal tension sources (10). Xu suggested that teacher burnout is an extreme reaction when teachers fail to cope with work stress effectively (11). More scholars argue that there are also distinctions between work stress and burnout. Li posited that burnout is a specific and multidimensional work stress, often accompanied by the development of negative attitudes (12). Bian and Long pointed out that work stress often carries a general connotation, while burnout is more closely associated with specific contexts (13). According to the Conservation of Resources Theory, employees are prone to resource depletion when facing stressful situations, which may stimulate individuals to engage in resource defensive behavioral responses, such as doing work procrastination behaviors that reduce the resource invested in order to reduce resource loss and preserve existing resources (14). Work stress poses a threat to the professional lives of university teachers. They are compelled to expend energy to regulate the perceived threat brought about by work stress. And this self-regulation process will lead to a depletion of self-regulation resources (15). Teachers experiencing job burnout may manifest a range of issues related to ineffective self-regulation, such as avoiding work, ultimately leading to the intention to resign in order to preserve existing resources. Thus, there is a close connection between work stress and the turnover intention. Logically, this should be the case; however, this relationship has not yet been empirically verified among teachers in local undergraduate universities in China. Therefore, this study will investigate how work stress among university teachers affects the their turnover intention through job burnout, providing new empirical support, as well as new perspectives on expanding the research path of work stress.

Additionally, considering the psychological cognitive differences among individual teachers, when facing the same work stress, individuals tend to assess it based on their own cognition. Consequently, there may be significant variations in the assessment results and corresponding strategies among teachers with substantial differences. Self-efficacy refers to an individual's estimation of their ability to undertake challenging tasks and their expectations of exceeding task completion. In dealing with work stress, the self-efficacy of individual teachers is a crucial factor influencing their responses. Recognized as a personal resource, teachers' self-efficacy is considered one of the most critical resources (16). Per the principle of resource investment in the COR theory, individuals with ample initial resources possess stronger capabilities to acquire resources and are more likely to engage in resource investments, thereby facing a lower

risk of resource loss. Therefore, this study posits that self-efficacy, as a positive psychological resource, facilitates proactive acquisition or construction of new resources, particularly self-regulation resources. This, in turn, helps offset potential over-consumption of resources in dealing with work stress, alleviating the degree of job burnout and consequently reducing the likelihood of intentions to resign. Hence, this study incorporates self-efficacy as a moderating variable to delve into the relationship between work stress and turnover intention. So another theoretical contribution of this study lies in revealing the boundary conditions of the transmission mechanism of work stress on Chinese local undergraduate teachers' turnover intention (1–9, 14, 15, 17–20).

2.1 Work stress and turnover intention

This study proposes that work stress is an important factor that induces university teachers' turnover intention. The work stress of local undergraduate university teachers includes teaching stress, research stress, economic stress, daily trivial affairs, etc. (21, 22). This study argues that there are two key reasons why work stress triggers turnover intention. First, high work stress often reflects high job demands, and fulfilling higher job demands tends to accelerate the loss of employees' resources. Conservation of Resources Theory (COR) suggests that in each iteration of the resource loss spiral, resource reserves are sharply reduced and university teachers first adopt a defensive mode to reduce or avoid investing resources, which in turn generates a willingness to leave (23). Second, university teachers also have to expend more limited emotional and cognitive resources to cope with work stress. In order to preserve existing resources or reduce further loss of resources, university teachers are more likely to adopt a defensive attitude of reducing resource investment, engage in more job procrastination behaviors, and have a stronger turnover intention. Therefore, the following hypothesis is proposed:

> *H1:* Work stress positively predicts turnover intention, that is, faculties with higher work stress are more likely to have a stronger turnover intention.

2.2 The mediating effect of job burnout

Why do university teachers have the intention to resign in the face of work stress? This study proposes that job burnout mediates the relationship between work stress and turnover intention. Burnout is seen by Durham as an extreme form of work stress, a product of irreconcilable stress responses, and by Maslach as a stress response that includes emotional exhaustion, dehumanization, and a lack of personal effectiveness (24). However, it is worth pointing out that burnout is not equivalent to work stress, as the two have essential differences. Work stress is studied from a one-dimensional perspective, while job burnout is studied from a multidimensional perspective. It not only includes emotional reactions to work stress, but also includes evaluations of others and self-evaluations caused by work stress. Stress response is usually generated by the perceived inconsistency between the individual's perceived job demands and his or her ability, while job

burnout is generated by the perceived inconsistency between the individual's perceived commitment to the job and the rewards obtained from the job, with emotional factors taking a low priority. Work stress itself does not necessarily lead to burnout, but if individuals are under prolonged work stress that cannot be resolved, and there are no buffer resources and no support systems during this period, then these irreconcilable stresses can develop into burnout (25). Given that burnout is a comprehensive physical and psychological response in stressful situations, the definition of teachers' burnout is determined in the context of Maslach's three-dimensional theoretical model: teachers' burnout refers to an extreme reaction when teachers cannot successfully cope with work stress, and is a state of emotional, attitudinal, and behavioral exhaustion that teachers experience over a long period of stressful experiences (26). When faced with these negative experiences, university teachers try to alleviate their feelings of conflict and negative emotions through self-regulation behaviors, which will consume a large amount of valuable self-regulation resources. Moreover, this type of depleted resource is limited and usually not immediately reversible, which may easily lead to excessive depletion of self-regulation resources, ultimately forming a spiral of resource loss.

In addition, faced with work stress, university teachers need to make trade-offs in resource allocation between in-role and extra-role tasks, and such trade-offs can also deplete university teachers' self-regulation resources. Emotional exhaustion, as a typical negative experience of job burnout, is an important influencing factor for employees to exit from organizations (27). When employees are physically and emotionally exhausted for a long period, their sense of belonging to the organization is diminished and they think of leaving the organization (28, 29). Emotionally exhausted employees lack enthusiasm for their work, have a sense of frustration, and are unable to devote time and energy to their work (30), which makes them more likely to become bored with their current job and the organization and leads to leaving. Withdrawal is a typical way to reduce the psychological cost of emotional exhaustion (31), and chronically exhausted employees tend to overestimate the importance of both avoidance and withdrawal coping strategies, and are highly likely to withdraw from their current work environment (32).

Emotionally depleted employees become less able to resist damage and may intentionally leave their current organization in order to avoid further physical and psychological damage (33). Research has shown that turnover intention is a negative result of emotional exhaustion continuing to develop to a certain extent (34). Conservation of Resources Theory (COR) emphasizes that individuals are more concerned about the extent of resource depletion than resource acquisition. Individuals in a state of burnout adopt a strength-preserving attitude and reduce their attention and effort in order to prevent the momentum and magnitude of the spiral of resource loss from continuing to grow, thus resulting in a willingness to resign. In addition, previous studies have shown that individuals in a state of job burnout have cognitive biases and believe that they lack control over the external environment and are prone to problems related to self-regulation failure, leading to avoidance, which is a form of self-regulation failure. Following this logic, this study predicts that local undergraduate university teachers in a state of burnout may be more likely to leave their jobs. Therefore, the following hypothesis is proposed:

H2: Job burnout mediates the relationship between work stress and turnover intention, that is, work stress may influence faculties' turnover intention by increasing their job burnout.

2.3 The moderating effect of self-efficacy

Since work stress can cause burnout among university teachers, under what conditions can this adverse effect be mitigated? To answer this question, under the framework of Conservation of Resources Theory (COR), this study introduces an individual characteristic variable that is closely related to individual resources, namely teachers' self-efficacy, to explore its possible moderating effect in the process of work stress affecting job burnout. According to Bandura, self-efficacy refers to an individual's expectation of his or her ability to perform a behavior in a given situation, and it includes two components: outcome expectation and efficacy expectation. Outcome expectation refers to an individual's speculation about what kind of outcome his or her behavior may lead to, while efficacy expectation refers to an individual's subjective judgment about his or her ability to implement a certain behavior. According to Bandura's theory, self-efficacy emerges as a cognitive mediator of an individual's behavior, and an individual's self-efficacy expectation reflects the nature and scope of his or her behavior, especially it reflects the level of effort and persistence that an individual puts forth when facing difficulties. R.S. Bhagat et al. argued that individuals with more positive self-beliefs are relatively less negatively affected when facing occupational stress (35). Jex found that self-efficacy plays a very important role in individuals' coping with stressors (36). These findings corroborate Bandura's view that individuals with high levels of self-efficacy usually do not perceive stressors as threats to themselves and are more likely to respond positively to stress, while individuals with low levels of self-efficacy experience self-doubt, lower achievement requirements, or even give up halfway once they encounter difficulties. In addition, the study by Kirsch et al. showed that individuals with high levels of self-efficacy take active measures to prevent stress before it occurs. Based on the views of many scholars on work pressure and self-efficacy, Xu Xiaodong believes that the mechanism of self-efficacy on work stress is mainly realized through the adoption of positive coping strategies, which may be mainly reflected in two aspects: willingness to control work and choice of coping strategies (37).

Self-efficacy, as an important resource of individuals, not only helps individuals to actively seek various resources, but also compensates for the over-consumed self-regulation resources, thus alleviating job burnout caused by work stress. Specifically, according to the investment principle of Conservation of Resources Theory (COR), individuals with high self-efficacy will make full use of positive psychological resources to obtain benefits, and further invest resources to avoid or recover from the loss of resources (38). Therefore, in the face of work stress, university teachers with a strong sense of self-efficacy are good at mobilizing psychological resources to construct an understanding of work stress from a positive perspective and alleviate negative experiences; in addition, they are also adept at acquiring work environment resources to balance the conflict between work stress and job tasks. With the easing of negative experiences and a sense of role conflict, university teachers' self-regulation activities caused by work stress are reduced, and the consumption of

self-regulation resources is reduced accordingly, which eventually alleviates the job burnout of university teachers. On the contrary, university teachers with low self-efficacy tend to protect existing resources and are not good at actively acquiring new resources from the university, thus it is harder to have sufficient psychological resources or work resources to cope with work stress, and they are prone to produce strong adverse reactions that cannot be relieved, which intensify the degree of job burnout. Therefore, the following hypothesis is proposed:

> *H3:* Self-efficacy can buffer the positive effects of work stress on job burnout, that is, university teachers with high self-efficacy may experience relatively lower levels of burnout when faced with work stress.

2.4 Moderated mediation

Per the Conservation of Resources Theory (COR), work stress triggers teachers' burnout in local undergraduate universities in China, which further stimulates teachers' turnover intention. However, whether work stress triggers job burnout depends on teachers' comparison of the value of acquiring the inputs and outputs of the resources in their work in colleges and universities. Self-efficacy can influence teachers' value comparison process, and this paper hypothesizes that self-efficacy can influence the strength of the mediating effect of job burnout. In practice, it is often observed that there is a high level of teacher burnout among local undergraduate colleges in China. Theoretically, in the face of the same work stress, teachers with high self-efficacy are confident in investing resources to obtain good work performance, thus weakening the mediating effect of job burnout on turnover intention, and then teachers are less likely to leave. On the other hand, teachers with low self-efficacy are less confident in their ability to cope with work stress, which will strengthen the mediating effect of burnout on the willingness to leave, and they are more likely to escape from the local undergraduate colleges and universities. Therefore, the following hypothesis is proposed:

> *H4:* Self-efficacy moderates the mediating effect of job burnout in the relationship between work stress and turnover intention.

To sum up, this study aims to study the relationship between work stress, job burnout, and turnover intention of faculties in Chinese local universities, and examine the mediating role of job burnout and the moderating role of self-efficacy. The hypothesis model is shown in Figure 1.

3 Methods

3.1 Participants

This study distributed a faculty survey questionnaire to undergraduate institutions nationwide in May–June 2022. Faculties filled out the questionnaire by logging in to the online survey platform and answered all the questions before submitting them. The returned questionnaires were screened and the following four types of invalid questionnaires were excluded: first, questionnaires with less than 118 s of answer time were considered invalid; second, questionnaires with obvious regularity of answers were considered invalid; third, questionnaires with obvious logical problems, such as sleeping for more than 24 h and being older than 100 years, were considered invalid; fourth, questionnaire with wrong answers to the lie detection questions is regarded as invalid. After excluding the above four types of invalid questionnaires, 7,565 local undergraduate university teachers carefully finally filled out the questionnaire, with an effective response rate of 76.7%. Among them, 62.0% were female; 38.0% were male; 10.5% of them hold the professional title of full professor, 32.8% had the title of associate professor, 45.5% hold the intermediate professional title, and 11.2% hold the junior professional title; The proportion of university teachers with the highest degree of doctoral degree is 28.9%; master's degree accounted for 59.4%; bachelor's degree accounted for 11.7%; in terms of job types, teaching-oriented-type teachers accounted for 45.7%, research-oriented-type teachers accounted for 2.5%, teaching & research-oriented-type teachers accounted for 51.8%.

3.2 Measure

In this study, the Liker five-point scoring method (consent evaluation) was used for all scales.
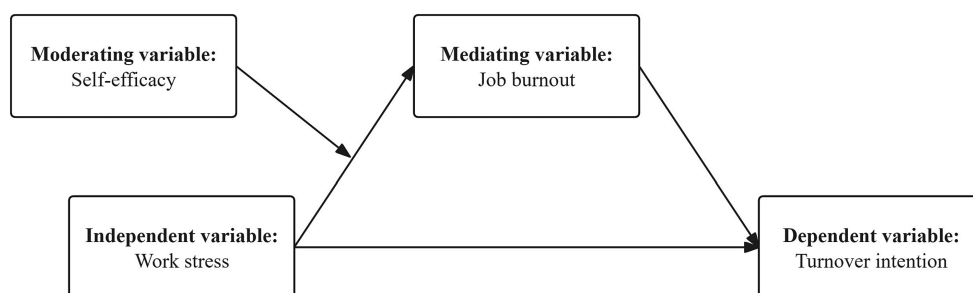

FIGURE 1
Concept of the moderated mediation model.

3.2.1 Work stress scale

The Work Stress Scale was based on a revision of the 26-item Sources of Faculty Stress Scale originally developed by Leung et al. (39). The scale has been published and widely used, ensuring its reliability and validity. Considering that the survey in this study was conducted in Chinese and that the questionnaire and scale have high scientific requirements for accuracy, the back-translation method was used in this study to translate this scale (40). The method followed a translation-back translation procedure to ensure the accuracy of translating from the original English scale into Chinese. Because this study measures the impact of work stress on work outcomes of local undergraduate university teachers, the specific scale questions were designed to accurately and realistically measure the work stress of local undergraduate university teachers by adding the statement "Please based on your actual feelings about various aspects of university work stress." Examples include "overloaded with teaching tasks," "stressful in writing and publishing papers/books," "conflicting demands," "teaching schedules are too tight" and "inadequate research grant," etc. (Cronbach's $\alpha = 0.95$).

3.2.2 Job burnout scale

The Job Burnout Scale is based on the MBI Burnout Inventory developed by Maslach et al. (41). This inventory is currently the gold standard for measuring occupational burnout. There are three forms of the MBI scales: the service industry version of the MBI-HSS (Human Services Survey), the education version of the MBI-ES (Educators Survey), and the general version of the MBI-GS (General Survey). The Burnout Scale for Local Undergraduate University Teachers is a 12-question scale selected from the MBI-ES (42), which inquiries about the true feelings of local undergraduate university teachers in their work. This scale adopts a five-point Likert rating, with 1 representing "never," 2 representing "rarely," 3 representing "occasionally," 4 representing "often," and 5 representing "always." Item examples include "Work makes me feel exhausted," "I treat certain students and colleagues as emotionless objects," "Work makes me more and more numb," and "Work makes me more and more indifferent to people" etc. (Cronbach's α = 0.91).

3.2.3 Turnover intention scale

The Turnover Intention Scale consists of one item that asks local undergraduate university teachers about their willingness to leave their jobs by Farhjl et al. (43). This scale adopts a five-point Likert scoring method, with 1 being "very small" and 5 being "very strong." The specific test item is "My turnover intention is (very small 1 2 3 4 5 very strong)."

3.2.4 Self-efficacy scale

The self-efficacy scale uses the 18-question scale of Te-Sheng Chang et al. (44). The sample questions such as "I believe I can teach according to the level of my students," "I believe I can use information technology effectively to improve teaching," "I have confidence in inspiring and maintaining students' learning motivation," "I believe I can utilize a variety of assessment methods to evaluate students' learning results" and "I believe I can nurture a pleasant learning environment" etc. (Cronbach's α = 0.91).

3.2.5 Control variables

Gender, age, rank, teaching experience, education background, and type of position of university teachers were controlled.

3.3 Data analysis

This study first used confirmatory factor analysis to test the reliability and validity of the scale, followed by descriptive statistics and correlation analysis of the variables, and finally used a moderated mediation model of latent variables to explore the relationship among work stress, job burnout, self-efficacy, and turnover intention. In model analysis, we used the latent moderated structural equation (LMS) method to construct the moderated mediation model. Given that the LMS method cannot output conventional model fit indicators such as RMSEA, CFI, and SRMR, it is necessary to judge the model fit of the baseline model that does not involve the product term of the independent and moderating variables, and then to determine whether the fit of the LMS model is acceptable by comparing the AIC indicators of the LMS model and the baseline model (45). Subsequently, the bias-corrected Bootstrap method was further used to test the mediating effects, moderating effects, and moderated mediating effects in the model.

4 Results

4.1 Confirmatory factor analysis

In order to ensure the reliability and validity of the research tool, this study first used Mplus 8.3 to conduct a confirmatory factor analysis including 15 first-order factors. The results showed that the fit index of the measurement model was good: $\chi^2[1070] = 17760.31$, $p < 0.001$, RMSEA = 0.04, CFI = 0.96, NNFI = 0.95, SRMR = 0.04. The loading values of each factor item were greater than 0.60 ($p < 0.001$), indicating that the research tool had good construct validity; the AVE values of all factors were greater than 0.50, indicating that the convergent validity was good; the square root of AVE were all greater than the correlation coefficient between factors, indicating that the discriminant validity was good; the Cronbach's α and combination reliability of all factors were greater than 0.70, indicating that the reliability of the factors was good. Overall, the reliability and validity of this research tool were ideal and suitable for further analysis.

4.2 Descriptive statistics and correlation analysis

Stata17.0 was used for descriptive statistics, normal distribution test and correlation analysis, and the specific results are shown in Table 1. In terms of work stress, university teachers scored higher than the theoretical median in only research stress (M = 3.52), while in role stress (M = 1.99), organizational stress (M = 2.40), teaching-research balance stress (M = 2.73), teaching stress (M = 2.66), student quality stress (M = 2.55), and competence stress (M = 2.28) were lower than the theoretical median, indicating that the overall work stress of university teachers was relatively low, and it was mainly research stress. In terms of job burnout, teachers' emotional exhaustion (M = 2.31) and

TABLE 1 Correlation matrix, reliability and validity, and descriptive statistics for each dimension of work stress, job burnout, self-efficacy, and turnover intention (n = 7,565).

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	Cronbach's α	CR	AVE	Loadings range
1.	RoS	0.82																0.86	0.86	0.67	0.72–0.88
2.	OS	0.75***	0.80															0.87	0.88	0.64	0.67–0.88
3.	ReS	0.43***	0.55***	0.84														0.91	0.91	0.71	0.81–0.89
4.	BS	0.48***	0.60***	0.66***	0.78													0.85	0.86	0.61	0.66–0.88
5.	TS	0.49***	0.61***	0.52***	0.61***	0.83												0.86	0.87	0.68	0.80–0.86
6.	SS	0.46***	0.57***	0.47***	0.48***	0.52***	0.84											0.87	0.88	0.70	0.80–0.89
7.	CS	0.45***	0.54***	0.42***	0.46***	0.46***	0.60***	0.86										0.89	0.89	0.73	0.79–0.91
8.	EE	0.41***	0.48***	0.36***	0.41***	0.44***	0.37***	0.36***	0.84									0.90	0.90	0.70	0.76–0.93
9.	DE	0.42***	0.40***	0.19***	0.31***	0.31***	0.30***	0.36***	0.62***	0.82								0.89	0.89	0.67	0.71–0.91
10.	CDE	−0.23***	−0.23***	−0.07***	−0.14***	−0.15***	−0.22***	−0.34***	−0.29***	−0.44***	0.95							0.96	0.96	0.90	0.94–0.96
11.	TSE	−0.23***	−0.26***	−0.13***	−0.17***	−0.18***	−0.28***	−0.38***	−0.30***	−0.40***	0.85***	0.91						0.94	0.94	0.84	0.90–0.93
12.	CME	−0.26***	−0.27***	−0.10***	−0.17***	−0.19***	−0.26***	−0.36***	−0.31***	−0.46***	0.85***	0.87***	0.91					0.94	0.94	0.84	0.89–0.93
13.	IRE	−0.24***	−0.24***	−0.07***	−0.15***	−0.16***	−0.22***	−0.33***	−0.28***	−0.46***	0.82***	0.80***	0.90***	0.94				0.96	0.96	0.88	0.93–0.94
14.	LSE	−0.25***	−0.27***	−0.10***	−0.17***	−0.18***	−0.25***	−0.36***	−0.30***	−0.45***	0.83***	0.84***	0.87***	0.89 ***	0.94			0.96	0.96	0.89	0.94–0.95
15.	TTE	−0.25***	−0.26***	−0.10***	−0.17***	−0.17***	−0.24***	−0.39***	−0.28***	−0.43***	0.79***	0.78***	0.82***	0.84***	0.87 ***	0.93		0.95	0.95	0.86	0.88–0.96
16.	TT	0.36***	0.37***	0.17***	0.22***	0.25***	0.25***	0.24***	0.35***	0.35***	−0.19***	−0.18***	−0.20***	−0.18***	−0.19***	−0.18***	-	-	-	-	-
	Mean	1.99	2.40	3.52	2.73	2.66	2.55	2.28	2.31	1.62	4.37	4.24	4.36	4.40	4.34	4.34	1.69				
	SD	0.86	0.97	1.08	1.03	1.05	0.87	0.84	0.88	0.73	0.69	0.73	0.69	0.68	0.69	0.71	1.03				
	Skewness	0.78	0.45	−0.42	0.33	0.35	0.28	0.43	0.38	1.23	−0.83	−0.64	−0.84	−0.92	−0.74	−0.78	1.41				
	Kurtosis	3.28	2.58	2.47	2.44	2.50	2.92	3.00	2.96	4.34	3.11	2.76	3.16	3.25	2.88	2.92	4.18				

The mean scores for each scale ranged from 1 to 5. The triangular matrix is the Pearson correlation coefficient, and the diagonal line is the square root of the average extracted variance (AVE). RoS, Role stress; OS, Organizational stress; Res, Research stress; BS, Teaching-research balance stress; TS, Teaching stress; SS, Student quality stress; CS, Competence stress; EE, Emotional exhaustion; DE, Depersonalization; CDE, Curriculum design efficacy; TSE, Teaching strategy efficacy; CME, Classroom management efficacy; IRE, Interpersonal relationship efficacy; TTE, Teaching technology efficacy; TT, Turnover intention. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ (two-tailed).

depersonalization (M=1.62) were also lower than the theoretical median, indicating that teachers' overall job burnout was relatively low and mainly manifested as emotional exhaustion. In terms of self-efficacy, teachers' curriculum design efficacy (M=4.37), teaching strategy efficacy (M=4.24), classroom management efficacy (M=4.36), interpersonal relationship efficacy (M=4.40), learning assessment efficacy (M=4.34), and teaching technology efficacy (M=4.34) were higher than the theoretical median, indicating that university teachers have a high sense of self-efficacy in all aspects. In terms of turnover intention, teachers scored lower than the theoretical median, indicating that university teachers have a low turnover intention.

Additionally, the results of the normality tests indicate that, with the exception of depersonalization (skewness=1.23, kurtosis=4.34) and turnover intention (skewness=1.41, kurtosis=4.18), all other variables exhibit skewness within the range of −1 to 1 and kurtosis within the range of 2–4, suggesting a close approximation to a normal distribution. Given that both depersonalization and turnover Intention demonstrate a slight rightward skew and a more concentrated distribution, it is proposed to employ the bootstrap method to correct for non-normality in the data in subsequent statistical analyses. This approach will provide a more robust estimation result.

The results of correlation analysis indicated that, on the one hand, among the internal dimensions of each latent variable, first, there was a moderate to strong positive correlation between the seven factors of work stress ($0.42 \leq r \leq 0.75$). Second, there was a strong positive correlation between the two factors of job burnout ($r=0.62$). Third, there was a strong positive correlation between the six factors of self-efficacy ($0.78 \leq r \leq 0.90$). On the other hand, among the variables of work stress, job burnout, turnover intention, and self-efficacy, first, there was a moderate positive correlation between the seven stress factors and the two burnout factors ($0.30 \leq r \leq 0.48$). Second, there was a weak to moderate positive correlation between the seven stress factors and turnover intention ($0.17 \leq r \leq 0.37$). Third, there was a moderate positive correlation between the two burnout factors and turnover intention ($r=0.35$). Fourth, there was a very weak to moderate negative correlation between six self-efficacy factors and seven stress factors ($-0.39 \leq r \leq -0.07$). Fifth, there was a weak to moderate negative correlation between the six self-efficacy factors and two burnout factors ($-0.46 \leq r \leq -0.28$). Sixth, there was a weak

negative correlation between the six self-efficacy factors and turnover intention ($-0.20 \leq r \leq -0.18$).

The above correlation analysis results collectively showed that there was a strong positive correlation among the internal dimensions of the three latent variables: work stress, job burnout, and self-efficacy. Moreover, there was a positive correlation between work stress, job burnout and turnover intention, while there was a negative correlation between self-efficacy and work stress, job burnout and turnover intention.

Before conducting the moderated mediation model analysis, the Harman single-factor method was used to test for common method bias. Since the first factor explained 35.5% of the unrotated exploratory factor analysis, which has not reached half of the total explanatory power, the common method bias in this study was not severe (46). Therefore, the data in this study are suitable for further model analysis.

4.3 Moderated mediation model

In this study, a benchmark model without the product item of work stress and self-efficacy was constructed first, and the results showed that the fitting index of the benchmark model was good: $\chi^2[226]=9564.03$, $p<0.001$, RMSEA=0.07, CFI=0.91, NNFI=0.89, SRMR=0.06, AIC=207246.69. Subsequently, the LMS method was used to further construct a complete moderated mediation model, and the model results were shown in Figure 2. The AIC of this model was 207182.12, which was lower than the AIC value of the benchmark model, indicating that the moderated mediation model constructed in this study fit well and was acceptable. Each variable in the model explained 56.2% of the variation rate of job burnout and 23.5% of the variation rate of turnover intention. Overall, the hypothesis of this study was supported.

Firstly, among work stress, job burnout and turnover intention, work stress directly and positively predicted job burnout (B=0.600, $p<0.001$) and turnover intention (B=0.321, $p<0.001$), and job burnout directly predicted turnover intention (B=0.463, $p<0.001$). The results showed that work stress could positively predict turnover intention, and hypothesis 1 of this study was supported. In addition, when the moderating variable, self-efficacy, was at its mean value, the
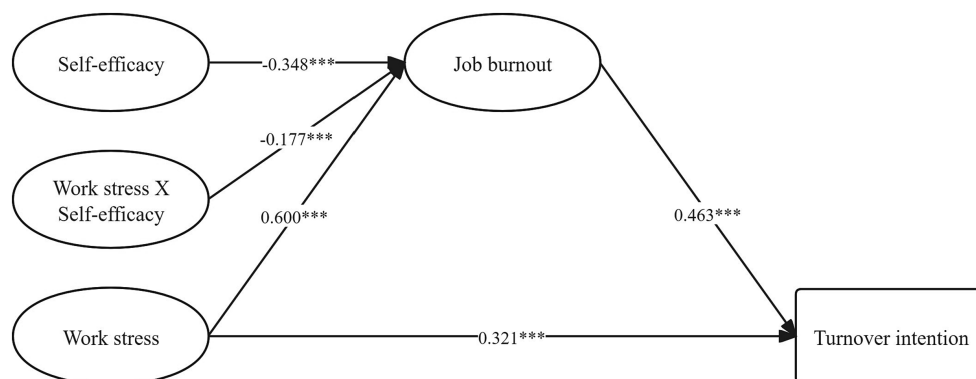
FIGURE 2
The moderated mediation model among work stress, job burnout, self-efficacy, and turnover intention. The image displays the non-standardized results. ***$p<0.001$. For the sake of clarity and simplicity in the results diagram, the measurement indicators for each latent variable and control variables (gender, age, rank, teaching experience, education background, and type of position of university teachers) are omitted.

TABLE 2 The moderating effect of self-efficacy.

Path	Simple slope	95%CI	
		Lower	Upper
Work stress- > Job burnout	0.710 (Mean − 1 SD)	0.648	0.764
	0.600 (Mean)	0.556	0.644
	0.491 (Mean + 1 SD)	0.434	0.547
	0.220 (diff)	0.146	0.286
Work stress- > Job burnout- > Turnover intention	0.329 (Mean − 1 SD)	0.280	0.386
	0.278 (Mean)	0.239	0.323
	0.227 (Mean + 1 SD)	0.192	0.267
	0.102 (diff)	0.066	0.140

The table presents non-standardized results; All simple slopes across various levels of self-efficacy demonstrate statistical significance at the 0.001 level; diff refers to the difference between the simple slope of the group one standard deviation below the mean score (M − 1SD) and the simple slope of the group one standard deviation above the mean score (M + 1SD).

FIGURE 3
The moderating effect of self-efficacy in the relationship between work stress and job burnout.
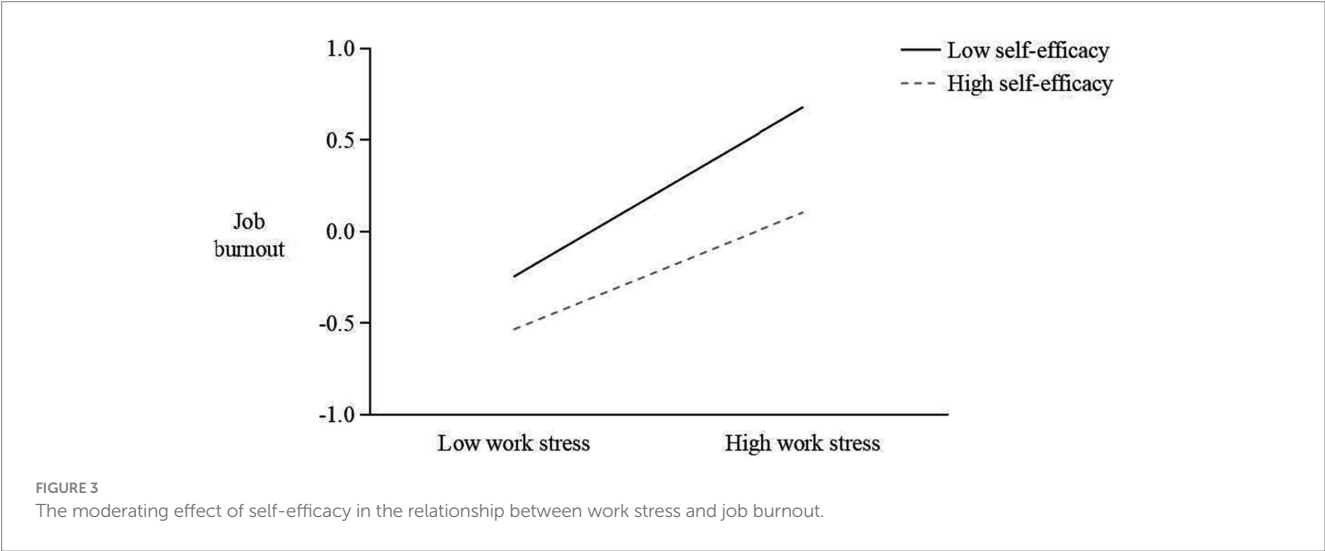
total effect of work stress on turnover intention was 0.599, comprising a direct effect of 0.321 and a mediating effect through job burnout of 0.278 (95%CI: 0.239–0.323). This mediating effect accounted for 46.4% of the total effect, indicating that work stress could indirectly predict turnover intention through job burnout, and hypothesis 2 of this study was supported (Table 2).

Secondly, in terms of the adjustment of self-efficacy on the impact of work stress on job burnout, the interaction term of self-efficacy and work pressure negatively predicted job burnout (B = −0.177, $p < 0.001$), indicating that self-efficacy could buffer the positive impact of work stress on job burnout. A simple slope diagram was shown in Figure 3. A further simple slope test showed that when the self-efficacy was one standard deviation below the mean value (M − 1 SD), the predictive effect of work stress on job burnout (B = 0.710, 95% CI: 0.648–0.764, $p < 0.001$) was higher, and when the self-efficacy was one standard deviation higher than the mean value (M + 1 SD), the predictive effect of work stress on job burnout (B = 0.491, 95% CI: 0.434–0.547, $p < 0.001$) was lower. Moreover, the difference between the simple slopes of self-efficacy in the two situations was also significant (diff = 0.220, 95% CI: 0.146–0.286, $p < 0.001$). In conclusion, the above results showed that as the self-efficacy of teachers in local undergraduate universities increased, the predictive effect of work

stress on job burnout decreased, and hypothesis H3 of this study was supported.

Finally, in terms of the moderated impact of self-efficacy on the mediating effect of job burnout, there is a significant differences in the mediating impact of job burnout across different levels of self-efficacy (diff = 0.102, 95%CI: 0.066–0.140, $p < 0.001$). When the self-efficacy was at low (M − 1 SD), the mediation effect of job burnout (B = 0.329, 95%CI: 0.280–0.386, $p < 0.001$) was higher, and when the self-efficacy was at high (M + 1 SD), the mediation effect of job burnout (B = 0.227, 95%CI: 0.192–0.267, $p < 0.001$) was lower. In conclusion, the above results show that as the self-efficacy of local undergraduate university teachers increased, the mediating effect of job burnout decreased, and H4 of this study was supported.

5 Discussion

Based on the Conservation of Resources Theory (COR), this paper constructs a moderated mediation model to explore the effects of work stress on faculty turnover intention in local undergraduate universities in China, and verifies the mediating effect of job burnout

and the moderating effect of self-efficacy on the above direct and indirect effects. The findings of this paper enrich the discussion on the negative motivational effects of work stress, and promote the theoretical and practical fields to pay attention to the negative effects of work stress on teachers in local undergraduate universities in China.

5.1 The effect of work stress on turnover intention and the mediating role of job burnout

Studies have shown that teaching is a high-intensity and high-stress profession, and that high work stress can reduce teachers' work efficiency, affect their physical and mental health, and hinder their professional development (47). Using turnover intention as an indicator, this study reveals that work stress has a direct positive predictive effect on turnover intention, expanding the scope of previous studies to a certain extent.

The relationship between work stress and job burnout is generally perceived in academia as a causal one. Vandenberghe and Huberman suggested that if an individual is under prolonged stress that cannot be resolved, and there are no buffer resources and support systems during this period, then the stress will gradually cause burnout (25). Li et al. (48) pointed out that work stress not only fails to effectively enhance the academic development of university teachers but instead leads to serious job burnout among them. Du argued that many university teachers are overwhelmed by teaching and research tasks, leading to significantly increased physical and emotional exhaustion (49). Ding et al. (50) identified high job demands and significant stress as the primary reasons for teacher burnout in universities. Joanne also highlighted that work stress is a key factor contributing to burnout, high turnover rates, and shortages among special education teachers in the United States (51). The present study found that the work stress of teachers in local undergraduate universities in China is significantly and positively correlated with job burnout, which is consistent with Kokkinos' study (52).

The Conservation of Resources Theory (COR) considers resources as all things that are valuable to an individual, and the motivation for an individual's behavior is to conserve and acquire valuable resources. When an individual perceives that resource depletion is unstoppable, or when invested resources do not yield the expected resource outputs, it will lead to stress, which will trigger the stress response (53). According to the Conservation of Resources Theory (COR), the likelihood that an individual will have access to high-value output resources will have a direct impact on the generation of stress. When an individual faces performance stress, there are two possible responses: to stop consuming resources in order to preserve them, or to continue to invest in existing resources in order to obtain other more valuable resources (54). How an individual acts depends on how he or she compares the value of resource inputs and outputs; when the value of the output resource is higher than the value of the input, the individual tends to put in a lower-value resource in exchange for a higher-value resource; when the value of the resource in return is lower than the value of the input, the individual tends to discontinue the depletion in order to conserve the resource. The loss spiral perspective in the Conservation of Resources Theory (COR) states that the initial loss of a resource triggers a further loss of the resource, and that the spiral of resource loss develops more rapidly and the negative effects are more intense. Work stress is the main

cause of burnout. The Job Demands-Resources Model suggests that in an environment with high job demands and low job resources, individual employees are prone to burnout, which in turn leads to poor work outcomes (55). This study proves that job burnout mediates the relationship between work stress and turnover intention, revealing the cognitive path of "work stress—job burnout—turnover intention," which supports these theories to a certain extent, makes up for the deficiencies of previous studies, and deepens the understanding of the intrinsic mechanism by which work stress affects the turnover intention.

The most prominent cognitive precursor to teacher turnover is their turnover intention (56), which refers to an individual's psychological inclination to depart from the organization (57), directly triggering actual resignation behaviors (58). Research on factors influencing teacher turnover intention has predominantly focused on individual factors, compensation, job characteristics, and organizational management. Individual influencing factors encompass gender, teaching experience, marital status, among which novice teachers tend to exhibit a higher turnover intention (59). In terms of job characteristics, factors such as role stress, work–family conflict, professional identity, and job burnout also impact the level of turnover intention. Within organizational management, the support system proves pivotal in encouraging teachers to continue their educational roles, with higher perceived organizational fairness and identification reducing the likelihood of choosing to leave their positions. Furthermore, the decision to leave is often an outcome of the interaction between individuals and their surrounding environment. According to the Job Demands-Resources model, social support, serving as a job resource, effectively buffers the physiological and psychological effects of job demands, thereby reducing teacher turnover intention (60). Social support, defined as external assistance and protection (61), is crucial for university teachers and typically emanates from leaders, colleagues, family, and friends (62). Hence, social support is recognized as a significant protective factor in alleviating the inclination of university teachers to resign. External care and assistance enable teachers to approach their work more positively and optimistically, mitigating job burnout, fostering a higher degree of work engagement, and consequently lowering the turnover intention.

5.2 The moderating role of self-efficacy

This study found that self-efficacy of teachers in local undergraduate universities in China moderates the relationship between work stress and job burnout as well as the relationship between work stress and turnover intention. Overall, when the self-efficacy of teachers of local undergraduate universities in China is high, the role of work stress is weakened both in terms of job burnout and turnover intention, while when the self-efficacy of teachers of local undergraduate universities in China is low, the role of work stress is greatly enhanced both in terms of job burnout and turnover intention. This finding is also consistent with the results of related studies at home and abroad (63).

When the occupational stress caused by job demands is associated with a lack of coping resources, i.e., the job demands exceed the individual's coping resources, then it will lead to the phenomenon of threat and damage, and the long-term imbalance will further develop occupational burnout. These coping resources can be external, such as social support, or internal, such as perceived self-efficacy, self-concept, role conflict/ambiguity, and other cognitive factors. This is also

illustrated by the research findings that among the many coping resources, two are the most important: self-efficacy is the most influential internal resource and social support is the most significant external resource (64).

Ten Brummelhuis and Bakker pointed out that critical resources are the constraints under which individual employee stress processes occur and play an important moderating role. They further pointed out that self-efficacy, as an individual characteristic resource, is a key resource (65). Self-efficacy refers to an individual's confidence or belief in his or her own abilities (66). Employees with high self-efficacy believe in their own abilities and are confident in their ability to accomplish their goals and tasks, and they will be more active in facing their goals and tasks and achieve high performance levels through high commitment (67). According to the Conservation of Resources Theory (COR), individuals' behavior in response to stress depends on their value judgments of resources, and individuals are willing to invest low-value resources in exchange for high-value resources, thus realizing the transformation of resources in different fields and the growth of resource stock. Employees with high self-efficacy have more confidence and resources to cope with work pressure, and believe that they can obtain high performance rewards through their own efforts. Compared to employees with low self-efficacy, they place a higher value on their personal abilities and efforts, and are less likely to suffer from job burnout or to run away from their jobs. Therefore, for local undergraduate university teachers with high self-efficacy, the effect of work stress on turnover intention is weakened. Teachers with low self-efficacy do not have enough confidence in relying on their own efforts to achieve good performance, and feel constrained in terms of time, energy, and resources, so they are more likely to experience a spiral of resource loss, which in turn leads to job burnout. Therefore, for teachers with low self-efficacy, the effect of work stress on the turnover intention is enhanced. The moderating effect of self-efficacy found in this study also supports the above view, and is consistent with the findings of overseas studies that efficacy moderates the relationship between work stress and job burnout (68).

5.3 Theoretical implications

Firstly, this study expands on the research on antecedent variables of teachers' turnover intention in higher education. Over the past few decades, China has experienced intensified organizational reforms, leading to a significant increase in personnel mobility between organizations, with unpleasant work experiences becoming a key driver of faculty turnover. During this period, Chinese higher education universities underwent various changes in organizational structure and management systems. These changes included the establishment of dual-level administrative structures with certain autonomy granted to colleges and departments, reforms in curriculum design such as the introduction of new courses and interdisciplinary programs, and an emphasis on practical teaching and encouraging student participation in research projects. While these reforms aimed to enhance the quality of higher education and align it with social and economic development, they also brought additional work pressures, particularly for university faculty, making work-related stress a significant factor influencing their work experiences. This study employs the COR theory as a theoretical framework to investigate the impact of work stress on turnover intentions among university faculty.

The results of the empirical study indicate that work stress affects job burnout and turnover intention. This study expands the research on the antecedent variables of university teachers' turnover intention and provides a new direction for the study of turnover behavior (69–72).

Secondly, based on the Conservation of Resources Theory (COR), this study introduces the intermediary variable of job burnout, trying to reveal the "black box" of the mechanism of the relationship between work stress and turnover intention. The findings show that job burnout plays a mediating role between work stress and turnover intention. This is because, in the face of work stress, local undergraduate university teachers often go through a self-regulation process, which will excessively consume self-regulation resources that can be used for follow-up work. In the state of resource depletion, university teachers often choose to preserve existing resources, and generate turnover intention.

Third, based on the theoretical framework of resource conservation, this study further reveals the individual contingency mechanism by which work stress affects turnover intention: the negative moderating effect of self-efficacy. This study believes that local undergraduate university teachers with high self-efficacy can withstand higher work pressure, often actively seek ways to supplement the consumed self-regulation resources, and restrain or avoid the generation of turnover intention by improving self-control ability. The above results not only support the constructive effect of self-efficacy in helping local undergraduate university teachers cope with work stress, but also further deepen the academic circle's understanding of the boundary conditions of work stress affecting university teachers' turnover intention.

5.4 Management implications

Firstly, teachers and administrators of local undergraduate universities in China should arrange the work of each post reasonably, pay attention to the adverse consequences of work stress, and reduce the generation of turnover intention. It is worth noting that sometimes there may be certain reasons for assigning non-compliance tasks to university teachers. Then the administrators should explain the reasons or express apologies to the relevant faculties in order to reduce their work stress and weaken their negative impact (73). Secondly, local undergraduate universities should prevent the loss of teachers' self-regulation resources. This requires the organization to build reasonable and effective communication channels between superiors and subordinates, and to fully understand the working status of university teachers through online and offline communications. Finally, since self-efficacy can alleviate the depletion effect of work stress, and the research results show that the self-efficacy level of female teachers is higher than male teachers, it would be beneficial to implement measures that focus on cultivating the self-efficacy of male teachers. This could help reduce the turnover intention among university faculty. In terms of professional titles, the self-efficacy of the professor group and associate professor group is higher than that of the junior professional title group, which reminds university administrators to pay special attention to junior professional title faculties, and to improve and cultivate the self-efficacy of young teachers such as teaching assistants who have just entered the university. In terms of job types, the self-efficacy of teaching-oriented-type teachers is lower than that of teaching and research-oriented-type teachers and research-oriented-type teachers. Local undergraduate

universities in China can guide teachers to develop into teaching and research-oriented-type and give full play to the advantages of a virtuous cycle of teaching and scientific research that complement each other.

5.5 Limitations

The shortcomings of this paper are as follows: firstly, the study lacks multi-source data. Future research can collect data from different time points and different sources to reduce the impact of common method bias. Secondly, future research can consider whether there are other mediating and regulating mechanisms between work stress and turnover intention. According to the theory of cognitive evaluation of stress, stress can be divided into obstructive stress and challenging stress. Future research can further refine the different mediating mechanisms of different stresses; it may be interesting to explore some states or situational moderating factors, such as paying attention to the moderating role of leadership factors (e.g., narcissistic leadership). Third, in terms of control variables, considering that facing work stress may cause local university teachers to experience negative emotional problems, and the process of repairing these negative emotions may also trigger ego problems with mediation failures that generate turnover intention. Therefore, it is necessary to use the emotional state of local university teachers as a control variable in future research to exclude the impact of negative emotions on the results of this study. Fourth, there are other theories and variables that can be used to elucidate the moderating role of self-efficacy. For example, Eccles' Expectancy-Value Theory identifies expectancy for success and subjective task value as two important motivators for choice, performance, and persistence (74). Self-perception of competence explains people's expectations of success, which refers to the belief that challenging tasks can be performed well (i.e., self-efficacy). Subjective task value refers to the importance people place on the tasks they plan to undertake. In future research, the variables of expectancy for success and subjective task value can be incorporated based on Expectancy-Value Theory to examine their effects on university teachers' turnover intention.

6 Conclusion

The main findings of this paper are as follows.

1. The predictive effect of work stress on job burnout and turnover intention among local undergraduate teachers: this study reveals that work stress was effective in predicting burnout and turnover intention. Teachers experiencing higher levels of work stress are more prone to emotional exhaustion and professional identity disintegration, consequently leading to higher turnover intentions. Quality enhancement in higher education necessitates attention and intervention in addressing work stress among teachers in local undergraduate universities. This is crucial not only for the individual well-being of teachers but also for ensuring the stability of organizational structures in higher education institutions.

2. The complex relationship between work Stress, job burnout, and turnover intention: work stress among teachers in local undergraduate universities positively influences both job burnout and turnover intention, with job burnout partially mediating the relationship between work stress and turnover intention. Faced with heightened work stress, teachers are prone to experiencing physical and mental exhaustion, resulting in reduced work efficiency, ultimately leading to job burnout and reinforced turnover intentions. Therefore, to alleviate work stress among university teachers, it is imperative for administrators to follow the principles of job-person fit, rationally allocate work positions, and thereby effectively reduce turnover intentions.

3. The moderating role of self-efficacy in the relationship between work stress and turnover intention: the results indicate that self-efficacy significantly moderates the relationship between work stress and turnover intention among teachers in local undergraduate universities in China. When self-efficacy is high, the impact of work stress on turnover intention is relatively low. Conversely, teachers with lower self-efficacy are more likely to be affected by work stress and strengthen turnover intentions. This finding contributes beneficially to existing theories by emphasizing the importance of enhancing teachers' self-efficacy to better cope with career changes, adapt to environmental shifts, overcome work stress, and consequently reduce turnover intentions.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Ethics Committee of Xiamen University (ECXMU-2022036). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

SP: Conceptualization, Writing – original draft. SW: Formal analysis, Writing – original draft. RJ: Investigation, Writing – review & editing. JG: Conceptualization, Supervision, Writing – review & editing. JN: Writing – original draft, Data curation.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Social dimensions as resources in promoting academic well-being: the case study of the University of Foggia

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Recently, scholars have focused more on changes in higher education, leading to significant insights into the working lives of academics and certain related processes, such as stress or well-being. The interest in academia is also justified by the role of universities as institutions that promote health and well-being, serving as a bridge between society, the world of work, and the local community. This study aims to identify social factors that can enhance the well-being of academic workers (lecturers and technical–administrative staff), highlighting how processes linked to social identity, based on the dynamics of identification with a territory or an organization, can serve as resources that promote well-being. Researchers conducted the survey on 198 workers at the University of Foggia (South Italy). Correlation and reliability assessments were first performed between the variables. Finally, a SEM study was completed. The goodness of fit of the model seems to be sufficient. The social aspects examined in the study, namely, organization identification, territorial well-being, and place attachment, were positively and significantly correlated with general well-being. Findings of the study demonstrated that for teaching and technical–administrative staff, among the key components for enhancing well-being in the academic setting was the social dimension of relationships, understood both inside and outside the university. Therefore, acting the belonging process to an area, implementing and strengthening relations with the social actors involved, as well as on the sense of belonging and identification with an organization, can have precise impact in enhancing well-being.

KEYWORDS

well-being in academia, organizational identification, place attachment, territorial well-being, SEM, job resources

1 Introduction

In recent years, more and more attention has been paid to changes in higher education, stimulating increasingly crucial insights into the working lives of academics and certain linked processes, such as stress or well-being (Brondino et al., 2022; Tilak and Kumar, 2022). The interest in academia is also supported by the fact that universities, as institutions, foster and

enhance health and well-being, and institutions hold great significance in the minds of individuals and social groups, serving as a link between society, the world of work, and well-being of the local (Smith, 2007).

A significant role has been played, in this respect, by the present study on healthy organizations, in which emphasis is placed on specific elements that can enhance employees' well-being. Healthy organizations, in actuality, are ones in which the combined presence of a good psychological climate and good practices allows for the creation of an environment that promotes the health and well-being of workers, in addition, of course, to the overall effectiveness of the organization (Di Fabio, 2017; Lowe, 2020). Within such organizations, in fact, the goal is to protect the business (Grawitch and Ballard, 2016) but by leveraging the inextricable relationship that exists between organizational performance and the well-being of workers (Arnoux-Nicolas et al., 2016), without creating an imbalance between the two. Recently, universities have also been the subject of studies on healthy organizations. Healthy universities would therefore represent a crucial strategy in approaching health-promoting environments (Dooris and Doherty, 2010). As an institution, higher education plays an important role in shaping society, with significant social, economic, and environmental landscape on a local, national, and international scale (Brennan et al., 2004).

Together with these factors, the increased interest in university well-being was also the result of the changes induced by the COVID-19 pandemic, which caused significant transformations in the academic environment, resulting in an increased complexity in the various social actors involved: academic activity is characterized by different stakeholders (faculty, administrative staff, students), all of whom have felt the effects of this massive transformation. The intricate shift of work in the academy has been demonstrated by several studies: the research by Casacchia et al. (2021) conducted on lecturers revealed that the use of new technologies on the one hand contributed to psychological issues but at the same time encouraged the ability to put themselves on the line, as well as personal growth in other participants. Additionally, new methods of working have increased uncertainty and instability in the workplace, changing times and modes, and consequently, impacting workers' well-being (Evanoff et al., 2020; Pacheco et al., 2020). Universities therefore continue to encounter significant obstacles, leading to raised levels of work-related stress for academic, research, technical, and administrative staff (Tilak and Kumar, 2022) consider empowering these stakeholders as one of the priorities to invest in, in order to preserve the best aspects of educational institutions. For these reasons, a focus on the health of workers in universities became increasingly important. Indeed, although some studies point out that the higher education sector is currently evidencing strong interest in promoting a culture of well-being (Marcus et al., 2018; Amaya et al., 2019), little literature still focuses on this topic. Brooker and Woodyatt (2019) explored various aspects of wellbeing in higher education, including student and staff support, strategic leadership, and psychological wellbeing literacy. Tay (2021) further emphasized how research into factors that promote wellbeing in higher education can be an integral part of community wellbeing, thus mainly emphasizing the social aspect. In summary, prior research concentrated on either interactional or situational dimensions (e.g., family/home stressors, job insecurity), while there are no studies examining the individual dimension and perception in relation to social identity within the framework of work-organizational

context. The latter aids in defining a person's affective and belonging characteristics that can potentially stimulate energies and advance resources.

Because of the abovementioned context, this study aims to identify social factors that can support a broader understanding of academic workers' well-being (e.g., lecturers and technical–administrative staff), highlighting how processes related to social identity in workers, based on the dynamics of identification with a territory or an organization, can trigger well-being. The research was conducted in the University of Foggia, in South Italy. The University of Foggia represents a very significant role for the area, not least because of the problems that have always plagued it, including organized crime. To this purpose, in reality, successive heads and rectors have sought to establish vibrant communities, involving different stakeholders, to outline the university's aims. From these moments of reflection, the main goals of the university for the benefit of the region emerged, including teaching, research and internationalization, building and infrastructure, spin-offs, business accelerators, start-ups and placement, social responsibility, sustainability and the environment, health, building and infrastructure, orientation and teacher training, culture, youth policy and sports, student services, organizational well-being and governance models, and press and public engagement. The role of the university for the territory was further reaffirmed by Head of State Mattarella, who speaking in attendance at the opening of the previous academic year emphasized the significance of forming consciences to combat organized crime, and in this regard, the University of Foggia is playing a central role for the territory. All institutions must work in synergy to offer Foggia a different future. The university, in actuality, fosters the cultural dynamism and zeal required to combat crime.

Within this context, then, protecting the well-being of the academic community, in terms of workers, is essential to the idea of offering a supportive foundation in the university's operation in the area.

In this regard, therefore, this study aims to demonstrate how specific factors of social identification (with the university, with the territory, and with Foggia) can serve as catalysts to enhance academic well-being.

2 Theoretical foundations and hypothesis development

2.1 Social identity as a driver for well-being: the role of place attachment

Social identity is "that part of the self- concept that derives from a person's sense of belonging to a group (or to a particular social group) and that is associated with the emotional and evaluative significance that derives from such belonging" ((Tajfel, 2010), p. 63). According to Tajfel (2010), social identity serves a crucial purpose for the self, since it contributes to retaining a healthy degree of personal self-esteem: in actuality, by introducing (positive) traits linked with those groups to which the person attaches significance, the person develops a "good" self-image. It is a crucial component of individual well-being, according to several research, including those by Eyles and Williams (2008) and (Rollero and De Piccoli, 2010). Social identity, however, is not only formed through groups, but also through physical

places, especially places where people spend large amounts of their lives. Place identity (Proshansky, 1983) represents belonging defined by locality, by sharing the same space with a social group: therefore, individuals choose, attach to, and identify with certain places to enhance or maintain a positive social identity, just as they choose, attach to, and identify with a plurality of social groups (professional, political, ethnic, religious, etc.). In conclusion, places are an important source of identity content (Breakwell, 1999); they represent symbols and are invested with social connotations. Among places, cities have a special status, to the extent of structuring in their inhabitants an actual urban identity (Lalli, 1992). Indeed, being born in each city, or living there for significantly long periods, means absorbing traits and images, anthropological and psychological qualities that, while associated with the city, extend to its residents. These characteristics, transferring from the perception of the city to that of its people, become part of their social identity.

The affective component of place-related identity is defined through the concept of attachment, which denotes an affective link between an individual and a particular place, the main characteristic of which is the person's tendency to maintain proximity to it (Hidalgo and Hernández, 2001). Even more explicitly than the cognitive aspects of identity, attachment to place contributes to determining the level of existential pleasure of individuals; in actuality, those who possess a strong attachment bond seem to be happier with their lives than people without one (Bonnes et al., 2016). Additionally, the global COVID-19 pandemic significantly altered the way in which people developed connections to their place, also rekindling attachment to it, partly because of the mandatory lockdown and closure (Devine-Wright et al., 2020). Given the absence of a more thorough examination of the connection between this construct and overall well-being, the initial research hypothesis is as follows:

H1: Place attachment improves general academic workers' well-being.

2.2 Social identity in the work context: organizational identification

Similar to the territory, the social identity that is created in connection to the work context, i.e., the degree of identification that people develop with their work organization, also favors the triggering of processes linked to well-being. Organizational identification is defined as "the conception of belonging to a group, as well as the value and emotional significance attributed to belonging to that group" (Smidts et al., 2001). Numerous investigations have demonstrated that this social identification dynamic has a significant impact on well-being-related outcomes. Among these, the study by Welander et al. (2017) highlighted how, in different types of workers, social identification is an important variable mediating the relationship between personal and organizational resources, as defined according to the job demands-resources model. Indeed, social identity theory has also included affective components, such as the emotional significance and feelings of belonging that an individual gives to belonging, in its theorizations (Nordhall et al., 2020) found that within a group of teachers, processes related to social identity, based on cognitive mechanisms (processes such as incorporation and

assimilation into a new social group) and emotional mechanisms (attachment/belonging/closeness, pride, esteem), are essential for enhancing mental health and work motivation. The study by Simbula et al. (2023) confirmed how, in line with theoretical conceptualizations of social identity and social exchange, factors such as identification and social relationships are significant in determining work-related well-being outcomes such as engagement. The study was carried out on workers in a longitudinal method; consequently, it appears that this position is also significant from a different angle in terms of time periods. The aforementioned studies indicate that phenomena related to social identity are also capable of explaining processes of well-being improvement, providing evidence for their potential investigation and analysis as antecedents (rather than mediators) of overall well-being. Put differently, they would be viewed as employment resources.

Furthermore, employees who strongly identify with their work are more likely to be dedicated to it (Loi et al., 2014; Karanika-Murray et al., 2015). Individuals therefore feel more personally invested and tend to achieve more satisfactory outcomes, both individually and for the organization through performance (Carmeli et al., 2007). Thus, according to the foregoing, the second research hypothesis is as follows:

H2: Organizational identification has a positive impact on general academic workers' well-being.

2.3 The role of the university in fostering the well-being of academic workers

Universities, as higher institutions, include in their mission the cultural and social advancement of the communities in which they operate. These aspects, in fact, come under the so-called third mission, which parallels research and instruction. The main goal of the third mission is to convey societal principles by directly involving external actors (Cassella, 2017). The goal is therefore to "feed the local system […] promoting projects of innovation and change in the territory, transferring services and models of development of new technologies, activating at the same time feedback processes, which transform the university itself, making it more sensitive to the problems and needs of companies and/or a territory" (Lazzeroni et al., 2009). This concept thus emphasizes how the university establishes itself as a catalyst of regional growth. They therefore serve as a catalyst for the expansion of the interface between university and territory. Some studies acknowledged this leading, improving role for universities (Benneworth and Jongbloed, 2010; Lazzeroni and Piccaluga, 2015), by concentrating on the growth of the knowledge economy of their host region (Stachowiak et al., 2013) highlight the critical role of the social component in strengthening the interaction between the university and the local setting. The authors stress the value of the spaces of interaction and social or personal networks that might form in academic settings, factors that can trigger an increase in trust between the university and the local community. According to Goldstein and Glaser (2012), universities have significant capacity for supporting the development of their local community (economic, social), regardless of the importance of teaching, research, and technological advancement. This position becomes even more crucial in the presence of increasingly competitive and knowledge-based economies.

Additionally, as also noted by Solari and Gambarotto (2014), a feeling of connection and belonging to a place might enhance well-being. Specifically, it is the sense of rootedness that determines the development of a sense of identity, which can then lead to implications related to well-being. This need, therefore, can also extend to workers as a component of their own well-being. This idea was later adopted by Torrisi and Pernagallo, (2022), who in their research determined the role of territoriality in academic well-being as critical. Specifically, by connecting the construct of territoriality [examined in terms of (i) differences with foreign countries and (ii) multi-local] with work engagement and job satisfaction, it emerged that a higher sense of territorial well-being is associated with better job engagement and satisfaction.

As therefore explained above, many studies in the literature have concentrated on the welfare role represented by universities toward their host areas. In this study, we want to investigate the hypothesis that this role of universities is positively seen by the workers within it, thus fostering well-being. As mentioned earlier, in fact, social identity theory claims that an identification with the organizations to which one belongs might lead to the introjection of good traits associated with them to which the person attaches value, developing a positive self-image. The territorial development mission of universities, therefore, could allow workers to incorporate this positive component into their being, implementing their self-esteem and increasing individual well-being. Thus, the third hypothesis is as follows:

> *H3:* The university's capacity to enhance territorial well-being has a positive impact on academic workers' well-being.

Figure 1 displays the entire model along with research hypotheses.

3 Method

3.1 Procedure

The survey was conducted on 198 workers in the University of Foggia (South Italy). Regarding academic position, the sample consisted of lecturers (associate professors, full professors, TDa and TDb researchers – 134 individuals, 67.7%) and technical–administrative personnel (64 individuals, 32.3%). Research participants received a link through which they could fill in a questionnaire examining factors related to academic well-being. For participation, anonymity was assured and the possibility of withdrawing from the study at any time: the information was examined in aggregate form and without the possibility of tracing it back to the person in any scenario. The experiment was approved by the Ethics Committee for Psychological Research of the University of Foggia (protocol n. 36,714). Participants provided informed consent at the start of the online questionnaire completion form. The responses to the questionnaire were correctly gathered using the browser used to develop it and then properly tagged for further examination. The only sensitive data needed is that described in the participating section. The study is part of a larger project, called Pro. Be, distinguished by a multi-method (qualitative–quantitative) survey aimed at gathering the opinions of workers and students at the university, on a range of factors that can define the quality of organizational life and well-being in the academic setting of the University of Foggia. Apart from the University of Foggia, the initiative involves the collaboration of the University of Salento and the University Federico II of Naples.
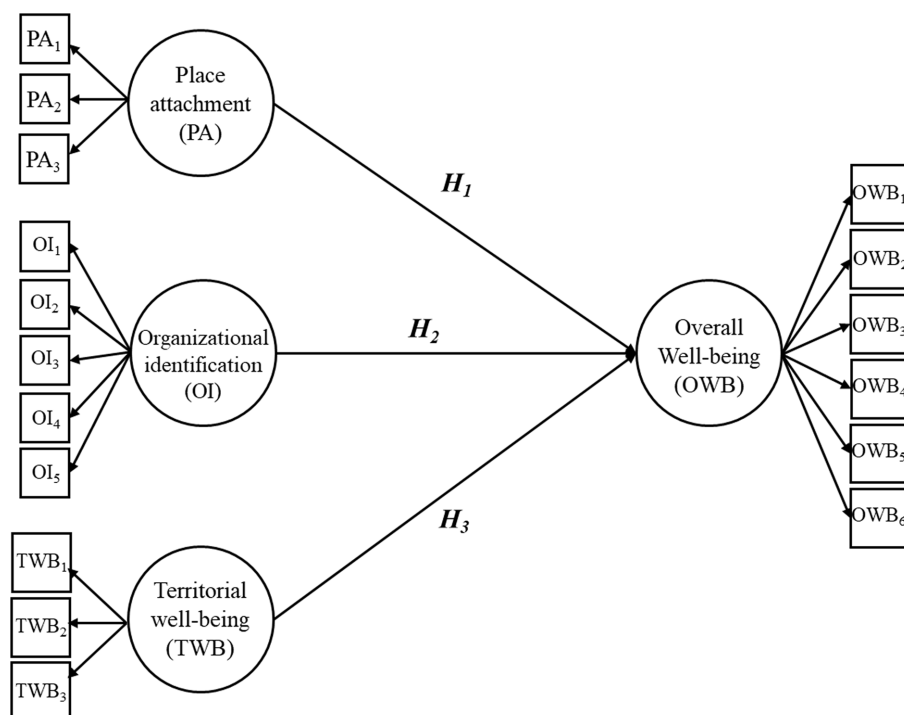

FIGURE 1
Full model along with research hypotheses.

3.2 Participants

Not all study participants responded to the demographic inquiries. Among the present responses, in sociodemographic terms, 57.9% of the sample were female workers (66 individuals), 39.5% were male workers (45 individuals), and 2.6% were nonbinary workers (3 individuals). 42.4% of the sample did not respond to the question (84 individuals). The predominant attributes expressed as a percentage are listed below: regarding marital status, 71.7% of the participants were married/cohabiting (81 individuals), 16.8% single (19 individuals), 10.6% separated/divorced (12 individuals), and 0.9% widowed (1 individual). 39.5% of the participants reported that they had underage children (45 individuals), 36.0% that they had no children (41 individuals), 16.7% that they had children of full age (19 individuals), and 7.9% that they had children of both full age and underage (9 individuals).

Lastly, almost 96.4% of the participants said that they lived in the university's hometown or province (102 individuals), 0.9% in other parts of the regions (1 individual), 3.6% in regions bordering the university (4 individuals), and 4.5% in distant regions (5 individuals). 43.2% of the sample did not respond to the question (86 individuals).

3.3 Analysis procedures

The empirical model was validated in its assumptions utilizing structural equation modeling. Prior to using this approach, certain preliminary analyses were created to validate the dependability and internal consistency of the measurements. To this end, reliability assessments such as Cronbach's alpha, McDonald's omega, and average variance extracted were performed. Additionally, to assess the theoretical consistency between the constructs, correlation tests were performed between the variables, calculated using synthetic indicators. Lastly, a structural equation model was evaluated, with particular attention paid to the goodness of fit of the structural and measurement model and the related fit indices (RMSEA, SRMR, CFI, TLI). Analyses were done using Jamovi program (Rosseel, 2019; Gallucci and Jentschke, 2021; Jamovi Project, 2021; R Core Team, 2021).

3.4 The survey and variables

The academic staff intercepted for research purposes answered a standardized quantitative questionnaire characterized by several constructs already validated in the literature. The items mentioning place demonstrate clearly to the in-depth case study and concentrate on the city of Foggia, as evident in the constructs below:

• Place attachment: three items from (Boley et al., 2021) and translated in Italian. Example item is "I am very attached to Foggia." The response is coded on a Likert scale that assumes choice options ranging from 1 = Not at all to 6 = Totally.

• Organizational identification: five items from (Mael and Tetrick, 1992), as translated in Italian by Brondino et al. (2022). Example item is "The success of the university is mine too." The reaction is measured on a Likert scale assuming choice options ranging from 1 = Not at all agree to 6 = Completely agree.

• Territorial well-being: three *ad hoc* constructed items. Example of item is "In your opinion, does the University of Foggia contribute to the overall well-being of the area, in terms of the cultural, social, and economic wealth it directly or indirectly brings?" The response is coded on a Likert scale which assumes choice options ranging from 1 = Not at all to 6 = Very much.

• Overall well-being: six items derived from the present scores on well-being as hypothesized by Esposito et al. (2022b), i.e., interpersonal, occupational, health, community, psychological, economic, and overall. An example of an item is "Given how your life is in general these days, which number do you choose now?" The response is coded on a Likert scale that assumes choice options ranging from 1 = Worse to 10 = Better.

4 Results

Table 1 shows that the values for skewness and kurtosis were all within the range $-2/+2$ and $-7/+7$, respectively (Curran et al., 1996); consequently, the distribution of the data appears apparently normal.

The variables considered in the study all had outstanding reliability and validity indices, as Table 2 demonstrates, with the only exception of the variable territorial well-being, which reveals a slightly lower Cronbach's alpha than the norm (0.66). Although the latter turns out to be the sole measure of reliability that is slightly subthreshold (in particular, an acceptable McDonald's omega of 0.73 and an Average Variance Extracted (AVE) over 0.50), it opens up the possibility of further in-depth research of the items of territorial well-being in the future. Regarding the remaining constructs, McDonald's omega is above 0.80 for the other constructs, whereas AVE is above 0.5 for all of them.

Regarding correlations (Table 3), conducted using synthetic indicators, data demonstrate positive and significant correlations between organizational identification and territorial well-being ($r_1 = 0.426$, <0,001), place attachment ($r_2 = 0.342$, <0.001), and overall well-being ($r_3 = 0.445$, <0.001), as well as between territorial well-being and place attachment ($r_4 = 0.258$, <0.001) and overall well-being ($r_5 = 0.437$, <0.001), and place attachment and overall well-being ($r_6 = 0.324$, <0.001).

Moreover, in terms of the structural equation model, the following standards were deemed suitable: (i) comparative fit index (hereafter CFI) ≥0.90, root–mean–square error of approximation (hereafter RMSEA) ≤0.08, and standardized root–mean–square residuals (hereafter SRMR) ≤0.10 (O'Boyle and Williams, 2011).

Hence, the goodness of fit of the model appears to be satisfactory except for RMSEA index, as CFI = 0.91, TLI = 0.90, SRMR = 0.075, and RMSEA = 0.089. The value of RMSEA, however, as indicated by Kenny et al. (2015), can be significantly impacted by the low sample size, so much so that the authors themselves raise the question of whether it should be utilized with small numbers. Regarding the structural model, all variables are sufficiently and significantly measured by their manifest indicators, as the saturation ranges for the factor organizational identification from 0.632 to 0.938, for territorial well-being from 0.433 to 0.923, for place attachment from 0.832 to 0.948, and for overall well-being from 0.464 to 0.907 (Table 4). As far as the measurement model is concerned, conversely, the explicit theoretical conjectures appear to be supported (as can be seen in Figure 2). Specifically, in fact, the place attachment ($\beta_1 = 0.21$, <0.05), the organizational identification ($\beta_2 = 0.34$, <0.05), and the role of territorial well-being that the mission of the university itself promotes

TABLE 1 Descriptive statistics of the sample.

	Place attachment	Organizational identification	Territorial well-being	Overall well-being
Mean	3.53	4.98	4.48	7.44
Standard deviation	1.42	1.17	0.861	1.71
Skewness	-0.129	-1.87	-1.24	-0.806
Std. error skewness	0.219	0.212	0.219	0.222
Kurtosis	-0.822	3.55	3.22	1.01
Std. error kurtosis	0.435	0.422	0.435	0.440

TABLE 2 Reliability indices for study variables.

Variables	α	ω	AVE
Place attachment	0.923	0.927	0.810
Organizational identification	0.897	0.882	0.633
Territorial well-being	0.660	0.726	0.508
Overall well-being	0.887	0.894	0.561

in the area ($\beta_3 = 0.31$, <0.05) appear to be viewed by the academic staff as helpful tools to improve well-being, understood in its multidimensional dimension. Thus, hypotheses H1, H2, and H3 were verified.

5 Discussion

Universities are among the significant institutions for the development of future generations of workers and for the social integration function they fulfill for the communities in which they are situated (Smith, 2007). To fulfill these missions, they need to study the organizational and psychological framework that enables workers to enhance their quality of life and well-being (Brondino et al., 2022). Universities, in turn, as they have undergone numerous changes recently, including the COVID-19 health emergency, require careful consideration and research to determine potential risk and protective variables (Esposito et al., 2022a). The current study aimed to close a gap in the existing literature, which focused on either interactional or situational dimensions (e.g., family/home stressors, job insecurity) that may be related to well-being, while there are no studies examining the individual dimension and perception in relation to social identity. Furthermore, studies in the field of social psychology demonstrate how social identity-related constructs (such as place attachment, organizational identification, and territorial well-being) act as antecedents of general well-being, contrary to what has been theorized in the job demands-resources model, which rather viewed them as mediators. Consequently, it appears intriguing to consider them as antecedents in the frame of work-organizational context. Overall, this study confirms how organizational identification, i.e., that individual process allows individuals (or workers) to incorporate favorable aspects of their organization within their own identity structure, acts as a driver of well-being, as identified in other studies, such as that of Hameed et al. (2022) and De Giorgio et al. (2023) At the same time, the study emphasizes other aspects related to relationality (in a broad sense) are also significant in promoting activities related to well-being. Specifically, in fact, as stated in the studies of Joaquim Araújo De Azevedo et al. (2013), Scannell and Gifford (2017), the significant

relationship with one's place (city) is extremely important in determining aspects of well-being. Lastly, although there are still few studies on the subject (Torrisi and Pernagallo, 2022), the possibility of intervening in the territory, promoting the growth of the economy and structures, can also instill well-being processes in workers.

Findings of the study demonstrated that for teaching and technical–administrative staff, among the key components for enhancing well-being in the academic setting is the social dimension of relationships, understood both inside and outside the university. As previously mentioned, relationships are the foundation for the development of a social identity (Harris and Orth, 2020) that is linked both to working groups and to the territory itself. Actually, the process by which this identity is realized is based on the logic of forming and strengthening interactional bonds with social groups based on belonging to a place or territory. Acting on the sense of belonging to an area, implementing and improving relations with the social actors involved, as well as on the sense of belonging and identification with an organization, can have specific effects in enhancing well-being.

Lastly, the study suggests a possible application of the identification elements associated with a location or an organization in terms of enhancing motivational processes, thus directly related to well-being. Specifically, according to the standpoint of the JD-R model (Bakker et al., 2023), these components could be considered the human and organizational resources. Personal resources are defined as "positive self-evaluations that are linked to resiliency and refer to individuals' sense of their ability to control and impact upon their environment successfully (…) [and] (a) are functional in … protect from threats and the associated physiological and psychological costs, and (b) stimulate personal growth and development" (Xanthopoulou et al., 2009, p. 236). Although this suggestion requires further study, with larger and more structured samples, the findings of this research demonstrate how attachment to a place and organizational identification, which might well be caused by the introduction of positive traits derived from the social mission of the university's third mission (i.e., from fostering the social well-being of the community), can enhance workers' well-being.

The study findings highlight the significance of creating well-being-oriented intervention programs that involve community and territorial engagement. Regular evaluations of the organizational climate could be instrumental in maintaining and advancing the identified protective variables.

6 Limitations

The study has some limitations that must be considered when interpreting the findings. First is the numerosity of the sample, which

TABLE 3 Correlation matrix between variables.

	Organizational identification	Territorial well-being	Place attachment	Overall well-being
Organizational identification	–			
Territorial well-being	0.426***	–		
Place attachment	0.342***	0.258**	–	
Overall well-being	0.445***	0.437***	0.324***	–

<0.01 *<0.001.

TABLE 4 Factor loadings and latent variables.

Latent variables	Indicators	Factor loadings	*p*.value
Organizational Identification	Item 1	0.819	<0.001
	Item 2	0.708	<0.001
	Item 3	0.937	<0.001
	Item 4	0.888	<0.001
	Item 5	0.634	<0.001
Territorial well-being	Item 1	0.946	<0.001
	Item 2	0.563	<0.001
	Item 3	0.416	<0.001
Place attachment	Item 1	0.912	<0.001
	Item 2	0.947	<0.001
	Item 3	0.832	<0.001
Overall well-being	Item 1	0.549	<0.001
	Item 2	0.844	<0.001
	Item 3	0.751	<0.001
	Item 4	0.501	<0.001
	Item 5	0.846	<0.001
	Item 6	0.721	<0.001

does not allow the findings to be generalized. Therefore, future research could use a bigger sample in order to reinforce the findings, going beyond the limitations of the present study, which probably also impacts specific fit indices such as the RMSEA. In this sense, therefore, an extension of the sample could lead to more consistent findings. Second, the metric of territorial well-being has a marginally lower reliability than desired by the relevant indices. This factor needs to be considered when interpreting the findings and in potential follow-up research, which might use more rigorous and reliable methods. Additionally, being a case study, the research requires additional data to support the findings, using workers from other universities in addition to the one considered in the study. Third, the measures in the study are derived from self-report questionnaires and are therefore susceptible to potential bias; a follow-up study using a more rigorous research design and a more thorough psychometric analysis of the constructs (particularly for the *ad hoc* built items) supported by the utilization of more objective measurements (e.g., number of events in the local territory which originate from the university, count of university–territory interactions) could give strength and empirical validity to the findings of this initial study. Finally, the nature of the study is cross-sectional, which is why a

longitudinal extension of it could provide both a deeper knowledge of the phenomenon being studied and a better robustness of results.

7 Conclusion

The study highlighted further that it is crucial for the university institution to address specific societal issues. Given the positive contribution of place attachment, organizational identification, and territorial well-being in fostering well-being among workers in the academic setting, it is crucial to consider this aspect as a potential element in raising the quality of life of workers. The social actors that define the university setting, in fact, can profit from these phenomena of a social nature for the development of positive personal self-esteem through the introduction of (positive) traits associated with groups or territories to which the individual attributes value. The human being, in reality, can develop a good self-image through social interactions or belonging to a common context or territory (Breakwell, 1999), elements that then flow into identity structures helpful for a coherent consideration of one's being. In this particular case, in fact, individual factors such as well-being turned out to be associated with processes intrinsically tied to the territory (place attachment and territorial well-being) and to a shared sense of belonging (organizational identification), all of which can serve as the foundation for the formation of social identities. Thus, the interaction between workers to strengthen organizational identification and the territory to create a sense of belonging constitutes work resources, i.e., components capable of creating motivational processes and favorable results. According to Ryff's theory (Ryff, 1989) and application studies in this area (Haslam et al., 2009; Sharma and Sharma, 2010), if social groups or belonging to a territory conveys positive meanings, purposes, and affiliations, these can influence psychological implications of improved well-being.

7.1 Practical implications

Ultimately, this study, despite its limitations, offers an empirical insight on the way in which workers' well-being can be promoted. Organizations, in actuality, are frequently seen as a straightforward means of generating wealth and advantage, thus without considering the relational and social aspect established inside. In this sense, in fact, an enhanced ability for dialog with the territory, promoting mutual learning and development, may inadvertently impact worker well-being. Therefore, focusing on the positive aspects of the organizations and the places in which they operate could allow a better identification with the worker and, consequently, greater well-being and quality of
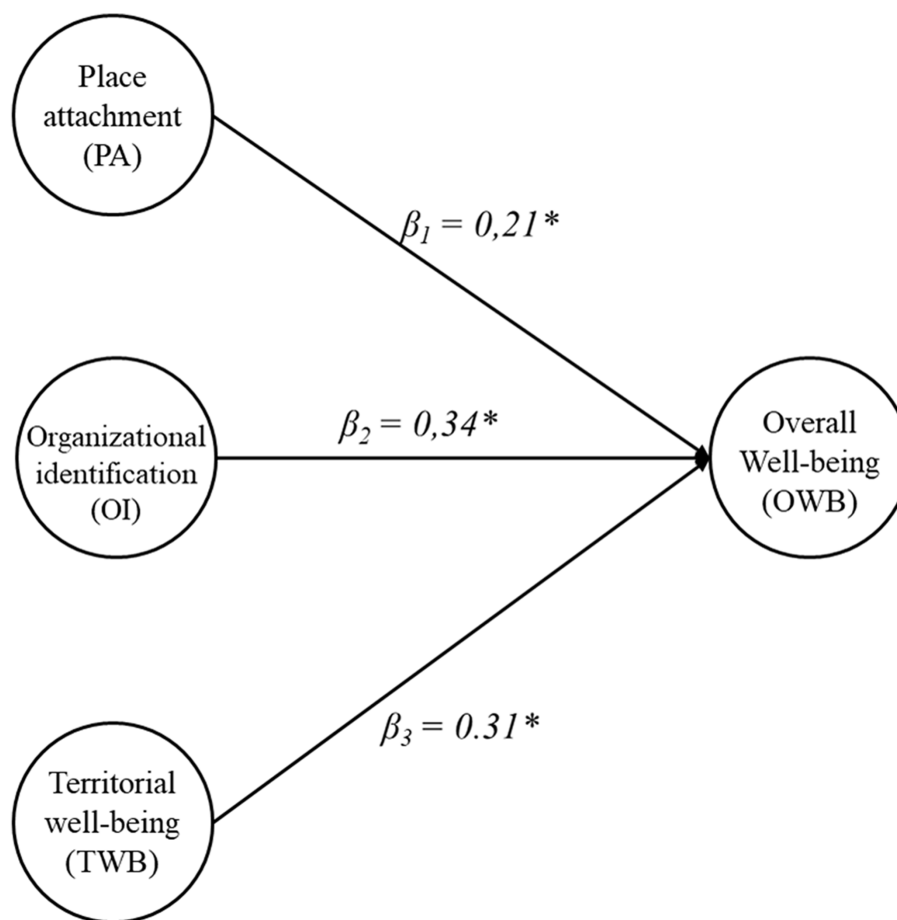
FIGURE 2
Model estimates.

life in the organization. At the same time, finally, encouraging collaboration between territories and institutions, such as universities, highlighting their function as "promoters of well-being," may benefit workers.

Data availability statement

The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author, stefania.fantinelli@unifg.it.

Ethics statement

The studies involving humans were approved by the University of Foggia Committee Board. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

FS: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. CE: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. IN: Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. BA: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Supervision, Validation, Writing – original draft, Writing – review & editing. EI: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Supervision, Validation, Writing – original draft, Writing – review & editing. TM: Conceptualization, Data curation, Investigation, Methodology, Resources, Software, Supervision, Validation, Writing – original draft, Writing – review & editing. GT: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources,

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Irritable Bowel Syndrome in medical students at a Peruvian university: a cross-sectional study

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Background: Irritable Bowel Syndrome has emerged as a significant public health challenge, particularly relevant in medical students due to the high demands of their studies, academic stress, and susceptibility to eating disorders. Nevertheless, conclusive evidence regarding the factors associated with Irritable Bowel Syndrome in the Latin American student population remains limited. The objective of this study was to determine the prevalence and factors associated with Irritable Bowel Syndrome in Human Medicine students at a university in northern Peru.

Methods: A cross-sectional analytical study conducted in Lambayeque, northern Peru. With 403 Human Medicine students (66.5% female, 33.5% male). A simple random probabilistic sampling type was used, based on a list of students enrolled. A multivariate analysis was conducted to determine the factors associated using simple and multiple regression models. Generalized Linear Models were applied, using the Poisson distribution family, robust variance, and the academic year as a cluster.

Results: The prevalence of Irritable Bowel Syndrome was 16.9% (95% CI: 13.37–20.86). The median age was 21 years, with 66.5% being female. In the multiple regression analysis, Irritable Bowel Syndrome was associated with a higher prevalence of depression (PR: 3.63; 95% CI: 1.26–10.49) and eating disorders (PR: 1.57; 95% CI: 1.01–2.43). For each additional year of age, the prevalence of Irritable Bowel Syndrome decreased by 9% (PR: 0.91; 95% CI: 0.83–0.99).

Conclusion: This study reveals that approximately two out of every 10 students exhibit symptoms related to IBS, underscoring its significance in the Human Medicine student population. Furthermore, depression and eating disorders were identified as significant factors associated with IBS in students. Consequently, it is essential to focus efforts on early identification and the implementation of preventive measures to mitigate the development of this pathology, given its substantial prevalence in this context of Human Medicine students.

KEYWORDS

Irritable Bowel Syndrome, medical students, social factors, Peru, mental health

Introduction

Irritable Bowel Syndrome (IBS) is a benign functional digestive disorder with significant social and economic repercussions on the daily lives of those affected by it (1). According to the Rome IV criteria, IBS is defined as the presence of recurrent abdominal pain for more than 3 days per month, during the previous 3 months, associated with two or more of the following criteria (relation to defecation, changes in stool frequency, and/or changes in stool consistency) (2). The symptoms characterizing IBS include chronic abdominal pain accompanied by abdominal distension and flatulence, predominantly diarrheal bowel movements, and constipation or mixed bowel habits caused by a biochemical or structural abnormality (3).

According to a systematic review, the global prevalence of IBS ranges between 9.3 and 35.5% (4). In Italy, 21.1% of medical and nursing students presented IBS based on Rome IV criteria, and it was associated with anxious symptoms and adherence to the Mediterranean diet (5). In Malta, 17.7% of medical students and young physicians experienced IBS using Rome IV criteria (6). Among French university students, IBS prevalence was 7.8%, with higher prevalence associated with depressive symptoms, stress, insomnia, cyber addiction, and eating disorders using Rome III criteria (7). In German university students, an association between psychological stress and IBS was evident according to Rome III criteria (8). In Saudi Arabia, the prevalence of IBS was 2.7% in medical students based on Rome IV criteria (9).

However, the average prevalence of IBS for Latin America was 15.4%; furthermore, according to Rome II, III, and IV criteria, the prevalence of IBS was 23.5, 11.8, and 6.98%, respectively (10). Multiple factors have been proposed that influence the increase in IBS prevalence (4), such as bacterial etiology, psychological components (stress, anxiety, and/or depression), social and academic factors, female gender (11), and disorders in eating behavior (7). In Puerto Rico, 36.3% of medical students exhibited IBS according to Rome III criteria, of which 48.1% were females with IBS, and family history of IBS and stress were positively associated with IBS, in contrast to tobacco use, which acted as a protective factor (12). In Peru, it was found that the prevalence was 9.5% for IBS, using Rome III criteria, and it was also concluded that students in their final year and those with stress symptoms were more frequently associated with this syndrome (13).

IBS represents a significant public health problem and is primarily reflected in medical students, due to their high study hour demands, academic stress overload, eating disorders, among others (4, 7). However, currently in Latin America, very little is known about the prevalence and its factors associated with IBS in this student population, as there are few published studies (11, 12). Previous studies have collected data in very small populations (14, 15). Other studies conducted on medical students in Ecuador and Peru have used outdated Rome criteria (Rome III criteria) (16, 17). Moreover, it is worth noting that the aforementioned studies have not employed rigorous biostatistical methods, the findings are descriptive, and variables such as alcohol consumption, tobacco dependence, which were associated with IBS (14–17), have not been evaluated and have been considered in the present research.

Additionally, IBS transcends its initial physiological manifestations, delving into psychosomatic intricacies that profoundly affect the enduring academic quality of life (8, 18, 19), particularly medical students. The persistent nature of IBS introduces an interplay between gastrointestinal symptoms and the psychological well-being of medical students, potentially resulting in heightened stress and anxiety over time (7, 20–22). These compounded psychosomatic effects may manifest as obstacles to sustained academic performance, disrupting concentration, productivity, and overall academic well-being specifically within the demanding context of medical education (22).

Given the above, the general objective of this study is to determine the prevalence and factors associated with IBS in Human Medicine students from a northern Peruvian university, 2021. Additionally, as a specific objective, we aim to estimate the prevalence of Irritable Bowel Syndrome (IBS) within the sampled medical student population. We hypothesize that factors such as academic year, female gender, depressive and stress symptoms, as well as eating disorders, will be associated with a higher prevalence of IBS.

Methods

Study design and population

An analytical cross-sectional study was conducted with the aim of determining the prevalence and factors associated with IBS in human medicine students at the Universidad San Martin de Porres (USMP)-Northern Branch during the academic period 2021–2. The study population consisted of 1,325 students from the first to the seventh academic year of the Faculty of Human Medicine at the USMP–Northern Branch during the academic semester 2021–2.

A simple random probabilistic sampling type was used, employing the statistical software EpiDat 4.2, based on a list of students enrolled in the current cycle 2021–2. For the sample size calculation, a statistical formula for finite population was used, employing a precision of 5%, a confidence level of 95%, and an expected proportion of 9.5%, similar to a study applied to human medicine students in Peru (13), resulting in a sample size of 121 students; to this, an additional 10% for losses and 10% for rejection were added, giving a sample size of 146 students. However, this research managed to capture a larger number of students than estimated, as convenience sampling was used ($n = 409$).

All students from the first to the seventh year of the Faculty of Human Medicine at the USMP-Northern Branch were included. Students who refused to participate after informed consent ($n = 24$), students who reported having a diagnosis of IBS ($n = 4$), and students who reported having a history of recently diagnosed structural gastrointestinal pathologies (less than 1 year) and/or recently performed gastrointestinal surgeries (less than 1 year) ($n = 2$) were excluded.

Variables

IBS was the dependent variable, operationally defined as any person clinically diagnosed through a questionnaire based on the Rome IV criteria, which categorizes as IBS the presence of recurrent abdominal pain for more than 3 days per month, during the previous 3 months, associated with two or more criteria (related to defecation, changes in stool frequency, and/or changes in stool consistency).

The independent variables were age (expressed in years), sex (male or female), academic year (I, II, III, IV, V, VI, and VII year), anxiety disorders (normal, mild, moderate, severe), depression (normal, mild, moderate, severe), stress (normal, mild, moderate, severe), eating behavior disorders (present or absent), daily hours of sleep (less than 8 h/day and 8 h or more/day), self-report of frequent tobacco use (no, yes), and self-report of frequent alcohol consumption (no, yes).

Instruments

A questionnaire was designed consisting of:

Socio-educational Data: a questionnaire was constructed based on 13 questions: academic year (from first to seventh year), age (expressed in years), sex (male or female), self-report of weight (expressed in kilograms), self-report of height (expressed in cm), self-report of frequent alcohol consumption (Yes or No), self-report of exhaustion due to academic activities (Yes or No), self-report of regular physical activity (Yes or No), quality of sleep measured by hours of sleep (<8 h/day or ≥ 8 h/day), parents' marital status (single or married), and student's place of residence (parents' house, own house, or apartment rental).

Rome IV Questionnaire: designed to identify and clinically diagnose patients with the presence of Irritable Bowel Syndrome, it is composed of six questions based on the new Rome IV criteria (2). A study on the validity of this questionnaire in the adult population was conducted, considering 1,162 participants without previous gastrointestinal disorders; the questions were formulated and verified with clinical experts using a recursive process, yielding a sensitivity of 62.7% and a specificity of 97.1% for Irritable Bowel Syndrome (23). Another study conducted in Argentina compared the degree of agreement for the old and modern Rome criteria (I-IV), of which the Rome III and IV criteria stand out above the rest, having a Kappa index of 0.87, compared to Rome II (Kappa index: 0.73) and Rome I (Kappa index: 0.76) (24). The current questionnaire consists of a dichotomous question (Yes or No), a picture selection question (Bristol Scale), three multiple-choice questions: Always (100%), Almost always (66%), Sometimes (33%), and Never (0%), and the last one about frequencies (Never, less than 1 day per month, 1 day during the month, 2 to 3 days during the month, 1 day during the week, 2 to 3 days during the week, 4 to 6 days during the week, and more than 6 days during the week). To establish the diagnosis of IBS, the following must be met: Q42 (1 day a week) + Q46 (Yes) + two of the following (Q43, Q44, Q45) with a minimum response of "Sometimes."

DASS21: questionnaire designed to measure stress, anxiety, and depression consisting of 21 items; which are subdivided into three subscales to find the aforementioned parameters (depression, anxiety, and stress). The responses are represented on a Likert scale; the options have a score of 0 ("does not describe anything that happened to me") to three points ("Yes, this happened to me a lot, or almost always"), with the maximum score for each subscale being 21 points, respectively (25). This scale was applied in a population of adolescents and university students in Chile, yielding a Cronbach's alpha of 0.91 (26).

SCOFF: questionnaire to determine symptoms related to eating behavior disorders (anorexia and bulimia nervosa) in the last 3 months. It consists of five items, each question has dichotomous answers (yes or no), of which affirmative answers are worth one point

and negative answers zero points; thus, they will be valued on the five-point Likert scale (Between zero and five) (27). The questionnaire ranges from zero to five points, within which the cut-off points for eating behavior disorder are two or more points. In a study conducted in Colombia, in a population of young university students, it yielded a Cronbach's alpha of 0.480 (28).

Procedures

A virtual questionnaire was designed that included elements from the DASS-21 instruments, the SCOFF Questionnaire, and the Rome IV Criteria (obtained from the Rome Foundation) (2). This questionnaire was implemented through the REDCap platform and distributed to medical students via email and personal WhatsApp. Before participating, electronic informed consent was presented. The average time to complete the questionnaire was approximately 15 min, and its completion was promoted during weekends, avoiding coinciding with academic activities or upcoming exams. The collected data were automatically stored in a 2016 Excel database for subsequent processing and analysis.

In adherence to rigorous reporting standards, this study meticulously followed the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) checklist guidelines, ensuring transparency and completeness in presenting our observational study's data.

Statistical analysis

Statistical analysis was performed in the Stata v.17.0 program

Univariate analysis was performed to estimate absolute and relative frequencies. For numerical variables, the best measure of central tendency and dispersion was estimated, after evaluating the assumption of normal distribution. Bivariate analysis was performed, using contingency tables to evaluate the factors associated with IBS. For qualitative variables, the Chi-square test or Fisher's exact test was used, after evaluating the assumption of expected frequencies. For numerical variables, the assumption of normal distribution was evaluated, and depending on this, the Student's t-test or Mann Whitney U test was used, as appropriate. Finally, a multivariate analysis was conducted to determine the factors associated with IBS using simple and multiple regression models, which allowed estimating the prevalence ratio (PR) with a 95% confidence interval. Generalized Linear Models (GLM) were applied, using the Poisson distribution family, robust variance, and the academic year as a cluster. Variables that were significant in the simple model were included in the multiple model (p less than 0.05). Colinearity between the variables of interest was assessed.

Results

General description of the population

Out of the 403 surveyed Human Medicine students, the average age was 21 years, with a higher percentage being women (66.5%), and 22.6% were in their third year. 50.9% of the students do not exercise

regularly. 77.9% reported sleeping less than 8 h a day. It was also found that 27.3% showed moderate depression, 26.5% had extremely severe anxiety, and 40.4% of the participants had eating behavior disorders. 9.7% reported having a family member diagnosed with IBS. 16.9% (95% CI: 13.37–20.86) of medical students had IBS (Table 1).

Prevalence and characteristics of IBS

In the bivariate analysis, we found significant differences in the prevalence of IBS according to sex (10.2% males vs. 20.2% females; $p = 0.011$), age ($p = 0.003$), and academic year ($p = 0.014$). Students with severe depression levels had a higher frequency of IBS compared to those without depression (32.0% vs. 3.5%; $p < 0.001$). Students who exhibited severe anxiety levels had a higher frequency of IBS compared to those without anxiety (29.8% vs. 5.3%; $p < 0.001$). Additionally, it was found that students with eating behavior disorders had a 14.6% higher frequency of IBS compared to those without such disorders (25.8%) (Table 2).

In the simple regression model, we found that the factors associated with lower prevalence of IBS were age (PR: 0.88; 95% CI: 0.79–0.97) and sex (PR: 0.52; 95% CI: 0.34–0.81). Meanwhile, the factors associated with higher prevalence were having depression (PR: 6.30; 95% CI: 2.59–15.33), having anxiety (PR: 4.07; 95% CI: 1.63–10.13), and exhibiting eating behavior disorders (PR: 2.32; 95% CI: 1.70–3.18). In the multiple regression model, what was observed in the simple model was retained in terms of magnitude and direction, except for the variables of sex and anxiety. The prevalence of IBS was higher in students with depression (PR: 3.63; 95% CI: 1.26–10.49) and with eating behavior disorders (PR: 1.57; 95% CI: 1.01–2.43). Additionally, for each additional year of age, the prevalence of IBS was reduced by 9% in students (PR: 0.91; 95% CI: 0.83–0.99) (Table 3).

Discussion

Prevalence of IBS

In our study, it was found that 16.9% of the participants had IBS, according to the new Rome IV criteria. This prevalence is within the range reported (9.3–35.5%) in a systematic review, based on 16 studies reported in 2015, in a population of human medicine students; however, the criteria used were from previous versions (Rome III, Rome II, and Rome I) (4).

Regarding European studies, our research demonstrates a prevalence lower than that found in medical and nursing students in Italy (21.1%) (5), slightly lower than reported in medical students and young physicians in Malta (17.7%) (6). However, it is higher than the prevalence described in French university students (7.8%) (7). It is important to note that our study employed the Rome III criteria for assessment (7).

Nevertheless, this is slightly higher than the average total prevalence reported for IBS in the general population in Latin America, which was estimated at 15.4% (Rome II criteria 23.5%; Rome III 11.8%; and Rome IV 6.98%) (10). The prevalence of the present study reflects a superiority compared to another study conducted in human medicine students from a university in Peru, using the Rome

TABLE 1 Socio-educational characteristics of human medicine students.

Characteristics	N (%)
Age (years)*	21 (19–23)
Sex	
Female	272 (66.5)
Male	137 (33.5)
Academic year**	
1st year	60 (14.9)
2nd year	51 (12.7)
3rd year	91 (22.6)
4th year	60 (14.9)
5th year	40 (9.9)
6th year	39 (9.7)
7th year	62 (15.4)
Frequent alcohol consumption	
No	376 (91.9)
Yes	33 (8.1)
Frequent tobacco use	
No	392 (95.8)
Yes	17 (4.2)
Exhaustion from career activities**	
Never/almost never	15 (3.7)
Sometimes	217 (53.9)
Almost always/always	171 (42.4)
Regular exercise**	
No	198 (49.1)
Yes	205 (50.9)
Parents' condition**	
Living together	309 (76.7)
Single	94 (23.3)
Family member diagnosed with IBS**	
No	364 (90.3)
Yes	39 (9.7)
Current housing**	
Parents' house	351 (87.1)
Own house	23 (5.7)
Apartment rental	29 (7.2)
Level of depression**	
Normal	115 (28.3)
Mild	68 (16.8)
Moderate	111 (27.3)
Severe	50 (12.3)
Extremely severe	62 (15.3)
Level of anxiety**	
Normal	114 (28.0)
Mild	72 (17.7)

(Continued)

TABLE 1 (Continued)

Characteristics	N (%)
Moderate	66 (16.2)
Severe	47 (11.6)
Extremely severe	108 (26.5)
Level of stress**	
Normal	151 (37.2)
Mild	68 (16.8)
Moderate	89 (21.9)
Severe	77 (19.0)
Extremely severe	21 (5.2)
Hours of sleep**	
<8 h/day	314 (77.9)
≥8 h/day	89 (22.1)
BMI (Body Mass Index)**	
Normal	278 (69.5)
Overweight	108 (27.0)
Obesity	14 (3.5)
Eating behavior disorder**	
No	241 (59.7)
Yes	163 (40.4)
Irritable Bowel Syndrome	
No	340 (83.1)
Yes	69 (16.9)

*Median (25th percentile – 75th percentile).
**Some variables do not sum up to 409 due to missing data.

III criteria, in which the prevalence of IBS was 12.4% (29). It is also slightly higher than another study conducted in human medicine students from a university in Malaysia, where the Rome IV criteria were used, finding that the prevalence of IBS was 14.7% (30). However, it differs from another research carried out in human medicine students from Paraguay, using the Rome IV criteria, where the prevalence was higher (23.8%) (14). It is lower than a study conducted in human medicine students from a university in Puerto Rico; however, they used the Rome III criteria, finding a prevalence of IBS of 36.3% (12).

The high prevalence of IBS found in this research could be explained by the fact that human medicine students experience situations of high academic stress, extensive study hours that generate alterations in the circadian rhythm, leading to insomnia problems and lifestyle disorders (1). High academic stress generates stimulation in the hypothalamic–pituitary–adrenal axis, triggering the release of a series of substances, highlighting corticotropin-releasing hormone, adrenocorticotropic hormone (ACTH), and cortisol; these, in turn, affect intestinal function (inhibiting the growth of the microbiota) and stimulate the sympathetic nervous system (altering intestinal motility) (31). Lastly, it has been seen that long hours of insomnia lead to prolonged and sustained release of ACTH and cortisol, generating alterations in motility and gastrointestinal functionality, as mentioned above (32).

Factors associated with IBS

Students with depression had a higher prevalence of IBS. This is consistent with what was described in a study conducted in human medicine students from a university in Malaysia, where it was found that students with depression were more likely to have IBS (OR: 4.7; 95% CI: 2.01–11.1) (30). Another study conducted in Human Medicine students from Arabia also found that depression increased the likelihood of IBS (OR: 3.28; 95% CI: 1.85–5.82) (33). This is consistent with a meta-analysis study that included 22 cross-sectional studies in human medicine university students, finding that students with depression had a statistical association for the development of IBS (OR: 2.15; 95% CI: 1.88–2.47) (34). Our results mirror those reported in France, where depressive symptoms were positively associated with having IBS (ORa: 1.16; 95% CI: 1.03–1.31) (7). This association could be explained by abnormal responses that occur at the level of the central nervous system (CNS) to fluctuating mood situations, which send signals to the gastrointestinal tract, leading to the appearance of intestinal contractions that subsequently cause the characteristic symptoms of IBS (30).

Having an eating disorder increased the prevalence of IBS by 57%. This is consistent with what was documented in a study conducted in France, which evaluated students from different careers (engineering, psychology, medicine, nursing, among others), and students with eating disorders were twice as likely to have IBS (OR: 2.42; 95% CI: 1.30–4.51) (7). This is reinforced by similar studies which conclude that between 41 and 52% of patients with eating disorders tend to have IBS (35–37). This association could be explained by the fact that students spend many hours studying, which leads to the development of stress that leads to the consumption of foods high in carbohydrates and fats, which contributes in the long term to the slowing of gastrointestinal transit, favoring the development of IBS with the constipation phenotype according to the Rome IV-Bristol Scale (38).

For each additional year of age, the prevalence of IBS decreased by 9%. This is consistent with what was described in a descriptive study conducted in Arabia, based on a general population (age ≥ 18 years) of 1,319 people, in which the prevalence of IBS was higher in adolescents (4.7%), but decreased with age, however, this finding was not so significant ($p = 0.196$) (39). However, it contrasts with what was reported by Vázquez R et al. who found that the prevalence of IBS was higher in senior students from Peru, compared to junior students, being statistically significant (OR: 2.77; 95% CI: 1.30–5.92; $p < 0.01$) (13).

It also contradicts the findings of Agwa et al., as their research indicated that age did not show statistical significance with IBS ($p = 0.135$) (9). Spillebout et al. similarly failed to observe an association between age and IBS in French university females (ORa: 0.98; 95% CI: 0.84–1.13) (7). This association could be explained because senior medical students have higher stress loads, however, they had more experience in managing stress loads, learned in the early years (13).

Presenting anxious symptoms increased the prevalence of IBS in the simple model, however, this association was diluted in the multiple models. This is consistent with what was described in a systematic review based on data from a university population in China, and it was found that anxiety increases the likelihood of the appearance of IBS (OR: 2.35; 95% CI: 2.03–2.72) (34). Additionally, our findings are

TABLE 2 Factors associated with IBS in human medical students in bivariate analysis.

Variables	Irritable Bowel Syndrome		p*
	No (n = 340)	Yes (n = 69)	
	n (%)	n (%)	
Age (years)****	21 (19–24)	20 (18–22)	0.003***
Sex			0.011
Female	217 (79.8)	55 (20.2)	
Male	123 (89.8)	14 (10.2)	
Academic year			0.014
1st year	40 (66.7)	20 (33.3)	
2nd year	43 (84.3)	8 (15.7)	
3rd year	75 (82.4)	16 (17.6)	
4th year	52 (86.7)	8 (13.3)	
5th year	33 (82.5)	7 (17.5)	
6th year	34 (87.2)	5 (12.8)	
7th year	57 (91.9)	5 (8.1)	
Frequent alcohol consumption			0.834
No	313 (83.2)	63 (16.8)	
Yes	27 (81.8)	6 (18.2)	
Frequent tobacco use			0.749**
No	325 (82.9)	67 (17.1)	
Yes	15 (88.2)	2 (11.8)	
Exhaustion from career activities			0.848
Never/almost never	13 (86.7)	2 (13.3)	
Sometimes	178 (82.0)	39 (18.0)	
Almost always/always	143 (83.6)	69 (16.4)	
Regular exercise			0.302
No	168 (84.9)	30 (15.2)	
Yes	166 (81.0)	39 (19.0)	
Parents' condition			0.364
Living together	259 (83.8)	50 (16.2)	
Single	75 (79.8)	19 (20.2)	
Family member diagnosed with IBS			0.299
No	304 (83.5)	60 (16.5)	
Yes	30 (76.9)	9 (23.1)	
Current housing			0.542
Parents' house	289 (82.3)	62 (17.7)	
Own house	21 (91.3)	2 (8.7)	
Apartment rental	24 (82.8)	5 (17.2)	
Level of depression			<0.001
Normal	111 (96.5)	4 (3.5)	
Mild	61 (89.7)	7 (10.3)	
Moderate	84 (75.7)	27 (24.3)	
Severe	34 (68.0)	16 (32.0)	
Extremely severe	47 (75.8)	15 (24.2)	
Level of anxiety			<0.001

(Continued)

TABLE 2 (Continued)

Variables	Irritable Bowel Syndrome		p*
	No (n = 340)	Yes (n = 69)	
	n (%)	n (%)	
Normal	108 (94.7)	6 (5.3)	
Mild	67 (93.1)	5 (6.94)	
Moderate	52 (78.8)	14 (21.2)	
Severe	33 (70.2)	14 (29.8)	
Extremely severe	78 (72.2)	30 (27.8)	
Level of stress			0.092
Normal	135 (89.4)	16 (10.6)	
Mild	54 (79.4)	14 (20.6)	
Moderate	73 (82.0)	16 (18.0)	
Severe	59 (76.7)	18 (23.4)	
Extremely severe	16 (76.2)	5 (23.8)	
Hours of sleep			0.177
<8 h/day	256 (81.53)	58 (18.5)	
≥8 h/day	78 (87.6)	11 (12.4)	
BMI (Body Mass Index)			0.217
Normal	225 (80.9)	53 (19.1)	
Overweight	94 (87.0)	14 (13.0)	
Obesity	13 (92.9)	1 (7.1)	
Eating behavior disorder			<0.001
No	214 (88.8)	27 (11.2)	
Yes	121 (74.2)	42 (25.8)	

* P-value of categorical variables calculated with the Chi-Square test.
** P-value of categorical variables calculated with Fisher's exact test.
*** P-value of categorical-numerical variables calculated with the Mann–Whitney U test.
**** Median – interquartile range.

consistent with those reported in medical and nursing students in Italy, where anxious symptoms were associated with a higher prevalence of IBS (5). This is also similar to another study in Human Medicine students from Saudi Arabia, in which it was found that anxiety increased the likelihood of presenting IBS (OR: 2.44; 95% CI: 1.30–4.55) (33). Furthermore, it is consistent with the findings reported by Spillebout et al., where French university females with anxiety had a 1.20 times higher probability of IBS (ORa: 1.20; 95% CI: 1.04–1.40) (7). However, it contrasts with what was reported by Seger et al. in Malaysia where the anxiety factor was not associated with IBS (OR:1) (30). The association found, at least in the simple model, could be explained by the same conditions that depression generates for the appearance of IBS, through which there is a bidirectional relationship between the central nervous system (CNS) and the enteric system that when faced with situations of anxiety generate abnormal responses in the motility of the gastrointestinal tract (40).

Male students had a lower prevalence of IBS in the simple model, however, this association was diluted in the multiple model. This is consistent with what was described in a study in a university population in Lebanon, in which it was found that women had a higher significant correlation with IBS compared to men (OR: 0.40; 95% CI: 0.26–0.61) (11), this factor is also reinforced with another study conducted in France, in which it was found that women were

2.4 times more likely to have IBS than men (OR: 2.4; 95% CI: 1.2–4.7) (41). Our findings align with those in France, where female university students had a 2.49 times higher probability of presenting IBS compared to males (ORa: 2.49; 95% CI: 1.14–5.45) (7). However, another study conducted in Saudi Arabia found that the male population had a higher significant correlation (OR: 3.31; 95% CI: 1.59–6.87) (42). This differs from findings in Saudi Arabian university students, where gender was not associated with IBS ($p = 0.793$) (9). This association could be explained because women experience more hormonal variations, and these hormones predispose to weaker regulation in stressful situations, in addition to hindering gastrointestinal peristalsis, as they increase sympathetic tone, and are also said to increase the perception of visceral pain; leading to a higher association with IBS compared to men (43).

Relevance of findings in public health

The results of the present study provide preliminary scientific evidence that IBS is very common in human medicine students, thereby offering a consistent analysis for implementing preventive measures. For example, encouraging improvements in lifestyle, reinforcing participation in sports activities to reduce the constant stress experienced

TABLE 3 Factors associated with IBS in human medicine students, in simple and multiple regression analysis.

Characteristics	Irritable Bowel Syndrome					
	Simple regression			Multiple regression		
	RP	95% CI	p*	RP	95% CI	p*
Age (years)*	0.88	0.79–0.97	0.015	0.91	0.83–0.99	0.028
Sex						
Female	Ref.			Ref.		
Male	0.52	0.34–0.81	0.004	0.85	0.61–1.18	0.335
Frequent alcohol consumption						
No	Ref.					
Yes	1.32	0.45–3.90	0.608			
Frequent tobacco use						
No	Ref.					
Yes	1.06	0.21–5.38	0.940			
Exhaustion from career activities						
Never/almost never	Ref.					
Sometimes	1.35	0.33–5.46	0.676			
Almost always/always	1.23	0.33–4.51	0.757			
Regular exercise						
No	Ref.					
Yes	1.26	0.90–1.76	0.185			
Parents' condition						
Living together	Ref.					
Single	1.25	0.86–1.82	0.245			
Family member diagnosed with IBS						
No	Ref.					
Yes	1.40	0.72–2.71	0.317			
Current housing						
Parents' house	Ref.					
Own house	0.49	0.17–1.39	0.179			
Apartment rental	0.98	0.44–2.16	0.952			
Depression						
No	Ref.					
Yes	6.30	2.59–15.33	<0.001	3.63	1.26–10.49	0.017
Anxiety						
No	Ref.					
Yes	4.07	1.63–10.13	0.003	1.59	0.71–3.57	0.264
Stress						
No	Ref.					
Yes	1.95	0.78–4.86	0.154			
BMI (Body Mass Index)						
Normal	Ref.					
Overweight	0.68	0.31–1.49	0.336			
Obesity	0.37	0.06–2.35	0.295			
Hours of sleep						
<8 h/day	Ref.					
≥8 h/day	0.67	0.35–1.35	0.229			
Eating behavior disorder						
No	Ref.					
Yes	2.32	1.70–3.18	<0.001	1.57	1.01–2.43	0.044

*P values obtained with Generalized Linear Models (GLM), Poisson family, log link function, robust variance, cluster by academic year.

during university life (44, 45), or employing educational talks on nutrition such as the use of a low FODMAP diet (46) or consuming a diet richer in proteins, as it acts as a protective factor for IBS (47). All the aforementioned have had a positive effect on IBS, aiming to prevent its progression and/or severity (46). This would seek to avoid economic expenses for medical treatment and also to achieve optimal academic learning. Our study is relevant as it encourages the development of more research with a longitudinal design, in which students are followed through academic cycles, and multiple participating university campuses are included to more accurately determine the prevalence of IBS in students. Additionally, future studies could include specialized and multidisciplinary evaluation composed of gastroenterologists, psychiatrists, nutritionists, and psychologists; generating preventive measures: formulating suitable diets for each student, raising awareness of warning signs of functional dyspepsia through educational sessions to prevent the onset or progression of anxiety or depression during undergraduate studies. Thus, limiting the progression of IBS and avoiding substantial expenses in treatment.

Practical implications of the study

The study's revelation of a 16.9% prevalence of IBS among medical students, coupled with identified factors influencing its occurrence, holds substantial practical implications for student well-being and academic success. The lower prevalence observed among younger and male students underscores the imperative for tailored preventive and stress management strategies. Specific interventions should address the distinct challenges faced by these demographic groups, promoting a nuanced and personalized approach to enhance overall mental health and well-being. Conversely, the heightened prevalence linked to depression and eating behavior disorders necessitates the integration of mental health and nutritional support services within academic healthcare structures. These findings emphasize the imperative for medical institutions to prioritize comprehensive student wellness initiatives that address both physiological and psychological aspects. Implementing targeted interventions, including stress management programs, mental health resources, and nutritional counseling, stands poised to not only alleviate the burden of IBS but also enhance the overall health and resilience of medical students throughout their academic journey.

Limitations and strengths

This research presents some limitations. First, potential selection bias, as it only involves findings from one university campus and the findings cannot be inferred to the entire study population. Second, due to the cross-sectional design of the study, it is not possible to attribute causality between the variables that were associated with IBS. While a longitudinal study would offer valuable insights into the long-term effects of the interventions, the current study's cross-sectional approach provides valuable insights into the prevalence and immediate associations of Irritable Bowel Syndrome (IBS) among medical students. The findings serve as a foundation for future research endeavors, potentially including longitudinal studies, to delve deeper into the temporal aspects and causal relationships. This acknowledgment ensures transparency about the study's scope and sets the stage for further exploration and refinement of the research questions in subsequent investigations. Third, there is a temporal bias,

as it was based only on students enrolled in the study cycle, and therefore it was not possible to follow up subsequently, as the study was conducted in a specific period of time. Fourth, since the research was conducted virtually, it could lead to social desirability bias, as some students might not report real responses. Fifth, measurement bias, as variables such as sleep, physical activity, and academic stress have been measured by self-report and not with validated and reliable instruments; moreover, other variables associated with IBS have not been evaluated (family income, lifestyle characteristics, academic performance, history of traumatic events, history of intestinal infections, among others) (4, 48). Despite the limitations, we have the following strengths: this research has used updated Rome IV instruments, DASS21, which have high sensitivity and specificity, and have been applied to Human Medicine students globally (2, 16). Additionally, these findings represent a solid approach based on rigorous biostatistical-epidemiological methods that have allowed estimating consistent findings on the causative factors of IBS in human medicine university students, and have included students from all academic years. Furthermore, a large and diverse sample of the student population from a Latin American country has been collected, which adds to the existing knowledge gap in the regional context. Finally, it allows us to understand a disease that has been little reported nationally and even more so in human medicine university students.

Conclusion

In the present study, it was found that 2 out of every 10 students developed IBS. The factors that showed a higher prevalence of association with IBS were depression and eating behavior disorders. Additionally, it was observed that as age increased, the prevalence of IBS decreased. These results underline the importance of implementing preventive measures, such as improving diet, promoting exercise, and offering educational talks, to prevent the development of IBS in this student population.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving humans were approved by the Research Ethics Committee of the Universidad de San Martín de Porres (Official Letter No. 040-2022). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

PQ-C: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Software, Supervision, Writing – original draft, Writing – review & editing. IB-V: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project

administration, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. DV-G: Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing. VV-P: Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Software, Supervision, Visualization, Writing – review & editing. JZ-V: Formal analysis, Methodology, Resources, Validation, Visualization, Writing – original draft. CP-V: Formal analysis, Funding acquisition, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing – review & editing. MV-G: Data curation, Funding acquisition, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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First validation of the technical and administrative staff quality of life at work tool (TASQ@work) in academia

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Introduction: Based on the job demands-resources (JD-R) model, the present study aimed to validate "The Technical and Administrative Staff Quality of Life At Work" (TASQ@work), a new tool to assess the quality of life at work in academia focused on technical and administrative staff.

Methods: This tool was developed by the QoL@Work research team, a group of expert academics in the field of work and organizational psychology affiliated with the Italian Association of Psychologists. The TASQ@work was elaborated in different steps. The first phase was aimed at the identification of the dimensions of the tool. The second phase was aimed to assess the psychometric properties of the tool. The validation process involved confirmatory analysis and measurement invariance of the various constructs selected. The analyses were performed in a convenience sample of two Italian universities in different regions (one in the Northwest and the second in Central Italy).

Results: The sample was composed of 1820 Administrative Staff, comprising 69.4% from University 1 (N = 1,263) and 30.6% from University 2 (N = 557). The TASQ@work presented satisfactory psychometric properties (normality of the items, reliability and content, construct and nomological validity) and measurement invariance across gender, seniority, and Athenaeum.

Discussion: The results indicate that the tool can be considered a reliable and valid instrument to assess job demands, job resources, and outcomes in the working life of technical and administrative academic staff. In this perspective, the present study represents the first contribution to the debate on the psychosocial risks in academic contexts by presenting a new tool, the TASQ@work, aimed at contextualizing the JD-R model to understand the role played by psychosocial aspects in affecting the well-being of the academic employees.

1 Introduction

In an economic and social context characterized by continuous and in-depth transformations (e.g., globalization of the work market, technological advancements, and increased competition) (Kinman and Johnson, 2019; Urbina-Garcia, 2020), universities worldwide have undergone major changes over the last years. These included, for example, a focus on internationalization, an increased number of students and a growing importance of performance indicators to measure quality (Lee and Stensaker, 2021; Wray and Kinman, 2022). As a result, workers in higher education institutions – including academics as well as technical and administrative staff (TAS) – have to face new challenges, which may result in greater work intensification (Burchell et al., 2001) and, therefore, negative consequences on employee's health and well-being (Johnson et al., 2019; Urbina-Garcia, 2020). Specifically, TAS – which generally includes technical, clerical, services and professional staff (Gander, 2018) – represents a significant component of the university workforce (Salifu et al., 2021) who plays a central role in planning, budgeting and international networking as well as supporting academics' research, teaching, and public engagement activities (Jung and Shin, 2015). Thus, similarly to academics, TAS are subject to organizational pressure coming from the need to deal with the aforementioned changes, leaving them exposed to an increased risk of work-related stress (WR-S). However, previous research suggests that there are likely differences in psychosocial risk factors experienced by TAS and academics (Rothmann and Essenko, 2007; Johnson et al., 2019).

Additionally, the COVID-19 pandemic has radically changed the nature and intensity of job demands (i.e., risk factors for WR-S) faced by workers in higher education (Wray and Kinman, 2022). Particularly, TAS - as well as workers from other occupational sectors – may have experienced an accentuation of traditional risk factors because of the adoption of compulsory teleworking (e.g., increased workload, technostress and work-life conflict), as well as the emergence of new ones (e.g., the perceived risk of being infected at work, PRIW), during the COVID-19 pandemic. On the one hand, changes in working practice, in terms of new work procedures and schedules, the need to manage work with remote colleagues, as well having to respect the rule of social distancing, may ultimately have resulted in increased workload and extended work hours (Ghislieri et al., 2022; Guidetti et al., 2022). Moreover, being forced to experimenting new ways of working from home may have led to increased work–family conflict and perception of loss of boundaries between private and professional life (Wood et al., 2021), while using ICT as the unique and compulsory way to communicate with remote colleagues and users may have resulted in increased technostress (Spagnoli et al., 2020). On the other hand, TAS with regular contacts with colleagues or users at work during the pandemic (i.e., those with a hybrid work arrangement) were potentially exposed to the risk of infection at work – an additional job demand specifically related to COVID-19.

Based on the job demands-resources (JD-R) model (Bakker and Demerouti, 2017), the present study aims to validate a new tool to assess the quality of life at work in academia specifically addressed to TAS. It intends to contribute to the literature on psychosocial risks in academic settings by developing and testing the psychometric properties of a questionnaire able to analyze and understand the specificities of the work challenges the TAS personnel has to handle and how the new ways of working introduced during the COVID-19 pandemic can affect their perceived quality of working life. Notably, previous research suggests the importance of investigating contextualized (i.e., occupation-specific) psychosocial risk factors in the assessment of WR-S risk and well-being, which should be identified according to the literature and/or through discussion with organizational stakeholders (Menghini and Balducci, 2021). In particular, we would address normality of the items, reliability, content, construct and nomological validity. Moreover, we will test measurement invariance across gender, seniority, and Athenaeum of the TASQ@work.

1.1 Risk and protective factors for work-related stress among administrative and technical staff

Literature showed that TAS may be exposed to several risk factors for work-related stress. First, previous research highlighted the central role of both quantitative and qualitative workload. The former, namely the amount of work to be done in a given time (Nixon et al., 2011), refers to a large amount of administrative and bureaucratic tasks that have to be completed, or the necessity to carry out multiple tasks assigned by different people (e.g., academics or senior staff) at the same time. This may result in conflicting pressures, difficulty in meeting deadlines, and long working hours (Rothmann and Essenko, 2007; Biron et al., 2008; Ziaei et al., 2015). Interestingly, while experiencing a pressure to complete several tasks at the same time, TAS often believe they do not have sufficient variety in their assignments (Poalses and Bezuidenhout, 2018). Qualitative workload pertains to the difficulties or complexity of the tasks to be performed, especially when the worker does not have adequate skills or resources to deal with his/her assignments (Xie et al., 2008). In this respect, TAS frequently have to perform complex tasks, often involving new technologies, without adequate training (Rothmann and Essenko, 2007), or they face cognitive overload due to frequent calls and interruptions in their daily activities (Li, 2021). Additional risk factors for WRS among TAS include job insecurity (at least in specific national contexts) (Tytherleigh et al., 2005), work-life conflict (Foy et al., 2019; Johnson et al., 2019), as well as role stressors, which encompass role conflict and role ambiguity (Xiaotian Li, 2021; Dhakate et al., 2022), suggesting a lack of clarity in role expectations (Poalses and Bezuidenhout, 2018). Moreover, previous research has shown that conflicting relationships with supervisors, academic staff, and users, in addition to poor quality of communication, may

contribute to WRS and impaired well-being among TAS (Biron et al., 2008; Poalses and Bezuidenhout, 2018; Foy et al., 2019). Similarly, emotional demands from work relationships (e.g., with colleagues or students) were positively associated with TAS burnout (Lei et al., 2023). With respect to the COVID-19 pandemic, PRIW has been conceptualized as an additional job demand for employees who continued working in presence or started working partly in presence and partly remotely during the pandemic (Guidetti et al., 2022). In addition, previous research has shown that a return to work in presence was associated with negative emotional states among TAS (Arias-Flores et al., 2022).

Finally, the literature identified several aspects of work that may contribute to the prevention of WRS (i.e., protective factors) or promote motivation and well-being among TAS. These primarily encompass autonomy, in terms of discretion to schedule one's work (e.g., time and place) and choose the methods used to perform tasks (Jacobs et al., 2007), which is associated with reduced WRS and increased work motivation (Cropanzano et al., 2001; Jung and Shin, 2015; Kaiser et al., 2021). Moreover, organizational and social support – from supervisors and colleagues (Jolly et al., 2021) – may help prevent WRS and its negative outcomes (Cropanzano et al., 2001; Rothmann and Essenko, 2007; Foy et al., 2019; Lei et al., 2023). Other central job resources include participation in decision making, opportunities for professional and personal growth and career advancement, as well as adequate reward systems (e.g., salary, incentives, and welfare), which may positively influence TAS mental health and motivation (Biron et al., 2008; Jung and Shin, 2015; Poalses and Bezuidenhout, 2018). Furthermore, organizational justice, for example in terms of distributive, procedural, and interactional justice (Jolly et al., 2021), is positively associated with job satisfaction and performance among TAS (Ziaei et al., 2015; Bilal et al., 2021).

1.2 Measuring the well-being of technical and administrative staff

Accurate analysis of demands and resource levels in university context is fundamental for developing interventions to reduce work-related stress at source and raise levels of individual and organizational well-being. To achieve this goal, it is essential to focus on the theoretical reference model and the choice of suitable and appropriately measuring instruments, validated in organizations that face the same psychosocial stressors. Some studies have dealt with these issues in Europe and worldwide, also from the perspective of the JD-R model (Mudrak et al., 2018; Adil et al., 2019; Charoensukmongkol and Phungsoonthorn, 2021; Daumiller et al., 2021), mainly through quantitative and cross-sectional designs. For example, Innstrand and Christensen (2020) in Norway presented a comprehensive plan for investigating and implementing interventions addressing the work environment in higher education to improve the health and well-being of academic staff, drawing inspiration from the JD-R model. Similarly, Burke and Pignata (2021) presents a study on the factors of well-being and discomfort in academia, applying the JD-R model in Australian universities. These studies, like many others, have addressed the phenomenon of the well-being of university workers by exploring aspects eminently related to the work of teachers and researchers and those of administrative staff, keeping the focus on the key variables representing both types of workers of that complex and multifaceted organization.

The JD-R model states that health will be impaired when prolonged exposure to high psychosocial demands is paired with inadequate resources. Conversely, when adequate resources are provided in high-demanding work environments, work motivation increases, and well-being improves (Fredrickson and Losada, 2005).

The JD-R model is flexible and allows for identifying resources and demands within the context in which employees operate. Over time, this has led scholars to focus on different types of job demand and resources among university staff, well-being, and detrimental outcomes. The measures to detect these constructs are also very different, depending on the study and the context. Consistently with the model assumptions, the main adopted variables as an outcome, were job satisfaction, work engagement (Bezuidenhout and Cilliers, 2011; Mudrak et al., 2018), and organizational commitment (Khan et al., 2021); distress symptoms, emotional exhaustion (Mudrak et al., 2018; Zábrodská et al., 2018) and work-related fatigue (Akanni et al., 2020).

The demands were considered job insecurity, work–family conflicts, quantitative work demands, workload (Van Rensburg, 2020) and role conflict (Innstrand and Christensen, 2020). Finally, as far as resources are concerned, variables mainly considered were: perceived support from colleagues and supervisors (Charoensukmongkol and Phungsoonthorn, 2021), organizational support (Bakker and Xanthopoulou, 2013; Pasamar Reyes et al., 2020) and autonomy (Bakker and Xanthopoulou, 2013).

However, with some exceptions (Charoensukmongkol and Phungsoonthorn, 2021), these works have used the same psychosocial variables for both teaching and research staff and technical-administrative staff, without distinguishing between them, and in some cases without analyzing differences in the values of the variables. In our opinion, this may be a limitation. Even if the organizational culture is shared by university staff, the tasks, the functions, and the objectives are not completely comparable (e.g., tasks related to teaching issues are not typical demands for TAS workers). In addition, work-time control is regulated differently for each category of workers. For example, in Italy, the TAS must register arrival time and leaving time at work through electronic attendance control methods, which change the individual perception of job autonomy.

In view of the above and in line with our previous study (Brondino et al., 2022), which proposed a specific tool for evaluating the quality of life at work of teachers and researchers, the present study aimed to validate a new tool drawn on the Job Demands-Resources (JD-R) theoretical framework (Bakker and Demerouti, 2017), adapted by the QoL@Work Italian Academic network (Quality of Life at Work[1]) to assess the quality of life at work in academia specifically addressed to TAS. The following sections of the study will detail the process that led to the development of the "Technical and Administrative Staff Quality of life At Work Tool" (TASQ@work) and discuss its psychometric properties.

2 Materials and methods

The development of the tool involved different steps. The first phase was aimed at the identification of the dimensions of the tool and

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1   https://aipass.org/qolwork-quality-life-work

the adaptation of the scales of the AQ@workT (Brondino et al., 2022) to the TAS work conditions. Existing scales relating to quality of life at work, and specifically to TAS academics, were collected from the literature and used as the initial foundation of the adapted questionnaire. Subsequently, a national focus group was formed (*N*=22), composed of representatives from Italian academia (members of QoL@Work), to develop and identify the most important variables in the current literature and in academic practice of WR-S. Finally, based on the insights and experience of participants in the focus groups, and bearing in mind contextual and geographical characteristics, the principal risk, and protective factors for stress in technical and administrative academic settings were identified. Once these procedures were completed, a set of variables was chosen and used to create the questionnaire (Figure 1).This instrument comprised a series of variables that was divided into demands (transversal/general, role-related, technologies-related), resources (job and organizational, and personal), and outcomes in accordance with the JD-R theoretical model. Notably, in line with JD-R, the relationships between the constructs shown in Figure 1 can be complex and involve interactions

as well as reverse effects (e.g., personal resources may moderate the impact of job demands on employee well-being) (Bakker et al., 2023).

The second phase was aimed to assess the psychometric properties of the tool. The validation process involved confirmatory analysis and measurement of the invariance of the various constructs selected, which all together aim to create the basis of the intended instrument.

2.1 Participants and procedures

The analyses were performed in a convenience sample of two Italian universities in different regions (one in the Northwest and the second in Central Italy). In the first semester of 2021, two universities agreed to participate in the project. The survey described hereafter adopted specific procedures and instruments, to optimize the match between research outcomes and the needs of the two universities involved. An online survey was conducted involving all technical and administrative staff of the two Universities. In order to obtain participation, all technical and administrative staff of the Universities
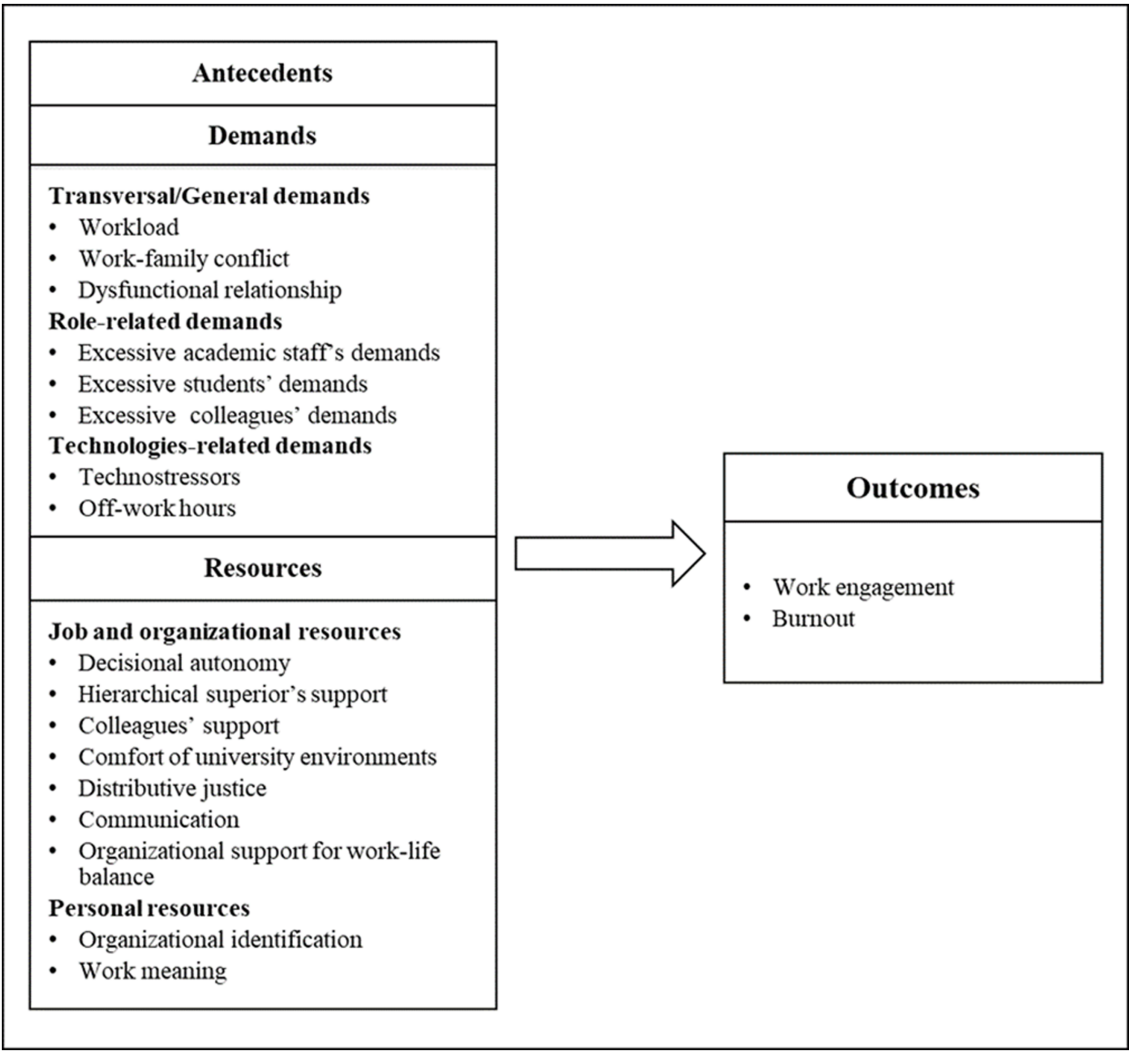
FIGURE 1
Risk and protective factors for stress of technical and administrative staff in academia.

were sent an invitation email during the second semester 2021. Prior to completing the questionnaire, participants were informed of the study's objectives and provided written consent to participate in the survey. Consistent with privacy regulations and guidelines, participants were also guaranteed anonymity and the possibility to withdraw from the study at any time. Finally, the data were processed in aggregate form, without therefore being able to be traced back to the individual participant in any way. The project has been approved by the Bioethics Committee (protocol n. 327,010).

The final sample was composed of 1820 Administrative Staff, comprising 69.4% from University 1 ($N = 1{,}263$) and 30.6% from University 2 ($N = 557$). Table 1 presents detailed socio-demographic characteristics of the sample. In the total sample, there was a slight majority of men (58%); most of the sample was between 30 and 50 years old (57%), the 40% of respondents was over 50 years old and only 3% were under 29 years old. Most of the participants worked for more than 10 years (68%), while the proportion of workers with children and without children was balanced in the sample (55% with children). Considering both the complexity of the tool and the substantial number of items, in order to meet the different Universities' requirements, the surveys conducted in the two universities were not fully identical, as described in the next sections. More specifically, few scales (i.e., the off-work hours scale, the work meaning scale, distributive justice and organizational support for work-life balance) were used only in one university, since it was necessary to negotiate with the steering committee of each university the list of constructs to be included in the questionnaire. In addition, for some of the constructs we had to use a reduced version of the scales.

2.2 Development of the TASQ@work

The final version of the tool is composed of the following 17 constructs and 113 relative items. It was developed using a combination of items from existing scales and *ad-hoc* items (the full Italian version of the tool is available on request. In Appendix A an English version of the item is available).

2.2.1 Demands

Workload was measured using 3 items from the Italian short version by Balducci et al. (2015) of HSE Management Standards Indicator Tool (Edwards et al., 2008), to investigate mental workload, or "how hard workers work". An example item is "I have unreachable deadlines" with a response scale from 1 = Totally disagree to 6 = Totally agree. In the short Italian version of scale (Balducci et al., 2015) the construct was measured with 4 items. However, in the current study we reduced the number of items by eliminating one item ("I am pressured to work long hours"), which in the short version showed the lowest factor loading (.47).

Dysfunctional relationships were measured with 4 items from the Italian short version by Balducci et al. (2015) of the HSE Management Standards Indicator Tool (Edwards et al., 2008). The items measure relational conflicts and unacceptable behavior at work; for example: "There is friction or anger between colleagues", with a response scale from 1 = Never or almost never to 6 = Always or almost always.

Work-family conflict was measured by 5 items (Netemeyer et al., 1996) adapted in the Italian version by Colombo and Ghislieri (2008). The items measure the respondents' subjective sense of degree to

TABLE 1 Socio-demographic characteristics of the sample.

	University1		University2		Full sample	
	N	*%*	*N*	*%*	*n*	*%*
Gender						
Male	861	68.2%	191	34.3%	1,052	57.8%
Female	389	30.8%	356	63.9%	745	40.9%
Missing	13	1%	10	1.8%	23	1.3%
Age						
Younger than 29 y	35	2.8%	22	3.9%	57	3.1%
30–50 y	685	54.2%	349	62.7%	1,034	56.8%
More than 51	543	43.0%	186	33.4%	729	40.1%
Missing	0	0	0	0	0	0
Tenure						
Less than 1 to 10 y	353	27.9%	219	39.3%	572	31.4%
More than 10 y	905	71.7%	338	60.7%	1,243	68.3%
Missing	5	0.4%	0	0	5	0.3%
Children						
Yes	710	56.2%	283	50.8%	993	54.6%
No	553	43.8%	270	48.5%	823	45.2%
Missing	0	0	4	0.7%	4	0.2%
University						
Univ1					1,263	69.4%
Univ2					557	30.6%

which role responsibilities from the work and life domains are incompatible; e.g., "The demands of my work interfere with my home and family life", with a response scale from 1 = Totally disagree to 6 = Totally agree.

Role-related Demands were divided into three subcategories based on the type of customers: academic staff, students, colleagues of other units. The items were adapted from the disproportionate customer expectations subscale of the customer-related social stressors scale (Dormann and Zapf, 2004; Loera et al., 2016), which investigates service expectations that might be legitimate but that seem to be disproportionate from the service provider's point of view. For all types of customers, the initial CFA of the original version with 10 item showed poor fit (CFI=0.73, RMSEA=0.22, TLI=0.65, SRMR= 0.14 for Excessive students' demands; CFI=0.76, RMSEA=0.21, TLI=0.69, SRMR= 0.12 for Excessive academic staff's demands; CFI=0.70, RMSEA=0.22, TLI=0.62, SRMR=0.14 for Excessive colleagues' demands). Factor loadings, for all Role-related demands subcategories, were higher except in two cases (item 4 and item 9) whose factor loadings range from.33 to.38.To improve the fit of the models, we decided to remove item 4 and 9 for all subcategories.

Finally, all subcategories were measured with 8 items with a response scale from 1 = Never or almost never to 6 = Always or almost always.

An example item for excessive academic staff's demands is "Professors do not understand when I am busy"; for excessive students' demands is "Students do not understand when I am busy" and for excessive colleagues' demands is "My colleagues do not understand when I am busy".

Technostressors were detected by three subdimensions of the TCS Technostress Creator Scale (Ragu-Nathan et al., 2008) and adapted and translated into Italian by Molino et al. (2020). We considered techno-overload, techno-invasion and techno-complexity dimensions, because of their relevance to the current scenario, where the increase of technology use, due to remote working, leads workers to experience overload, an intrusion of work into their private life, and difficulties in managing complex technologies. Techno-overload, 4 items, e.g. "I am forced by technology to work much faster", with a response scale from 1 = Totally disagree to 6 = Totally agree.

Techno-invasion, 3 items, e.g. "I feel my personal life is being invaded by this technology", with a response scale from 1 = Totally disagree to 6 = Totally agree.

Techno-complexity, 3 items, e.g., "I need a long time to understand and use new technologies", with a response scale from 1 = Totally disagree to 6 = Totally agree.

Off-work hours (technologically assisted job demands) were measured by 3 items (Ghislieri et al., 2017). Participants were asked to think how often they work beyond the agreed-upon work hours, with the aid of technology. An example item is: "I find myself answering the telephone or emails outside working hours", with a response scale from 1 = Never or almost never to 6 = Always or almost always.

2.2.2 Resources

Decisional Autonomy was measured by 6 items (De Carlo et al., 2019). The items measure autonomy defined as the extent to which a job allows freedom, independence, and discretion to schedule work, make decisions, and choose the methods used to perform tasks. An example item is: "My job allows me to decide with a certain degree of

autonomy on the programming and planning of the activities I carry out". Response scale from 1 = Totally disagree to 6 = Totally agree.

Hierarchical superiors' support was measured by 3 items from the short Italian version by Balducci et al. (2015) of the HSE Management Standards Indicator Tool (Edwards et al., 2008). They measure encouragement, sponsorship and resources provided by one's supervisor (Jolly et al., 2021), e.g., "I am given supportive feedback on the work I do". Response scale from 1 = Never or almost never to 6 = Always or almost always. In the original version of the scale (Balducci et al., 2015) the construct was measured with 5 items. However, in the current study we reduced the number of items by eliminating two items which, according to the authors' specification, showed the lowest factor loading in the short version (Balducci et al., 2015).

Colleagues' support was measured by 4 items from the Italian version by Balducci et al., 2015 of the Stress Indicator Tool (Edwards et al., 2008). The items measures colleague encouragement, empathy, and the provision of instrumental resources at work (Jolly et al., 2021), e.g., "I get help and support I need from colleagues", with a response scale from 1 = Totally disagree to 6 = Totally agree.

Comfort of university environments was measured by 5 ad hoc items which measure the satisfaction for physical spaces of the working environment (office, etc.), e.g., "Assess the level of appropriateness of the following aspects of your working environment: The state of my office". Response scale from 1 = Not completely appropriate to 6 = Completely appropriate.

Distributive justice was measured by 4 items from the Italian adaptation of the Colquitt's Organizational Justice Scale (Colquitt, 2001; Spagnoli et al., 2017), which investigate the perception of equity in the results of decisions and in the implicit norms regulating an organization's resource allocation. An example item is: "Does your outcome reflect what you have contributed to the organization?". Response scale from 1 = Not at all 6 = Always.

Organizational support for work-life balance was measured with adaptation of the WFOS (Work-Family Organizational Support) Scale (Thompson et al., 1999; Lo Presti et al., 2017). Specifically, in the current study for parsimony sake we used just 6 items of the original 9-item version which refer to the perceived easiness and supportiveness of balancing work and life within the organization, and managerial empathy toward employees' conciliation needs. An example item is: "At this university, employees can easily find a work-life balance". Response scale from 1 = Totally disagree to 6 = Totally agree.

Communication was measured by three items from the Copenhagen Psychosocial Questionnaire (Kristensen et al., 2005). The items (e.g., "I am informed in good time regarding for example important decisions, changes, or plans for the future") measure the predictability and timeliness of communication, which deals with the means to avoid uncertainty and insecurity. Response scale from 1 = Never or almost never 6 = Always or almost always.

Organizational identification was measured by 5 items translated in Italian from the 6-items of the original scale by Mael and Ashforth (1992). The items (e.g., "The success of the university is mine too") refer to the perception of belonging to an organization, in which the individual defines him/herself in terms of involvement or membership in the organization. Response scale from 1 = Never or almost never to 6 = Always or almost always. In the current study, item 5 was removed due to missing data (missing = 73%).

Work meaning was measured with the Italian translation and adaptation of the Copenhagen Psychosocial Questionnaire

(Kristensen et al., 2005), which concerns both the meaning of the aim of work tasks and the meaning of the context of work tasks. Specifically, in the current study 4 items were used, e.g., "Is your work meaningful?", with a response scale from 1 = Totally disagree to 6 = Totally agree.

2.2.3 Outcome variables

Work engagement was measured by two subdimensions of the Utrecht Work Engagement Scale (UWES; Schaufeli et al., 2006; Balducci et al., 2010). The items measure a positive work-related state of fulfillment with response scale from 1 = Never, almost never to 6 = Always, almost always. Vigor dimension was measured with 3 items, e.g., "At my work, I feel bursting with energy". Dedication dimension was measured with 3 items, such as: "I am proud of the work that I do".

Burnout was assessed through two subdimensions from MBI (Maslach et al., 1997). Items measure feelings of energy depletion/exhaustion as well as increased mental distance from one's job in response to chronic stressors at work with response scale from 1 = Never, almost never to 6 = Always, almost always.

As far as the outcomes are concerned we considered the dimensions of exhaustion/vigor and detachment/dedication as representative of the two opposite dimensions of energy and identification, respectively (González-Romá et al., 2006). Emotional exhaustion dimension was measured with 5 items, e.g., "I feel emotionally drained from my work". Detachment dimension was measured with 4 items, e.g., "I sometimes get detached from my work". Specifically, for the detachment dimension, one item was removed due to missing data (missing = 73%).

3 Data analysis

As explained above, the study provided indications on the confirmatory verification of the psychometric goodness of the tailor-made instrument for technical-administrative academic staff.

Confirmatory Factor Analysis (CFA) and reliability analysis were performed on the scales chosen through the aforementioned steps of the study to examine internal structure and coherence.

Before carrying out the appropriate confirmatory analyses, the distribution of the data was explored by means of skewness and kurtosis. Reliability and construct validity analyses were also proposed, using McDonald's Omega and correlations between constructs. CFAs and invariances were processed using MPlus, version 8.

Items that worsened the goodness-of-fit indices of the scale were evaluated to see if they were necessary for the theoretical consistency and robustness of the scale. The final version of the questionnaire, therefore, shows the exclusive presence of items and constructs with adequate indices of reliability and factorial structure.

To assess construct validity, we decided to run a series of CFAs. On one hand, according to the JD-R model, we chose to conduct CFAs aggregating constructs by the macro groups: demands, resources and outcomes. On the other hand, we had to consider the different numerosity of samples which depended both on the specificity of some scale targeted on a subsample of participants and on real missing data. In fact, large unbalanced group size might affect the results of CFA and factorial invariance. For this reason, within the macro groups (demands, resources and outcomes), the scales are aggregated according to different samples. The different numerosity of samples depended both on the specificity of some scale targeted on a subsample of participants and on real missing data. Finally, observations with real missing data of less than 10% were estimated using the FIML (Full Information Maximum Likelihood) algorithm. In detail, the ratio that led us to perform a series of CFAs were as follows:

(a) Resources included aspects of job content (decisional autonomy), the organizational context (comfort of university environment, organizational justice, organizational support for work-life balance, quality of communication), the interpersonal context (supervisors' support, co-workers support), as well as personal resources (work meaning, organizational identification). Following this criterion, we tested a five-factor correlated model which evaluated the factor structure of hierarchical superior's support, colleagues' support, decisional autonomy, comfort of university environments and communication factors, while distributive justice, organizational support for work-life balance were tested separately with two separate one-factor models, because these scales were used only in one university. Finally, organizational identification and work meaning were tested separately with two one-factor models because these constructs were considered as personal resources;

(b) As with resources, three different factorial models were tested for job demands: a three-factor correlated model, which included workload, dysfunctional relationship and work-life conflict dimensions (i.e., transversal/general demands). In addition, three unidimensional one-factor models were tested, respectively, on excessive academic staff's demands, excessive students' demands, and excessive colleagues' demands (i.e., role-related demands). The factorial structure of the relationship with academic staff, students and colleagues dimensions were investigated separately because of the difference in the sample size due to the different role of participants in the organizations. Additionally, a correlated three-factor model on technostress was tested, which included the three sub-dimensions techno-overload, techno-complexity and techno-invasion. The factorial structure of techno stressors dimensions (i.e., technologies-related demands) was tested separately to assess demands related to the job and technological transformations accelerated by the COVID-19 pandemic. Finally, because the off-work hours dimension was included in the questionnaire by only one of the two universities and is a three-item scale, we tested its factorial structure running a CFA jointly with technostressors' scale;

(c) Concerning the outcomes, two correlated two-factor models on positive and negative outcomes were tested separately. Specifically, the model on burnout included the two sub-dimensions of emotional exhaustion and detachment, while the model on work engagement included the two sub-dimensions of dedication and vigor

Regarding CFAs, the following were considered as appropriate indices: Comparative Fit Index (hereafter CFI) ≥ 0.90, Root Mean Square Error of Approximation (hereafter RMSEA) ≤ 0.08, and Standardized Root Mean Square Residuals (hereafter SRMR) ≤ 0.10 as threshold values (Kline, 2016).

Finally, measurement invariance across gender, seniority and Athenaeum was conducted. According to this procedure, different levels of invariance were tested: configural invariance, metric invariance, and scalar invariance.

To assess if the different levels of invariance were met, we considered variations in CFI, RMSEA, and SRMR. In accordance with Chen's criteria (Chen, 2007), invariance was confirmed if the change in CFI was less than 0.010, the one in RMSEA was less than 0.015, and a change in SRMR less or equal to 0.030 was considered as the threshold for testing metric invariance, and less or equal to 0.010 for assessing scalar invariance.

Construct's validity was assessed through the analysis of the strength and the significance of the relationships between the examined variables.

4 Results

4.1 Descriptive statistics and reliability

Results about descriptive statistics (mean, DS), sample distribution (skewness and kurtosis) and reliability (McDonald's Omega) are highlighted in Table 2.

The reported values for assessing normality were skewness and kurtosis calculated as the mean of the absolute values of skewness and kurtosis of each item of the scales (Muthén and Kaplan, 1985). They were all within the range $-2/+2$ and $-7/+7$, respectively (Curran et al., 1996) confirming the normality distributions of the scales. In terms of constructs' mean, among the job demands, workload (3.25) had the higher values; in the job resources' categorization, hierarchical (4.39) and colleagues' support (4.71), as well as work meaning (4.26), had the strongest mean. Finally, by considering positive outcomes, work engagement's sub-dimension of dedication (3.98), while for negative outcomes the same was reached for emotional exhaustion (2.57). All the scales revealed a good reliability.

4.2 Confirmatory factor analyses and construct validity

Results of CFAs are shown in Table 3.

Concerning the Transversal/general demands (MD1), the model fit was evaluated and the values of CFI and RMSEA were lower and higher than what is normally considered for an acceptable fit, respectively. Following the modification indices, and hence correlating two error terms of items 1 and 2 of work-life conflict and the error

TABLE 2 Principal descriptive statistics and reliability on the scales and subscales.

	No of Items	Mean	DS	Skewness	Kurtosis	Reliability
Demands						
Workload	3	3.25	1.20	0.48	0.61	0.80
Dysfunctional relationship	4	1.83	1.03	1.83	3.32	0.88
Work–family conflict	5	2.81	1.31	0.53	0.72	0.93
Off-work hours	3	2.32	1.48	1.05	0.54	0.93
Excessive academic staff's demands	8	2.93	1.15	0.41	0.74	0.90
Excessive students' demands	8	2.91	1.10	0.44	0.74	0.89
Excessive colleagues' demands	8	2.40	0.99	0.83	0.36	0.89
Techno-overload	4	2.45	1.21	0.56	0.89	0.91
Techno-invasion	3	2.26	1.16	0.80	0.69	0.79
Techno-complexity	3	2.27	1.08	0.78	0.47	0.78
Resources						
Hierarchical superior's support	3	4.39	1.48	0.68	0.73	0.92
Colleagues' support	4	4.71	1.20	0.96	0.37	0.93
Decisional autonomy	6	4.09	1.16	0.39	0.71	0.90
Organizational identification	5	4.13	1.25	0.53	0.70	0.87
Communication	3	3.74	1.14	0.31	0.74	0.75
Comfort of university environments	5	3.86	1.20	0.35	0.98	0.80
Distributive justice	4	3.51	1.49	0.04	1.15	0.96
Organizational support for work-life balance	6	3.83	1.11	0.26	0.71	0.88
Work meaning	4	4.26	1.18	0.54	0.40	0.90
Outcomes						
Vigor	3	3.84	1.26	0.21	0.74	0.90
Dedication	3	3.98	1.35	0.32	0.79	0.91
Emotional Exhaustion	5	2.57	1.38	0.71	0.70	0.90
Detachment	4	2.42	1.26	0.82	0.68	0.81

TABLE 3 Confirmatory factor analysis aggregated by demands, resources, and outcomes in the final sample.

Models	N	CHI (DF)	CFI	RMSEA	SRMR
Demands					
MD1: Transversal/general demands (Workload, Dysfunctional relationships, Work-life conflict)	1797	1709.863 (51)	0.888	0.135	0.047
MD2 (with errors correlations) transversal/general demands (Workload, Dysfunctional relationships, Work-life conflict)	1738	271.192 (49)	0.985	0.050	0.033
MD3:Excessive academic staff's demands	698	302.442 (20)	0.918	0.142	0.053
MD4:Excessive students' demands	405	200.859 (20)	0.904	0.149	0.066
MD5: Excessive colleagues' demands	1,217	526.078 (20)	0.900	0.144	0.061
MD6: Technostressors (Techno-overload, Techno-invasion, Techno-complexity)	1745	485.324 (32)	0.956	0.090	0.055
Resources					
MR1: Job and organizational resources (Hierarchical superior's support, Colleagues' support, Decisional autonomy, Comfort of university environments, Communication)	1797	1488.554 (179)	0.943	0.064	0.038
MR2: Distributive justice	1,263	125.447 (2)	0.978	0.221	0.014
MR3: Organizational support for work-life balance	1,263	199.141 (9)	0.954	0.129	0.032
MR4: Work meaning	487	71.793 (2)	0.947	0.268	0.040
MR5: Organizational identification	1751	76.237 (5)	0.984	0.090	0.023
Outcomes					
MO1: Burnout (Emotional exhaustion and Detachment)	1749	553.724 (26)	0.941	0.108	0.050
MO2: Work engagement (Vigor and Dedication)	1749	482.327 (8)	0.952	0.184	0.065

terms of items 1 and 2 of dysfunctional relationship, the fit improves (MD2). This makes sense, given that these items were focused on similar issues. Regarding the remaining models tested for both demands and resources and outcomes, CFI and SRMR were satisfactory, although the RMSEA was still not satisfactory. However, the use of RMSEA to assess model fit in models with small degrees of freedom could be problematic (Kenny et al., 2015). Factor loadings for transversal/general demands range from 0.62 to 0.95, for excessive academic staff's demands ranged from 0.53 to 0.91, for excessive students' demands ranged from 0.39 to 0.90, for excessive colleagues' demands ranged from 0.43 to 0.87, and finally, for technostress ranged from 0.64 to 0.94. Concerning the factor loadings for resources: for job and organizational resources ranged from 0.44 to 0.95, for distributive justice ranged from to 0.90 to 0.94, for organizational support for work-life balance ranged from 0.49 to 0.89, for work meaning ranged from 0.71 to 0.94 and for organizational identification ranged from to 0.62 to 0.97. Finally, concerning the outcomes, for burnout the factor loading ranged from 0.55 to 0.87 and for work engagement ranged from 0.72 to 0.97.

The correlations between latent factors varied from 0.35 (work-life conflict with dysfunctional relationships) to 0.66 (work–family conflict with workload) in transversal/general demands, from 0.42 (techno-complexity with techno-overload) to 0.74 (techno-overload with techno-invasion) in technostressors, from 0.23. (hierarchical superior's support with comfort of university environments) to 0.64 (hierarchical superior's support with communication) in job and organizational resources. Finally, concerning outcomes, the correlations between latent factors detachment and emotional exhaustion in burnout was 0.65, while for the engagement dimensions (vigor and dedication), it was 0.78.

In conclusion, the construct's validity was confirmed as the strength and the significance of the relationships between demands, resources, positive and negative outcomes were consistent with Job Demands-Resources literature.

The results of the aggregated model by technostressors and off work hours are shown in Table 4.

4.3 Measurement invariance

Measurement invariance was analyzed for transversal/general demands, role-related demands and technostressors. Regarding the transversal/general demands results showed that the measurement invariance, both metric and scalar, across gender, seniority and Athenaeum was confirmed (Table 5). Concerning the role-related demands, results reported an adequate fit and, thus, the measurement invariance was confirmed. Whereas, concerning the excessive students' demands, the scalar measurement invariance across Athenaeum was not confirmed. Finally, concerning technostressors, results presented in Table 5 reported an adequate fit and, thus, the measurement invariance, both metric and scalar, across gender, seniority and Athenaeum was confirmed.

Regarding the model aggregated by technostressors and off work hours, results showed that the measurement invariance, both metric and scalar, across gender and seniority was confirmed (Table 6).

Regarding resources, the job and organizational resources construct showed a good fit of all indices, while Δ RMSEA for the constructs "distributive justice," "meaning of work," "organisational support for work-life balance," and "organisational identification" was higher than the cut-off for about metric and scalar invariance (Table 7).

Finally, the measurement invariance, both metric and scalar, across gender, seniority and university for the outcome constructs was

TABLE 4 Confirmatory factor analysis aggregated by technostressors and off work hours.

Models	N	CHI (DF)	CFI	RMSEA	SRMR
Demands					
Aggregated model of Technostressors (Techno-overload, Techno-invasion, Techno-complexity) and off work hours	475	285.355 (59)	0.944	0.090	0.069

confirmed. There was one exception related to the RMSEA: "work engagement" construct was larger than the cut-off (Table 8).

4.4 Construct validity

To assess construct validity, we analyzed the correlations between the constructs to check if they were coherent by a theoretical perspective. The correlation analysis was performed on overall scores. Correlations between variables confirmed those reported in the literature regarding the JD-R model, as shown in Table 9. Specifically, results showed that job demands (i.e., workload, dysfunctional relationship) were significantly and positively correlated with each other with a Person's r range from $r = 0.24$, $p < 0.001$ (technostress-dysfunctional relationship) to $r = 0.60$, $p < 0.001$ (work–family conflict-workload), and significantly and negatively correlated with job resources with a range from $r = -0.11$, $p < 0.05$ (technostress – distributive justice) to $r = -0.55$, $p < 0.001$ (Colleagues' support-excessive colleagues' demands). Results showed a not significant correlation between excessive students' demands and dysfunctional relationships ($r = 0.07$, $p = 0.14$). In addition, job demands were positively correlated with the negative consequences of health impairment mechanisms, such as burnout: results showed a correlation coefficient ranging from $r = 0.30$ ($p < 0.001$) for the relationship between burnout and excessive students' demand, to $r = 0.44$ ($p < 0.001$) for the relationship between burnout and work–family conflict. Furthermore, results showed as demands were negatively correlated with positive outcomes related to the motivational process, such as work engagement: Person's r range from $r = -0.21$ ($p < 0.001$) for the relationship between work engagement and workload, to $r = -0.43$ ($p < 0.001$) for work engagement-excessive academic staff's demands. Conversely, results showed that job resources were positively correlated with each other and with positive outcomes, such as work engagement (Person's r range from $r = 0.30$ with $p < 0.001$ for the relationship between work engagement and comfort of university environments, to $r = 0.46$ with $p < 0.001$ for the relationship between work engagement and organizational support for work-life balance) and negatively correlated with job demands and with negative outcomes, such as burnout (Person's r range from $r = -0.23$ with $p < 0.001$ for burnout-Comfort of university environments relationship, to $r = -0.44$ with $p < 0.001$ for burnout-organizational support for work-life balance). To assess the construct validity of the off-work hours dimension, included in the questionnaire by only one of the two universities, we analyzed the correlations between the constructs on a subsample (see Table 10). Again, the results confirmed what was hypothesized by the JD-R model: the job demands were positively correlated with each other with a Person's r range from $r = 0.13$, $p < 0.001$ (off-work hours-Excessive colleagues' demands) to $r = 0.67$, $p < 0.001$ (work–family conflict-workload), except for off-work hours which are not significantly correlated with

Excessive students' demands ($r = 0.02$, $p = 721$). In addition, results showed a positive and significant correlation between job demands and burnout with a ranging of Person's r from $r = 0.23$ ($p < 0.001$) for burnout-off-work hours relationship, to $r = 0.53$ ($p < 0.001$) for burnout-WFC relationship. Furthermore, job demands were negatively correlated with job resources, except for work meaning and decisional autonomy, which were not significantly correlated with off-work hours ($r = 0.05$, $p = 0.26$ for off-work hours-work meaning relationship; $r = 0.03$, $p = 0.42$ for decisional autonomy-off work hours relationship) In addition, the off-work hours were positively correlated with organizational identification (see Table 10). Also in the subsample, job demands were negatively and positively correlated with positive outcomes, such as work engagement with a Person's r range from $r = -0.18$, $p < 0.001$ (work engagement-workload) to $r = -0.41$, $p < 0.001$ (work engagement-dysfunctional relationship). Furthermore, results showed that work engagement is not related to off-work hours ($r = -0.00$, $p = 0.91$). Finally, results showed that the job resources were negatively correlated with job demands and positively with work engagement with a ranging of Person's r from $r = 0.32$ ($p < 0.001$) for work engagement-comfort of university environments relationship to $r = 0.67$ ($p < 0.001$) for work engagement-work meaning relationship.

5 Discussion and conclusion

This study presents the first validation of a new tool to assess the quality of life at work in academia specifically focused on technical and administrative staff (TAS), the TASQ@work, developed by a group of expert academics in the field of work and organizational psychology, affiliated with the Italian Association of Psychologists, belonging to the QoL@Work Italian Academic network. Over the last few years, the QoL@Work Italian Academic network has elaborated a conceptual framework that has been reflected in creating new assessment tools to detect relevant job demands, resources well-being and health-related conditions among academic staff and TAS. The purpose is to offer reliable scales to design effective data-driven interventions to improve the quality of life at work in the academic community, considering the differences between the occupational groups that form it. After validating an assessment tool targeted explicitly to academic teaching staff (the AQ@workT) (Brondino et al., 2022), the network has promoted data collection on a national basis to identify a set of job demands and resources that could have a significant impact on the level of well-being among TAS.

Based on the JD-R model (Bakker and Demerouti, 2007; Bakker et al., 2023) as a theoretical framework, the TASQ@work showed satisfactory psychometric properties (normality of the items, reliability, and content, construct and nomological validity) and measurement invariance across gender, seniority, and Athenaeum. The results of this initial validation indicate that the tool can

TABLE 5 Results of invariance analyses for demands across gender, seniority, and Athenaeum.

Constructs groups model	χ² (df)	CFI	RMSEA	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
Demands							
Transversal/general demands							
Gender							
Configural inv.	320.913 (98)	0.985	0.051	0.034	-	-	-
Metric inv.	332.309 (107)	0.984	0.049	0.037	0.001	0.002	0.003
Scalar inv.	347.956 (116)	0.984	0.047	0.037	0.000	0.002	0.000
Seniority							
Configural inv.	326.305 (98)	0.985	0.051	0.034	-	-	-
Metric inv.	341.147 (107)	0.984	0.049	0.037	0.001	0.002	0.003
Scalar inv.	354.395 (116)	0.984	0.048	0.037	0.000	0.001	0.000
Athenaeum							
Configural inv.	322.825 (98)	0.985	0.051	0.035	-	-	-
Metric inv.	341.792 (107)	0.984	0.049	0.037	0.001	0.002	0.002
Scalar inv.	377.844 (116)	0.982	0.050	0.037	0.002	0.001	0.000
Excessive academic staff's demands							
Gender							
Configural inv.	318.049 (40)	0.918	0.142	0.055	-	-	-
Metric inv.	324.986 (47)	0.918	0.131	0.060	0.000	0.011	0.005
Scalar inv.	330.275 (54)	0.919	0.122	0.060	0.001	0.009	0.000
Seniority							
Configural inv.	326.479 (40)	0.917	0.143	0.055	-	-	-
Metric inv.	330.119 (47)	0.918	0.131	0.058	0.001	0.012	0.003
Scalar inv.	346.068 (54)	0.915	0.124	0.061	0.003	0.007	0.003
Athenaeum							
Configural inv.	326.005 (40)	0.917	0.143	0.055	-	-	-
Metric inv.	339.506 (47)	0.915	0.134	0.065	0.002	0.009	0.010
Scalar inv.	344.349 (54)	0.915	0.124	0.067	0.000	0.010	0.002
Excessive students' demands							
Gender							
Configural inv.	221.227 (40)	0.904	0.150	0.069	-	-	-
Metric inv.	230.140 (47)	0.903	0.139	0.078	0.001	0.011	0.009
Scalar inv.	245.75 (54)	0.898	0.133	0.082	0.005	0.006	0.004
Seniority							
Configural inv.	237.234 (40)	0.896	0.156	0.071	-	-	-
Metric inv.	255.260 (47)	0.891	0.148	0.089	0.005	0.008	0.018
Scalar inv.	262.800 (54)	0.890	0.138	0.094	0.001	0.010	0.005
Athenaeum							
Configural inv.	221.197 (40)	0.905	0.150	0.068	-	-	-
Metric inv.	229.764 (47)	0.904	0.139	0.077	0.001	0.011	0.009
Scalar inv.	262.047 (54)	0.891	0.138	0.089	0.013	0.001	0.012
Excessive colleagues' demands							
Gender							
Configural inv.	538.213 (40)	0.899	0.144	0.063	-	-	-

(Continued)

TABLE 5 (Continued)

Constructs groups model	χ^2 (df)	CFI	RMSEA	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
Metric inv.	557.683 (47)	0.896	0.134	0.068	0.003	0.010	0.005
Scalar inv.	565.335 (54)	0.896	0.126	0.067	0.000	0.008	0.001
Seniority							
Configural inv.	554.389 (40)	0.897	0.146	0.063	-	-	-
Metric inv.	561.744 (47)	0.897	0.134	0.065	0.000	0.012	0.002
Scalar inv.	570.528 (54)	0.897	0.126	0.065	0.000	0.008	0.000
Athenaeum							
Configural inv.	566.143 (40)	0.895	0.147	0.064	-	-	-
Metric inv.	574.008 (47)	0.895	0.136	0.065	0.000	0.011	0.001
Scalar inv.	600.992 (54)	0.891	0.129	0.067	0.004	0.007	0.002
Technostressors							
Gender							
Configural inv.	538.787 (64)	0.953	0.093	0.058	-	-	-
Metric inv.	549.874 (71)	0.953	0.088	0.058	0.000	0.005	0.000
Scalar inv.	565.520 (78)	0.952	0.085	0.058	0.001	0.003	0.000
Seniority							
Configural inv.	527.070 (64)	0.955	0.091	0.056	-	-	-
Metric inv.	537.698 (71)	0.954	0.087	0.057	0.001	0.004	0.001
Scalar inv.	581.434 (78)	0.951	0.086	0.058	0.003	0.001	0.001
Athenaeum							
Configural inv.	518.936 (64)	0.954	0.090	0.056	-	-	-
Metric inv.	523.312 (71)	0.955	0.085	0.056	0.001	0.005	0.000
Scalar inv.	559.459 (78)	0.952	0.084	0.058	0.003	0.001	0.002

TABLE 6 Results of invariance analyses for model aggregated by technostressors and off work hours across gender and seniority.

Constructs groups model	χ^2 (df)	CFI	RMSEA	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
Aggregated model by technostressors and off work hours							
Gender							
Configural inv.	389.115 (118)	0.933	0.099	0.076	-	-	-
Metric inv.	399.423 (127)	0.933	0.095	0.077	0.000	0.004	0.001
Scalar inv.	413.641 (137)	0.932	0.093	0.078	0.001	0.002	0.001
Seniority							
Configural inv.	341.917 (119)	0.946	0.089	0.071	-	-	-
Metric inv.	361.065 (128)	0.943	0.088	0.074	0.003	0.001	0.003
Scalar inv.	390.613 (137)	0.938	0.088	0.075	0.005	0.000	0.001

be considered a reliable and valid instrument to assess job demands, job resources and outcomes in the working life of technical and administrative academic staff. In this perspective, the present paper represents the first contribution to the debate on the psychosocial risks in academic contexts by presenting a new tool, the TASQ@ work, that contextualizes the JD-R to the employees who manage the administrative and technical tasks within the University. Indeed, while much previous research on university psychosocial risks has focused on academics (i.e., teachers and research staff) or has adopted

assessment tools that did not differentiate academics from the administrative staff, this tool has a specific focus on TAS. The considered psychosocial factors refer to organizational and work aspects, which pertain to job demands and job resources, taking into account both variables consistent with the traditional work-related stress theories, and those related to the job and technological transformations accelerated by the COVID-19 pandemic. More specifically, the section related to job demands includes indicators of workload and stressors, also connected with the growing introduction

TABLE 7 Results of invariance analyses for resources construct across gender, seniority, and Athenaeum.

Constructs groups model	χ^2 (df)	CFI	RMSEA	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
Resources							
Job and organizational resources							
Gender							
Configural inv.	1731.510 (358)	0.940	0.066	0.041	-	-	-
Metric inv.	1713.489 (374)	0.940	0.065	0.043	0.000	0.001	0.002
Scalar inv.	1746.496 (390)	0.939	0.064	0.044	0.001	0.001	0.001
Seniority							
Configural inv.	1688.223 (358)	0.941	0.066	0.041	-	-	-
Metric inv.	1714.768 (374)	0.941	0.065	0.043	0.000	0.001	0.002
Scalar inv.	1751.089 (390)	0.940	0.064	0.043	0.001	0.001	0.000
Athenaeum							
Configural inv.	1776.889 (358)	0.939	0.066	0.042	-	-	-
Metric inv.	1802.319 (374)	0.939	0.065	0.044	0.000	0.001	0.002
Scalar inv.	1995.940 (390)	0.931	0.068	0.047	0.008	0.003	0.003
Distributive justice							
Gender							
Configural inv.	132.384 (4)	0.977	0.227	0.014	-	-	-
Metric inv.	135.657 (7)	0.977	0.171	0.019	0.000	0.056	0.005
Scalar inv.	136.300 (10)	0.977	0.142	0.019	0.000	0.029	0.000
Work meaning							
Gender							
Configural inv.	91.982 (4)	0.934	0.302	0.043	-	-	-
Metric inv.	93.221 (7)	0.935	0.226	0.048	0.001	0.076	0.005
Scalar inv.	101.759 (10)	0.931	0.195	0.049	0.004	0.031	0.001
Seniority							
Configural inv.	73.309 (4)	0.947	0.267	0.043	-	-	-
Metric inv.	78.520 (7)	0.946	0.205	0.067	0.001	0.062	0.024
Scalar inv.	80.954 (10)	0.946	0.171	0.072	0.000	0.034	0.005
Gender							
Organizational support for work-life balance							
Configural inv.	209.669 (18)	0.953	0.131	0.033	-	-	-
Metric inv.	212.454 (23)	0.953	0.115	0.036	0.000	0.016	0.003
Scalar inv.	217.637 (10)	0.953	0.104	0.039	0.000	0.011	0.003
Gender							
Organizational identification							
Configural inv.	83.635 (10)	0.983	0.092	0.024	-	-	-
Metric inv.	89.416 (14)	0.983	0.079	0.032	0.000	0.013	0.008
Scalar inv.	93.713 (18)	0.983	0.070	0.030	0.000	0.009	0.002
Seniority							
Configural inv.	81.950 (10)	0.984	0.091	0.024	-	-	-
Metric inv.	84.876 (14)	0.984	0.076	0.029	0.000	0.015	0.005
Scalar inv.	98.202 (18)	0.982	0.071	0.031	0.002	0.005	0.002
Athenaeum							
Configural inv.	81.950 (10)	0.984	0.091	0.024	-	-	-
Metric inv.	84.876 (14)	0.984	0.076	0.029	0.000	0.015	0.005
Scalar inv.	99.041 (18)	0.982	0.072	0.032	0.002	0.004	0.003

TABLE 8 Results of invariance analyses for output construct across gender, seniority, and Athenaeum.

Constructs groups model	χ^2 (df)	CFI	RMSEA	SRMR	Δ CFI	Δ RMSEA	Δ SRMR
Burnout							
Gender							
Configural inv.	573.444 (52)	0.941	0.108	0.052	-	-	-
Metric inv.	585.276 (59)	0.941	0.102	0.053	0.000	0.006	0.001
Scalar inv.	590.695 (66)	0.941	0.096	0.052	0.000	0.006	0.001
Seniority							
Configural inv.	597.666 (52)	0.939	0.110	0.052	-	-	-
Metric inv.	607.347 (59)	0.939	0.103	0.054	0.000	0.007	0.002
Scalar inv.	632.515 (66)	0.937	0.099	0.054	0.002	0.004	0.000
Athenaeum							
Configural inv.	629.712 (52)	0.934	0.113	0.056	-	-	-
Metric inv.	653.628 (59)	0.932	0.107	0.059	0.002	0.006	0.003
Scalar inv.	682.496 (66)	0.929	0.103	0.062	0.003	0.004	0.003
Work engagement							
Gender							
Configural inv.	512.223 (16)	0.949	0189	0.068	-	-	-
Metric inv.	517.404 (20)	0.949	0.170	0.069	0.000	0.019	0.001
Scalar inv.	522.894 (24)	0.949	0.155	0.069	0.000	0.015	0.000
Seniority							
Configural inv.	489.851 (16)	0.952	0.184	0.065	-	-	-
Metric inv.	493.747 (20)	0.952	0.165	0.066	0.000	0.019	0.001
Scalar inv.	506.902 (24)	0.951	0.152	0.067	0.001	0.013	0.001
Athenaeum							
Configural inv.	493.196 (16)	0.950	0.185	0.067	-	-	-
Metric inv.	495.216 (20)	0.950	0.165	0.067	0.000	0.020	0.000
Scalar inv.	504.130 (24)	0.950	0.151	0.069	0.000	0.014	0.002

of computer-based administration tasks (e.g., technostress creators); moreover, it assesses the extent of work–family conflict and the emotional demands associated with the interpersonal relationships with multiple stakeholders, lectures, students and colleagues. The section related to resources includes aspects of job content (decisional autonomy), the organizational context (the comfort of the university environment, organizational justice, organizational support for work-life balance, quality of communication), the interpersonal context (supervisors' support, co-workers support), as well as personal resources (work meaning, organizational identification). Finally, this scale assesses multiple dimensions of well-being by including work engagement and burnout. These psychological aspects deserve to be investigated as the TAS work contents within universities have profoundly changed over the last few years also due to the Covid-19 pandemic (Wray and Kinman, 2022), leaving these employees exposed to an increased risk of work-related stress. In this sense, creating a tool that can detect the levels of well-being of TAS within universities by correlating them to job demands and resources can represent an advantage in order to identify critical issues and intervene to improve working conditions. It can help academic

organizations to identify the specific job and organizational demands that increase the risk for work-related stress and to plan programs to enhance resources, which could represent protective factors.

Although the analyses conducted on the instrument confirm its good psychometric properties, there are some limitations that we aim to address and overcome with subsequent research.

The first limitation concerns the invariance results with respect to the RMSEA index in some resources scales (work meaning, distributive justice, organizational support for work-life balance, organizational identification). Although the other indices are very good, the RMSEA exceeds the desired cut-off threshold. We believe that this limitation is related to the others mentioned so far and that with a larger sample size and more differentiation per university, we can improve the goodness of fit of this index. This is supported by a reflection on this index conducted by Kenny et al. (2015): the authors agree that when the degrees of freedom (df) and the sample (N) are small a "larger" RMSEA is easy (Kenny et al., 2015, p. 487). To assess the sampling error in the RMSEA, a confidence interval (CI) can be calculated (Kenny et al., 2015). Several groups of researchers have studied the performance of the RMSEA using simulations that

TABLE 9 Correlation analyses on the studied constructs ($N = 1820$).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 WKL	—															
2 CONFL	0.342 ***	—														
3 WFC	0.602 ***	0.335 ***	_													
4 TECHNO	0.394 ***	0.238 ***	0.440 ***	__												
5 EASD	0.414 ***	0.382 ***	0.384 ***	0.339 ***	__											
6 ESD	0.265 ***	0.073	0.290 ***	0.257 ***	0.340 ***											
7 ECD	0.348 ***	0.489 ***	0.345 ***	0.344 ***	0.471 ***	0.303 ***	__									
8 SUP	−0.184 ***	−0.462 ***	−0.206 ***	−0.178 ***	−0.321 ***	0.004	−0.314 ***	--								
9 COL SUPP	−0.176 ***	−0.536 ***	−0.233 ***	−0.189 ***	−0.279 ***	−0.044	−0.549 ***	0.526 ***	__							
10 AUT	−0.164 ***	−0.281 ***	−0.239 ***	−0.242 ***	−0.383 ***	−0.232 ***	−0.274 ***	0.320 ***	0.333 ***	__						
11 ID ORG	−0.001	−0.117 ***	0.015	−0.047	−0.164 ***	−0.015	−0.118 ***	0.222 ***	0.192 ***	0.228 ***	__					
12 COM	−0.293 ***	−0.484 ***	−0.274 ***	−0.237 ***	−0.427 ***	−0.126 **	−0.410 ***	0.580 ***	0.441 ***	0.415 ***	0.233 ***	__				
13 ENV	−0.204 ***	−0.212 ***	−0.201 ***	−0.184 ***	−0.262 ***	−0.179 ***	−0.235 ***	0.211 ***	0.253 ***	0.341 ***	0.218 ***	0.321 ***	__			
14 JUST	−0.216 ***	−0.258 ***	−0.192 ***	−0.113 ***	−0.315 ***	−0.067	−0.287 ***	0.291 ***	0.273 ***	0.293 ***	0.283 ***	0.359 ***	0.266 ***			
15 ORG SUPP	−0.293 ***	−0.413 ***	−0.374 ***	−0.262 ***	−0.429 ***	−0.209 **	−0.358 ***	0.473 ***	0.444 ***	0.464 ***	0.341 ***	0.479 ***	0.358 ***	0.338 ***	__	
16 BURN	0.350 ***	0.380 ***	0.439 ***	0.328 ***	0.425 ***	0.298 ***	0.386 ***	−0.311 ***	−0.310 ***	−0.393 ***	−0.291 ***	−0411 ***	−0.233 ***	−0.312 ***	−0.444 ***	__
17 ENG	−0.213 ***	−0.367 ***	−0.232 ***	−0.260 ***	−0.435 ***	−0.248 ***	−0.363 ***	0.363 ***	0.349 ***	0.443 ***	0.456 ***	0.436 ***	0.296 ***	0.353 ***	0.464 ***	−0.574 ***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$ 1. WKL, Workload; 2. CONFL, Dysfunctional Relationship; 3. WFC, Work–family conflict; 4. TECHNO, Technostressors; 5. EASD, Excessive academic staff's demands; 6. ESD, Excessive students' demands; 7. ECD, Excessive colleagues' demands → Job Demands; 8. SUP, Hierarchical Superior's support; 9. COL SUPP, Colleagues' support; 10. AUT, Decisional Autonomy; 11. ID ORG, Organizational identification; 12. COM, Communication; 13. ENV, Comfort of university environments; 14. JUST, Distributive justice; 15. ORG SUPP, Organizational support for work-life balance → Job Resources; 16. BURN, Burnout (Emotional Exhaustion and Detachment); 17. ENG, Work Engagement (Vigor and Dedication); → Outcomes Overall scores on the scales were considered for correlation analyses. Sample size may vary due to missing data and to the specificity of some scales targeted on a subsample of participants, the sample size ranging from 174 to 1783.

TABLE 10 Correlation analyses on the studied constructs on subsample ($N = 557$).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 WKL	—															
2 CONFL	0.301 ***	—														
3 WFC	0.669 ***	0.312 ***	—													
4 TECHNO	0.405 ***	0.201 ***	0.514 ***	—												
5 EASD	0.436 ***	0.369 ***	0.409 ***	0.384 ***	—											
6 ESD	0.258 ***	0.013	0.294 ***	0.370 ***	0.340 ***											
7 ECD	0.301 ***	0.268 ***	0.312 ***	0.327 ***	0.471 ***	0.303 ***	—									
8 OFF	0.504 ***	0.164 ***	0.506 ***	0.264 ***	0.241 ***	0.024	0.134 **	—								
9 SUP	−0.264 ***	−0.395 ***	−0.289 ***	−0.238 ***	−0.333 ***	−0.037	−0.235 ***	−0.217 ***	—							
10 MEAN	0.056	−0.280 ***	−0.002	−0.142 **	−0.179 ***	−0.086	−0.190 ***	0.051	0.287 ***	—						
11 COL SUPP	−0.253 ***	−0.462 ***	−0.276 ***	−0.210 ***	−0.340 ***	−0.058	−0.439 ***	−0.137 **	0.517 ***	0.324 ***	—					
12 AUT	−0.202 ***	−0.295 ***	−0.263 ***	−0.292 ***	−0.345 ***	−0.226 ***	−0.253 ***	0.035	0.336 ***	0.356 ***	0.386 ***	—				
13 ID ORG	0.012	−0.163 ***	0.068	−0.110 *	−0.114 *	0.040	−0.135 **	0.131 **	0.209 ***	0.533 ***	0.216 ***	0.229 ***	—			
14 COM	−0.323 ***	−0.445 ***	−0.293 ***	−0.258 ***	−0.449 ***	−0.084	−0.375 ***	−0.193 ***	0.579 ***	0.427 ***	0.500 ***	0.403 ***	0.261 ***	—		
15 ENV	−0.194 ***	−0.281 ***	−0.233 ***	−0.265 ***	−0.209 ***	−0.142 *	−0.226 ***	−0.136 **	0.271 ***	0.247 ***	0.302 ***	0.315 ***	0.227 ***	0.396 ***	—	
16 BURN	0.457 ***	0.409 ***	0.531 ***	0.482 ***	0.489 ***	0.240 ***	0.427 ***	0.231 ***	−0.384 ***	−0.380 ***	−0.332 ***	−0.375 ***	−0.307 ***	−0.424 ***	−0.286 ***	—
17 ENG	−0.180 ***	−0.414 ***	−0.214 ***	−0.266 ***	−0.375 ***	−0.186 **	−0.291 ***	−0.005	0.350 ***	0.672 ***	0.365 ***	0.474 ***	0.518 ***	0.496 ***	0.325 ***	−0.653 ***

$*p < 0.05$, $**p < 0.01$, $***p < 0.001$ 1. WKL, Workload; 2. CONFL, Dysfunctional Relationship; 3. WFC, Work–family conflict; 4. TECHNO, Technostressors; 5. EASD, Excessive academic staff's demands; 6. ESD, Excessive students' demands; 7. ECD, Excessive colleagues' demands; 8. OFF, Off-work hours → Job Demands; 9. SUP, Hierarchical Superior's support; 10. MEAN, Work meaning; 11. COL SUPP, Colleagues' support; 12. AUT, Decisional Autonomy; 13. ID ORG, Organizational identification; 14. COM, Communication; 15. ENV, Comfort of university environments → Job Resources; 16. BURN, Burnout (Emotional Exhaustion and Detachment); 17. ENG, Work Engagement (Vigor and Dedication); → Outcomes Sample size may vary due to missing data and to the specificity of some scales targeted on a subsample of participants, the sample size ranging from 193 to 524.

considered the RMSEA and its CI and concluded the RMSEA tends to improve with the inclusion of more variables in the models (O'Boyle and Williams, 2011; Kenny et al., 2015). Therefore, by increasing the sample size in future surveys to be able to use the full range of variables in the theoretical model, we hope to overcome this important limitation. Now, we can identify an initial correct functioning of the scales within the university context as far as staff are concerned.

The second limitation concerns the sample: the research we conducted is still at a preliminary stage and it is not possible to generalize the results. We could only examine the psychometric properties of the scales by comparing only two universities. Further analyses could extend the sample by considering other universities. Third, in this study we provide evidence of normality of the items, reliability, content, construct and nomological validity. Moreover we tested measurement invariance across gender, seniority, and Athenaeum. Although these are promising results, other kinds of validity should be tested in the future, such as convergent and criterion validity, and temporal reliability. Future research could also benefit from the use of this tool for testing longitudinally the J-DR model in the same Universities. In practice, the reiterate use of the tool for investigating the quality of working life in academia could be useful to verify the effect of possible intervention implemented after the investigation.

From a practical standpoint, it should be noted that the TASQ@work is proposed as a comprehensive instrument that captures the most relevant dimensions for measuring the quality of life at work among TAS, as highlighted in the literature (see Introduction section). At the same time, the TASQ@work is a flexible tool that can be adapted according to the contextual characteristics of each university (e.g., size, geographical location, or internal structure), which means that each steering group can tailor the survey according to its specific needs. For example, based on the JD-R model, if a university was interested in the assessment of WR-S risk factors in accordance with the European Framework Agreement on Work-Related Stress (2004), then the scales aimed at determining job demands (e.g., excessive academic staff's demands, dysfunctional relationships)—and, possibly, burnout—could be administered. Conversely, if a university was interested in those work-related factors that can promote motivation and work engagement, in line with the Sustainable Development Agenda (e.g., Goal 8), then scales aimed at measuring job resources (e.g., decisional autonomy, supervisor's/colleagues' support)—as well as personal resources and work engagement—could be used. Secondly, if the aim of the investigation was to identify risk/protective factors in specific homogeneous groups of workers and/or organizational sectors involving, for example, frequent interactions with students (e.g., Student office, Erasmus office, Tutoring office), then the focus could be on context-specific scales including, for example, the excessive students' and academic staff's demands. Similarly, if the investigation was targeted at homogeneous groups of workers/organizational sectors where working from home or hybrid work arrangements are common—and workers are therefore particularly exposed to risks related to new technologies—then the technostress creator as well as the technologically assisted job demands scales could be particularly valuable. Finally, certain scales could be omitted in those homogeneous groups of workers/organizational sectors where a single risk factor is not present.

All in all, it should be noted that the TASQ@work is a constantly evolving tool that can be adapted to emerging contextual factors arising from field experiences. For example, the off-work hours scale was used in one of the two universities in the sample as it was considered strategic by the steering group to monitor work-related changes during the COVID-19 pandemic. Similarly, the QoL@Work research team is working to include scales to detect specific risks related to temporary employment in Academia.

In conclusion, this paper presents an initial psychometric validation of the TASQ@work questionnaire that shows properties to be promising and provide valuable aid to the study of factors influencing the well-being of a specific occupational group in the academic context, the technical-administrative staff. This contribution becomes even more important if one reflects on the historical period that universities are going through, which is determined by strong changes and modifications in the way they perform their work. Equipping oneself with a suitable tool, aimed at identifying possible risks and protective factors against the development of stress syndromes, becomes even more crucial. The tool, moreover, rests its existence on a literature study on stress-related phenomena related to technical-administrative personnel and on the experience of a team of academics with expertise in work and organizational psychology. The first results are comforting, as they outline the consistency of the instrument and its effective connection with the phenomenon it intends to measure in its specific target. Therefore, although the instrument needs further confirmation of its validity (on other samples, in a longitudinal and cross-cultural sense), it may represent a valid way of providing important and functional implications in the university management of technical administrative staff, a crucial component of the organization's functioning. Furthermore, by focusing on the positive aspect of employee development in a general sense, the variables adopted in the instrument, identified with precise references to the literature, could serve to improve the quality of academic organizational life and better manage work-related stress in the post-Covid time. Moreover, from a preventive point of view, identifying early signs of "danger" that include the perceived effects of the technological transformations of the TAS personnel's tasks may be a valuable initiative to enable effective and timely action to create a more balanced and sustainable working environment. Finally, the tool can trace a fruitful path in the implementation of interventions aimed at reinforcing those job and organizational aspects capable of fostering motivational processes and increasing satisfaction, acting in concert on the reduction of processes that impact on health, such as burnout.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by the Bioethics Committee, Alma Mater Studiorum—University of Bologna (protocol n. 327010). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

AB: Conceptualization, Project administration, Supervision, Writing – original draft, Writing – review & editing. CB: Writing – original draft, Formal analysis, Methodology, Software, Validation. AF: Writing – original draft, Conceptualization, Supervision, Writing – review & editing. MB: Formal analysis, Methodology, Software, Validation, Writing – original draft. VC: Conceptualization, Supervision, Writing – original draft, Writing – review & editing. GD: Formal analysis, Investigation, Methodology, Writing – original draft. MG: Visualization, Writing – original draft, Writing – review & editing. SG: Writing – review & editing, Conceptualization, Supervision, Writing – original draft. DaG: Conceptualization, Writing – original draft, Writing – review & editing. DiG: Data curation, Funding acquisition, Investigation, Supervision, Writing – review & editing. EI: Writing – original draft. MM: Funding acquisition, Investigation, Supervision, Writing – review & editing, Data curation. FP: Visualization, Writing – original draft, Writing – review & editing. SP: Formal analysis, Methodology, Software, Validation, Writing – review & editing. FS: Formal analysis, Methodology, Software, Validation, Writing – review & editing. PS: Conceptualization, Project administration, Supervision, Writing – review & editing.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyg.2024.1346556/full#supplementary-material

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Education, relationships, and place: life choices in the narratives of university master students

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Choice is one of the most roughly defined concepts in contemporary social sciences. Previous studies have elucidated the factors that influence young people's choices in different life situations. However, it is still unclear how young people evaluate these choices and how they integrate them into their biographies. In this study, we examine the narratives of 30 first-year master's students at HSE University with regard to two categories of life choices: those that they perceive as fortunate and those that they perceive as unfortunate. Using a written online survey, the data was collected in the spring of 2022. To categorize the different decision kinds, thematic analysis was applied. Overall, we discovered that narratives about the life choices made by master students concentrated on education, relationships and place.

KEYWORDS

life choices, fortunate choices, unfortunate choices, narrative analysis, McAdams, essays, written communication, university students

1 Introduction

Choice is a vague concept in contemporary social sciences. Firstly, choice can be equated with decision-making, and secondly, choice can be considered a turning point in a life story. A significant part of psychological research is devoted to the study of preferences from a limited number of alternatives, personality traits, and cognitive distortions/biases (Kahneman, 2003; Galotti, 2007; Leontiev et al., 2020).

Structural, cultural, interpersonal, and personal factors also influence young people's choices (Eun et al., 2013; Guan et al., 2015; Mitra and Arnett, 2021). The number of available options is one of the *structural* factors that could make the process of choosing harder for people (Schwartz et al., 2002). Having many alternatives can lead to regret due to the fact that it is impossible to try them all. Additionally, personal autonomy influences choice; specifically, when a person feels more autonomous, it is easier for them to make a choice coherent with their values (Ryan and Deci, 2006). For example, students that can better self-regulate during decision-making are more likely to choose a professional trajectory that corresponds with their specialization in college (Eun et al., 2013). Concurrently, the existence of options increases motivation, life satisfaction, and wellbeing (Bone et al., 2014). Therefore, when people make choices based on their intrinsic motivation, they have more successful educational experiences, feel more satisfied with their job, and progress more quickly up the career ladder (Ryan and Deci, 2000). Values are one of the *cultural* factors that influence decision-making. Young people in countries with a collectivist type of culture take into account social expectations when making choices related to their education and career, while

young people from an individualistic type of culture tend to pay less attention to others' opinions (Mitra and Arnett, 2021). If a country has both collectivist and individualistic values, young people balance their own thoughts and wishes about their future with social expectations (Akosah-Twumasi et al., 2018). *Confidants' opinions* are a significant interpersonal factor that can impact young people's choices (Sanfey, 2007). For instance, students may choose an educational path that they do not like personally due to being strongly influenced by important members of their social circles, such as parents, teachers, and significant others (Guan et al., 2015). Self-esteem, self-efficacy, and personal interests are *personal factors* that are important in choice (Galotti et al., 2006; Parker et al., 2012; Skatova and Ferguson, 2014). Moreover, Kunnen (2013) identified that young people tend to consider educational choices as fortunate if they correspond with individual preferences, improve their wellbeing and job satisfaction, and make them feel more stable. Furthermore, age-related factors can affect choice among different age groups. For example, adolescents tend to postpone life choices (Bochaver, 2008), but young people tend to make more choices than people of other ages. During youth, a lot of people tend to make career decisions and other important decisions that could determine their future life (Gati and Saka, 2001; Mather, 2006; Reed et al., 2008). These choices are developmental tasks that help young people become more responsible for their lives and the lives of their significant others (Schulenberg et al., 2004; Mayseless and Keren, 2014; Arnett, 2015).

1.1 Narrative identity and the promise of narrative analysis framework for life choices investigations

Overall, previous studies have shown how young people make choices, but it is unclear how they evaluate their choices in later life and in relation to their biography. To address this research question, we used the concept of narrative identity (McAdams, 2011). Reflection on personal life in the forms of internal and external monologues is an important part of the individual process of aging (McAdams and Pals, 2006; McAdams, 2011). By thinking about personal life experiences and evaluating them, individuals may alter their future (Kaźmierczak et al., 2021). Concurrently, self-life reflections constitute narrative identity and represent an important life path development factor (McAdams, 2011). To be precise, narrative identity is a life story that is based on individual experiences, their evaluations, values, life goals, and visions of the future. Studies on narrative identity building in relation to different life spheres and at various life stages have helped scholars to identify how psychological disorders and wellbeing manifest themselves and may be identified through personal self-representations in daily life (Cowan et al., 2021; Shiner et al., 2021). Additionally, narratives are important for counseling, since they provide material for professional coaches, psychologists, and other mental health specialists to guide critical self-improvement sessions with clients and help them to build more meaningful and prosperous lives (Newitt et al., 2019; Singer, 2019; Turner et al., 2021).

1.2 Study rationale

In this paper, we focus on the analysis of university students' narrative identity building in relation to two types of life choices:

choices that they consider fortunate and choices that they consider unfortunate. In this work, choices refer to independent decisions based on intrinsic motivation (Ryan and Deci, 2000) that a person makes during the current period of their life and that determine their life trajectory (Arnett, 2000). Our goal is to compare the narratives on fortunate and unfortunate choices to reveal what types of choices are considered fortunate and what types are thought to be unfortunate. In terms of studying fortunate and unfortunate choices, we base the classification of choices as fortunate or unfortunate on individual perceptions and do not evaluate the meaning of the choices for the participants' biographies.

2 Methods

The analysis was conducted using data from an online survey (cross-sectional design).

2.1 Participants

First-year master's students of an elite Russian higher education facility (Higher School of Economics - HSE University). These students were all enrolled in a course on contemporary childhood studies in the spring of 2022, which is a minor (second specialization) in master's programs at HSE University. During the course, all the students (46) were asked to participate in an online survey focusing on their life trajectories. The participants were required to be at least 18 years of age. Out of all the invited students, 65% (30) decided to take part in our research and provided informed consent. The average age of the participants was 24.8 years (SD = 4.4). Overall, 24 of the participants were female, and 6 were male. The study participants represented 15 different master's programs.

2.2 Procedure

The survey items were based on the narrative tradition in psychology (McAdams et al., 1996). Specifically, the survey included two open-ended questions that asked the participants to discuss two life situations in a free format essay of 300–1,000 words. Firstly, the participants were requested to describe the situation in which they made a choice that they considered unfortunate and that had a tremendous impact on their current life. The participants were asked to specify what happened, when, where, who was involved in the situation, and what feelings and thoughts this situation caused then and evoked in the present. Secondly, the participants were requested to discuss another situation in which they made a fortunate choice using the same format.

2.3 Data analysis

Qualitative thematic analysis (Braun and Clarke, 2012) was used to reveal the types of choices made by the participants. The data were condensed into categories of choices by three

researchers. As a result, we obtained five codes for both unfortunate and fortunate choices, including (1) higher education choice, (2) other education and work-related choices, (3) romantic relationships and friendships, (4) relationships with relatives, (5) and moving to another city (Table 1). All coding was done in Excel.

3 Results

3.1 Unfortunate choice narratives

The most frequently mentioned unfortunate choice type was the higher education choice. Overall, 10 out of the 30 participants reported that either their decision to pursue their bachelor's or master's degree was not the most suitable decision for them (Table 1 and Supplementary Table S2). Specifically, some participants expressed that their choice of higher education was unfortunate because they had to move away from their native city, where they had warm and supportive relationships with family, friends, or romantic partners:

"In 2013, I got into the HSE master's program through the Olympiad. During that period, I was living with my mother in Altai Krai. At the end of August, I needed to go back to university. The tickets were bought, the suitcase was packed, but I got rid of these tickets because I fell in love. I decided to stay at home. My mother and other relatives did not try to change my mind, and it was difficult to make this decision for a long time." (female, 32 years old).

Others claimed that their higher education choice was unfortunate because they did not choose the right program. This happened either because of pressure from relatives or misconceptions regarding the program format.

"I think that my unfortunate choice was to become a public accountant. When I chose this type of education, I wanted to build a successful career and be an independent woman. Therefore, at 17, I needed to move from my home city to a bigger one. My parents always advised me to be a doctor since they

were doctors. I was confident in my choice to be a doctor, but I was sure that it would be impossible to be wealthy in that profession. Now, I think that I should have become a doctor; I frequently think that it is a pity that I am not a doctor." (female, 39 years old).

Additionally, romantic and friend relationships (8), other education and work opportunities (8), relationships with relatives (3), and changing their residence place (1) were mentioned as other types of unfortunate choices.

3.2 Fortunate choice narratives

The reported fortunate choices also mainly focused on significant decisions related to higher education. Overall, 9 students reported being satisfied with their choice of studying at the university. The students explained that this choice helped them to access new resources, such as social connections and work-related opportunities.

"In 2018, I decided to go and get a master's degree in France. However, I did not have money, and it was impossible to get help with that from others. Furthermore, this project seemed outrageous to me, and I was scared. Now, I am very happy that I made such a decision. At that time, I thought that I was going on an adventure. Now, I understand that it was a brilliant decision that made it possible for me to access a lot of developmental paths and helped me find the most interesting field for me. That choice defined my future." (female, 24 years old).

"Following my graduation, I found myself at a loss about my next course of study. I had no idea what I wanted, and "advisers" from all angles were pressuring me, which made things worse. I also felt uncertain and had low self-esteem. I chose to compile a list of universities and a "short-list" of bachelor programs that could probably be applied when completing the budget using my points from the unified state test. Eventually, I managed to find that location and path, for which I am incredibly appreciative. I now see

TABLE 1 Fortunate and unfortunate choice types, *n* = 60.

Type	Unfortunate (*n*)	Fortunate (*n*)
(1) Higher education choices	Studying in college (8), program choice (2)	Studying in college (9)
(2) Other education and work-linked choices	Changing school (1), not changing school (1), not finishing education supplementary to schooling (2), supplementary education choice (1), handing in the wrong assignment at university (1), work choice (2)	Changing job (1), work choice (2), choice of university scientific advisor (2), not quitting higher education (2), supplementary education choice (1)
(3) Romantic and friend relationships	Bullying somebody (1), ending a relationship with a friend (1), not accepting a marriage proposal (1), ending a romantic relationship (1), starting a romantic relationship (4)	Continuing a romantic relationship (1), socializing with peers during higher education (1), participating in a festival instead of spending time with friends (1), starting a romantic relationship (2)
(4) Relationships with relatives	Parental divorce (1)[1], moving out from parents' house (1), not saying goodbye to a relative who died later (1)	Returning to parents (1), following father's advice (1)
(5) Changing residence place	Moving to another city (1)	Traveling (1), moving to another city (5)

In brackets are presented the numbers of participants who mentioned certain choice type.
[1]Student considered the parental divorce a choice.

> *this as the beginning of my capacity to organize knowledge, think critically, and analyze in a way that has evolved with me."* (male, 24 years old).

Other fortunate choices related to work and education (8), changing residence place (6), changes in relationships with friends or romantic partners (5), and changes in relationships with parents (2).

4 Discussion

Mostly, the young people reported failing in their educational choices. The reasons for those failures were moving from their native city, a lack of close relationships in the new place, pressure from relatives in choosing a studying program, and ignorance regarding the program format. Regretting the wrong choice of educational program is common, as young people try different spheres of life, determine their preferences, and develop their life experiences. However, students from countries in which the educational trajectory can be changed do not perceive this choice as fatal (Kucel and Vilalta-Bufí, 2013). In Russia, there are specific expectations regarding the educational backgrounds of specialists based on the profession pursued (Minina and Pavlenko, 2022). As in the example given, becoming a physician takes many years of prior education, and it is hard for middle-aged people to undertake this (Galkin, 2020; Temnitskiy, 2021). Another narrative focused on career choices in design or social sciences, which seem to be much more accessible even to people who are in the period of "established adulthood." We suppose that, in order to make the education of physicians seem a more financially prosperous path, more money should be spent on financial aid, and stereotypes about the economic aspects of being a physician in Russia should be addressed (Temnitskiy, 2021). However, surprisingly, educational choices were most often evaluated as fortunate. In this study, as in previous research, we found that the majority of students reported their choice of university education as fortunate because it positively affected their career prospects (Hemsley-Brown and Oplatka, 2015).

Overall, the same life events can be marked as fortunate or unfortunate, and this can be explained by personality differences. For example, students in more negative emotional states are more prone to classifying certain events as unfortunate (Rakhshani et al., 2022). Furthermore, the events mentioned were all in line with the findings of studies on major life events; however, unlike in the latest studies, the events mentioned by the students did not include legal, health, and societal issues (Haimson et al., 2021). Furthermore, in comparison to Haimson et al. (2021), starting college and graduation were more likely to be perceived as positive events. Relocation to another city was perceived heterogeneously, and relationships were found to be the most heterogeneously perceived area in the assessment; indeed, they involve a significant amount of uncertainty and dependence on other people.

If we compare our findings with the previous literature on choices, it is clear that in the students' narratives, structural and cultural factors as the limits or the sources of possibilities were almost not acknowledged. This means that the students did not

perceive their choices to be particularly affected by societal norms and expectations. Therefore, according to the students, socioeconomic status, regional well-being, and other elements of the social structure did not significantly affect their decisions. Conversely, interpersonal effects such as parental advice and personal factors, including interests and self-esteem, played important roles in their stories. We assume that the influence of the macro contexts that impede or foster choices are hidden from people (Laughland-Booÿ et al., 2015; Minina and Pavlenko, 2022). For instance, an internal locus of control may lead to self-esteem distortions (Wang and Lv, 2020).

4.1 Limitations

Firstly, we cannot clearly distinguish the students' interpretations of their choices from the influences of educational context, social desirability, and other factors. Context could have caused the participants to remember primarily education-related choices, and social desirability may have facilitated them to hide unpleasant situations and disclose only the ones for which they would not be judged by others. To increase the validity of the results, it would be more reliable to use unsolicited personal data in future studies (Jones, 2000). Secondly, the gender is a factor that influences the perception of life events, but it was not examined in this study, so in the future, it is necessary to evaluate the contribution of this variable to the construction of narratives. For instance, males are more likely to experience stressful life events related to achievements, whereas females are more likely to experience stressful events connected with interpersonal experiences (f.e., caregiving) (Cohen et al., 2019). Finally, the conclusions obtained cannot be extended to the whole population, because only students of one Russian university took part in the study. In future studies, it would be useful to increase the size and heterogeneity of the sample in order to assess the contribution of socio-demographic variables.

4.2 Implications

Our findings can be used by university career counseling services. Clients of such services may be advised to write narratives about their successful and unsuccessful choices, as this may help them better reflect on their achievements and failures. In order to make recollections regarding unpleasant life situations less self-centered, self-blaming, and traumatic, career counselors should advise students to think more on the external factors unrelated to themselves that may have caused these failures. In addition, as an example of possible ideas for implementing writing in career counselling, we provide some worthwhile writing practices for university students counselling in the Appendix.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The study does not go against the ethical guidelines set forth by HSE University (https://www.hse.ru/en/org/hse/irb/ethics). The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

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All that glitters is not gold! Job insecurity and well-being in STEM research fellows: a latent profile analysis

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Job insecurity is now one of the major stressors affecting well-being at work. In academia, researchers appear to be in the most precarious position. To explore the relationship between job insecurity and well-being at work, we analyzed a sample of research fellows belonging to STEM disciplines in Italy. Using a latent profile approach, we identified three "hidden" subgroups: "Safe & Sound"; "Safe not so Sound" and "Neither Safe or Sound." Compared to previous studies, our results show that even within a population of STEM researchers that tends to have good levels of employability and mobility, there are subgroups of people characterized by greater job insecurity and low work commitment, who suffer from emotional exhaustion and cynicism at work level, i.e., more exposed to the risk of burnout.

KEYWORDS

job insecurity, academia, researchers, work-related stress, work engagement, latent profile analysis (LPA)

1 Introduction

Job insecurity has emerged as a prominent stress factor in recent years, particularly among younger workers. It embodies an individual's subjective fear of involuntary job loss in the near future (Sverke et al., 2002). This fear signifies a potential fundamental, involuntary change in one's current employment status, revealing the delicate nature of job stability in today's organizational landscape. The implications go beyond mere employment concerns and affect critical work-related facets such as financial stability, social relationships and personal identity.

Classified as a stressor due to its detrimental effects on work-related resources (Vander Elst et al., 2016), job insecurity stems from a discrepancy between an individual's experienced and desired levels of security (Hartley et al., 1991; Keim et al., 2014), exacerbating its psychological impact. Studies have equated the distress caused by fear of job loss to that experienced when unemployed, particularly during adverse labor market conditions such as economic crises (Gallie et al., 2017).

This uncertainty at work potentially leads to increased turnover intentions and reduced employee loyalty (Arnold and Feldman, 1982; Davy et al., 1997). Different research suggests conflicting results - some suggesting lower self-rated performance due to job insecurity, while others argue for increased employee effort to secure their position (Brockner, 1988; Ashford et al., 1989; Armstrong-Stassen, 1993; Rosenblatt and Ruvio, 1996; Sverke and Hellgren, 2001;

Sverke et al., 2002). The complexity of this relationship requires further research.

In addition, job insecurity is pervasive in academia, particularly affecting young researchers in training, due to the increased reliance on temporary contracts as a result of recent labor market reforms in European countries (Castellacci and Viñas-Bardolet, 2021). This trend has a significant impact on roles such as postdoctoral positions, which are characterized by employment uncertainty, limited career prospects and high workloads (Guidetti et al., 2022). As a result, these uncertainties discourage many talented young researchers from pursuing an academic career (Langenberg, 2001; Dorenkamp and Weiß, 2018), which has multiple implications for academia.

This study aims to deepen the understanding of job insecurity among research fellows and, in particular, to explore its impact on well-being. It seeks to identify distinct groups of early career researchers based on their experienced levels of job insecurity and its correlates - work engagement, emotional exhaustion and cynicism - essential dimensions of early career academic researcher well-being.

2 Job insecurity

In the constantly evolving world of the modern workplace, the nature and meaning of job insecurity has changed. Greenhalgh and Rosenblatt (1984) initially defined job insecurity as "the perceived powerlessness to maintain desired continuity in a threatened job situation" (p. 438), emphasizing the subjective aspect within the immediate work environment.

As defined by Heaney et al. (1994), Davy et al. (1997), Cheng and Chan (2008), and Shoss (2017), job insecurity reflects an individual perception of job continuity and includes concerns about job existence and job stability. Beyond the fear of immediate job loss, it includes concerns about valued aspects of work and career uncertainty (Greenhalgh and Rosenblatt, 1984; Hartley et al., 1991).

Although increasingly difficult to define and measure, it is important to note that job insecurity does not always signal imminent job loss (Sverke et al., 2002). Rather, it signifies the anticipation of a potentially stressful event when individuals perceive their employment to be at risk.

Research suggests that job insecurity has a profound effect on employees' health, well-being, attitudes towards work, job perceptions and behaviors (De Witte, 1999). As engagement declines, individuals may distance themselves from the stressor by using coping mechanisms related to job insecurity (Cheng and Chan, 2008). When job insecurity arises, employees may adopt withdrawal strategies in response to decreased commitment. However, the relationship between job insecurity and employee commitment remains a subject of ongoing debate, with some studies showing no significant relationship (Sverke et al., 2002; Loi et al., 2011).

Despite extensive research on individual differences as moderators, there is still a gap in understanding how work environments influence the impact of job insecurity on employees' work-related behaviors, as highlighted by Rosen et al. (2010). A more detailed identification of the effects of job insecurity on job performance is essential for the design of management interventions aimed at mitigating its negative effects.

Whereas there are many studies that have examined the relationship between different aspects of job insecurity and job outcomes using a variable-centered approach (De Witte et al., 2016), few studies have used a person-centered approach. The latter approach is advantageous because might help to identify high-risk subgroups

and to shed light on the specific mechanisms by which variables (i.e., job insecurity and work-related health outcomes) differently work and combine each other across subgroups. In addition to a comprehensive measure, Wang et al. (2015) examined the specific effects of different dimensions of job insecurity. Currently, there is a lack of research on how work environments specifically influence the impact of job insecurity on employees' work engagement. Further research is needed to identify the work conditions in which job insecurity has a significant impact on employees' work engagement.

2.1 The situation of research fellows in Italy

In Italy, the path after obtaining a PhD degree is rather long and tortuous, and the reforms on public spending have led to significant cuts in research in public universities (Donina and Hasafendic, 2019).

After obtaining a PhD degree, according to the Law 240/2010, there are several steps in the academic career in the Italian public university system: (1) non-tenure-track postdoctoral researcher, (2) non-tenure-track type A researcher (three-year contract renewable for another 2 years after a positive evaluation by the university, at the end of which it is possible to access the type B position), (3) tenure-track type B researcher (three-year non-renewable contract, at the end of which direct access to the position of associate professor is possible, if the national scientific qualification is held and subject to a positive evaluation by the university), (4) associate professor and (5) full professor (Guidetti et al., 2022).

The Italian higher education system has experienced a decrease in public funding, resulting in the majority of scholarships being sourced from external funds. In both scenarios, doctoral students are actively involved in full-time research activities, typically working under the guidance of a faculty member who often serves as the principal investigator for the project. According to legal provisions, doctoral students can be granted research fellowships for a maximum duration of 6 years, whether consecutively or with gaps, with each fellowship spanning one to 3 years. Consequently, this system elevates the probability of interruptions between fellowships, which are inadequately compensated for through social protection measures.

This situation places the Italian system among the most precarious in Europe, and many researchers express the belief that their working conditions also impede their performance (Toscano et al., 2014).

If we refer to the population of early career researchers in STEM (science, technology, engineering, mathematics), their job satisfaction is mainly related to job insecurity (Grinstein and Treister, 2018), lack of work-life balance (Bogle et al., 2018), excessive workload (Dorenkamp and Weiß, 2018) and lack of organizational support (Miller and Feldman, 2015), which leads them to abandon their academic careers in favor of careers in other organizational settings. Some American studies have shown that young researchers at the beginning of their careers often developed poor well-being due to job insecurity and the long and often frustrating academic journey, which damaged their job satisfaction (Grinstein and Treister, 2018).

2.2 Work engagement, emotional exhaustion and cynicism in research fellows

For the purposes of this study, it was important to us to have a look at two of the key components of burnout: emotional exhaustion

and cynicism. Emotional exhaustion refers to a chronic state of physical and emotional depletion, also described as feelings of extreme fatigue; cynicism describes an attitude characterized by detachment and hostility towards one's work (Maslach and Jackson, 1981). In recent years, great importance has also been given to the dimension considered "opposite' to burnout: work engagement. Work engagement is a multidimensional construct defined as a positive, fulfilling, work-related state of mind that is characterised by vigor, dedication, and absorption (González-Romá et al., 2006). Postdoctoral researchers who feel very capable when working on their research projects are generally highly motivated by the project and are also likely to show resilience when faced with challenges and difficulties. It has been suggested that dedication is the main form of commitment among early career researchers in the behavioral sciences (Vekkaila et al., 2012) which is shaped by various factors, encompassing a feeling of ownership, a sense of self-efficacy, and a sense of being part of a collaborative research team.

Disengagement, conversely, denotes a state of passivity or a lack of engagement in a specific task or activity, as highlighted by Fredricks et al. (2004) and Reeve et al. (2004). This state is often a consequence of prolonged work-related stress, as described by Lazarus (1998). Experiences of disengagement typically encompass negative emotions, decreased commitment, and the adoption of cynical attitudes toward one's work in a broader context, as exemplified by Schaufeli et al. (2002). They are marked by feelings of ineffectiveness, psychological distress, and cynicism (Schaufeli et al., 2002). Professional ineffectiveness entails a reduced sense of accomplishment and a perception of one's work as excessively demanding, psychological distress, on the other hand, manifests as anxiety, low energy, exhaustion, and heightened tension. The element of cynicism introduces a critical dimension as involve a waning and loss of interest in one's work and the sense that its intrinsic purpose has been eroded, often leading to withdrawal from professional engagement due to diminished enthusiasm (Maslach and Leiter, 2008). Ultimately, the intricate facets of disengagement portray a vivid picture of the toll prolonged work-related stress has on the individual. It goes far beyond mere indifference, encompassing psychological strain, diminishing professional effectiveness, and a palpable loss of purpose in the workplace.

In the present study, we are interested in finding out whether there are homogeneous groups within our sample of researchers and how they are distributed in terms of job insecurity, work engagement, emotional exhaustion, and cynicism. We also analysed how the different clusters differ based on sociodemographic data.

3 Procedure

We conducted a survey in January 2022 among research fellows who had a position at a North Italian university in the fields of Science, Technology, Engineering and Mathematics (STEM). For the purpose of our survey, a research fellow is a PhD or graduate student with a scientific and professional curriculum vitae suitable for carrying out research activities, who is remunerated by means of 'research grants'. Participants volunteered for the study without compensation, gave informed consent, and agreed to complete the questionnaire anonymously. The research adhered to the tenets of the Declaration of Helsinki of 1995 and its subsequent revisions, and all necessary ethical guidelines and legal requirements for human research in each country were strictly adhered to.

Of the 513 questionnaires sent out, 218 (42.7%) were returned correctly. A total of 137 respondents were males (62.6%) and 82 were females (37.4%), with mean age of 31.7 (SD = 5.08) and 78.1% (N = 171) of the participants were aged between 27 and 36 years. The gender distribution of the study sample reflects the gender distribution of STEM's researcher population. This sample had a current contract of 1.5 years (SD = 0.9) but they had a history of collaboration with the institution of 4.09 years (SD = 3.44).

The *Individual Job Insecurity (IJI)* (α = 0.728; M = 9.71; SD = 3.39) was measured with six-item scale proposed by Låstad et al. (2015) ('I feel insecure about the future of my job').

Cynicism (CYN) (α = 0.908; M = 10.8; SD = 6.7) was measured using the five-item subscale of the Maslach Burnout Inventory-General Survey (It. version: Loera et al., 2014) ('I have become less enthusiastic about my work').

Work Engagement (WE) (α = 0.875; M = 39.08; SD = 9.52) was measured with the nine-item scale of Utrecht Work Engagement Scale (U-WES9) (Balducci et al., 2010) (At my work, I feel bursting with energy').

Emotional Exhaustion (EE) (α = 0.865; M = 14.4; SD = 6.9) was measured using five-item scale of the Maslach Burnout Inventory-General Survey (Loera et al., 2014) ('I feel used up at the end of the work day').

Responses to the cynicism and dedication measures were provided on a scale ranging from 0 ('Never') to 6 ('Every day'), while those on-the-job insecurity scale were rated on a four-point response scale ranging from 0 ('Not at all') to 3 ('Completely').

3.1 Group analysis

To understand if there are "hidden" subgroups of researchers in the sample based on the levels of precariousness and the relative consequences in terms of well-being, a latent profile analysis (Oberski, 2016) was conducted using the mixture model specification embedded in the statistical software Mplus. The scores of IJI, EE, CYN and WE were used as criterion variables to identify the latent classes. To determine the number of classes the approximate fit indices (Akaike Information Criterion-AIC, Bayesian Information Criterion-BIC and it adjusted version) were used, where lower values indicate superior model fitIn addition, we considered the Vuong-Lo–Mendell–Rubin adjusted likelihood ratio test (VLMR-LRT) which assess whether adding a class leads to a statistically significant improvement in model fit: a non-significant p-value for a k class solution lends support for the k - 1 class solution (Vermunt, 2024). Finally, the entropy coefficient and the average latent posterior probabilities predicting class membership for individuals were used to evaluate how accurately the selected model defines classes: an entropy value close to 1 is ideal and above 0.8 is sufficient, while probabilities between 0.80 and 0.90 are considered acceptable.

We estimated three nested models predicting the existence of 4, 3 or at least 2 latent classes (Table 1).

Considering all the diagnostics, we opted for the 3 classes solution (LRT tests significant, entropy above 0.8 and class membership over 0.9 or comprised between 0.8 and 0.9), that resulted a well- structured and meaningful partition of the examined researchers (Figure 1A). Moreover, the partition demonstrated an appreciable heuristic value since the three classes, or groups, accounted the variability of different

convergent and divergent construct indicators (Figure 1B), denoting a valid nomological network.

Table 1 shown LCA model fit and description of the selected 3 class solution.

The cluster analysis assigns a total of 218 scholars into three classes. The first cluster, named 'Safe & Sound', comprises 28.4% of the scholars, the second cluster, named 'Safe not so Sound', comprises 50.0%, and the third cluster, named 'Neither Safe nor Sound', comprises 19.4%. The labels for the clusters were assigned based on the average responses. The first group, in which scholars are more engaged, shows lower levels of emotional exhaustion and cynicism, which are also associated with lower levels of individual job insecurity. The scholars in the second group appear to be more emotionally exhausted and detached from their work. This group has low levels of work engagement and greater individual job insecurity. The third group has the lowest levels of work engagement and the highest levels of emotional exhaustion and detachment from work. These are also associated with higher levels of job insecurity.

As previously reported, the 'Safe & Sound' group exhibited higher levels of work engagement ($M = 45.52$) than the other two groups (Safe not so sound, $M = 39.9$; 'Neither Safe or Sound', $M = 29.5$). Consistent with this finding, the third group reported higher levels of emotional exhaustion ($M = 21.2$) than the other two groups ('Safe & Sound', $M = 6.9$; 'Safe and not so Sound', $M = 15.9$), as well as hostility towards their work ('Safe & Sound', $M = 4.2$; Safe and not so Sound, $M = 10.2$; 'Neither Safe or Sound', $M = 21.06$).

These results are also associated with levels of job insecurity. In the first cluster, where there are higher levels of engagement, job insecurity is lower ($M = 8.5$) than in the other two clusters where job insecurity increases (Safe not so Sound, $M = 9.37$; 'Neither Safe or Sound', $M = 12.09$) as work engagement decreases.

The validity of the partition was also tested with respect to other criterion variables that are considered antecedents of well-being. These variables include workaholism, which consists of overwork ($F = 12.4$) and compulsive work ($F = 10.4$); support from colleagues ($F = 7.6$) and supervisors ($F = 19.9$); and self-efficacy, regarding weaknesses ($F = 14.1$) and strengths ($F = 15.6$). All F-tests, controlled by Manova, were statistically significant ($p < 0.05$).

Jansen et al. (2002) stated that the need for recovery is a precursor to prolonged fatigue or psychological distress (p. 324). In everyday situations, individuals express their need for recovery as a desire to recharge their batteries. After a busy day at work, individuals may have reached a high level of activity, implying a high level of arousal, and consequently, they may have exhausted many of their resources. In

such situations, individuals may require more time to recover, and the need for recovery may persist beyond the immediate rest period. Inadequate recovery may result in individuals starting the next working day with a high need for recovery. Like the previous variables, the F-test is statistically significant ($F = 37.6$).

Equally important in the area of occupational well-being is the support of colleagues and supervisors (Schreurs et al., 2012). Furthermore, according to theoretical and empirical evidence, supervisor support has been primarily viewed as a buffer for the link between individual job insecurity and well-being outcomes (Schreurs et al., 2012; Cheng et al., 2014). The sample demonstrates significantly higher levels of supervisor support within the type 1 cluster ('Safe & Sound'). Additionally, social support from co-workers was found to be associated with a positive mood and higher commitment, which is in agreement with the literature. The type 1 cluster ('Safe & Sound') also shows higher levels of peer support and work commitment.

Self-efficacy is widely recognized as a crucial resource for coping with the unpredictability of today's work and career environment (Hirschi et al., 2013; Garcia et al., 2015). Self-efficacy refers to an individual's confidence in their ability to successfully pursue goals and cope with difficulties that may arise in the process. In cluster 1, self-efficacy is higher than in the other two clusters, both in terms of strengths and weaknesses.

4 Discussion

Compared to the data in the literature, our study shows that research fellows at a university in the STEM disciplines do not exhibit significant levels of individual job insecurity. This finding may be due to the motivation of these researchers, who choose to pursue this path despite many job offers outside the university context.

It is interesting to note the gender distribution, where women, although in the minority, are more representative within cluster 1 'Safe & Sound'. This observation contrasts with traditional gender stereotypes in academic settings, suggesting that women in STEM fields may possess distinctive characteristics contributing to higher commitment levels (van Veelen and Derks, 2022; Schmader, 2023).

In line with the literature, support from supervisors and peers is greater in the committed type, showing its importance in reducing job insecurity.

It is reasonable to speculate that individuals who believe in their ability to secure a new job might not respond as negatively to

TABLE 1 LCA model fit and description of the selected 3 class solution.

Latent classes (K)	AIC	BIC	Adj. BIC	LRT test (K vs. K-1)	p	Entropy
2	5477.535	5521.533	5480.337	187.521	0.000	0.846
3	5435.594	5496.515	5439.474	50.081	0.004	0.766
4	5420.991	5498.835	5425.950	23.721	0.136	0.753
		Classification Probabilities for the Most Likely Latent Class Membership				
		1	2	3	% male	Mean age (SD)
1: "Safe & sound"		0.826	0.174	0.000	59.68	32.05 (6.15)
2: "Safe and not so sound"		0.077	0.896	0.027	64.22	31.23 (4.26)
3: "Neither safe or sound"		0.000	0.059	0.941	63.83	31.98 (4.79)

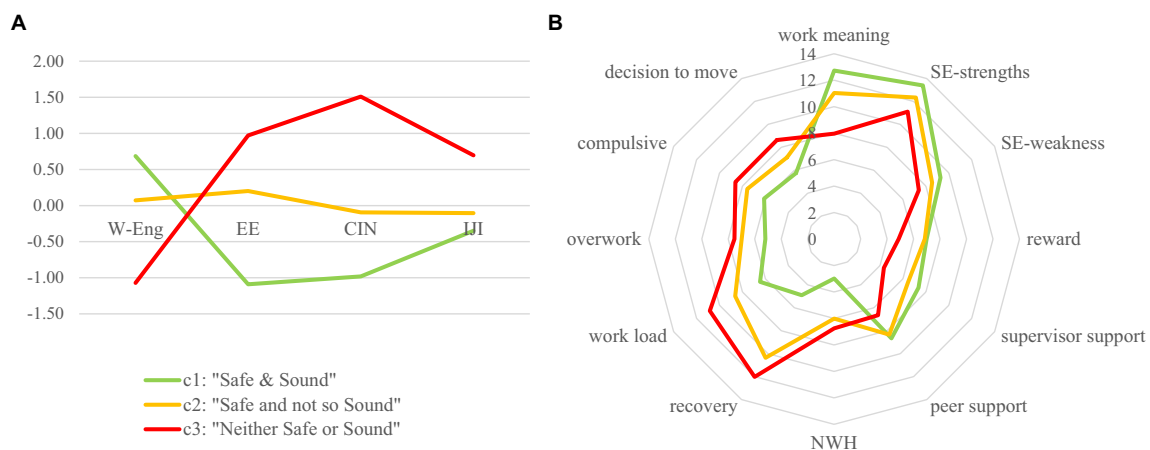*Lo–Mendell–Rubin Adjusted LRT test K vs K-1 latent classes.

FIGURE 1
Displays the results of the cluster analysis. **(A)** Latent class profiles on standardized criterion variables and **(B)** nomological network of latest classes.

perceptions of job insecurity compared to those who lack such confidence. The relationship between job insecurity and its outcomes has not been extensively explored, particularly in terms of how employment dynamics moderate these relationships.

From a practical point of view, findings from the present study suggest that job insecurity represents a detrimental condition for employees as it always appears in combination with high level of burnout and, in the case of the "neither safe or sound" subgroup, also in presence of poor work engagement. In this view, in order to reduce stress and support motivation, national reforms that increase the opportunity for post-doc researchers to reach tenure-track positions would be beneficial. When this is not feasible, due to lack of financial resources, academic organizations should pay great attention to the improvement of the quality of the psychosocial work environment. In particular, it was found that the presence of a supportive social environment (both from superior and peers) might mitigate the likelihood for the individual to fall in the subgroup exposed at the highest risk for psychosocial well-being ("neither safe or sound"). Accordingly, implementing programmes addressed at empowering leadership skills among research group coordinators might help them to develop awareness and capability in holding their role of mentoring (and not only merely of coordination) towards younger and precarious employees. In addition, organization should offer both formal and informal occasions of socialization among peers; some example are: organizing meetings of peer confrontation regarding research projects and academic life; arranging areas in the workplace for socializing, dining and relaxing specifically dedicated to PhD and post-doc researchers. These initiatives might favor sharing experience among precarious employees and strengthen their feeling of being part of a supportive social network, thus enhancing job engagement and reducing stress.

4.1 Strengths, limitations and future research

The study offered some insight regarding the role of employment dynamics in the relationship between job insecurity and its outcomes opens up new research avenues. The assumption that individuals who are confident in their ability to secure alternative employment may respond differently to perceptions of job insecurity warrants a more

detailed investigation. This suggests the need for longitudinal studies to understand how employment dynamics influence the psychological responses to job insecurity over time, providing a more comprehensive understanding of the complex interplay between individual beliefs, employment opportunities, and the experience of job insecurity.

The long-term effects of job insecurity remain unclear, so longitudinal research is needed to understand their evolution. A nuanced relationship exists between job insecurity and outcomes, with studies suggesting that initial levels of job insecurity predict negative outcomes in the future (Garst et al., 2000). The study cross-sectional design gives us a snapshot of job insecurity among researchers, but it limits our ability to draw causal relationships. Future research could explore job insecurity evolution and long-term effects using longitudinal methods. Research fellows in a specific region that is specific to Italy, which limited its generalizability. The use of self-reported data introduces the possibility of response bias. A more diverse sample across different geographical locations could provide a broader perspective. Understanding how these experiences unfold may provide valuable insights for intervention strategies. Adding qualitative insights to quantitative data can provide a more comprehensive understanding of the contextual factors influencing job insecurity. Focus groups and in-depth interviews can help capture subtleties that quantitative measures cannot. A critical component of mitigating job insecurity's negative effects is the effectiveness of various interventions. Future studies may explore organizational factors that may exacerbate or alleviate job insecurity, including mentoring programs, training initiatives, and organizational support structures. Researchers can contribute to a more nuanced understanding of job insecurity in STEM fields and develop targeted interventions to support the well-being of research fellows by addressing these limitations and pursuing these future research directions.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical approval was not required for the studies involving humans because The research conformed to the provisions of the Declaration of Helsinki in 1995 (and subsequent revisions), and all ethical guidelines were followed as required for conducting human research, including adherence to the legal requirements of Italy. Additional ethical approval was not required since there was no treatment including medical, invasive diagnostics or procedures causing participants psychological or social discomfort, nor were patients the subject of data collection. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

GB: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. SV: Writing – original draft, Writing – review & editing. LB: Writing – original draft, Writing – review & editing. DC: Conceptualization, Supervision, Writing – original draft, Writing – review & editing. BL: Conceptualization, Formal analysis, Methodology, Supervision, Writing – original draft, Writing – review & editing.

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Evaluating well-being and psychosocial risks in academia: Is management the "forgotten phase"?

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In recent years, there has been a noticeable increase in attention towards promoting well-being within academic settings. In the specific context of academia, a critical issue is understanding whether the current practices for assessing and managing well-being can bridge the implementation gap and increase opportunities for creating healthy academic conditions. The paper explores the practices adopted for assessing and managing work-related stress (WRS) risks in Italian academia by referring to data from a group of Italian universities of the QoL@Work network (Quality of Life at Work in academia). The aim is to improve understanding of the factors that influence the realization of a WRS risk assessment-management pathway and how they may facilitate or hinder the transition from assessment to the implementation of interventions in the academic context. The results suggest that the assessment-management pathway should prioritize the creation of organizational scaffolding to support participatory processes in order to prevent the data collected from failing to stimulate organizational change in working conditions.

KEYWORDS

healthy university, work-related stress, implementation gap, psychosocial work environment, psychosocial risks, higher education, evaluation

1 Introduction

In recent years, there has been a noticeable rise in interest in how to contrast work-related stress (WRS) risks and promote well-being in academic settings, as several studies have shown an increase in stress symptoms among university staff (Johnson et al., 2019; Urbina-Garcia, 2020). Explanations for this worsening mental health situation point to the changes occurring in higher education institutions worldwide, such as a focus on internationalization, increased student numbers, and the growing importance of performance indicators to measure quality (Kinman and Johnson, 2019; Lee and Stensaker, 2021). Moreover, some scholars have highlighted that these adverse effects are a consequence of the spread of a neoliberal approach in universities. While these institutions have traditionally focused on education and societal betterment, this approach has emphasized high productivity and market-oriented strategies. This shift in mission has provoked emotional struggles due to the perceived dissonance between identity and academic work, negatively affecting well-being (Smith and Ulus, 2020).

Scholars agree that the essential condition for countering WRS risks and developing well-being at work is to design and implement a valuable methodology for assessing and managing risks related to workplace stress. To date, many models have been developed to effectively design this methodology (Leka et al., 2008; INAIL, 2018), but little is known about how the overall assessment

and management pathway is put into practice in academia and what facilitates or hinders its progress (some exceptions: Pignata et al., 2018; Innstrand and Christensen, 2020). Filling this information shortage is critical for several reasons. Firstly, evidence from other business sectors suggests that practices adopted to manage this pathway play a critical role in well-being strategy effectiveness, as they influence the quality of data collected (Di Tecco et al., 2015). Secondly, Cox (2016) notes that although this pathway aims to identify, assess, and manage risks to employee health, in many contexts less attention is paid to how these risks are subsequently managed once they have been assessed. The risk management phase is often a "forgotten phase." This has led to an implementation gap between assessment and intervention management. In academia, this gap can turn the stated emphasis on well-being into a rhetorical discourse, with data seldom used to inform management decisions. Moreover, neoliberal approaches can endorse an individualistic vision of well-being, focusing on personal responsibility in managing health and stress while overlooking underlying issues within the structures and programs of contemporary universities (Gill and Donaghue, 2016; Elraz and McCabe, 2023).

Building on these premises, this perspective article argues that we need to consider the key enabling practices that could prevent the implementation gap in stress assessment-management pathways in academia. Understanding these practices could help mitigate the risk of well-being assessments becoming a mere rhetorical exercise rather than

a catalyst for initiating organizational change. Therefore, this study aims to improve understanding of the factors that influence the realization of a WRS risk assessment-management pathway and how they may facilitate or hinder the transition from psychosocial risk assessment to the implementation of interventions. To this end, it explores the practices adopted for assessing and managing WRS risks in academia by referring to a group of Italian universities of the QoL@Work (Quality of Life at Work in academia) network. This network, established in 2016, involves 23 Italian universities and comprises academic work and organizational psychologists. One of the network's missions is to share good practices for assessing and managing WRS risks in universities. The QoL@Work network has developed assessment tools (Brondino et al., 2022; Bruno et al., 2024) and a flexible and iterative model to evaluate and manage well-being and WRS risks (described in Ingusci, 2021). Based on previous models (Leka et al., 2008; INAIL, 2018; Innstrand and Christensen, 2020), it consists of defined phases, starting from the constitution of the group responsible for the process to the monitoring system of the improvement actions (see Figure 1).

2 Research design and methods

This perspective article is based on an empirical study that included all the universities of the QoL@Work network that carried

FIGURE 1
QoL@Work main phases for assessing and managing WRS risks.

TABLE 1 Perceived facilitators and barriers to move from the assessment phase to the intervention management.

Phases	Facilitators	Barriers
Building the steering committee	• Involving multiple actors • Regular and formal meetings of the steering committee with academic governance • Integration of technical and institutional roles	• Responsibility for the process in only a few specialized and separate units • Focus of the steering committee on the assessment phase rather than the process as a whole
Communication	• Targeting specific academic units • Making differentiated data understandable and actionable for different groups of employees • Contextualizing the assessment process to interpret results • Reaching precarious workers, who are less represented in institutional bodies • Sustaining the perceived fairness of the process	• The results of the assessment only communicated to the governance • The results of the assessment only disseminated via digital technology • Widespread and non-tailored dissemination of information • Reports delivery without further discussion and involvement
Intervention planning	• Focus-groups or workshops to engage employees in the action planning • Clearly and formally identify the people responsible for implementing *each* action • Strong governance endorsement for action implementation	• Delayed return of data • The assessment report is perceived as the endpoint of the process • Unclear accountability of the transition from the assessment phase to the intervention phase

out a WRS risk assessment and management pathway between 2016 and 2023. They were monitored in two steps.

The first step aimed to analyze the practices realized, from the assessment phase to intervention planning. Respondents were full and associate professors, and researchers in work and organizational psychology, members of the Qol@Work network, who participated in the WRS risk and well-being assessment and management pathway at their university. They were invited to complete a qualitative survey with open-ended questions. Questions included the description of each phase of the pathway, the organizational devices and tools used, as well as facilitators and barriers encountered (e.g., describe how the steering committee was formed, its goals and activities; describe the communication activities carried out, and the actors involved; describe which tools were used; describe any factors that hindered this phase; describe any factors that facilitated this phase). In cases of unclear or incomplete information, semi-structured telephonic interviews were conducted with the respondents to gain further insight into specific phases and the overall process of WRS risk assessment and management (e.g., could you please provide more details on the barriers of this phase?). In the second step, to monitor and follow up on the implementation phase (Figure 1), we engaged those respondents (i.e., the academic work and organizational psychologists who participated in the first step) whose universities had completed the assessment phase by at least one year and had moved to the intervention management phase. A questionnaire comprising both closed and open-ended questions was developed and made available online via the Qualtrics platform. Areas of inquiry included intervention design and implementation, their target population, the distribution of responsibilities, the allocation of resources, the duration of the process, the monitoring plan and methods, the practices of worker involvement, and the facilitators and barriers of the process (e.g., what types of interventions were designed? For what kind of reasons? Was the implementation plan formalized? Who was the target population of the interventions? Were the interventions implemented? Was a plan established to monitor and evaluate interventions? Which factors hindered the effectiveness of the implementation phase?).

In both steps of the study, informed consent for data usage was obtained from participants by providing a clear explanation in an email invitation, outlining the purpose of data collection, and assuring confidentiality and anonymity, according to the Helsinki Declaration.

All the data were anonymized, and qualitative data were analyzed using thematic analysis (Braun and Clarke, 2006; Bingham, 2023). First, following a deductive analysis process, topic codes were developed a priori in line with the purpose of the study and based on the QOL@work model for assessing and managing WRS risks (Figure 1). Topic codes were created for each phase, and data were sorted into categories related to practices and associated barriers and facilitators. After this step we inductively analyzed the data, defining codes. These codes were further refined through contrasts and comparisons. Finally, we reviewed code definition and labeling. We used traditional pencil and paper methods. Researchers independently analyzed the data and the credibility of the analysis, as a criterion for qualitative research, was assessed through supervision sessions to check the coding strategies and to review the interpretation of the data by discussing any reasons for variation (Barbour, 2001).

3 Results

In total, we collected data on 11 WRS risk assessment and management pathways carried out in 11 universities located in the northern, central, and southern regions of Italy. In the first step of the monitoring, 13 respondents were involved (for two universities, two key informants jointly completed the questionnaire), of whom 5 were additionally interviewed. Interviews lasted an average of 40 min (min: 20 – max: 50 min). In the second step, 7 of the 11 universities were involved, with 7 respondents completing the questionnaire.

Several key elements emerged by analyzing and comparing the practices adopted in the different phases of WRS risk assessment and management pathways. In particular, we focused on drivers and barriers to moving from assessing to implementing interventions (see Table 1). Due to space limitations, this study will not describe the specific planned and implemented interventions.

3.1 Building the steering committee

As Figure 1 illustrates, establishing the steering group[1] and securing the commitment of academic governance to define and share goals, methods, and actions is the first phase of the WRS/well-being assessment and management pathway.

In this phase, differences were observed in the strategies adopted for constituting the steering group and in the interpretation of its role. Regarding its composition, in some universities, only one organizational unit (typically the health and safety office) was delegated to oversee the assessment phase and design the intervention plan. Regarding the steering group's role, the assessment task was seen as the priority. Respondents underlined that great care was taken to design a reliable data collection method and procedure. To this end, experts in methodological issues (e.g., academic work and organizational psychologists) were involved and tasked with planning the assessment phase, analyzing the collected data, and reporting findings. In this case, some respondents noted the risk that delegating to a specialized but isolated organizational unit could result in the discharge of responsibility by other organizational units that are also critical to the well-being of the various components of the academic community.

Conversely, in other universities, several key organizational actors were involved, such as strategic roles within the administrative area (e.g., Human Resources and Communication Unit) and academic committees (e.g., members of the Guarantee Committee for Equal Opportunities, Employee Well-being, and Non-Discrimination at Work). In this context, the steering group members did not merely focus on the assessment: regular and formal meetings were held with academic governance. Moreover, other organizational actors who could provide insights into working conditions and contribute to the identification of context-specific indicators were consulted (e.g., trade unions, ethics committees, and confidential counselors for cases of discrimination, harassment, and mobbing).

> "*We had formal meetings at each phase. Countless informal meetings for managing organizational aspects. Constant updates via email to the restricted group*" (University 1).

According to the respondents, these meetings facilitated the emergence of a shared belief that well-being is a challenge for the entire organization and that WRS risk assessment can become an organizational learning process. Integrating different institutional roles, especially when supported by academic governance, was seen as a choice that facilitated the collaboration across organizational units in data sharing and intervention planning.

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1   According to the Italian guidelines (INAIL, 2018), based on the Italian Law on Health and Safety (81/2008), the Steering Group for the assessment and management of work-related risk must be formally established upon the Employer's initiative and is generally made up of the Employer and/or delegated manager, the Health and Safety Manager, the Prevention and Protection Service Operator, the Occupational Physician (where appointed) and the workers' representatives for Health and Safety.

3.2 Communication strategies: from information to building shared meanings

As depicted in Figure 1, communication plays a central role both before the data collection and after the assessment phase. Communication practices varied according to the targets and levels of involvement of academic working groups and stakeholders (administrative staff managers, department heads, and workers' representatives). Three different patterns of communication practices were observed. In a first pattern, communication strategies mainly involved written communications targeted at academic governance. For example, reports were delivered and occasionally presented, but respondents worried that these reports might be archived without being utilized, especially when academic governance commitment was deemed lacking. In a second pattern, the communication strategy was characterized by activities addressed at the entire academic community, mainly mediated through computers: for example, professors, researchers, and administrative staff were informed about the WRS assessment by e-mail; after the data collection, wide dissemination of information to the entire academic community was realized by uploading the final report on the academic intranet, or by webinars. Despite the declared emphasis on worker involvement, some respondents pointed out that the utilization of such tools conveyed non-personalized communication. It did not help academic and non-academic staff understand the value of the WRS assessment. As a result, they were reluctant to complete the questionnaire. This reaction was observed particularly when well-being and psychosocial risk management were perceived as a low-priority issue and a concern for other professional categories but not for academics. A third pattern was less common. It was characterized by localized and tailored communication practices that were specifically targeted to academic divisions, sectors, and departments. These practices were considered pivotal by respondents because they reduced worker resistance to the assessment process and enabled outreach to precarious workers, such as research fellows, who are less represented in institutional bodies. In these cases, the goal was to ensure that the data could be understood and usable by different groups. Customized reports were prepared to provide each target group with the specific information they needed. Additionally, data return targeted to specific groups of workers or managers was considered an important strategy to ensure the perceived fairness of the process and to contextualize the interpretation of the results. The return of data with the goal of collaborative interpretation was perceived as a means of fostering a more robust connection between data and organizational processes.

> "*Providing data with the aim of better interpreting it with feedback from stakeholders helps promote a better understanding of the processes being analyzed and reduces the risk of the evaluation being perceived as a judgment*" (University 3).

3.3 From assessment to intervention

As shown in Figure 1, the assessment phase is followed by identifying the improvement interventions to address critical issues and enhance organizational strengths. Indeed, addressing psychosocial risk factors requires an iterative cycle that includes intervention planning, implementation, and evaluation phases.

Most respondents reported a noticeable slowdown in the process and the perception that the implementation of the interventions lost priority. Several barriers emerged, including unclear accountability for the new phase, delayed data return long after the assessment, limited involvement of workers in the intervention design, and inadequate coordination among different organizational actors.

> "*The process took a very long time, almost three years. We drafted a plan for future action, but it has not been implemented yet. For the faculty, it seems to be a bit of a taboo. In the meantime, with the pandemic, there has been a shift in priorities*" (University 4).

> "*Once the assessment phase was over, the Health and Safety Office and Human Resources Department struggled to reach an agreement about how to define responsibilities.*" (University 5).

In some cases, interventions were not clearly identified, and the steering group ended its work without a clear handover. When the HR department was involved only at the end of the assessment phase, problems arose in agreeing on intervention priorities and deciding which organizational units were responsible for implementing specific actions.

Respondents mentioned strategies to mitigate the above barriers. First, from the beginning of the assessment phase, there should be an emphasis on fostering a culture of well-being management in which the assessment report is not seen as the endpoint of the process. Second, when designing interventions, simply providing a final report with suggested improvement actions may not be sufficient to initiate the implementation process. Conversely, in other cases, to support action implementation, some universities have involved employees not only in the data collection phase but also in the action planning phase through focus groups or workshops. A third element is to clearly and formally identify the people responsible for each action and involve the staff who could oversee its implementation, with strong endorsement from governance.

4 Discussion

This perspective article offers insights into critical factors that need to be considered to promote a process of assessing and managing academic WRS risks capable of reducing the 'implementation gap' and increasing the possibility of creating healthy academic conditions.

One relevant factor is how to set up and build the coordinating structure that supports the entire evaluation and intervention process. Two patterns of practice emerged from respondents' experiences. The first pattern is characterized by a delegation-based approach: the management of the process is delegated to specific university offices specialized in safety and health, and to technical experts in WRS risk assessment. The main challenges perceived by the steering committee are related to methodological issues of ensuring reliable and valid data collection and analysis. The academic context is likely to reinforce this interpretation of the steering committee's tasks because of the generally shared mission to produce high-quality research. Interestingly, our findings show that this pattern not only forgets the intervention phase, as suggested by Cox (2016), but also neglects the organizational aspects of the risk management process. Indeed, while great attention is paid to the methodological aspects of the assessment tasks, the steering committee tends not to attribute value to the construction of an organizational scaffolding that can support the translation of the collected data into interventions. A silo organizational culture seems to shape this pattern of practices. It can lead to negative consequences that contribute to the implementation gap: indeed, it creates barriers to information sharing and collaboration among organizational units that are empowered to implement the interventions to improve health conditions and well-being.

In contrast, a more integrative approach, resulting in a heterogeneous steering committee, is able to mitigate such barriers. It views the WRS risk assessment-management pathway primarily as an organizational change process, not just a methodology. Great value is placed on the time and effort required to create an inclusive coordinating structure in which diverse organizational actors can engage in dialogue and share a common vision of transforming working conditions to promote academic well-being. The involvement of key organizational actors responsible for initiatives in the intervention phase – such as HR managers – is a crucial task from the beginning of the pathway. This is consistent with previous studies (Suárez-Reyes and Van den Broucke, 2016) that have shown the importance of academic leaders and administrators considering well-being as a core issue across the university, rather than siloing it within a single unit. Within this pattern, the implementation gap can be overcome because the steering group is committed to creating the organizational conditions for ensuring the sustainability of the initiatives that emerge from the assessment phase by integrating them into existing academic strategic planning.

Based on our analysis, a second factor – which is connected to the first – may affect the implementation gap: it is related to the practices adopted to communicate and involve the academic community during the WRS risk assessment-management pathway. Indeed, the approach used in the first phase of the entire cycle (see Figure 1) is reflected in different logics of communication and worker engagement. More specifically, the delegation-based approach seems to be related to the first and second patterns of communication: vertical and dissemination. In these cases, as previously discussed, assessment is conceived as an objective and expert process based on the academic model which holds scholars responsible for generating scientific knowledge through rigorous research design and methods. The assumption is that the scientific framework may offer evidence-based solutions, and that vertical information or dissemination of knowledge is the only way to communicate with the stakeholders and produce change. However, this strategy could be perceived as distant from those who experience the working context daily, thus reinforcing the implementation gap.

In contrast, the integrative pattern used by the steering committee seems to sustain locally tailored practices of communication. The data return phase is considered as an opportunity to gain a deeper understanding of the context, by requiring a shift from an expert-oriented approach to a process consultation perspective (Schein, 1969). This pattern allows for the cultural adaptation of the entire process, through the integration of scientific knowledge and local knowledge of workers (Innstrand and Christensen, 2020; Ohadomere and Ogamba, 2021). In this direction, the WRS risk assessment and management pathway is conceived as a continuous learning process that requires participatory and personalized practices to address the unique working conditions of the specific academic population.

Therefore, following this approach, it is a priority for academic governance to question and care about the quality of community involvement, also by reaching employees who are less represented. In line with previous studies, our results show that participatory practices need to be used in the WRS risk assessment-management pathway in order to reduce the implementation gap. First, investing in participatory practices can potentially counteract resistance and low organizational commitment to implementation. Active involvement of workers and key organizational stakeholders is crucial for both obtaining reliable findings and defining fitting and effective actions (Di Tecco et al., 2020). Secondly, participation is fundamental to promoting stakeholders' empowerment, equipping them with the know-how and tools needed to embrace a healthy work environment (Innstrand and Christensen, 2020). In fact, the competencies of those managing the WRS risk assessment affect the process implementation (Di Tecco et al., 2015). Moreover, participatory practices resist the individualistic approach of the neoliberal model, which does not appear effective in addressing the root causes of WRS risks (Guthrie et al., 2017).

This study has some limitations: in most cases, data collection was retrospective to the WRS risk assessment, which may have influenced the richness of the data. Moreover, the findings are based on the representation of events as perceived by a single academic member, which could lead to a single-source bias. However, the respondents were able to observe and reflect back on the decisions and practices adopted during the process, because they were members or collaborators of the steering committee as work and organizational academic psychologists. Future research could benefit from including the multiple stakeholders involved in, or bypassed by, each university's WRS risk assessment and management pathway. Analyzing their perspectives may enrich the understanding of the organizational dynamics affecting the implementation gap. Finally, future research needs to examine the relationship between the different patterns of practices in managing the stress risk assessment process in academia and the types of interventions implemented. Despite its limitations, this perspective article contributes to the academic health and well-being literature by highlighting how the WRS risk assessment and management pathway involves not only methodological issues but also organizational mindsets and choices. To minimize the risk of generating rigorous data without triggering organizational change in working conditions, academic governance should prioritize the creation of temporary organizational scaffolding to support participatory processes.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Author contributions

AB: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Data curation, Conceptualization. GD'A: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Data curation, Conceptualization. SG: Writing – review & editing, Writing – original draft, Validation, Supervision, Methodology, Investigation, Data curation, Conceptualization.

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Conflict of interest

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Students' perceived restorativeness of university environment: the validation of the Rest@U scale

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University students are likely to encounter mental health issues throughout their educational journey. Among the various factors that can impact students' wellbeing, the physical environment can potentially restore cognitive, physiological, and emotional resources, thereby enhancing academic performance, and overall quality of life, while reducing feelings of stress and depression. The Perceived Restorativeness Scale is the most commonly used tool to assess the level of restorativeness derived from the educational physical environment. However, a tailored measure could be a more psychometrically suitable approach to capture the context-specific characteristics of university environments for academic students. This study aimed to validate an instrument that can accurately evaluate university spaces to measure the perceived restorativeness of university students. A total sample of 685 students from two Italian universities participated in the evaluation of the psychometric properties of the Restorativeness at University scale (Rest@US), consisting of 13 items divided into four dimensions: fascination, being-away, scope, and coherence. The hypothesised four-factor model (being-away, fascination, scope, and coherence) demonstrated excellent fit indices in both the calibration and validation samples and was invariant for sex. The scale demonstrates good reliability. Furthermore, criterion validity has been confirmed, highlighting that, in a theoretically consistent manner, the perceived restorativeness of university physical environments from the point of view of students and its dimensions were negatively correlated with techno-overload and study-related workload and positively correlated with perceived performance and psycho-physical wellbeing.

KEYWORDS

restorativeness, academia, students, validation, environment

1 Introduction

Administrators at higher learning institutions are concerned about their students' psychological wellbeing as university students often encounter and experience many demanding and stressful situations (Yusli et al., 2021). Indeed, university students' mental health is an important public health issue (Sheldon et al., 2021) because they have a higher risk of developing cognitive problems such as stress, anxiety, and depression than the general population (Ibrahim et al., 2013; Brenneisen Mayer et al., 2016). The systematic review

proposed by Sheldon et al. (2021) reveals that, while studying at university, 25% of students experience depression and 14% of students experience outcomes related to suicide. A World Health Organization (WHO) survey of 1,572 university students interviewed also identified that one-fifth (20.3%) exhibited DSM disorders (Auerbach et al., 2016). Sheldon et al. (2021) also observed a higher rate of depression in student populations than the general population, which has a prevalence of 12.9% (Lim et al., 2018). The narrative synthesis proposed by the authors and the meta-analysis on risk factors highlighted several key determinants of mental health problems among university students, encompassing individual, interpersonal, and systemic factors (Sheldon et al., 2021). Considering the issue from a systemic approach, factors such as academic pressures, cost-related stress, and difficulties associated with the social environment have certainly been considered. A meta-synthesis by Hazell et al. (2020) highlighted that university environments can influence the mental wellbeing of doctoral students, emphasising that the problem spans across all levels of higher education. These results underscore the importance of addressing the issues from a contextual perspective, especially from a preventive standpoint. This involves considering both organisational and cultural issues, identifying guidelines for best practices, and exploring potential protective contextual factors. This also includes the physical environment in which students spend their time at the university; therefore, understanding the design insights from the research can help using the biophilic design properly on university campuses.

1.1 The role of the physical environment in restoration

Students need opportunities to restore cognitive and emotional resources, and the physical environment plays a role in students' overall experience. For this reason, it may also contribute to the restoration of cognitive and emotional resources. Restorative environments, designed to promote relaxation, stress reduction, and overall wellbeing, are increasingly considered key settings for promoting health (Frumkin, 2001; Bratman et al., 2019). The restorativeness of an environment could be defined as its ability to promote (not only allow) the recovery of resources (biological, cognitive, psychological, and social) in an individual (Hartig, 2004). This can be considered a source of psychological restoration, which refers to activities or environments that help individuals recover from mental fatigue, stress, and cognitive overload. Engaging in restorative experiences is linked to several positive health outcomes. Natural environments are considered the most restorative environment (for a review, see Berto, 2014; McMahan and Estes, 2015; Ohly et al., 2016; Menardo et al., 2019). However, in recent years, researchers' attention has shifted to build environments where people spend most of their time, both in their private lives and during work or study experience. The concept of restorative environments is closely connected to the notion of stress. Individuals adopt coping strategies to protect themselves from potential stressors, i.e., ways to deal with stressful situations. Among these strategies, exposure to natural environments has been identified as a promoter of both stress reduction and recovery of cognitive abilities that may have declined due to mental fatigue. The most frequently cited theories in this regard are the biophilia hypothesis (Wilson, 1984), attention restoration theory (ART, Kaplan

and Kaplan, 1989; Kaplan, 1995), and the stress reduction theory (SRT, Ulrich, 1983; Ulrich et al., 1991), which suggest that contact with nature influences both cognitive recovery and wellbeing. Many studies have supported these positive effects of natural environments (Menardo et al., 2019). According to the literature (e.g., Kaplan, 1995; Korpela and Hartig, 1996; Pasini et al., 2014), some environmental features successfully enhance the quality of restoration in individuals. According to Kaplan's paradigm (1995), frequently used in research in this field, there are four regenerative factors: fascination, which refers to how an environment might attract the involuntary attention of a person; being-away, which refers to how an environment causes a person to feel freed from everyday demands and obligations; extent, a characteristic composed by coherence, which refers to how an environment is perceived as organised or not, and scope that refers to how an environment offers the possibility of exploration; compatibility which refers to the correspondence between the characteristics of an environment and expectations of a person.

While research extensively emphasises the positive effects of natural environments, an equally significant line of inquiry explores the restorative potential of built spaces within the "biophilic design" framework (Ulrich, 1983; Kaplan, 1995; Berto et al., 2015). Biophilic design, rooted in the concept of biophilia, posits that humans possess a genetic predisposition to love nature (Wilson, 1984). This approach focuses on the crucial features that built environments must incorporate to foster healthy spaces. Authors such as Chawla (2002), Colucci-Gray et al. (2006), and Kellert (2002) underscore the importance of establishing a connection with nature, especially in childhood, to shape meaningful relationships and positive environmental sentiments. This instinctual connection, called biophilia (Wilson, 1984), is inherent to the human species. Stephen R. Kellert, a pioneer in biophilic design, advocates for its widespread adoption to innovate in shaping spaces. Biophilic design aims to integrate individuals with nature through architectural elements, materials, and psychological responses to the environment (Kellert et al., 2011). While direct contact with nature is crucial, as emphasised in attention restoration theory (ART) and stress reduction theory (SRT), the biophilic approach surpasses the mere inclusion of elements such as green walls or natural light. In his research, Kellert (2008) conceptualised biophilic design through six elements: environmental features, natural shapes and forms, natural patterns and processes, light and space, place-based relationships, and evolved human–nature relationships. These six categories are detailed with over 70 biophilic design attributes. As exposure to nature, the biophilic design could reduce stress and anxiety (Gray and Birrell, 2014; Roskams and Haynes, 2020) and enhance students' wellbeing and quality of life (Hipp et al., 2016; Gulwadi et al., 2019; Payne et al., 2020; Yusli et al., 2021). Different research on biophilic design cites studies in restorative environments and claims that biophilic elements could improve the restorativeness of the built environment (e.g., Joye, 2007; Gray and Birrell, 2014; Ryan et al., 2014). However, if the effect of natural elements (e.g., plants and nature view from windows) on stress and cognitive functioning has been largely investigated (Gritzka et al., 2020; Aydogan and Cerone, 2021), few research studies have explored the effect of the others biophilic elements (Gillis and Gatersleben, 2015). As an example of the application of this framework in designing a workplace environment, Pasini et al. (2021) conducted a research project on biophilic design's impact on workplace wellbeing. Through the participatory design of the work environment, and using biophilic

design principles, the team aimed to reduce stressors, resulting in improved perceived restorativeness. This improvement correlated with enhanced quality in specific workplace elements, such as light, air, acoustics, natural views, and destress areas. In particular, the study found a positive link between the improved quality of these elements and increased job satisfaction and work engagement. In conclusion, this approach can provide interesting insights for the design of work environments or university campuses, so that these structures can become places where wellbeing and sustainability, alongside performance, are priorities.

1.2 The effect of restorative environments on several outcomes for university students

It has been shown that a restorative physical environment plays an important role in enhancing students' wellbeing and quality of life (Hipp et al., 2016; Gulwadi et al., 2019; Payne et al., 2020; Yusli et al., 2021). The World Health Organization (WHO) defines quality of life as an individual's perception of their position in life in the context of the culture and value systems in which they live, and concerning their goals, expectations, standards, and concerns. It is a broad-ranging concept that encompasses various aspects of an individual's wellbeing, including their physical health, psychological state, level of independence, social relationships, personal beliefs, and their relationship to their environment. Hipp et al. (2016) used the WHOQOL-BREF, a short version of an instrument developed by the WHO, to evaluate quality of life (QOL) in a sample of university students. The instrument covers four main domains: physical health, psychological health, social relationships, and environment (which include financial resources, safety, access to health services, and the quality of living conditions). Using a cross-sectional research design, they assessed both perceived greenness and perceived restorativeness of university students concerning their university campus, in association with QOL. They found that perceived greenness was correlated with both QOL and perceived restorativeness; moreover, QOL was significantly correlated with perceived restorativeness. The path model showed that perceived restorativeness partially mediates the relationship between greenness and QOL. In a later study, Gulwadi et al. (2019) proposed a similar correlational study involving two university students' samples (one from a campus in Turkey and one from a campus in the United States). Once again, the study considered the QOL of students in relation not only to the perception of greenness and restorativeness but also to objectively measured greenness using the Normalised Difference Vegetation Index (NDVI). This measurement considered three campus environments (central, building, and overall). The results indicated that the objective measurement of greenness correlates with the subjective one and that this objective measure is a predictor of QOL, both directly and mediated by subjective perceptions of greenness and regenerativeness.

Recent studies have examined the relationship between the physical environment and the wellbeing of university students. For instance, Payne et al. (2020) highlighted a positive correlation between restorativeness and students' wellbeing, as well as a statistically significant negative relationship between restorativeness and distress. Using a one-way ANCOVA, the authors verified that students in the experimental group, who spent time in a natural environment, showed a significant decrease in stress levels, although not in burnout or quality

of life compared to the control group. In this way, the hypothesised beneficial predicting effect of natural environments on stress and quality of life was only partially confirmed. However, after comparing the single pre- and post-intervention results for each variable, a statistically significant difference between the values of burnout and quality of life has been noted between the two groups. Participants in the experimental group experienced a greater average decrease in stress and burnout levels than those in the control group. This second result leads the authors to conclude that natural environments have a beneficial effect. A cross-sectional study conducted by Yusli et al. (2021) assessed the association between the perceived restorativeness of university students and psychological wellbeing, considering the four dimensions of the attention restoration theory (ART): fascination, being-away, extension, and compatibility. The study also examined the view of nature from the window as a moderating variable. The results demonstrated a positive relationship between three of the four regenerative factors with wellbeing (excluding the extent factor). Furthermore, the data analysis emphasised the moderating effect of the view of nature from the window on the relationship between these three factors and wellbeing.

Examining the effects of greenery and restorative environments on cognitive performance, it is possible to identify studies that specifically focus on the university student population. Studente et al. (2016) used a between-subjects experimental research design to examine the impact of exposure to greenery on visual and verbal creativity in a group of university students. These students were randomly assigned to three groups corresponding to three conditions (two experimental and one control groups). The results showed that having the opportunity to see elements of nature, such as plants inside the room or a view of nature from the window, alongside the green colour of the sheet on which they had to respond, enhanced visual creativity, although it did not affect verbal creativity. According to the attention restoration theory (ART), having the opportunity to experience a natural environment has restorative effects on cognitive aspects, such as working memory, after a cognitive depletion task. In a study conducted by van Oordt et al. (2022), a group of university students observed a digitally presented nature scene, an urban scene, or no specific scene after completing a task that depleted working memory capacity (WMC). They then performed a digit span task to assess the restoration of WMC. The results showed that performance was better for those who had observed natural scenes compared to the other two groups. Some studies have shown that natural environments can improve students' self-discipline and concentration abilities. Taylor et al. (2002) compared and demonstrated that students who have access to natural views, plants, and the colour green in a classroom show greater visual creativity than students in a classroom with blinds drawn to block the view of natural settings. Mason et al. (2022) reviewed 14 studies in the existing literature that report investigations involving students at university in a study with short exposure to nature during a study day. The review shows that in 12 of the aforementioned studies, benefits on cognitive processes emerge, in terms of directed attention restoration from mental fatigue and improvement in tasks that evaluate executive functions, due to contact with nature in natural and campus environments. Furthermore, various evidence shows how natural features in a school's environment promote better academic performance (Matsuoka, 2010; Hodson and Sander, 2017; Li et al., 2019). For example, concerning the exposure to trees as a natural scene, Matsuoka (2010) found that trees and shrubs were positively correlated with academic performance, such as standardised test scores, graduation rates, percentages of students

planning to attend a 4-year college, and fewer occurrences of criminal behaviour, while exposure to lawn spaces showed a negative relationship. Li et al. (2019) highlighted a positive correlation between performance and the density of trees near school buildings, and Hodson and Sander (2017) found a significant positive relationship between tree cover in school environments and reading performance, suggesting that initiatives aimed at increasing tree cover in student environments could support academic success.

1.3 Perceived restorativeness in the university students' context

In the context of universities, different research has shown that nature exposure, design, and campus resources can impact restorativeness. For example, objective (i.e., the amount of green space) and perceived greenness were positively associated with the student perceptions of restorativeness (Hipp et al., 2016; Gulwadi et al., 2019). Moreover, windows that overlook nature can enhance the restorative potential of university spaces (Wang et al., 2018; Yusli et al., 2021), such as the presence of water features, planting flowers, and scattered trees (Wang et al., 2018; Lu and Fu, 2019). In addition, the possibility of regularly engaging in walking (Chou and Hung, 2021) or the duration of the visit (Du et al., 2022) in a natural environment increases perceived restorativeness. Finally, natural indoor elements, such as large murals, could enhance the restorative power of university indoor spaces (Felsten, 2009). These studies, except one (Felsten, 2009), investigated the whole university environment and not specific spaces. This is probably linked to the characteristics of students' routines. Indeed, students attend different spaces on the university campus to participate in different activities (e.g., attending lectures, individual study, and meetings with other students and/or professors). To investigate the university environment, the most used scale (e.g., Hipp et al., 2016; Gulwadi et al., 2019) was the Perceived Restorativeness Scale (PRS) developed by Hartig et al. (1997). This scale consists of 26 items that assess four key components of perceived restorativeness: fascination, i.e., the extent to which the environment is perceived as interesting, intriguing, or capturing attention; being-away, the degree to which the environment allows individuals to feel a sense of detachment from their usual concerns and obligations; extent, which evaluates the feeling that the environment provides a sense of scope and the opportunity to explore; compatibility, i.e., the perception that the environment is congruent with personal inclinations, preferences, or activities. The PRS is relatively straightforward to administer and analyse, making it accessible to researchers with diverse backgrounds and interests. This clear connection with the ART theoretical framework, joined with the ease of use in different contexts, contributes to its widespread adoption. This scale has been used to evaluate the perceived restorativeness in many different locations, such as educational, hospital, residential, and working spaces. Even though the use of the PRS managed to lead to statistically significant results, other groups of researchers decided to use other research tools or to adapt the PRS to evaluate the perceived restorativeness of campuses related to their research. An example of variation can be found in the study by Felsten (2009). In this study, the researcher made students rate their perceived restorativeness using only one item for each of the PRS components (being-away, fascination, extent, and compatibility). In addition, a final item was added to assess the overall perceived restorativeness of the students. In other cases,

different scales have been applied. In the experiment of Payne et al. (2020), the Restorative State Scale (RSS; van den Berg et al., 2014) was used to evaluate how the past experiences of students in a natural environment had a positive effect on their mental health when asked them to recall to their mind that experience. Another example of the use of a different scale is the Short-version Revised Restoration Scale (SRRS; Han, 2003). In one of the two experiments reported in the study of Wang et al. (2018), the researchers used the SRRS to evaluate the essential attributes of a mentally restorative landscape on a Chinese university campus. However, these scales (i.e., PRS and RSS) were developed to investigate natural (not built) environments, so these tools could not be suitable for the university environment as the opportunities for restoration vary according to the type of activities that an individual performs. It is worth noting that, in both the study and work environments, the formulation of certain items may fail to capture the profound sense of the dimensions of restorativeness, according to the theoretical approach of the attention restoration theory (ART) underlying the mentioned scale. For example, statements such as "I feel far away from everyday concerns" or "This place is a refuge from the demands of my daily life" (two examples of items from the B-A dimension in the PRS) may be totally inappropriate when applied to work or study contexts. As known, the consequences of an inadequate measuring instrument can be detrimental to the validity of research because they amplify the possibility of measurement errors. The fact that some items from scales traditionally used to measure the perceived restorativeness cannot be employed due to their inadequacy in capturing the specific dimension does not imply that these places cannot still possess characteristics that make them regenerative.

Other studies (Lu and Fu, 2019; Chou and Hung, 2021; Du et al., 2022) developed specific *ad hoc* questionnaires to evaluate the perceived restorativeness in campus locations. If in some cases (Chou and Hung, 2021; Du et al., 2022) these questionnaires were built through different items, containing parts of scales such as the Attention Recovery and Reflection (Staats et al., 2003) or the Recovery Component Scale (Laumann et al., 2001), in others (Lu and Fu, 2019) self-reporting measures, based on the attention restoration theory (ART), in which the perception that the environment is congruent with personal inclinations, preferences, or activities, have been made and used for evaluations. However, no scale has already been validated from a psychometric point of view that allows us to profile the restorative abilities of the university space. Brondino et al. (2023) have proposed a tool to assess workers' perception of restorativeness concerning the physical work environment. This process involved delving into the meaning of dimensions described in the attention restoration theory (ART) from the perspective of workers. This undertaking led to the development of a scale, the Rest@Work scale, which also served as the foundation for creating a specific tool for assessing the restorativeness of university study environments. The objective of this study was indeed to take the first step towards validating a tool that is specific for evaluating the perceived restorativeness of university spaces.

2 Methods

2.1 Participants

Two samples of Italian academic students, one for the calibration and one for the validation of the factor structure of the scale, were

used in the present study. The first sample was composed of 247 undergraduate students [64% women, mean (sd) age = 22.6 (4.5), age range = 19–56]. In total, 302 students agreed to participate in the survey. Of these, 55 (18%) were excluded: 50 did not complete the scale, and 5 were multivariate outliers. Participants mainly attended a degree course in psychology (51%) or physiotherapy (28%).

The second sample was composed of 400 undergraduate students [70% women, mean (sd) age = 21.3 (5.08), age range = 18–57]. In total, eight multivariate outliers were excluded. Most of the participants were enrolled in a degree course in psychology (81%).

2.2 Procedure

Students filled out a battery of questionnaires, including a scale aimed at measuring the perceived restorativeness of places within the university (Rest@U Scale) from the point of view of students, and, only for the validation sample, other measures to test criterion validity, in a controlled situation (e.g., in a room or during a zoom meeting, with the supervision of the research team). Upon accessing the survey on LimeSurvey, students were first presented with detailed instructions about the purpose of the study. This introductory section explained the procedure to complete the survey and emphasised the importance of honest and individual responses without consultation. Before proceeding, students were required to provide informed consent, ensuring that they understood the objectives of the study, their rights as participants, and the confidentiality measures in place. Once informed consent was obtained, participants were directed to the main section of the survey, where they responded to the set of questions. Participation was voluntary and data anonymous. Data collection was done from November to December 2022 for the first sample and from November to December 2023 for the second one. The research was approved by the Ethical Committee of the Department of Human Science of the University of Verona (Prot. number 2022_27).

2.3 Development of the restorativeness at university scale

The Rest@US was adapted by the authors from the restorativeness-at-work scale (Rest@WS, Brondino et al., 2023) to investigate the perceived restorativeness of the university's physical environment. The instruction was adapted as follows: "Thinking about the university you attended the most in the last week, carefully read each of the following sentences and then evaluate on a scale from 0 to 10 how much each statement corresponds to your experience in this place." We chose to ask for an evaluation of the university environment in general, rather than specific spaces because student activities are diverse (e.g., attending lectures, individual study, and meetings with other students and/or professors), and these activities are carried out in various university spaces. Therefore, we were interested in building a tool capable of assessing the restorativeness of the physical environment of the university as a whole. The Rest@US comprises 13 items, each rated on an 11-point Likert scale (not at all–very much). Items investigated the following dimensions of the ART: fascination (three items), being-away (three items), scope (three items), and coherence (four items). A pool of four experts examined the wording

of the items adapted to the university context about content validity. All the items were judged adequate. After that, a pilot study with 38 undergraduate students [84% female, mean (SD) age = 19.9 (1.7), age range = 18–28] was run to investigate the quality of the items (descriptive statistics, correlation, and discrimination index). The aim was to verify the appropriateness of the response scale and the ability of each item to discriminate different levels of the construct. Students filled out a battery of questionnaires, including R@US (see the Appendix for the italian version of the item), in a classroom with the supervision of one of the authors. Participation was voluntary and data anonymous, and informed consent was filled in by all participants. Descriptive statistics of items are presented in Table 1. All items were normally distributed except item #7 ("The place where I study is messy"), which has a leptokurtic and negative symmetrical distribution.

To investigate the discrimination ability of items, the distribution was divided into four using quartiles (except item #7, which was divided into three using tertiles). We used the Mann–Whitney test and the corresponding effect size ($r = z/\sqrt{N}$) to verify the difference between the lower and the upper group for each item with respect to the correspondence dimension's score. For all comparisons, the difference was significant with a high effect size (r range = 0.62–0.80), which indicates a high discrimination ability. All items were used in the main study because no one had floor or ceiling effects, and all of them had high discrimination ability.

2.4 Other measures

Workload was measured by three items from the HSE Management Standards Indicator Tool (Toderi et al., 2013; Balducci et al., 2017), to investigate student mental workload, or "how hard students work." An example of an item is "I have unreachable deadlines" with a response scale from 1 = Never-almost never to 5 = Always (Cronbach's α = 0.67).

Technostress was detected by the subdimension techno-overload of the TCS Technostress Creator Scale (Ragu-Nathan et al., 2008), which was adapted and translated into Italian by Molino et al. (2020). It was measured with four items, e.g., "I am forced by technology to work much faster," with a response scale from 1 = Totally disagree to 7 = Totally agree (Cronbach's α = 0.72).

Student psycho-physical wellbeing was measured with the General Health Questionnaire (GHQ-12) using the Italian version of 12 items (Piccinelli et al., 1993) on a response scale from 1 = Much less than to 4 = Better than usual (e.g., "Have you recently been able to concentrate on whatever you are doing?"; Cronbach's α = 0.87).

Finally, *perceived academic performance* was measured with a single *ad hoc* item: "In your opinion, expressing it through a percentage (from 0 to 100%), to what extent have you succeeded in achieving the goals you set yourself over the past year with regard to your study activity?"

Furthermore, some *socio-demographic* variables were collected, specifically sex, age, and the attended degree programme.

2.5 Data analysis

Preliminary analyses were performed following the suggestions of Tabachnick and Fidell (2013). First, we checked for the normal

TABLE 1 Descriptives of items from the pilot study (*n* = 38).

Id	Dimension	Item	Mean	Standard deviation	Min	Max	Asymmetry	Kurtosis
R@US 1	COH	The place where I study makes me mentally tired because of how it is structured*	7.05	2.40	2	10	−0.41	−0.92
R@US 2	FA	In the place where I study, my attention can be attracted by many interesting things *(e.g., furnishings, a beautiful view…)*	3.18	2.30	0	10	0.85	0.83
R@US 3	B-A	I am able to take a little break to think or do something pleasant at the place where I study	4.39	2.69	0	10	0.33	−0.88
R@US 4	COH	In the place where I study the spaces are well organised	6.45	2.26	1	10	−0.59	−0.16
R@US 5	COH	In the place where I study, I easily find the things I need to work	5.95	2.38	2	10	0.02	−0.92
R@US 6	B-A	The place where I study has elements that allow me to relax my mind from time to time *(e.g., plants, or a poster of a nice place etc)*	2.58	2.83	0	10	0.86	−0.34
R@US 7	COH	The place where I study is messy*	8.71	2.09	1	10	−2.49	6.49
R@US 8	B-A	The place where I study is structured in such a way that if I need I can stay focused or if I want I can let my mind wander *(for example looking out the window)*	6.42	3.18	0	10	−0.37	−1.27
R@US 9	FA	The place where I study has elements or characteristics that stimulate my curiosity	3.87	2.65	0	10	0.54	−0.42
R@US 10	SCO	In the place where I study there are barriers that prevent my eyes wandering (i.e., a small room with few features)*	6.87	2.75	0	10	−0.93	0.06
R@US 11	FA	The place where I study has characteristics that fascinate me	4.29	2.54	0	10	0.19	−0.87
R@US 12	SCO	The place where I study is designed so that I can visually explore space in many directions	4.32	2.60	0	10	0.13	−0.56
R@US 13	SCO	The place where I study is harmoniously structured	5.03	2.54	0	10	0.13	−0.61

COH, coherence; FA, fascination; B-A, being-away; SCO, scope. *means reversed item.

distribution of each Rest@US item and for the presence of univariate outliers (± 3.29 standard deviation from the group mean). Second, based on the Mahalanobis distance, we searched for the presence of multivariate outliers and checked for normal multivariate distribution (Mardia's test).

The theoretical four-factor structure was checked through confirmatory factor analysis (CFA) using the R package Lavaan (Rosseel, 2012) in two samples (calibration and validation sample). We used the diagonally weighted least squares (DWLS), which is specifically designed for ordinal data and does not assume normally distributed variables (Li, 2016). The overall goodness of fit was evaluated using the chi-square statistic (χ^2), the Comparative Fit Index (CFI; Bentler, 1990), the root mean square error of approximation (RMSEA; Steiger, 1990), and the standardised root mean square residual (SRMR; Bentler, 1995). Cutoffs that are usually used to verify the goodness of fit (Bentler and Bonett, 1980; Schermelleh-engel, 2003) are not adequate when the DWLS estimator is used (Xia and Yang, 2019; Groskurth et al., 2023). For this reason, we computed a tailored cutoff following the equation-based approach developed by Groskurth et al. (2023). In this approach, the cutoff is predicted by

regression formulae based on the computed coefficient, empirical data, and study characteristics. The calibration sample value higher than 0.983 for CFI, lower than 0.072 for RMSEA, and lower than 0.126 for SRMR suggests a reasonable fit. The validation sample value higher than 0.972 for CFI, lower than 0.061 for RMSEA, and lower than 0.094 for SRMR suggests a reasonable fit. To improve the fit of the model, we looked for modification indices (MIs) for each specified model, factor loading, and r squared of item.

In both the samples, the four-factor structure was compared with alternative nested models, which were theoretically plausible: (A1) one obtained by collapsing the four factors into one factor, (A2) one obtained by collapsing the factors in two factors (fascination + being-away and coherence + scope), and (A3) one in which the four first-order factors aggregate into a second-order factor. To this aim, $\Delta\chi^2$, ΔCFI, and ΔRMSEA were used as fit indices. To indicate that the null hypothesis of equivalence should be rejected (i.e., that the four-factor structure model had a better fit than the alternative models), a significant $\Delta\chi^2$ is required. Moreover, a value of ΔCFI (which is less affected by sample size) higher than 0.01 and a ΔRMSEA value higher than 0.015 indicated a deterioration of fit (Cheung and Rensvold, 2002).

The appropriateness of the CFA sample size was verified by calculating the statistical power of the model (MacCallum et al., 1996) using the R package "semPower" (Moshagen and Erdfelder, 2016). Following the *post-hoc* approach of MacCallum et al. (1996), we fixed the effect size (RMSEA) level to 0.5 and the alpha level to 0.05.

As the Rest@US is a multidimensional scale, we used McDonald's ω coefficient (McDonald, 1999) implemented in the R package semTools (Jorgensen, 2022).

In the validation sample, we also assessed measurement invariance across sex, analysing configural invariance, metric invariance, and scalar and strict invariance. In accordance with Chen's criteria (Chen, 2007), invariance was confirmed if CFI changes less than 0.01, RMSEA less than 0.015, and SRMR less or equal to 0.030 (less or equal to 0.010 for assessing scalar invariance). Finally, criterion validity was assessed by analysing the bivariate correlations between the perceived restorativeness of the university's physical environment and the single dimensions of the scale, with some outcome variables (techno-overload, study-related workload, perceived academic performance, and psycho-physical wellbeing).

3 Results

We first conducted some preliminary analyses to assess data quality and distribution. In both samples, no univariate outliers were found. However, we found and excluded five multivariate outliers in the calibration sample and five in the validation sample.

In both samples, all observed variables were univariate normally distributed (skewness and kurtosis were between approximately −1 and +1) with again the exception of item 7 ("My university campus is messy"), which reported, respectively, in both the samples skewness = −2.49/1.22 and kurtosis = 6.49/1.07 (see Table 2). The calculated Mardia's indices for the calibration and the validation sample were equal to 226.00 and 212.80, respectively. They were higher than the critical value of 195, suggesting that the data were not multivariate normally distributed in both samples.

After preliminary analyses, we conducted a confirmatory factor analysis first on the calibration sample and later on the validation sample.

TABLE 2 Descriptives of items from calibration and validation studies (*n* = 247/ 400).

Id	Dimension	Item	Mean	Standard deviation	Min	Max	Asymmetry	Kurtosis
R@US 1	COH	The place where I study makes me mentally tired because of how it is structured*	4.65/ 3.20	3.44/ 2.48	0/0	10/10	0.02/0.55	−1.39/ −0.47
R@US 2	FA	In the place where I study. my attention can be attracted by many interesting things (e.g., *furnishings. a beautiful view...*)	3.30/ 4.12	3.00/ 2.46	0/0	10/10	0.60/0.31	−0.78/ −0.74
R@US 3	B-A	I am able to take a little break to think or do something pleasant at the place where I study	5.21/ 6.07	3.39/ 2.52	0/0	10/10	−0.09/ -0.59	−1.35/ −0.43
R@US 4	COH	In the place where I study the spaces are well organised	4.85/ 6.05	2.76/ 2.20	0/0	10/10	0.02/ -0.58	−0.93/ −0.13
R@US 5	COH	In the place where I study. I easily find the things I need to work	4.60/ 5.31	2.74/ 2.32	0/0	10/10	0.12/ -0.17	−0.93/ −0.65
R@US 6	B-A	The place where I study has elements that allow me to relax my mind from time to time (e.g., *plants, or a poster of a nice place etc*)	2.63/ 3.12	3.04/ 2.78	0/0	10/10	0.93/0.62	−0.40/ −0.80
R@US 7	COH	The place where I study is messy*	3.19/ 1.97	2.48/ 2.00	0/0	10/10	0.43/ 1.21	−0.58/ 1.05
R@US 8	B-A	The place where I study is structured in such a way that if I need I can stay focused or if I want I can let my mind wander (*for example looking out the window*)	5.18/ 6.72	3.03/ 2.33	0/0	10/10	−0.05/ -0.69	−1.03/0.03
R@US 9	FA	The place where I study has elements or characteristics that stimulate my curiosity	3.59/ 5.03	2.90/ 2.54	0/0	10/10	0.50/ -0.21	−0.81/ −0.76
R@US 10	SCO	In the place where I study there are barriers that prevent my eyes wandering (i.e., a small room with few features)*	4.71/ 3.28	2.95/ 2.45	0/0	10/10	−0.02/0.48	−0.94/ −0.72
R@US 11	FA	The place where I study has characteristics that fascinate me	3.59/ 5.26	2.92/ 2.47	0/0	10/10	0.42/ -0.31	−0.99/ −0.79
R@US 12	SCO	The place where I study is designed so that I can visually explore space in many directions	4.15/ 5.40	2.87/ 2.45	0/0	10/10	0.30/ -0.26	−0.83/ −0.66
R@US 13	SCO	The place where I study is harmoniously structured	4.03/ 5.26	2.53/ 2.18	0/0	10/10	0.30/ -0.28	−0.64/ −0.29

COH, coherence. FA, fascination. B-A, being-away. SCO, scope. *means reversed item.

In the calibration sample, the hypothesised four-factor model with 13 items showed an excellent fit ($\chi^2 = 54.42$, $p = 0.68$; CFI = 1.000; RMSEA = 0.000, 90% C.I. = 0.000, 0.032; SRMR = 0.047; explained variance = 56%). As shown in Figure 1, the factor loadings ranged from 0.49 to 0.93 (mean and median = 0.74) and were all statistically significant ($p < 0.001$). The interfactor correlations ranged from 0.72 to 0.93. The confidence interval for each interfactor correlation did not include the value of 1, indicating that the four factors were separate.

Cronbach's alpha of the four dimensions was at least good, specifically 0.79 for coherence, 0.85 for fascination, 0.79 for being-away, and 0.75 for scope. The internal coherence of the total scale was very good (McDonald's $\omega = 0.93$). The statistical power of the model was good (0.86).

As shown in Table 3, $\Delta\chi^2$ suggested that the hypothesised four-factor model is better than the alternative models obtained by collapsing the four factors into one (A1) or two factors (A2 and A3). However, ΔCFI and ΔRMSEA confirmed a significant deterioration of fit only for the one-factor model (A1) and the two-factor model (A2). On the contrary, the hierarchical model (A3) was equivalent to the four-factor model.

On the validation sample, the confirmatory factor analyses confirmed the goodness of the hypothesised four-factor model ($\chi^2 = 135.34$, $p < 0.001$; CFI = 0.972; RMSEA = 0.056, 90% C.I. = 0.044, 0.069; SRMR = 0.062; explained variance = 44%; see Table 4). Factor loading and interfactor correlations are reported in the path diagram in Figure 1. Factor loadings were all statistically significant ($p < 0.001$) and ranged from 0.35 to 0.85 (mean and median = 0.64). The

interfactor correlations ranged from 0.53 to 0.83. Again, as in the calibration sample, the confidence interval for each interfactor correlation did not include the value of 1, indicating that the four factors were separate.

The reliability of the four dimensions was slightly worse than that of the calibration sample. Cronbach's alpha was 0.70 for coherence, 0.78 for fascination, 0.65 for being-away, and 0.60 for scope. The internal coherence of the total scale was good (McDonald's $\omega = 0.87$).

To test invariance across sex, we ran a sequence of gradually more restrictive tests on the parameters of the hypothesised model. The results for configurational, metric, scalar, and strict invariance are all confirmed (see Table 4).

Criterion validity was assessed by analysing Pearson's bivariate correlations between restorativeness and its dimensions with techno-overload, study-related workload, perceived academic performance, and psycho-physical wellbeing (see Table 5). As theoretically hypothesised, techno-overload and study-related workload were negatively related to restorativeness and all its dimensions. Correlations were all statistically significant apart from being-away and ranged for techno-overload from −0.06 (Fascination) to −0.15 (coherence and restorativeness) and for study-related workload from −0.10 (fascination) to −0.24 (coherence). Performance and psycho-physical wellbeing, coherently, were positively correlated with restorativeness and its dimensions. Performance was more correlated with restorativeness (0.14) and with being-away (0.13). However, the correlations related to coherence (0.10) and scope (0.09) were statistically significant only considering a one-tailed test. For psycho-physical wellbeing, the correlations ranged from −0.02 (fascination) to 0.13 (coherence).
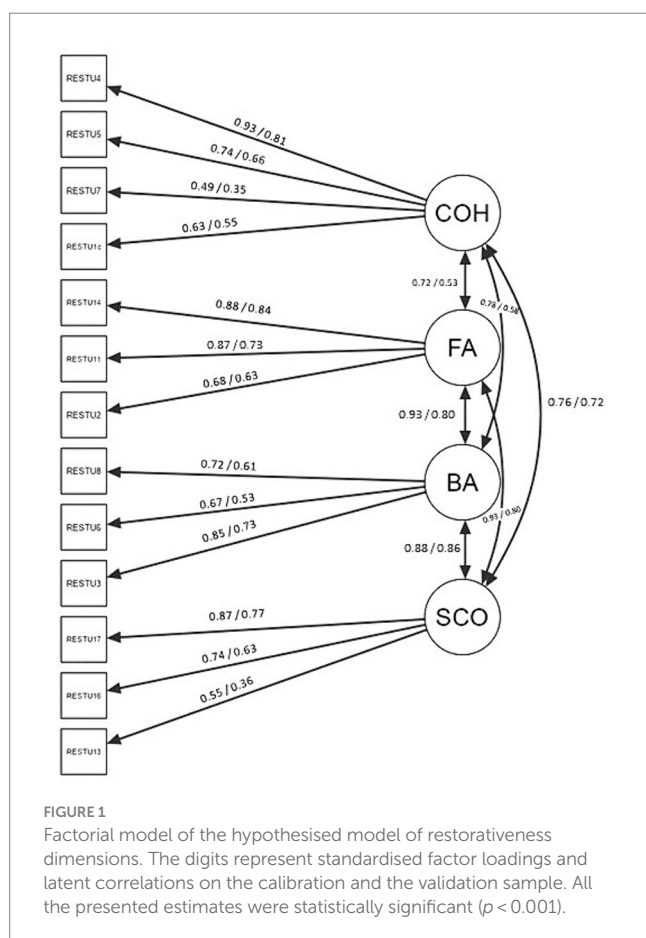
4 Discussion

As shown in the literature and stressed in the introduction of this study, the results about the effects of perceived restorativeness are growing. Perceived restorativeness seems to be linked with positive outcomes, promoting relaxation, reduction of stress, and overall wellbeing (Frumkin, 2001; Bratman et al., 2019). The restorative quality of an environment can be characterised by its capacity to facilitate, not just permit, the replenishment of resources (biological, cognitive, psychological, and social) in an individual (Hartig, 2004). This study arises from the awareness of the need to pay attention to the wellbeing of university students, considering contextual factors, including specifically the physical environment in which students carry out their activities within the university. The literature review has allowed an understanding of the importance of a construct such as restorativeness, i.e., the ability of physical environments to regenerate individuals, both cognitively and in terms of stress recovery. However, examining this literature has revealed a lack of specific attention to the quality of the instrument used to measure this construct, often applying tools uncritically more suitable for assessing natural environments where people spend leisure time, or environments not considering the demands of work or study. While it is not sensible to assume that such physical environments cannot simultaneously be places of engagement and restorative environments, it is crucial to recognise their specificity as environments where people are engaged in activities that involve physical and mental fatigue. The importance of using measurement tools for psychological constructs with excellent psychometric properties is well known, as a first step to ensure the validity of

FIGURE 1
Factorial model of the hypothesised model of restorativeness dimensions. The digits represent standardised factor loadings and latent correlations on the calibration and the validation sample. All the presented estimates were statistically significant ($p < 0.001$).

TABLE 3 Fit indices of the four-factor model and alternative models (calibration sample).

	CFI	TLI	RMSEA	SRMR	$\chi^2_{(df)}$	$\Delta\chi^2_{(\Delta df)}$	ΔCFI	ΔRMSEA	ΔSRMR
4-factor	1.000	1.002	0.000 (0.000–0.032)	0.047	53.42 $_{(59)}$	–	–	–	–
A1 - 1-factor	0.992	0.991	0.046 (0.026–0.064)	0.064	98.87$_{(65)}$	45.44$_{(1)}$***	−0.008	0.046	0.027
A2 - 2 factor (FA + BA) & (SCO+COH)	0.994	0.993	0.039 (0.015–0.058)	0.061	88.27$_{(64)}$*	34.85$_{(1)}$***	−0.006	0.039	0.014
A3.4-factor hierarchical	1.000	1.001	0.000 (0.000–0.033)	0.049	56.53 $_{(61)}$	3.11$_{(1)}$	0.00	0.00	0.002

COH, coherence. FA, fascination. B-A, being-away. SCO, scope. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 4 Results of confirmatory factor analysis and measurement invariance across sex (validation sample).

	CFI	TLI	RMSEA	SRMR	$\chi^2_{(df)}$	$\Delta\chi^2_{(\Delta df)}$	ΔCFI	ΔRMSEA	ΔSRMR
4-factor	0.972	0.963	0.056 (0.040–0.069)	0.062	135.34 $_{(59)}$	–	–	–	–
A1. 1-factor	0.938	0.926	0.083 (0.072–0.094)	0.085	244.26$_{(65)}$	108.92$_{(1)}$ ***	−0.034	0.027	0.023
A2. 2-factor (FA+BA) & (SCO + COH)	0.826	0.778	0.116 (0.103–0.129)	0.082	273.00$_{(43)}$	137.66$_{(1)}$ ***	−0.174	0.060	0.020
A3. 4-factor hierarchical	0.967	0.958	0.063 (0.051–0.075)	0.067	157.01 $_{(61)}$	21.67$_{(1)}$***	−0.005	0.007	0.005
MI across Sex									
Configural invariance	0.979	0.973	0.051 (0.035–0.065)	0.071	178.06$_{(118)}$	–	–	–	–
Metric invariance	0.976	0.97	0.053 (0.038–0.067)	0.075	198.43$_{(127)}$	20.37**	−0.003	0.002	0.004
Scalar invariance	0.976	0.973	0.051 (0.036–0.064)	0.072	205.41$_{(136)}$	6.98	0.000	−0.002	−0.003
Strict invariance	0.977	0.976	0.047 (0.033–0.061)	0.078	215.45$_{(149)}$	10.04	0.001	−0.004	0.006

COH, coherence. FA, fascination. B-A, being-away. SCO, scope. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

research. This study aimed to identify a valid and reliable measuring instrument specifically designed to assess perceived restorativeness among university students when evaluating the physical environments in which they study at their universities. The identification of the items in this scale is in continuity with the work done to develop the Rest@ Work scale, where four dimensions identified as fundamental, starting from ART (fascination, being-away, coherence, and scope), were articulated to deepen the meaning of each dimension with the specificity of what is carried out in the work environment. The research was conducted using a calibration sample, employed to assess construct validity, and a validation sample to confirm the goodness of the model identified in the first step. Additionally, the validation sample was used to evaluate criterion validity by incorporating specific constructs potentially correlated with restorativeness.

The results of confirmatory factor analyses confirmed the hypothesised model, indicating the presence of the four dimensions and a higher order factor identifying restorativeness. This confirmation was held true in both the calibration and validation samples. Furthermore, in the latter, there was also strong criterion validity observed through correlations with other constructs theoretically linked to restorativeness, such as stress (specifically technostress), wellbeing, and performance. From the data analysis, it has been clear that the new items managed to maintain the relationships in the existing literature. From the results, we can observe the presence of a negative correlation between perceived restorativeness and the dimensions of techno-overload and study-related overload. On the contrary, perceived restorativeness has been found to correlate positively with psycho-physical wellbeing. Even if with a slightly different connotation, these results are similar to the one stated by Payne et al. (2020) in their research. In their study, the scholars stated that the restorativeness produced from natural areas and evaluated through the RSS is negatively correlated with distress (burnout and stress) and positively correlated with wellbeing (life satisfaction).

A more relevant conclusion about the usefulness of specific items to evaluate perceived restorativeness can be drawn from the results obtained while looking for positive associations with perceived performance. This result is in line with the ones reported in the Mason et al. (2022) review, where exposure to natural and campus green environments led to better performances in cognitive tests and higher activations of brain areas related to executive functions while performing a task. This association between natural elements and performances does not stop only in the university grades, but it has a broader expansion in other levels of education, such as primary and secondary schools.

Despite the important results obtained from the present research, we can identify a series of limits that must be considered during this discussion. First, the type of population should be considered. First, the limitation pertaining to the conduction of the study within Italian universities poses several implications for the generalisability of the findings. The specificity of cultural, historical, and institutional context, educational structure, and language aspect constrains the results obtained in the Italian-specific context. In summary, while the focus of the study on Italian universities provides valuable insights into a specific context, it also necessitates caution when generalising findings to broader cultural and educational contexts. Researchers should consider these limitations when interpreting the results. To overcome these limitations and to enhance the robustness and applicability of our findings, we are planning to collect data from other countries and from different educational backgrounds to analyse the psychometric properties of this specific scale in different cultural contexts.

Another limitation is related to the research design. In the evaluation of criterion validity for variables such as perceived performance and psycho-physical wellbeing, a longitudinal study would have been more appropriate. Furthermore, in the criterion validity analysis, it should be acknowledged that criterion variables were consistently assessed using self-report scales, leading to the potential issue of common method variance.

TABLE 5 Pearson's bivariate correlation between restorativeness, its dimensions, and other constructs (validation sample).

	REST@U (total)	REST@U Coherence	REST@U Being-away	REST@U Fascination	REST@U Scope	Techno-overload	Study-workload	Performance	Psychophysical wellbeing
REST@U (total)	1								
REST@U_coh	0.72***	1							
REST@U_ba	0.80***	0.35***	1						
REST@U_fa	0.81***	0.36***	0.62***	1					
REST@U_sco	0.80***	0.48***	0.56***	0.53***	1				
Techno-overload	−0.15**	−0.15**	−0.12*	−0.06	−0.14**	1			
Study-workload	−0.20***	−0.24***	−0.14**	−0.10*	−0.15**	0.25***	1		
Performance	0.14**	0.10	0.13*	0.12*	0.09	−0.19***	−0.21***	1	
Psychophysical Wellbeing	0.09	0.13**	0.07	−0.02	0.09	−0.23***	−0.29***	0.38***	1

COH, coherence. FA, fascination. B-A, being-away. SCO, scope. $*p < 0.05$, $**p < 0.01$.

5 Conclusion

This study can be considered as the first attempt in the creation and evaluation of a context-specific scale to evaluate the perceived restorativeness of the physical environment at the university from the point of view of students. Moreover, one of the aims of this scale is to support future research by giving a wide-use tool adaptable specifically to the various university environments and campuses existing as more studies continue to be conducted in these contexts. The promising results obtained state how specific tools are needed for the research field as they allow the gathering of more reliable and accurate data and, consequently, findings. The lack of literature on specific scales, addressed in the introduction part of this study, concerning the investigation of restorativeness in different types of environments and spaces experienced daily, states the relevance of the results obtained in this study, aimed at developing a specific instrument for this specific potentially demanding physical environment. Therefore, this scale can permit future research to focus on the restorativeness of university spaces. The results of this future research and the application of the scale will be precious for the university to evaluate their spaces, valorising the ones resulting as already restorative and implementing action policies to improve the ones that are not very restorative, also inserting new biophilic features. To conclude, this new path can contribute to the definition of guidelines for the creation of new biophilic and restorative environments for students and universities.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Ethical board of the Department of Human Sciences of the University of Verona, Italy. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

EM: Conceptualization, Data curation, Methodology, Writing – original draft, Formal analysis, Writing – review & editing. MB: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing. OD: Data curation, Writing – original draft. ML: Data curation, Writing – original draft. CM: Data curation, Writing – original draft. MP: Conceptualization, Funding acquisition, Methodology, Project administration, Supervision, Writing – original draft, Writing – review & editing.

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Appendix

Italian version of the scale.

Pensando alla sede universitaria che hai frequentato di più nell'ultima settimana leggi attentamente ciascuna delle seguenti frasi e poi valuta su una scala da 0 a 10 quanto ogni affermazione corrisponde alla tua esperienza in questo luogo.

Il luogo in cui studio mi affatica mentalmente per come è strutturato
Nel luogo in cui studio la mia attenzione può essere attratta da tante cose interessanti (es. elementi d'arredo, una bella vista…)
Il luogo in cui studio è anche pensato per potersi prendere una piccola pausa per pensare o fare qualcosa di piacevole
Nel luogo in cui studio gli spazi sono ben organizzati
Nel luogo in cui studio trovo facilmente le cose che mi servono
Il luogo in cui studio, per come è strutturato, ha degli elementi che di tanto in tanto mi permettono di svagarmi con la mente (ad es. ci sono poster di luoghi di vacanza)
Il luogo in cui studio è disordinato
Il luogo in cui studio è strutturato in modo tale che se ho necessità posso stare concentrato o se voglio posso divagare, ad esempio guardando fuori dalla vetrata/finestra
Il luogo in cui studio ha degli elementi o delle caratteristiche che stimolano la mia curiosità
Il mio luogo di studio è fatto in modo che io possa esplorare lo spazio in molte direzioni
Il mio luogo di studio è strutturato in modo armonioso

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Emerging psychosocial factors and work overload perceptions of Mexican university teachers and students working and studying from home during the COVID-19 pandemic

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Introduction: In Mexico, academic activities during the COVID-19 pandemic were conducted from home for over 2 years. Especially during the initial months of the pandemic, the lockdown conditions necessitated a reorganization and a new understanding of social dynamics. Therefore, this study aimed to explore the perceptions of university students and teachers regarding emerging psychosocial factors that either encouraged or hindered work and/or study from home during confinement, as well as their perceptions of work overload. Furthermore, the differences between students and teachers in the studied variables were analyzed.

Method: A predominantly quantitative, cross-sectional, and correlational study was conducted with 108 participants (42.6% university teachers; 57.4% graduate or postgraduate students) who filled out an online questionnaire encompassing two open-ended inductors to identify the positive and negative aspects of working or studying from home and their frequency of perceptions, the COVID-19 Work Overload from Home Scale (ESTC-COVID-19), and questions about the hours per day devoted to different activities. The open responses were categorized by two independent groups of the research team; the emerging categories were then consensually agreed upon and further transformed into dummy and continuous variables. These variables and the results of the ESTC-COVID-19 were analyzed with SPSS 19 using Pearson's correlation coefficient, the Chi-squared test, and Student's t-test. The results identified 9 positive and 10 negative emerging psychosocial factors attributed to at least 10% of the sample's open answers. In addition, work overload correlated negatively with the emerging factor of "Making better use of time" and positively with "Work, school, and/or domestic activities overload;" moreover, students perceived more work overload than teachers.

Discussion: Differences between students and teachers were observed in the following psychosocial factors: "Self-management," "Comfort," and "Enjoying home" (as positive factors) and "Domestic work" and "Interruptions, distractors, noise" (as negative factors), with students generally reporting more discomfort than teachers. The study analyzes these differences in relation to the demands and nature of the study and work activities undertaken by both groups, as well as the previous training of the skills and the resources required to carry them out.

Introduction

In recent decades, the rapid evolution in the field of information and communication technologies has impacted work relationships and organizational structures. This shift, coupled with labor strategies implemented during the COVID-19 pandemic, led to work intensification and overload (Peiró and Soler, 2020; Avendaño, 2021). The advent of the Internet facilitated the continuation of the teaching and learning processes through online communication. However, this also increased the demand for constant connectivity and instant responses without pauses and delays. These new conditions for studying and working have introduced emerging psychosocial factors with both potential benefits and drawbacks for students and teachers in educational institutions, particularly within the university population.

The Committee on Occupational Health of the International Labor Organization and the World Health Organization (ILO/WHO) defines Psychosocial Factors at Work as those "interactions between and among work environment, job content, organizational conditions, and workers' capacities, needs, culture, personal extra-job considerations that may, through perceptions and experience, influence health, work performance, and job satisfaction" (International Labour Organization World Health Organization, 1986, p. 3). However, the conditions of those people who carried out their activities from home during the pandemic raise questions regarding the ILO/WHO concept since it separates the conditions of (and in) the organization from personal situations outside work, while, during confinement, everything was done in one place: personal and family activities, as well as working and studying, took place in the same dimension of space and time. Recognizing that a significant part of the academic work was already carried out from home even before the pandemic, Anwer (2020) and Sundari et al. (2020) pointed out that, with the lockdown, the boundaries between the spheres of life were completely blurred, particularly for female academics, leading possibly to perceived and objective work overload, especially for caregivers of scholars, who had to organize, support, and supervise children's homeschooling (Quezada et al., 2022a,b).

A conceptual framework that may be more consistent with the experience of working from home during the confinement is the proposal of Juárez and Camacho (2011), who define the psychosocial factors of work as "social facts occurring in the workplace that, in combination or dynamic interaction with an individual's traits and through bio-psychosocial pathogenic or salutogenic stress mechanisms, impact the health-disease process" (p. 202). These authors underline that the interrelationship among people, organizations, and work conditions results from a systemic, dynamic, and cyclic process of constant feedback. They also point out explicitly that not only negative factors but also salutogenic and protective factors must be considered, and both affect people and organizations. In their consideration not only of risk factors, the authors' proposal in their systemic framework resembles classical models, such as Karasek and Theorell's Demand-Control-Social Support model (Karasek and Theorell, 1990) and Siegrist's Effort-Reward Model (Siegrist, 1996) or the more recent and dynamic Job Demands-Resources theory of Bakker and Demerouti (2014), but it expands beyond their transactional and functional focus on specific demands and efforts, on the one hand, and resources and rewards, on the other hand, to take into account the peculiarities of the sociocultural and historical contexts, for example, of peripheral countries of the "global south" (i.e., outside of Europe or the USA), or non-white collar activities (as teaching and learning), inviting a more inductive approach that explores the point of view on the perceived reality of those who experience psychosocial factors, instead of applying predetermined and standardized models (Juárez et al., 2020). This framework, which represents the theoretical background of this article more accurately, adheres to the grounded theory tradition (Glaser and Strauss, 1967), which is centered on inductive categories that emerge from fieldwork rather than predetermined variables.

Gil-Monte (2012) states that psychosocial risk factors are those that originate from deterioration in task characteristics (e.g., high quantitative demands, monotony, and lack of control), organizational peculiarities (e.g., centralized leadership, poorly defined roles and functions), employment conditions (e.g., job insecurity, inadequate taxing conditions), and the organization of working time (e.g., long working days and flexible schedules). On the other hand, in addition to the perception of control, social support, and rewards (Karasek and Theorell, 1990; Siegrist, 1996), positive or salutogenic psychosocial factors include, for example, adequate material resources and tools, acknowledgment, and feedback (Juárez and Camacho, 2011), as well as the aspects and resources that promote personal growth, learning and development (Bakker and Demerouti, 2014), and positive relations with organizational leaders and family members, especially in times of crisis (Demerouti and Bakker, 2023).

Positive results and consequences of psychosocial factors can include overall wellbeing, satisfaction, personal development, motivation, and self-esteem. On the other hand, negative impacts can lead to work-related stress and occupational diseases, "especially the so-called psychosocial risks generated in the production processes, risks that negatively affect the relationships between the people with whom we work, the family, and the entire society" (Unda et al., 2016, p. 68). In this context, studying the emerging psychosocial factors in new or understudied work situations, such as working and studying from home in the specific distressing situation of the COVID-19 pandemic, seems relevant.

A significant number of studies have focused on the psychosocial risks of working from home even before the pandemic (Felstead and Henseke, 2017; Lott and Abendroth, 2023). This body of research grew enormously due to the nearly worldwide lockdown policies in 2020. However, fewer studies analyze both positive and negative psychosocial factors. Only a few studies across different occupations adopted an interactive perspective on the benefits and difficulties of working from home, and these studies were conducted before the COVID-19 lockdown policies (Oleniuch, 2021; Charalampous et al., 2022; Quezada et al., 2022b). Their findings outlined that working from home could increase job satisfaction, wellbeing, and organizational commitment, specifically if supervisors' trust and fairness were perceived and boundaries between personal life and work could be maintained (Lott and Abendroth, 2023). However, they also highlighted the risk of work intensification and difficulties in switching off (Felstead and Henseke, 2017). Other research focusing

not only on emerging risks but also on protective factors and experiences of working from home during the pandemic restriction policies highlighted both positive and negative outcomes. Positive feelings included effectiveness (efficiency, work commitment, motivation, and concentration) and wellbeing (overall satisfaction, less exhaustion, and better work-life balance). However, negative feelings such as isolation, loneliness, boredom, sadness, anger, frustration, and stress were also reported, along with perceptions of expected availability, less comfort, detachment from work, and loss of sense and discipline (Oleniuch, 2021; Charalampous et al., 2022).

Furthermore, it is important to emphasize that Oleniuch (2021) found that the perceived benefits diminish with remote work experience while the sensation of difficulties increases. Moreover, Quezada et al. (2022a,b), in a study of the Mexican population, found that positive aspects include enhanced family interaction, especially with children, the comfort of staying home, no commuting, improved time management, and opportunities for self-management, adaptation, and new learning. However, they also identified several negative aspects, such as issues with schedules, workload, multitasking, interruptions, lack of necessary tools, connection problems, and challenges with online classes, as well as missing contact and interaction with others and work precarity. They also examined gender differences, finding that comfort and interruptions were more commonly associated with men, while interaction with children, adaptability, opportunities for new learning, and multitasking were more frequently associated with women.

Despite recognizing the differences between the activity of productive work intended as employment and the processes, roles, and functions of being students (Díaz-Barriga, 2021), it must be taken into account that university students and teachers are members of the same social institution where psychosocial factors are emerging and interacting. Furthermore, in psychosocial terms, working is considered as more than just (and sometimes even different from) employment and the teaching and learning process as more than just the transmission and acquisition of knowledge. Agreeing with Martín-Baró (1998), both studying and working are substantial activities that shape our identity as human beings: "Learning […] is structuring a form of relation of a person with her/his environment, configuring a world where the individual occupies a place and materializes social interests. Working […] is primarily and fundamentally making one oneself, transforming reality, finding or alienating oneself in one's task in the spider web of interpersonal and intergroup relations" (Martín-Baró, 1998, p. 168–169).

Regarding psychosocial aspects, although a very high number of studies were interested in the experiences of schools and universities, only a few studies could be identified that focus on the psychosocial factors and wellbeing of both university students and professors during the pandemic. An inquiry at two universities in the Middle East found that, during the confinement due to the COVID-19 outbreak, good family relationships, physical comfort, and goal achievement had positive effects on academic wellbeing, while self-reported depression, headaches, enhanced eating, and sleeping affected the participants negatively (Al-Sabbah et al., 2021). Members (teachers, researchers, staff, residents, and interns)

of a veterinarian university in Canada reported more quantitative demands, burnout, stress, and depressive symptoms and less recognition and sense of community than the Canadian norm, as well as deterioration during the 1st months of the pandemic, with restrictions of emotional demands, health and wellbeing, and work-life conflict (McKee et al., 2021). While these two studies did not indicate differences between students and university professors, an inquiry at the University of Barcelona found that students were more affected by temporary employment, negative interaction between work and home and vice versa (while rating lower in positive home and work interaction), and teleworking itself, and they reported more interpersonal conflicts and negative affective states than the rest of the university population (Romeo et al., 2021).

At this point, it is important to note that, in Mexico, teleworking was not recognized in labor laws and regulations in 2020. It was not until mid-2023 that the official Mexican standard "Teleworking Conditions of Safety and Health at Work" (Ley Federal del Trabajo, 2023) was established. This standard acknowledges teleworking as a form of subordinate work organization that allows for paid activities to be performed outside the traditional workplace, which does not require the physical presence of the worker since information and communication technologies are used for contact and control between the worker and the employer. While this legal recognition provides a framework for implementing telework properly, bad practices persist among leaders and employers (Online Career Center, 2023), and many companies either disregard or remain unaware of the telework regulations (Salas, 2024). According to January 2024 statistics, 13 million people are working remotely or teleworking in Mexico (Becerra, 2024), including those starting during the COVID-19 pandemic, as well as those working under flexible or hybrid arrangements. This form of work is also used temporarily during emergencies such as health crises or shortages of public resources, among others. Given this context, it is relevant to understand the psychosocial processes involved in teleworking to enhance the adaptation and improvement of government regulations and, above all, to ensure that workplaces implement appropriate measures in their practice.

Regarding the educational conditions during the confinement policies due to the COVID-19 pandemic, UNESCO (2020) reported that, as of 30th March 2020, 166 countries worldwide had closed schools and universities. The Economic Commission for Latin America (ECLA), known by its Spanish acronym CEPAL, informed that, by August 2020, 29 Latin American countries had implemented strategies to ensure the continuity of schooling from a distance. These strategies include both synchronous and asynchronous activities, as well as offline and online methods. Additionally, they utilized Internet platforms and more traditional media, such as broadcasting classes on national television (Comisión Económica para América Latina y el Caribe, 2020).

Particularly in Mexico, since March 2020, university classes have been conducted mostly online for about 2 years. The Federal Government implemented different actions to reduce contagion, including national confinement (though not as controlled as in other regions), the temporary suspension of non-essential activities, and a significant shift to remote work from home. In April, the

Secretary of Public Education launched the "Learn from Home" program, indicating that formal schooling at all educational levels had to be done from home (SEP, 2020).

In any case and at all educational levels, online classes represented a challenge involving the transfer of traditional activities to a virtual environment. Often, both teachers and students lack the necessary skills and, in some cases, the means to use online platforms, making it difficult, and sometimes impossible, to adapt pedagogical contents to meet learning objectives. As Hurtado (2020) pointed out, these challenges extended to the abrupt shift to distance learning; the struggle to adapt to new technologies, which required additional learning for both students and educators; issues with connectivity, access, and infrastructure; impacts on mental health; adjustments to the virtual environment, including motivation, participation, and interaction with peers; interruptions and loss of social and extracurricular activities; and economic concerns, among others.

Regarding universities, Alcántara (2020) noted that higher education institutions worldwide mandated an abrupt transition to virtual education, even when there was insufficient infrastructure and preparation among teachers and students. This sudden shift highlighted the digital divide and socioeconomic issues affecting both groups. Universities faced the challenge of rapidly organizing teacher training programs, often encountering significant difficulties. Additionally, they had to implement urgent measures for economic and socioemotional support for students, among other critical needs.

In the particular case of Mexico, where this research was conducted, and Latin America in general, no specific studies that address university teachers and students regarding this study's goal were found. However, there is separate research on teachers and students in the region. Studies with teachers in Latin American countries since the beginning of the pandemic have reported several psychosocial risk factors in the workplace: adaptation to ICTs, increased work at home, fear of contagion (Robinet-Serrano and Pérez-Azahuanche, 2020), home and its environment characteristics, influence of the extra-work environment, control over work, poor rewards (Robalino, 2023), high job demands (Godínez-Tovar et al., 2023; Robalino, 2023), problems with household members (Avila-Valdiviezo et al., 2021), mental overload, work competence, and inadequate resolution of planned problems (Godínez-Tovar et al., 2023). Although psychosocial risk factors are more extensively documented with scientific evidence, there are also reports of positive psychosocial factors and wellbeing. For example, Soto-Crofford and Deroncele-Acosta (2021) report collaborative work, assertive communication, self-care habits, and spirituality.

On the other hand, in Mexico, Villagrán et al. (2022) investigated the perceptions of teachers from a public university and a teacher training college in Jalisco regarding the shift from face-to-face to virtual mode at work and the psychosocial risks arising from the COVID-19 pandemic. The study identified several factors significantly associated with teachers' negative evaluations, including the technostress caused by the demands of the sudden transition from face-to-face to virtuality and the incorporation of ICTs, the pressure to use these technologies, and the need to diversify the education strategies, which is associated with the perception of not being prepared or trained.

In the context of remote or online classes, university students have also been significantly affected. Previous reports indicate increases in stress levels (Martinez Arriaga et al., 2021; Robles et al., 2021; Romero et al., 2022), as well as heightened anxiety and sadness (Martinez Arriaga et al., 2021), uncertainty, fear, and even academic dropout (Romero et al., 2022). Robles et al. (2021) highlighted family conflicts, such as family violence, grief from losing family members, conflicts due to the invasion of privacy, and economic difficulties impacting students. Additionally, Rocha-Ibarra et al. (2023) found a correlation between the number of hours spent on academic activities at home using a computer and eye problems among Mexican university students from the University of Guanajuato.

Similarly, Gazca-Herrera and Mejía-Gracia (2022) study involving students from the University of Veracruz highlighted that the shift to virtual learning poses challenges for teachers and students not only due to inadequate preparation for online teaching and learning activities but also because of limited access to technology and its use at home. According to Martinek et al. (2021), these factors were predictors of student frustration in distance education and online learning. On the other hand, Martinek et al. (2021) emphasized that rapid and unexpected transition to virtual learning led to changes in the perception of teaching and learning processes, workload and time management, social relationships, and students' self-assessment of their competencies and ability to continue with previously projected trajectories. Furthermore, Tavera-Fenollosa and Martínez Carmona (2021) conducted a qualitative study with UNAM students, revealing significant negative emotional impacts from the interruption of face-to-face interactions on relationships and interactions with other key individuals in students' lives.

The objective of this study was to explore university students' and teachers' perceptions of emerging psychosocial factors that encourage, motivate, hinder, or stress work or study from home during confinement, as well as their perception of work overload, further analyzing the differences between students and teachers in their prevalences of experiencing emerging psychosocial factors and their perceptions of work overload. The findings from this research can enhance the understanding of difficulties affecting academic performance and the teaching and learning process, help identify psychosocial risk factors to prevent mental health problems, and inform measures to improve the effectiveness of this emerging work model. This is particularly relevant as some emerging psychosocial factors may continue to impact the university population even after the return to on-site schooling, and recognizing that, with or without the pandemic, a significant amount of academic activity for professors and students will be conducted at home is crucial.

Materials and methods

The study employed a predominantly quantitative approach with a qualitative component, utilizing a mixed analysis technique. Open-ended questions were analyzed using qualitative principles but were also quantified based on the participants' frequency of experience to estimate their perceived relevance (Juárez et al., 2020), as described in more detail in the following paragraphs.

Participants were selected through convenience and snowball sampling. The criteria for participation included being over 18 years old, residing in Mexico, and working and/or studying from home due to COVID-19 pandemic confinement period. This study focused on a sub-sample ($N = 108$) of academics, comprising university students ($N = 62$) and teachers ($N = 62$), representing 33.64% of the entire sample.

The protocol of the entire research project was approved by the Research Ethics Commission of the Transdisciplinary Research Center in Psychology of the Autonomous University of Morelos, and participation was voluntary and anonymous. Data were collected from 25th May 2020 to 6th August 2020 by an online survey. Invitations were sent by the research team, as well as colleagues' and friends' virtual social networks and e-mail lists. The sample was non-probabilistic by convenience.

Instruments

In order to explore the psychosocial factors from the participants' perceptions and experiences during the 1st weeks and months of confinement due to the pandemic outbreak in Mexico, the proposal of the mixed data analysis technique of Juárez et al. (2020) was adapted, formulating the following two open-ended inductors: *1. Indicate three to five aspects that you like the least, which affect the execution of your work, or which cause you tension or discomfort in your current work situation* and *2. Mention three to five aspects that you like the most, which motivate you, or which cause you enthusiasm in the execution of your work in your current work situation.* The participants were additionally asked to indicate the frequency of these aspects during their confinement at home on a Likert scale from 1 (*rarely or never*) to 5 (*always, every day*).

Furthermore, the *COVID-19 Work Overload from Home Scale* (ESTC-COVID-19 by its acronym in Spanish), developed and validated for the Mexican population by Quezada et al. (2022a,b), was applied. It intended to evaluate the qualitative work overload (considering spillover between productive and domestic activities) and the lack of balance between the demands and the control to manage them, i.e., the participants' subjective perceptions based on their evaluation of their capabilities, skills, and competencies to fulfill their tasks. The scale consisted of seven items (e.g., *I feel overwhelmed by work at home and domestic tasks*) and was responded with a Likert scale from 1 (*never*) to 5 (*always*). The analyses revealed a Cronbach's alpha of 0.778.

Finally, as a complementary and more objective, although self-reported, indicator of overload, participants were asked how many hours a day they were devoted to working and/or studying from home, domestic duties, caregiving, and helping with children's homework. Some sociodemographic indicators (sex, age, marital status, parenthood, and occupation) were also collected so that the sample could be characterized.

Data analysis

The answers to the open inductors that aimed to explore emerging positive and negative psychosocial factors were analyzed following the suggestions from Juárez et al. (2020). Corresponding to the grounded approach (Glaser and Strauss, 1967) of this

proposal, the answers were coded inductively (Corbin and Strauss, 2014) into macro- and micro-categories. To provide constant comparison and to avoid biases in the codification, this process was first conducted by two independent teams, who then came together (virtually in video calls and using online spreadsheets due to the confinement) to find consensus on the categorization and define the emerging categories. Additionally, one team was formed by experts in psychosocial factors, while the other team consisted of interns (students with bachelor's degree in psychology), so professional expertise and biases could be balanced with a fresher look at the participants' answers.

Once the categories were defined, owing to the indications of frequency of exposure to the aspects mentioned by participants, they could be transformed not only into dummy variables (i.e., whether a participant mentions or not an aspect categorized as a certain factor) but also into continuous variables (i.e., considering the indicated frequency of exposure to a certain aspect). Finally, these resulting variables of an inductive nature were matched with the database of the remaining deductive variables addressed by the study.

The resulting database was analyzed using SPSS 19 software, enabling descriptive statistics and exploratory correlations among the variables to be carried out and the differences between students' and teachers' perceptions of work overload to be analyzed, as well as their experiences with and exposure to emerging psychosocial factors: differences between means were analyzed using Student's *t*-test, and the association between the ESTC-COVID-19 scale and the emerging psychosocial factors was explored using Pearson's correlation coefficient. Furthermore, the chi-squared test was applied in order to explore if some of the emerging psychosocial factors, treated as a dummy variable (a participant did = 1 or did not = 0 give answers labeled with a category, not considering the frequency of its perceptions), were associated specifically with the nominal variable student or teacher.

Results

Sample characteristics

Out of the 108 participants, 42.6% ($N = 46$) were university teachers, and 57.4% ($N = 62$) were graduate or postgraduate students. They were distributed across 19 of the 32 federal states of Mexico. Table 1 provides detailed sociodemographic information, including age, marital status, and parenthood, categorized by participant type and sex.

Additionally, 42 students (32 women, 10 men) stated that they were only studying, while 20 students mentioned they were both studying and working (14 women, six men). Furthermore, 33 students (25 women, eight men) had some kind of scholarship, while the remaining 27 students (19 women, eight men) did not.

Categorization of emerging psychosocial factors

In the overall sample, 426 answers to the prompt to list positive aspects and 481 answers to the prompt to list negative ones were

TABLE 1   Sociodemographic information.

	N	%	Sex	n	Mean age	Age range	Marital status	
							With a partner	Single or separated
Students	62	57.4%	Female	46	28	18–47 years	15	30
			Male	16	26	18–35 years	2	14
Teachers	46	42.6%	Female	37	45	27–67 years	17	20
			Male	9	41	27–64 years	5	4

TABLE 2   Positive psychosocial factors by number of participants and frequency of experience.

Macro-categories	N	%	Mean of experience	SD
Family interaction	28	25.93	4.5	0.73
Self-management	20	18.52	3.9	1.03
No need for commuting	19	17.59	4.4	0.83
Nutritional wellness	17	15.74	4.6	0.82
Adaption and new learning	16	14.81	4.2	0.65
Comfort	16	14.81	4.4	0.51
Enjoying home	13	12.04	4.3	0.72
Teleworking	12	11.11	4.6	0.79
Making better use of time	11	10.19	3.5	1.03

N, number of participants that gave at least one answer labeled by a category.

given. Following the above-detailed procedures (Juárez et al., 2020), the positive aspects were categorized into 44 emerging macro categories and the negative ones into 50. For the aim of the present study, the descriptive results of the positive and negative emerging categories and variables, which included the answers of at least 10% of the 108 academic participants, are presented as follows.

Positive psychosocial factors

As detailed in Table 2, nine positive psychosocial factors that group the answers of at least 10% of participants could be identified: *Family interaction, Self-management, No need for commuting, Nutritional wellness, Adaption and new learning, Comfort, Enjoying home, Teleworking,* and *Making better use of time.* The mean frequency of experiencing the factors oscillated between 3.5 and 4.6 on the 1–5 Likert scale.

The category *Family interaction* ($N = 28$) includes answers referring to the possibility of communicating, living together, enjoying, having more time, solving problems, and giving attention to one's family. Some textual quotes from the participants' answers were: "Time with my parents because I [normally] live far from them," "I can be in touch with my parents," and "Visiting my family." The category *Self-Management* ($N = 20$) refers to the sensation or experience of having more control and the possibility to manage different aspects of life (working, household, personal

issues, etc.), as well as the time to organize one's schedule in an independent and self-taught way, for example: "Better organization," "Possibility to do other activities at home," and "I can work with my own schedule." *No need for commuting* ($N = 19$) is comprised of answers that refer to the benefits related to not needing to travel from home, avoiding wasting time, traffic, or public transportation (for example: "I do not deal with hours of commuting;" "Less transportation time;" and "Not to have to waste time in the commute to the university"). *Nutritional wellness* ($N = 17$) reassembles the benefits of eating at home, associated with the possibility of eating together, not going to another place to eat, eating at one's own schedule, and eating more varied, better-cooked, and healthier food. It is the positive factor with the highest mean score to be experienced. *Adaption and new learning* ($N = 16$) refers to the opportunities for new experiences, the possibility of work reorganization in the new reality, and new learning achieved during the confinement, including knowledge improvement, new training options, new ways of working, the acquisition of digital skills, and access to online learning. The category of *Comfort* ($N = 16$) includes answers that refer to the opportunity to work with comfortable clothing, not getting dressed up, or having the chance to take breaks. The category *Enjoying home* ($N = 13$) includes the pleasure of being at one's own home, taking care of the house and improving it, spending more time in it, and enjoying the place. The answers categorized as *Teleworking* ($N = 12$), the factor with the highest mean frequency of being experienced, refer to the benefit of working from home for the space, the available tools, and the convenience of working online, being more productive, and avoiding contagion. Finally, the category *Making better use of time* ($N = 11$) has the lowest mean frequency of being experienced. It bundles the perceptions of better time management and having more time for recreation, self-care, working, and studying.

Negative psychosocial factors

Table 3 shows the 10 negative psychosocial factors that emerged in at least 10% of the participants' answers: *Work overload, school and/or domestic activities; Schedules; Online classes; Interruptions, distractors, noise; Problems with Internet services; Confinement; Lack of physical and/or affective contact/interaction; Domestic work; Family environment;* and *Stress.* The mean frequency of experiencing the emerging factors shifts from 3.2 to 4.5, which is a slightly lower range than the one observed for positive factors.

The category that groups answers from most participants was *Work, school, and/or domestic activities overload* ($N = 29$), referring

TABLE 3 Negative psychosocial factors by number of participants and frequency of experience.

Macro-categories	N	%	Mean of experience	SD
Work, school, and/or domestic activities overload	29	26.85	4.3	0.87
Schedules	25	23.15	4.4	0.58
Online classes	17	15.74	4.2	0.58
Interruptions, distractors, noise	17	15.74	4.2	0.66
Problems with Internet services	17	15.74	3.2	1.01
Confinement	12	11.11	4.1	0.99
Lack of physical and/or affective contact/interaction	12	11.11	4.1	0.79
Domestic work	11	10.19	4.3	1.00
Family environment	11	10.19	3.6	0.72
Stress	11	10.19	4.5	0.68

N, number of participants that gave at least one answer labeled by a category.

TABLE 4 Mean and standard deviation SD of the ESTC-COVID-19 scale.

Participants	N	%	Mean	SD
Students	62	57.40	3.58	0.60
Teachers	46	42.60	3.31	0.60
Overall	108	100%	3.46	0.61

with this category, it has the lowest average frequency of being experienced. The category *Confinement* ($N = 12$) concentrates on answers that directly express the discomfort of being confined, such as isolation, enclosure, not going out, and/or feeling lonely, while answers categorized as *Lack of physical and/or affective contact/interaction* ($N = 12$) indicate explicitly the trouble of not having physical or affective contact and interaction with others (family, friends, students, teachers, or colleagues). The category *Domestic work* ($N = 11$) refers to the amount of house chores, such as cleaning, laundry, dishwashing, as well as the responsibility of organizing these tasks. Answers labeled as *family environment* ($N = 11$) refer to the difficult family dynamics during the confinement, patience in conflicts, stressful interaction, and a lack of cooperation between family members. Finally, the category *Stress* ($N = 11$), which has the highest observed mean score in its experimentation, groups answers that refer explicitly to the perceived tension and stress during the confinement.

Work overload from working or studying from home during the confinement due to COVID-19 and its relation with emerging psychosocial factors

Table 4 shows the means and standard deviations of the ESTC-COVID-19, which measured perceived work overload during the Mexican lockdown, and their differentiations between students and teachers. The differences between means are statistically significant ($p = 0.023$), indicating that students tend to perceive overload on average more frequently than teachers. Nevertheless, the more objective data of study from home showed that 22 teachers (47.83%) studied more than 8 h a day and 19 students (30.65%) studied only either 2–4 or 4–6 h; for house chores, both groups indicated spending 2–4 h daily, accounting for 43.48% of teachers and only 30.64% of students.

Furthermore, as shown in Table 5, only two factors correlated positively with the ESTC-COVID-19 at a statistically significant level: *Making better use of time* negatively and *Work, school, and/or domestic activities overload*. On the one hand, the more frequently the 11 participants (six students, five teachers) who gave answers categorized as *Making better use of time* indicated to experiment with this aspect, the less qualitative work overload they perceived. On the other hand, the 29 participants (15 students, 14 teachers) who indicated answers categorized as *Work, school, and/or domestic activities overload* experimented with this aspect more frequently, as they also perceived more quality work overload, indicating an interesting semantical concordance between the theoretical conception of the ESTC-COVID-19 and the inductive analysis.

to experiences of increased load in paid or productive work, school activities, and/or house chores. Among the textual answers were, for example, "Increase of workload" and "Homework overload;" one answer also explains the reason for the discomfort: "Workload. Due to training and instructions from the management staff, I have more work to do since I don't only have to review classes and grades but also develop work that was previously conducted by the administrative staff." Answers labeled with the category *Schedules* ($N = 25$) indicated problems in managing new schedules and time management during teleworking for individuals and organizations, e.g., extension of working hours, lack of clarity in schedules, feelings of having to stay available for work all the time, time being not enough for neither work nor personal activities, as well as not achieving good time management or organization. Some specific answers follow: "Not having a schedule," "More working hours," and "There is no fixed schedule to communicate, so they can ask for school assignments at any time of the day." The category *Online Classes* ($N = 17$) concentrates on answers about the discomfort of schooling at a distance perceived by both students and teachers, e.g., "Little concern from teachers," "Homework without explanation," and "Problems communicating with students of limited economic resources." Participants whose answers were categorized as *Interruptions, distractors, noise* ($N = 17$) mentioned agents that interfere with the performing of work or school activities at home, as interruptions and distractions by other people at home, as well as noise inside and outside the house and in the neighborhood: "There is a lot of noise at home;" "Noise from neighbors;" "Noise from household members while taking online classes." The category *Problems with Internet services* ($N = 17$) encompasses inconveniences resulting from problems with the Internet service, such as connection failures or slow service. For instance, although 15.74% of the participants gave answers labeled

Differences between students and teachers in the perceptions of psychosocial factors

In accordance with the abovementioned differences between students and teachers in their work overload perceptions, if there were differences in how they perceived the emerging psychosocial factors was also explored.

The possibility of treating the emerging factors as continuous variables not only permitted the correlation mentioned above with the ESTC-COVID-19 scale but also allowed the implementation of Student's t-test to see differences in the mean frequency with which students and teachers experienced certain factors.

Table 6 reports the differences in the frequency of perceptions of positive psychological factors. It can be seen that, on average, teachers enjoy *Self-management* and the *Comfort* of working from home more often than students do (although equal variances could not be assumed in both cases).

The differences in the frequency of perceiving negative factors are indicated in Table 7. The only difference found pertained to *Domestic work*: the four teachers who provided responses categorized under this label reported experiencing it consistently (5 = "always, every day"), and statistically more significantly than the seven students whose responses fell under the same category, with an assumption of unequal variances.

Finally, as shown in Table 8, exploring the association between psychosocial factors and being a student or teacher, the only prevalence between students and teachers for positive psychosocial factors was found in the category *Enjoying home* ($p = 0.039$; correct residual > 1.96): This variable appears to be statistically significantly related to teachers.

On the other hand, as reported in Table 9 for the negative psychosocial factors, statistical significance was found within the following categories: *Interruptions, distractors, noise* ($p = 0.032$) and *Confinement* ($p = 0.023$). Expressing discomfort from *Interruptions, distractors, noise* appears to be associated with being a student.

TABLE 5 Pearson correlation between the ESTC-COVID-19 scale and emerging psychosocial factors.

		Making better use of time	Work, school, and/or domestic activities overload
ESTC—COVID-19	Pearson correlation	−0.694*	0.552**
	Sig. (bilateral)	0.018	0.002
	N	11	29

*Correlation is significant at the 0.05 level (two-tailed).
**Correlation is significant at the 0.01 level (two-tailed).
Only significant associations are reported.

TABLE 6 *T*-test of differences between teachers' and students' perceptions of positive emerging psychosocial factors.

Emerging positive factors		N	Mean	SD	t	P
Family interaction	Students	17	4.32	0.85	−1.10	0.28
	Teachers	11	4.64	0.50		
Self-management	**Students**	**14**	**3.46**	**0.97**	**−4.44***	**0.00**
	Teachers	**6**	**4.83**	**0.41**		
No need for commuting	Students	12	4.58	0.51	0.91*	0.39
	Teachers	7	4.14	1.21		
Nutritional wellness	Students	9	4.78	0.44	1.12*	0.29
	Teachers	8	4.31	1.10		
Adaption and new learning	Students	8	4.31	0.70	0.56	0.59
	Teachers	8	4.13	0.64		
Comfort	**Students**	**12**	**4.25**	**0.45**	**−5.74***	**0.00**
	Teachers	**4**	**5.00**	**0.00**		
Enjoying home	Students	4	4.00	0.82	−0.88	0.40
	Teachers	9	4.39	0.70		
Teleworking	Students	5	4.40	0.89	−0.66	0.52
	Teachers	7	4.39	0.76		
Making better use of time	Students	6	3.50	1.05	0.15	0.88
	Teachers	5	3.40	1.14		

Significant statistical differences are in bold.
*Equal variances could not be assumed.

TABLE 7 *T*-test of differences between teachers' and students' perceptions of negative emerging psychosocial factors.

Emerging negative factors		N	Mean	SD	t	P
Work, school, and/or domestic activities overload	Students	15	4.20	0.86	−0.48	0.64
	Teachers	14	4.36	0.91		
Schedules	Students	13	4.37	0.55	−0.36	0.72
	Teachers	12	4.46	0.66		
Online classes	Students	7	4.21	0.39	−0.12	0.91
	Teachers	10	4.25	0.72		
Interruptions, distractors, noise	Students	14	4.29	0.61	0.66	0.52
	Teachers	3	4.00	1.00		
Problems with Internet services	Students	12	3.00	1.04	−1.12	0.28
	Teachers	5	3.60	0.89		
Confinement	Students	9	4.11	0.78	0.11*	0.92
	Teachers	3	4.00	1.73		
Lack of physical and/or affective contact/interaction	Students	8	3.88	0.83	−1.33	0.21
	Teachers	4	4.50	0.58		
Domestic work	**Students**	**7**	**3.86**	**1.07**	**−2.83***	**0.03**
	Teachers	**4**	**5.00**	**0.00**		
Family environment	Students	7	3.86	1.22	0.79	0.45
	Teachers	4	3.25	1.26		
Stress	Students	6	4.15	0.75	0.12	0.32
	Teachers	5	4.89	0.44		

Significant statistical differences are in bold.

*Equal variances could not be assumed.

Discussion

This research explored the emerging positive and negative psychosocial factors experienced and explicitly mentioned by Mexican university students and teachers who performed their work and study activities from home in the 1st months of confinement due to the COVID-19 pandemic. The mixed technique of answers to open-ended inductors with the indication of the frequency of experiencing the expressed positive and negative aspects (Juárez et al., 2020) allowed for an inductive and grounded approach to analyze the semantic content, identifying emerging categories from the fieldwork (Glaser and Strauss, 1967; Corbin and Strauss, 2014) that could be transformed into quantitatively analyzable variables. The technique based on the proposal of Juárez and Camacho (2011) allowed us to identify aspects that fit into more conventional theoretical models and can be interpreted by them. For example, learning and personal development are appreciated (Bakker and Demerouti, 2014), while high quantitative and qualitative job demands are perceived as discomfort and social support counts (Karasek and Theorell, 1990; Demerouti and Bakker, 2023) but emerged as much more due to its positive presence or conflict potential in the domestic and family sphere than from organizational leaders or superiors. Nevertheless,

showing the virtue of its inductive and explorative nature, the technique also allowed us to identify some aspects that reflect not only the contingency of the pandemic lockdown (such as lack of interaction) but also the advantages and disadvantages of working and studying from home in general (comfort, family interaction, noises, and distractors, etc.) and in the sociocultural context of countries like Mexico in particular (e.g., high relevance of family, infrastructural malfunction). Furthermore, this method allowed for basic statistical inferences and estimations despite not being as in-depth, purely qualitative research.

In this study, the emerging factors that reflected the answers of at least 10% of the sample were analyzed, standing out on the side of perceived positive aspects of studying and/or working from home, especially a positive *Family interaction* (25.93%), the possibility of *Self-management* (18.52%), and the benefit of *No need for commuting* (17.59%). These categories were followed by the answers of 15.74% of the sample into *Nutritional wellness*, the positive psychosocial factor with the highest average of being experienced (4.6 on a 1–5 scale). Particularly, positive relationships with the family resemble the findings of Al-Sabbah et al. (2021) for students and teachers in the Middle East during the COVID-19 lockdown, while negative family interactions or even conflicts were reported for university students by Robles et al. (2021) and

TABLE 8 Chi-square test between numbers of students and teachers who gave answers codified as a positive psychosocial factor.

Emerging positive factor		Observed count	Expected count	Corrected residual	Sig.
Family interaction	Student	17	16.1	0.4	0.825
	Teacher	11	11.9	−0.4	
Self-management	Student	14	11.5	1.3	0.316
	Teacher	6	8.5	−1.3	
No need for commuting	Student	12	10.9	0.6	0.619
	Teacher	7	8.1	−0.6	
Nutritional wellness	Student	9	9.8	−0.4	0.791
	Teacher	8	7.2	0.4	
Adaption and new learning	Student	8	9.2	−0.6	0.589
	Teacher	8	6.8	0.6	
Comfort	Student	12	9.2	1.5	0.172
	Teacher	4	6.8	−1.5	
Enjoying home	**Student**	**4**	**7.5**	**−2.1**	**0.039**
	Teacher	**9**	**5.5**	**2.1**	
Teleworking	Student	5	6.9	−1.2	0.354
	Teacher	7	5.1	1.2	
Making better use of time	Student	6	6.3	−0.2	0.542
	Teacher	5	4.7	0.2	

Significant statistical differences are in bold.

Romeo et al. (2021) and for university teachers by Avila-Valdiviezo et al. (2021).

However, this research brought up the category of a negative *Family environment* in the answers of 10.19% of the participants. Nevertheless, regarding the negative aspects mentioned by most participants, the perceptions of *Work, school, and/or domestic activities overload* (26.85%) and problems in managing *Schedules* (23.15%) were particularly relevant, followed by the discomfort generated by *Online classes*, the inconvenience of *Interruptions, distractors, noise*, as well as *Problems with Internet services* (15.74% each). Finally, although only 10.19% of the participants mentioned *Stress* as a negative aspect of working/studying from home due to the COVID-19 confinement, it was the negative psychosocial factor with the highest mean frequency of being experienced (4.5 on a 1–5 scale), resembling the findings of Oleniuch (2021) and Charalampous et al. (2022) for people who worked from home during the pandemic, in general and of Robles et al. (2021) and Romero et al. (2022) for students, in particular.

The discomfort expressed by the participants about managing *Schedules* and *Online classes*, on the one hand, and their *Problems with Internet services*, on the other hand, could be seen as a reflection of the abrupt transition to homeschooling with neither training nor sufficient infrastructure, as pointed out by Alcántara (2020), Hurtado (2020), and Gazca-Herrera and Mejía-Gracia (2022), as well as of resulting technostress, especially for students (Martinez Arriaga et al., 2021; Robles et al., 2021; Gazca-Herrera and Mejía-Gracia, 2022; Romero et al., 2022; Villagrán et al., 2022). Nevertheless, it is worth mentioning that the answers of 14.81%

of the participants in the present study mentioned *Adaptation and new learning* as positive challenges.

Either way, as just indicated above, the most prevalent emerging negative psychosocial factor was *Work, school, and/or domestic activities overload*. The qualitative work overload was also measured with the ESTC-COVID-19 scale, and the overall mean frequency of exposure was 3.46 (on a 1–5 scale) in the complete sample. The two variables correlated positively with a statistical significance at the 0.01 level, a result that strengthens the quality of the categorization of the open answers. Furthermore, the ESTC-COVID-19 scale correlated negatively with the positive psychosocial factor *Making better use of time*, indicating perhaps the importance of time management during the confinement period and the positive impact of achieving a containment of the inevitable work-life conflict when working from home (Lott and Abendroth, 2023).

Work intensification was observed in work at home even before the pandemic (Felstead and Henseke, 2017). According to other studies in Latin America, university teachers experimented with overload and incrementation of physical and mental demands during the pandemic (Robinet-Serrano and Pérez-Azahuanche, 2020; Godínez-Tovar et al., 2023). This study measured study and/or work workload and domestic tasks objectively by asking about the hours dedicated to it. Recalling a tendency for teachers to dedicate more hours per day to work and/or study and to domestic tasks than students could be observed in this study, it is important to contrast this result with the fact that it was the students who perceived more qualitative work overload in the ESTC-COVID-19 scale than the teachers.

TABLE 9 Chi-square test between numbers of students and teachers who gave answers codified as a negative psychosocial factor.

Emerging negative factor	Sex	Observed count	Expected count	Corrected residual	Sig.
Work, school, and/or domestic activities overload	Student	15	16.6	−0.7	0.515
	Teacher	14	12.4	0.7	
Schedules	Student	13	14.4	−0.6	0.646
	Teacher	12	10.6	0.6	
Online classes	Student	7	9.8	−1.5	0.183
	Teacher	10	7.2	1.5	
Interruptions, distractors, and noise	**Student**	**14**	**9.8**	**2.3**	**0.032**
	Teacher	**3**	**7.2**	**−2.3**	
Problems with Internet services	Student	12	9.8	1.2	0.291
	Teacher	5	7.2	−1.2	
Confinement	**Student**	**9**	**6.9**	**1.3**	**0.023**
	Teacher	**3**	**5.1**	**−1.3**	
Lack of physical and/or affective contact/interaction	Student	8	6.9	0.7	0.552
	Teacher	4	5.1	−0.7	
Domestic work	Student	7	6.3	0.4	0.756
	Teacher	4	4.7	−0.4	
Family environment	Student	7	6.3	0.4	0.756
	Teacher	4	4.7	−0.4	
Stress	Student	6	6.3	−0.2	0.542
	Teacher	5	4.7	0.2	

Significant statistical differences are in bold.

Differences between students and teachers could also be observed in the perception of the emerging psychosocial factors. On average, teachers perceived the positive factor of *Self-management* more frequently and felt *Comfort* more often than students, and there is a statistically significant association between being a teacher and the emerging factor of *Enjoying home* during confinement. By contrast, being a student is associated with considering *Interruptions, distractors, noise* as a negative aspect of work and/or study from home, showing the problematic scholar invasion of the family sphere. For instance, the only psychosocial factor that represented more burden for teachers was *Domestic work*, since all the teachers who gave answers labeled with this category experimented with the frequency 5 = "always, every day."

The fact that students seemed more negatively affected by studying and/or working from home is in line with the findings of Romeo et al. (2021), who observed that students suffer more from different negative aspects of COVID-19 confinement. The greater impact on students could be influenced by the different kinds of roles of being a student or a teacher. Specifically for students, the perception of the decrease in academic achievements could have a strong negative evaluation, either because they considered little attention from teachers or even because they saw their career path and future projects interrupted, as Romero et al. (2022) stressed out.

In other words, learning, studying, and academic performance were affected. Furthermore, it should be further examined in subsequent studies whether self-management skills for one's own learning (as self-regulated learning essential for online education) were less developed in students (as perceived in this way causing reduced self-efficacy) as compared to independence, time, and task skills mentioned by teachers as a positive factor. Due to the nature of their respective roles, the latter might have been more developed at the time of the abrupt transition to virtuality.

In addition, since our sample had a very high female prevalence (76.85%), it did not seem convenient to analyze differences between women and men, but it seems important to remember that the spillover and blurring of boundaries between different life spheres during the confinement due to the COVID-19 pandemic, reflected in various emerging psychosocial factors discussed here, were particularly complicated to manage for women (Anwer, 2020; Sundari et al., 2020; Quezada et al., 2022b). In this sense, special attention from gender studies on work (and study) from home after the pandemic is also imperative.

Although COVID-19 restrictions no longer apply, some practices of distance schooling, teaching, and studying specifically and working from home remain and, in certain sectors, has even increased. Technological development and innovation

opportunities allow and expand multiple possibilities of teleworking and virtual interaction. Although these can lead to better comfort, it is important to underline that the negative psychosocial aspects of working from home do not seem to diminish with time; on the contrary, they increase while benefits are reduced (Oleniuch, 2021) so that risk management, educational programs, and occupational health politics and practices should take into account the psychosocial factors that emerged during the pandemic. This is of utmost relevance, not only because of the exponential use of new virtual communicative forms in the teaching-learning process, but because, given the cost-saving results for organizations and companies, it establishes it as a new type of educational offer and a viable solution at eventual moments.

Conclusion

In conclusion, the present study had several limitations. For instance, no differentiation between graduate and postgraduate students was possible, and the different work contracts of teachers (part-time vs. full-time, associates vs. tenures, etc.) could not be analyzed either. However, the study was cross-sectional, and its sample was not representative, so the results are hardly generalizable. Further, accountability of online surveys is less reliable than applications *in situ*. Moreover, the mixed technique allowed only basic statistical inferences, so it did not allow for a deepening nor an interactive, collaborative interpretation between researchers and participants. Nevertheless, the results showed grounded inductive emerging topics that mattered to people who responded to the survey, and its interpretation and discussion should be developed by future quantitative and qualitative research and informed public decision-making.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The studies involving humans were approved by Comité de Ética en Investigación del Centro de Investigación Transdisciplinar en Psicología CEI-CITPsi, CONBIOÉTICA-17-CEI-003-20190509. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

BQ: Writing – review & editing, Writing – original draft. IH: Writing – review & editing, Writing – original draft. DC: Writing – review & editing, Writing – original draft.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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