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Emotional resilience for wellbeing and employability: the role of learning and training, volume II

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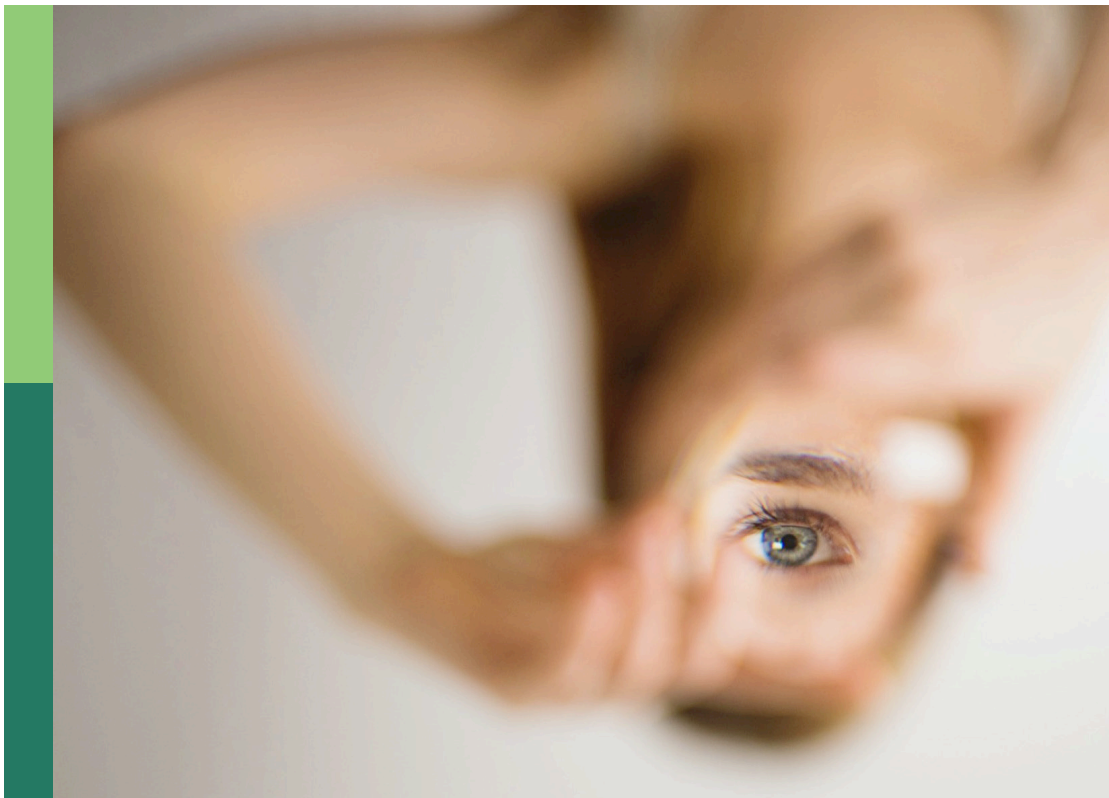

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Emotional resilience for wellbeing and employability: the role of learning and training, volume II

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Editorial: Emotional resilience for wellbeing and employability: the role of learning and training, volume II

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Editorial on the Research Topic
Emotional resilience for wellbeing and employability: the role of learning and training, volume II

1 Introduction

Emotional resilience has become a significant topic for researchers and educators who seek to understand what helps young people cope with stress when changing jobs or entering the job market. While considerable attention has been devoted to resilience in early childhood and clinical settings, its role in relation to the transition to adult life, employability and the nature of work has received more attention only in recent years (see Vol. 1 of Emotional Resilience for Wellbeing and Employability: The Role of Learning and Training). Resilience is now viewed as both an individual trait and a competence that can be developed through educational interventions and workplace practices (Smaliukiene et al.).

The ability to adapt positively in the face of adversity is particularly important in work and career contexts, where emotional demands, uncertainty and changing conditions are constant. During the pandemic, studies documented the psychological strain experienced by students, employees, and job seekers, highlighting the ways in which stress, anxiety, and social isolation interfered with learning, motivation, and career planning (Dost, 2025). In this context, interest in emotional resilience as a potential enabler of employability and a buffer against negative outcomes has grown.

At the same time, scholars have highlighted the trainable nature of resilience, suggesting that structured interventions, educational practices and coaching models could develop these capacities. However, the evidence base on how emotional resilience can be developed through learning and training remains fragmented. Although progress has been made in identifying key emotional and cognitive factors, such as self-regulation and adaptability, there are still gaps in understanding of the pedagogical processes and conditions through which emotional resilience contributes to wellbeing and employability across different groups of people.

This Research Topic brings together ten studies that address these concerns. The issue includes empirical and conceptual contributions that examine the development of emotional resilience through training, coaching, leadership and institutional learning contexts. Taken together, the papers offer evidence-based insights into how emotional resilience is cultivated, how it supports professional development and the role that educational and organizational systems can play in enabling these outcomes.

2 First field: developing emotional resilience for employability through interactions between psychological, organizational, educational and physical training

Research shows that emotional resilience can be developed. It is also becoming increasingly important to understand the psychological and educational factors that help people to develop this skill. Emotional resilience does not depend solely on personality. It is also shaped by leadership style; the level of support people feel they receive from their organization and how well their personal values align with the work environment. The following studies explore how personal characteristics, and the work environment influence emotional involvement and resilience for employability.

2.1 Leadership and resource-driven engagement

Tang et al. focus on the role of coaching leadership in enhancing employee engagement in vocational and professional environments. In an empirical study involving 402 Master of Business Administration (MBA) and Executive MBA (EMBA) students, the researchers found that coaching leadership significantly increased engagement, measured through vigor, dedication, and absorption. These effects were partially mediated by organizational self-esteem and further moderated by individuals' learning goal orientation. The findings point to a model in which leadership does not only direct but allows, creating conditions for employees to assume value, confidence, and purpose (Tang et al.). This study makes an important contribution to resilience research by strengthening the idea that positive emotional conditions such as enthusiasm and energy that are not isolated experiences but emerge in interaction with supportive social contexts. The implication is that engagement-enhancing leadership could be a developmental pathway for increasing emotional resilience, particularly in roles that demand adaptability and sustained motivation.

2.2 Training in psychological safety and secured leadership

Based on organizational perspective, Navas-Jiménez et al. explore emotional resilience in the military context through the lens of secure base leadership (SBL). drawing on attachment theory and the job demands–resources model, their study with 363 military cadets reveals that SBL increases emotional resilience indirectly through its impact on work (service) engagement. Here, leadership provides not only direction but also emotional reassurance, autonomy support, and psychological safety, which are conditions that help trainees internalize challenges as developmental opportunities rather than stressors. They also found that the mediating role of engagement is very important: the study suggests that resilience is not rooted directly, but fostered through motivational mechanisms tied to perceptions of safety, relatedness, and challenge. These findings are especially relevant for high-stress environments, where leadership must simultaneously increase discipline and emotional support. The results underscore the developmental potential of leadership models that balance authority with trust and individualized guidance.

2.3 Training and developing employability in vocational education

Li et al. examine how collaboration between universities and industry enhances vocational students' perceived employability. This addresses a gap in research on the role of macro-level institutional factors in vocational education, an area which is often underrepresented in employability discourse. Using data collected from 341 vocational college students, the study reveals that a culture of quality, defined as a collective institutional dedication to enhancement, ethical principles, and performance, significantly enhances students' perceptions of their career preparedness. The authors recommend integrating industry-oriented learning into curricula and reinforcing internal systems that foster a culture of excellence. They conclude that employability is not merely the outcome of skill development, but rather the result of a coherent institutional strategy, effective stakeholder engagement and active student participation in educational processes.

2.4 Physical fitness training for greater resilience

Physical fitness is a cornerstone of military readiness, directly contributing to operational effectiveness and reducing the risk of injury. Within this framework, aerobic endurance is of particular importance. Using data from 486 military recruits and cadets, Drozd et al. address a knowledge gap in the application of ergometer-based metrics to predict field endurance outcomes. The results suggest that the current model may misrepresent individuals' physical readiness, which has implications for the accuracy of recruitment and the adaptation of training. More broadly, the findings emphasize that personalized endurance training enhances physical capability and fosters psychological resilience, preparing personnel for the physical and mental challenges of military service. Therefore, updated assessment protocols and training designs need to incorporate physiological training in order to develop resilience for performance-oriented military service.

Taken together, these studies emphasize that emotional resilience for employability is not developed through efforts made in isolation within the study curriculum, but rather through the interaction of psychological, organizational, educational and physical systems. In professional, educational or military environments, resilience develops when individuals are encouraged to engage meaningfully with challenges through leadership that fosters trust, institutions that align learning with opportunities, and training that builds mental and physical resilience. These findings highlight the importance of designing study curricula that integrate not only skill-focused, but also structurally embedded, resilience-building initiatives.

3 Second field: coaching and support for employability and career development

Coaching and support are crucial in helping individuals adapt to the demands of modern labor markets, especially those in transitional or vulnerable professional situations. The six contributions in this Research Topic emphasize that employability and emotional resilience are developed through a combination of personal attributes and structured interventions, institutional environments and socio-cognitive mechanisms.

3.1 Coaching and support for employability and career development

Coaching has emerged as a vital means of fostering individual resilience and promoting long-term employability. Focusing on this intersection, Sipondo and Terblanche conducted a review of 51 studies to determine the extent to which organizational coaching contributes to workplace resilience. They identify a clear knowledge gap: despite the growing popularity of coaching as a developmental intervention, the existing body of research is fragmented and there is limited empirical evidence on the impact of coaching on resilience-related outcomes such as adaptability, self-efficacy and career engagement. They call for evidence-based coaching models to be developed that align coaching goals with resilience-building processes. They also recommend further research into the mechanisms that link coaching to employability and resilience outcomes.

3.2 Career development and employability among unemployed adults

Carvalho et al. evaluated the effectiveness of a career intervention based on Social Cognitive Career Theory (SCCT), which was proposed by Lent and Brown (2013). The aim was to enhance employability resources among unemployed adults. The study used a quasi-experimental longitudinal design to follow two intervention groups (one face-to-face and one online) and a control group. Notably, the researchers identified distinct patterns of influence for different employability dimensions. For instance, career identity and self-management resources had the greatest impact in the short term, whereas human capital and professional development became more significant over time. Meanwhile, social capital and networking showed the greatest influence immediately after the intervention. These findings suggest that the different facets of employability may respond differently to intervention stimuli depending on the timing and context of exposure.

3.3 Institutional culture for learning and employability in vocational education

Li et al. investigated the influence of institutional quality culture on students' perceived employability. The study introduces a conceptually rich definition of quality culture, integrating structural dimensions (e.g., accountability systems) and cultural dimensions (e.g., shared values and continuous improvement). Drawing on Huang's educational philosophy, the researchers argue that institutions of education and training must do more than simply teach skills; they must also foster professional ethics, collaborative habits and a sense of broader purpose in their students, thereby aligning education with the needs of the labor market and society. Empirically, the results demonstrate that students who perceive their school as being committed to providing high-quality teaching, ethical development and continuous improvement are more confident in their own employability. The study offers two significant contributions. Firstly, it provides a localized, culturally anchored model of how employability is developed in Chinese vocational education. Secondly, it empirically validates the theoretical claim that a quality culture alone is insufficient unless it is paired with industry linkages that convert educational efforts into experience that is relevant to the labor market.

3.4 The role of organizational support

While leadership and self-esteem are critical resources, individual differences in personality also contribute to resilience-related outcomes. Sun et al. investigate the relationship between conscientiousness and work engagement, focusing on the mediating effect of presenteeism and the moderating effect of perceived organizational support (POS). Using data from 376 employees, they demonstrate that conscientiousness predicts greater engagement but also increases the risk of presenteeism—continuing to work while unwell—which in turn negatively affects engagement. Notably, high levels of POS buffer this relationship, strengthening the positive impact of conscientiousness on engagement. This study adds a nuanced perspective to the research on emotional resilience by emphasizing the importance of conscientiousness. While conscientiousness is generally considered a positive trait, it can have negative consequences in unsupportive environments. Therefore, emotional resilience training must not only develop personal attributes, but also include organizational strategies that provide support and legitimacy in times of stress or illness. These findings confirm that personal and contextual resources are interdependent in fostering engagement and psychological functioning.

3.5 Support during workplace automation

Alshamsi et al. conducted a cross-sectional study to examine the relationship between the Technology Acceptance Model (TAM) and pharmacists' experiences of burnout and depression within the context of pharmacy robotic dispensing systems in the United Arab Emirates. Notably, the study found a negative correlation between TAM dimensions and mental health outcomes, indicating that pharmacists who found the technology more useful and easier to use experienced lower levels of burnout and depression. These results suggest that while automation in healthcare may not inherently reduce psychological strain, its effectiveness is closely tied to how well staff perceive and adapt to it. Furthermore, the findings imply that gendered experiences with technology and organizational demands may play a critical role in moderating the relationship between innovation and employee wellbeing.

3.6 Mediation for emotional resilience, grit, and gendered pathways to life satisfaction

Jia investigates how emotional resilience influences life satisfaction among teachers of Chinese as a Foreign Language (CFL), emphasizing the mediating roles of grit and employability, and the moderating role of gender. Drawing on data from 1,003 teachers in China, the study applies a chain mediation model and finds that emotional resilience has no significant direct effect on life satisfaction. Instead, its influence is fully mediated by grit and employability—two constructs critical for sustained engagement in demanding educational roles. Importantly, gender differences emerged in the structure of these pathways. This finding highlights the differentiated challenges and professional strategies experienced by male and female CFL teachers, and suggests that gender-responsive research may be needed to support teacher wellbeing across diverse cultural and institutional settings. The study is theoretically grounded in positive psychology and career adaptability frameworks, and contributes to research on emotional health in teaching by emphasizing that resilience is not only a personal asset but also a socialized and structurally shaped capacity.

Together, these studies emphasize that coaching and support for employability and career development should be considered multi-level processes shaped by personal, organizational and institutional dynamics. At the same time, career interventions, especially those targeting unemployed or at-risk populations, demonstrate that employability is developed in stages that reflect shifting psychological and social needs. Institutional environments, such as those in vocational education, further influence these outcomes by either reinforcing or undermining students' confidence in their career prospects. Finally, the interaction between personality traits and perceived support highlights the limitations of individual strengths when they are not reinforced by positive workplace or educational contexts. Overall, the findings suggest that meaningful progress in terms of employability and resilience requires a coordinated approach involving coaching models, the timing of interventions, institutional culture and organizational support.

4 Further perspectives

The studies in this Research Topic collectively support that emotional resilience is not a fixed personal trait, but rather a dynamic competence which is sensitive to context and can be developed through structured training, targeted support, and education and employment systems. This volume's key contribution is demonstrating that resilience and employability develop together through the interaction of personal attributes (such as self-regulation, career identity and conscientiousness) with organizational, institutional and technological resources.

Several areas for future research emerge. Firstly, the contributions of Research Topic highlight the need for integrative frameworks that exceed isolated constructs and embrace models capable of capturing the interaction of emotional, social, cognitive and physical resilience resources over time. For instance, studies by Carvalho et al. and Jia, among others, reveal distinct temporal patterns in the development of employability capacities. This suggests that longitudinal studies are essential for understanding when and how interventions have an effect.

Secondly, the findings emphasize the importance of adapting interventions to the characteristics of specific populations, such as unemployed adults, vocational students, educators, and military recruits. Emotional resilience is shaped by individual learning processes, institutional culture (Li et al.), leadership style (Navas-Jiménez et al.), and the perceived impact of technological change (Alshamsi et al.). These contextual variations demand a more granular approach to building resilience.

Thirdly, there is a need to better integrate the physical and psychological dimensions of resilience. Drozd et al. demonstrate that physical endurance training predicts not only operational readiness, but also prepares individuals psychologically for stress, challenges, and adaptation. Future research could examine how physical training interacts with emotional learning to enhance resilience and employability.

Finally, while this volume presents robust empirical findings, it also highlights methodological limitations. The most significant of these is the reliance on cross-sectional designs. There is a need for longitudinal, mixed-methods, and experimental designs that can more accurately trace the development of resilience.

Taken together, the articles in Research Topic point to a conceptual shift from viewing resilience as an individual psychological resource to recognizing it as a shared responsibility that is cultivated through pedagogical design, institutional commitment, and ongoing support throughout working life.

Author contributions

RS: Writing – original draft, Writing – review & editing. SB: Conceptualization, Project administration, Supervision, Writing – original draft, Writing – review & editing. SH-M: Writing – original draft, 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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Building a committed workforce: the synergistic effects of coaching leadership, organizational self-esteem, and learning goal orientation

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In today's volatile, uncertain, complex, and ambiguous (VUCA) work environments, mitigating employee burnout and turnover has become a critical concern. The enhancement of employee engagement stands out as a pivotal focus in corporate human resource management. Coaching leadership focuses on the encouragement and inspiration of employees, which can effectively stimulate the internal potential of employees, enhance work ability and enhance engagement. However, previous research on the relationship between coaching leadership style and employee engagement are limited, thus obscures the essential function in enterprise development and core competitiveness. The research collected 402 valid responses from MBA and EMBA students at the School of Business, and examines the effect of coaching leadership on employee engagement. Results indicate that coaching leadership significantly enhances multiple facets of employee engagement, including vigor, devotion, and absorption. Crucially, organizational self-esteem emerges as a mediating factor, while learning goal orientation strengthens the positive effects of coaching leadership. This research sheds light on the nuanced dynamics of effective leadership in contemporary workplaces, also it underscores the need for more nuanced, industry-specific analyses and broader exploration of moderating variables. Ultimately, the insights garnered hold profound implications for leadership training, human resource strategies, and performance metrics, emphasizing a more integrative and holistic approach to leadership and employee development in vocational contexts.

KEYWORDS

coaching leadership, employee engagement, organizational self-esteem, learning goal orientation, synergistic effects

1 Introduction

In the swiftly evolving VUCA (Volatility, Uncertainty, Complexity, and Ambiguity) landscape, contemporary organizations are undergoing profound transformations in their shapes and frameworks (Borde et al., 2024). These transformations necessitate a novel breed of leadership—one that is flexible, adaptable, and adept at navigating an ever-more unstable external milieu (Hensellek et al., 2023). Conventional leadership paradigms, while formerly

efficacious, now prove inadequate in addressing the complexities of the present-day challenges (Pizzolitto et al., 2023; Borde et al., 2024). The evolving terrain is additionally nuanced by the emergent values and expectations of the new generation of employees. This cohort, notably those born post-1995, exhibits a robust inclination toward self-realization, autonomy, and decision-making authority. They place unprecedented emphasis on the leadership styles of their superiors, which adds complexity to the evolving organizational landscape. The coaching leadership style is considered to be a promising leadership development practice (Ely et al., 2010), with more emphasis on guidance, inspiration and positive support, and has become a widely used leadership development intervention (Ladegard and Gjerde, 2014; Passarelli et al., 2023). Thus, coaching leadership has garnered notable attention in both academic discourse and management practice (Aghababaei, 2023). Characterized by its emphasis on encouragement, inspiration, and effective communication, coaching leadership emerges as a favored approach to engaging and empowering this new generation of employees (Ren et al., 2018).

While numerous studies have examined the influence of coaching leadership on various employee outcomes such as innovation, organizational citizenship, job satisfaction, and performance (Baird et al., 2020; Wee et al., 2020; Aghababaei, 2023), there remains a gap in understanding how this leadership style directly affects employee engagement—a crucial driver of organizational competitiveness (Schaufeli and Salanova, 2011; Kuan and Bakar, 2023), thus obscures the essential function of coaching leadership style in enterprise development and core competitiveness. Gallup's expansive analysis across multiple industries corroborates the importance of employee engagement, associating higher engagement levels with a 13% increase in retention, a 5% boost in productivity, a 52% rise in customer satisfaction, and a notable 44% growth in profitability (Harter et al., 2002). In an environment marked by internal competition and evolving career structures such as boundaryless careers, employee engagement is becoming increasingly elusive (Anitha, 2014). Thus, the uncertainty of employee engagement combined with the high level of modern turnover rate poses a major challenge to modern enterprise management (Climek et al., 2024).

To tackle this challenge effectively, it is imperative to delve deeply into the effects of coaching leadership on employee engagement. This paper utilizes Social Exchange Theory as a foundational framework to thoroughly examine the synergistic relationship between coaching leadership and employee engagement. We clame that coaching leadership cultivates a culture of reciprocity, which enhances employees' sense of organizational self-esteem and subsequently boosts their engagement levels. Notably, we acknowledge the diversity among employees, recognizing that they possess unique traits, needs, and values that profoundly shape their interactions with different leadership styles. Our research endeavors to elucidate the mechanisms underlying coaching leadership's synergistic impact on employee engagement. Specifically, we introduce organizational self-esteem as a mediating variable and examine the role of learning goal orientation as a moderating factor in this relationship. In doing so, this study contributes to both the theoretical understanding and the practical application of coaching leadership, filling an existing research gap and offering actionable insights for human resource management practices.

The research extends the theoretical framework regarding leadership efficacy, and also provides insights for addressing leadership challenges in the VUCA environment. By revealing the synergistic effects of coaching leadership on employee engagement, and also contributes to revealing the process and conditions conducive to the effective implementation of coaching leadership behaviors. This holds significant practical significance for improving leadership styles within enterprises and alleviating employee burnout. Simultaneously, it provides theoretical insights that can inform management practices in navigating complex and dynamic environments.

2 Research hypotheses and model construction

2.1 Research hypotheses

2.1.1 The impact of coaching leadership on employee engagement

Drawing from Social Exchange Theory, coaching leadership serves as a catalyst for creating reciprocal interactions between leaders and employees (Anitha, 2014). When leaders exhibit coaching behaviors, employees perceive them as supportive and approachable (Bedarkar and Pandita, 2014). This positive perception fosters emotional connections and initiates a cycle of mutual responsibilities that manifest through favorable work attitudes and behaviors (Kim and Kuo, 2015). Coaching leadership stands out as a pivotal element in achieving both individual and organizational success (Yukl and Mahsud, 2010). Numerous studies have revealed its beneficial impact on various employee outcomes, including psychological capital, work engagement, and happiness (Kelloway et al., 2013; Zbierowski and Góra, 2014; Alok, 2017), as well as organizational commitment (Al-Nasser, 2016) and role-based performance (Kim, 2014).

This leadership style places a strong emphasis on supporting employees by establishing open channels of communication and providing guidance and inspiration. Consequently, it serves multiple functions. Coaching leadership offers subordinates essential resources and informational support (Eldor and Vigoda-Gadot, 2017; Mäkelä et al., 2024). By valuing employee needs and promoting growth opportunities, coaching leadership enhances employees' sense of control over organizational processes, thereby boosting their engagement levels (Chughtai and Buckley, 2011). Techniques such as encouragement, effective communication, and inspiration are employed to unlock employees' latent potential (Eldor and Vigoda-Gadot, 2017). Through problem-solving assistance, constructive feedback, and soliciting employee input, coaching leadership ensures a mutually beneficial interaction, contributing to improved work capabilities and sustained vigor (Elloy, 2005). Furthermore, coaching leadership helps employees grasp the broader organizational goals, clarifies their roles (Yuan et al., 2019; Borde et al., 2024), and reinforces their sense of purpose. This heightened understanding ignites enthusiasm and dedication—critical elements that translate into higher engagement levels (Ferris et al., 2009). In addition, coaching leadership has been demonstrated to significantly enhance job satisfaction (Wee et al., 2020) and stimulate innovative behavior (Wang, 2013), among other positive outcomes. In summary, coaching leadership not only rejuvenates the workforce but also fosters a profound sense of responsibility and dedication, ultimately resulting in heightened levels of employee engagement.

Employee engagement, as defined by Schaufeli and Bakker, represents a deep and positive connection to one's work that goes

beyond mere involvement (Schaufeli et al., 2002). It is characterized by vigor, dedication, and absorption, wherein vigor signifies heightened energy levels, mental resilience, a readiness to invest effort, and the ability to persevere in challenging situations (Gruman and Saks, 2011). Dedication encompasses a sense of significance, enthusiasm, inspiration, pride, and an ongoing desire to confront challenges (Little and Little, 2006). It goes beyond basic involvement. Absorption, on the other hand, signifies complete concentration and deep immersion in one's work, resulting in a distorted perception of time and difficulty in disengaging from tasks, closely resembling the concept of 'flow' (Sun and Bunchapattanasakda, 2019). Together, these elements form the foundation of engagement, a critical driver of employee well-being and performance.

Based on this understanding, we propose the following hypotheses:

> *H1*: Coaching leadership has a significant positive impact on overall employee engagement.
>
> *H1a*: Coaching leadership positively influences employee vigor.
>
> *H1b*: Coaching leadership enhances employee dedication.
>
> *H1c*: Coaching leadership contributes to increased employee Absorption.

The Impact of Coaching Leadership on Organizational Self-esteem.

Organizational self-esteem refers to an employee's evaluation of their own value and role within the organizational context. Often, leaders are perceived as organizational proxies, embodying the values and standards of the workplace (Eisenberger et al., 2010). High-quality coaching leadership emphasizes effective communication through methods like guidance, inspiration, and encouragement. This fosters an enhanced perception of one's role within the organization (Yuan et al., 2019). Furthermore, coaching leadership cultivates employees' sense of competence and environmental mastery, thereby fostering organizational identification and enhancing organizational self-esteem. Moreover, such leaders instill confidence in their employees by clarifying objectives, reinforcing work values, and articulating high expectations. When employees perceive this supportive and nurturing leadership style, they interpret it as an endorsement from the organization. This boosts their positive emotions, fulfills their need for self-worth, and consequently, elevates their organizational self-esteem. Based on this, the following hypothesis is proposed:

> *H2*: Coaching leadership exerts a significant positive influence on organizational self-esteem.

2.1.2 Organizational self-esteem's influence on employee engagement

Elevated levels of organizational self-esteem positively influence feelings of competence and accomplishment among employees, subsequently enhancing their engagement at work (McAllister and Bigley, 2002). Existing research suggests a strong correlation between organizational self-esteem and work-related attitudes and behaviors (Mauno et al., 2007). Employees with high organizational self-esteem are likely to exhibit greater self-efficacy, increased absorption, and a more optimistic outlook. They are less prone to resource depletion and demonstrate higher levels of engagement (Pierce and Gardner, 2004; Filosa and Alessandri, 2024). On the flip side, those with low organizational self-esteem, often stemming from a lack of organizational support or acknowledgment, are less proactive and show diminished work engagement (Rich et al., 2010). Thus, this paper posits the following hypotheses:

> *H3*: Organizational self-esteem significantly positively impacts employee engagement.
>
> *H3a*: Organizational self-esteem positively influences employee vigor.
>
> *H3b*: Organizational self-esteem enhances employee dedication.
>
> *H3c*: Organizational self-esteem contributes to greater employee absorption.

2.1.3 Organizational self-esteem's mediating role

Drawing from the social exchange theory, employees who are nurtured and valued by their leaders often internalize this appreciation, perceiving themselves as pivotal and influential within the organizational fabric (Pierce et al., 1989). In this reciprocal dynamic, individuals reciprocate the goodwill, reflecting it back to the organization through positive work attitudes. High organizational self-esteem nurtures an optimistic self-image among individuals. Such employees approach setbacks and challenges with optimism, exhibit a heightened sense of duty, and are more inclined to adopt pro-organizational attitudes or behaviors, all to uphold this favorable self-view (McAllister and Bigley, 2002; Jaouadi, 2023), as advocated by Kim et al. (2018) that the corroborates the predictive power of organizational self-esteem on setting organizational expectations. Conversely, low organizational self-esteem often culminates in a pessimistic self-view, which can manifest in counterproductive work behaviors detrimental to the organization (Pierce et al., 1989). Thus, the hypotheses proposed are:

> *H4*: Organizational self-esteem acts as a bridge between coaching leadership and employee engagement.
>
> *H4a*: Organizational self-esteem mediates the impact of coaching leadership on employee vigor.
>
> *H4b*: Organizational self-esteem mediates the relationship between coaching leadership and employee engagement.
>
> *H4c*: Organizational self-esteem mediates the nexus between coaching leadership and employee absorption.

2.1.4 The moderating role of learning goal orientation

In the intricate landscape of employee diversity, which encompasses a spectrum of personality traits, needs, and values, the effectiveness of supportive organizational structures in enhancing an individual's value perception and responsiveness cannot be standardized (Chughtai and Buckley, 2011). Rather, it varies according to individual idiosyncrasies, lending credence to the notion that personal attributes play a significant role in interpreting supportive gestures from leadership (Dweck, 1986). In this context, learning goal orientation emerges as a particularly compelling variable. Distinguished from performance orientation, learning goal orientation emphasizes a continuous pursuit of learning, skill development, and personal growth. Employees with high learning goal orientation inherently believe that their performance is a direct consequence of their efforts (Chughtai and Buckley, 2011) and, when faced with challenges, are more likely to respond proactively, seeking to enhance their skills (Cianci et al., 2010). This outlook engenders a resilient commitment to learning, fostering a culture that values intellectual flexibility and reframes failures as opportunities for future growth (Song et al., 2015). When the goals of leadership align with the goals of such intrinsically motivated employees, the efficacy of a coaching leadership style is markedly increased (Che-Ha et al., 2014). In these synergistic scenarios, employees interpret the supportive gestures and encouragement from leadership as deeply resonant, thereby elevating their organizational self-esteem (Godshalk and Sosik, 2003).

Conversely, employees with low learning goal orientation exhibit a different dynamic (Wang and Hall, 2023). Typically risk-averse and resistant to challenges, these individuals often possess a defeatist attitude when encountering obstacles (Huang and Luthans, 2015). As a result, their intrinsic motivation and enthusiasm for work are limited, even when they are the recipients of robust coaching leadership (Mun and Hwang, 2003). This dampens the potential for a positive impact on their organizational self-esteem (Pierce and Gardner, 2004). However, for individuals propelled by a high learning goal orientation, aligning with coaching leadership surpasses merely enhancing their job satisfaction (Runhaar et al., 2010). Their outstanding performance, fueled by an intrinsic desire for autonomous learning, not only amplifies the effectiveness of coaching leadership but also positions them to receive heightened organizational support, thereby further bolstering their organizational self-esteem. Given these nuanced dynamics, we propose the following hypotheses:

> *H5*: Learning goal orientation serves as a moderating factor in the relationship between coaching leadership and organizational self-esteem.

2.2 Proposed research model

Based on the theoretical discussions and hypotheses formulated, we outline the subsequent conceptual model to guide our research. The proposed model elucidates the intricate dynamics between coaching leadership, organizational self-esteem, employee engagement, and the modulating effect of learning goal orientation.

3 Research design

3.1 Variable measurement

To achieve robustness in the study, a multi-faceted approach to variable measurement was adopted. Prior to administering the survey, the respondents were explicitly informed that their responses have no right or wrong answers and would be used exclusively for research purposes. This promoted candid, unbiased responses. A Likert 5-point scoring scale was employed, where "1" represents "strongly disagree," and "5" represents "strongly agree." Coaching Leadership (CL) is measured through an 8-item scale developed by Ellinger et al. (2003). Sample item includes: "My supervisor provides me with resources to enhance my job performance effectively." Organizational self-esteem was assessed using a 10-item scale from Pierce et al. (1989). Sample items include: "In my workplace, I have a great deal of influence." Employee engagement was evaluated using a 17-item three-dimensional scale by Schaufeli et al. (2002). The scale breaks down into vigor (EE1–EE6), dedication (EE7–EE11), and absorption (EE12–EE17). Sample items include: "I feel energetic while working" and "Once I start working, I become completely absorbed in it." Learning goal orientation was assessed via a 5-item scale crafted by Vandewalle (1997). Sample items include: "I often look for opportunities to develop new skills and acquire new knowledge." For specific questions, see Table 1.

3.2 Data collection

The research leveraged the expansive network of MBA and EMBA students at the School of Business, Guizhou University, as a fertile ground for data collection. Utilizing snowball sampling, a total of 494 questionnaires were initially collected. Post the removal of invalid samples, 402 valid questionnaires remained, translating to an effective response rate of 81.38%. The effective sample boasted balanced gender distribution, with females accounting for 53.7% and males making up 46.3%. The most represented age group was 26–30 years (27.4%), and education levels were predominantly bachelor's degrees (44%). A noteworthy segment of the sample comprised employees from private enterprises (183 participants). Work experience clustered mainly around two intervals: 1–3 years (25.6%) and 4–6 years (37.3%). The respondents' roles were primarily either ordinary staff (60.7%) or grassroots managers (21.6%). Overall, the surveyed individuals demonstrated the capability to effectively complete the survey questionnaire, thereby ensuring the validity of data collection. Specific descriptive statistics are presented in Table 2.

4 Research results

4.1 Reliability test

Prior to conducting formal regression analysis, it was crucial to establish the reliability of the research data. Utilizing SPSS software, we evaluated the internal consistency of the scales used in this study. As delineated in Table 3, the overall Cronbach's alpha coefficients for the scales and their respective dimensions all surpassed the 0.7

TABLE 1 Measurement scale for the impact of coach leadership on employee engagement.

Variable	Code	Measurement item	References source
Coaching leadership	CL1	My leader uses analogies, scenarios, and examples to help me learn.	Ellinger et al. (2003)
	CL2	My leader encourages me to broaden my perspective and understand the bigger picture.	
	CL3	My leader provides constructive feedback to me.	
	CL4	My leader seeks feedback from me to ensure their interactions are helpful to me.	
	CL5	My leader provides resources to help me work more effectively.	
	CL6	My leader helps me think through issues by asking questions rather than giving solutions directly.	
	CL7	My leader sets expectations and communicates the importance of these goals in achieving organizational objectives with me.	
	CL8	My leader helps me see issues from different perspectives by role-playing with me.	
Organizational self-esteem	OSE1	I am influential in the workplace.	Pierce et al. (1989)
	OSE2	I am valued in the workplace.	
	OSE3	I consider myself important in the workplace.	
	OSE4	I am trusted in the workplace.	
	OSE5	People around me have confidence in me at work.	
	OSE6	I am unique in the workplace.	
	OSE7	I am valuable in the workplace.	
	OSE8	I am useful in the workplace.	
	OSE9	I am highly efficient at work.	
	OSE10	I am a good collaborator at work.	
Employee engagement	EE1	When I wake up in the morning, I am eager to go to work.	Schaufeli et al. (2002)
	EE2	I am very energetic when working.	
	EE3	At work, I persevere even when things do not go smoothly.	
	EE4	I can work continuously for a long time.	
	EE5	I feel joyous while working.	
	EE6	I feel energetic at work.	
	EE7	My work is challenging to me.	
	EE8	My work inspires me.	
	EE9	I am passionate about my work.	
	EE10	I take pride in my work.	
	EE11	I find my work very meaningful.	
	EE12	When working, I forget everything around me.	
	EE13	Time flies when I work.	
	EE14	Once I start working, I become fully immersed.	
	EE15	It's difficult for me to put down my work while working.	
	EE16	I am completely absorbed in my work.	
	EE17	When I am fully engaged in my work, I feel happy.	
Learning goal orientation	LGO1	I am willing to choose challenging tasks and learn a lot from them.	VandeWalle (1997)
	LGO2	I often look for opportunities to expand new skills and acquire new knowledge.	
	LGO3	I enjoy challenging and difficult tasks because they help me learn new skills.	
	LGO4	Developing job skills is important to me, and I am willing to take risks for it.	
	LGO5	I prefer jobs that require high abilities and talents.	

threshold, signifying acceptable reliability. Additionally, the corrected item-total correlations for each item in the questionnaire exceeded the benchmark of 0.5. Moreover, after the hypothetical removal of individual items, the Cronbach's alpha coefficients remained lower than the overall Cronbach's alpha. These findings collectively underscore the high level of reliability of our questionnaire.

TABLE 2 Descriptive statistics ($N = 402$).

Demographic features		Frequency	Percentage (%)
Gender	Male	186	46.3
	Female	216	53.7
Age	≤25 years	75	18.7
	26–30 years	110	27.4
	31–35 years	73	18.2
	36–40 years	63	15.7
	41–50 years	42	10.4
	≥50 years	39	9.7
Education level	High school or below	70	17.4
	College diploma	81	20.1
	Bachelor's degree	177	44.0
	Master's degree or higher	74	18.4
Company type	State-owned enterprise	81	20.1
	Government agency/ public institution	72	17.9
	Private enterprise	183	45.5
	Foreign-funded/joint-venture enterprise	52	12.9
	Other	14	3.5
Years of work	≤1 year	70	17.4
	1–3 years	103	25.6
	4–6 years	150	37.3
	7–10 years	56	13.9
	≥10 years	23	5.7
Position	Ordinary staff	244	60.7
	First-line managers	87	21.6
	Middle managers	55	13.7
	Senior managers	16	4.0

4.2 Validity test

Confirmatory factor analysis was performed to assess the structural validity of the scales. Table 4 presents the results, which include key model fit indices. These indices—χ^2/df (1.388), NFI (0.905), TLI (0.969), and IFI (0.972)—all meet or exceed their respective criteria. The RMSEA value of 0.031 is notably lower than the highest acceptable threshold of 0.08, indicating that the model is a good fit.

For evaluating the convergent validity of the questionnaire, we examined the factor loadings, Average Variance Extracted (AVE), and Composite Reliability (CR) for each variable. As Table 5 reveals, the factor loadings for all items corresponding to each variable exceeded the 0.6 mark. This result attests to the high level of representativeness of our overall measurement scale. Furthermore, the AVE values for all variables exceeded the 0.5 threshold, and the CR values were all greater than 0.8. These measurements collectively indicate that the scale has met the standards for convergent validity. Taken together, the analysis of these indicators suggests that the scale has convergent validity that meets the testing standards.

TABLE 3 Reliability analysis of the scales.

Variable	Coding	Number of items	Cronbach's α coefficient
Coaching leadership	[CL]	8	0.917
Organizational self-esteem	[OSE]	10	0.935
Employee engagement	[EE]	17	0.939
Vigor	[EE1-6]	6	0.869
Dedication	[EE7-11]	5	0.890
Absorption	[EE12-17]	6	0.901
Learning goal orientation	[LGO]	5	0.859

TABLE 4 Overall fit indices of the scale.

Statistical test	Measurement value	Standard	Fit result
χ^2/df	1.388	<3	Qualified
NFI	0.905	>0.9	Qualified
TLI	0.969	>0.9	Qualified
IFI	0.972	>0.9	Qualified
RMSEA	0.031	<0.08	Qualified

4.3 Regression analysis

4.3.1 Hypothesis testing for the influence of coaching leadership on employee engagement

To examine the relationship between coaching leadership and employee engagement, we employed SPSS 25.0 for regression analysis. The detailed results are captured in Table 6. Initially, a baseline model M1-0 was established, featuring employee engagement as the dependent variable and incorporating control variables. Subsequently, we expanded this model into Model M1-1 by introducing coaching leadership as the independent variable. Upon scrutiny of Model M1-1, we found that the coefficient for coaching leadership was both positive and significant (0.506). This demonstrates that, even after accounting for control variables, coaching leadership exerts a substantial positive effect on employee engagement, thereby confirming our first hypothesis (H1). We extended this analytical framework by examining the individual dimensions of employee engagement—namely, Vigor, dedication, and absorption—as separate dependent variables. This approach led to the development of six additional models: M2-0, M2-1 for Vigor; M3-0, M3-1 for dedication; and M4-0, M4-1 for absorption. The results indicate that coaching leadership significantly enhances all three dimensions of employee engagement. Specifically, the coefficients were 0.407 for Vigor, 0.493 for dedication, and 0.438 for absorption. Importantly, introducing coaching leadership as an independent variable in each of these models resulted in a higher change in R-squared ΔR^2 compared to the baseline models that included only control variables. This increase in ΔR^2 underscores the model's enhanced explanatory power, thereby corroborating sub-hypotheses H1a, H1b, and H1c.

TABLE 5 Convergent validity analysis of the scale.

Path	Estimate	AVE	CR
CL1 ← Coaching leadership	0.734	0.585	0.919
CL2 ← Coaching leadership	0.800		
CL3 ← Coaching leadership	0.795		
CL4 ← Coaching leadership	0.735		
CL5 ← Coaching leadership	0.752		
CL6 ← Coaching leadership	0.719		
CL7 ← Coaching leadership	0.808		
CL8 ← Coaching leadership	0.772		
OSE1 ← Organizational self-esteem	0.796	0.594	0.936
OSE2 ← Organizational self-esteem	0.799		
OSE3 ← Organizational self-esteem	0.746		
OSE4 ← Organizational self-esteem	0.772		
OSE5 ← Organizational self-esteem	0.797		
OSE6 ← Organizational self-esteem	0.761		
OSE7 ← Organizational self-esteem	0.841		
OSE8 ← Organizational self-esteem	0.742		
OSE9 ← Organizational self-esteem	0.739		
OSE10 ← Organizational self-esteem	0.705		
LGO1 ← Learning goal orientation	0.741	0.551	0.860
LGO2 ← Learning goal orientation	0.760		
LGO3 ← Learning goal orientation	0.763		
LGO4 ← Learning goal orientation	0.698		
LGO5 ← Learning goal orientation	0.746		
EE1 ← Vigor	0.751	0.527	0.870
EE2 ← Vigor	0.769		
EE3 ← Vigor	0.651		
EE4 ← Vigor	0.672		
EE5 ← Vigor	0.763		
EE6 ← Vigor	0.742		
EE7 ← Dedication	0.734	0.619	0.890
EE8 ← Dedication	0.839		
EE9 ← Dedication	0.805		
EE10 ← Dedication	0.782		
EE11 ← Dedication	0.770		
EE12 ← Absorption	0.768	0.605	0.902
EE13 ← Absorption	0.770		
EE14 ← Absorption	0.809		
EE15 ← Absorption	0.760		
EE16 ← Absorption	0.789		
EE17 ← Absorption	0.769		

4.3.2 Initial examination of the impact of coaching leadership on organizational self-esteem

To delve into the mediating effect of organizational self-esteem in the relationship between coaching leadership and employee engagement, we conducted a series of regression analyses using SPSS 25.0. The pertinent outcomes are elaborated in Tables 7, 8. Initially, we constructed a base model, designated as Model M5-0, where organizational self-esteem served as the dependent variable and control variables were included. Building upon this, we introduced coaching leadership as the independent variable, resulting in Model M5-1. Evaluation of Model M5-1 revealed that the coefficient associated with coaching leadership was positively significant at 0.523. This substantiates that coaching leadership exerts a strong positive influence on organizational self-esteem after accounting for the control variables. Hence, Hypothesis H2 receives empirical support.

4.3.3 Analysis of the mediated relationship through organizational self-esteem

In a subsequent analysis aimed at unpacking the mediated effects, we used employee engagement as the dependent variable. A baseline model, named Model M5-2, was crafted, incorporating control variables. Extending from this, Model M5-3 was formulated by including both the independent variable, coaching leadership, and the mediating variable, organizational self-esteem. Close examination of Model M5-3 revealed that the coefficients for both coaching leadership and organizational self-esteem were positive and significant. Intriguingly, the inclusion of organizational self-esteem as a mediator led to a decline in the primary effect of coaching leadership on employee engagement, from a coefficient of 0.506 down to 0.325. This suggests that organizational self-esteem not only positively influences employee engagement but also partially mediates the effect of coaching leadership on engagement. As a result, Hypotheses H3 and H4 are corroborated.

4.3.4 Further validation of mediating effect through bootstrap analysis

To bolster the validity of our findings, this study utilizes the Process v4.0 plugin and employed a Bootstrap method with a 95% confidence interval and 5,000 bootstrap samples. According to established statistical norms, an effect is deemed significant if the confidence interval does not include zero. The detailed empirical outcomes are presented in Table 9. The Bootstrap analysis revealed that the total effect of coaching leadership on employee engagement is significant, with a coefficient $\beta = 0.4487$ and a 95% confidence interval [0.3736, 0.5237] that does not include zero. Importantly, even upon the introduction of organizational self-esteem as a mediating variable, the direct effect of coaching leadership on employee engagement remains significant $\beta = 0.2876$, 95% CI = [0.2044, 0.3708]. Additionally, the analysis confirms a significant indirect effect of organizational self-esteem in the relationship between coaching leadership and employee engagement $\beta = 0.1611$, 95%CI = [0.0953, 0.2395]. This lends further credence to Hypotheses H3 and H4, affirming that organizational self-esteem functions as a partial mediator between coaching leadership and employee engagement.

4.3.5 Examination of the mediating effect on vigor

Continuing our investigation, a separate regression analysis was conducted to study the influence of coaching leadership and organizational self-esteem on Vigor. The findings are summarized in Table 10. Initially, we formulated Model M6-0 with Vigor as the dependent variable and added control variables. This model was

TABLE 6 Regression analysis of coaching leadership on employee engagement.

Dependent variable		Employee engagement		Vigor		Dedication		Absorption	
		M1-0	M1-1	M2-0	M2-1	M3-0	M3-1	M4-0	M4-1
Control variables	Gender	−0.034	−0.028	−0.030	−0.025	−0.043	−0.037	−0.018	−0.012
	Age	0.094	0.036	0.114	0.067	0.042	−0.014	0.090	0.040
	Education level	0.047	0.076	0.089	0.112*	0.010	0.038	0.026	0.051
	Company type	0.084	0.057	0.114*	0.092*	0.084	0.057	0.028	0.004
	Years of work	0.035	0.036	0.007	0.008	0.034	0.035	0.049	0.050
	Position	0.199***	0.119**	0.204***	0.139**	0.154**	0.077	0.167**	0.098*
Independent variable	CL		0.506***		0.407***		0.493***		0.438***
	R^2	0.077	0.317	0.081	0.236	0.049	0.276	0.057	0.237
	ΔR^2	0.063	0.305	0.067	0.222	0.034	0.263	0.043	0.223
	F	5.510***	26.118***	5.792***	17.381***	3.382**	21.428***	4.007**	17.478***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 7 Regression analysis of coaching leadership on organizational self-esteem.

Dependent variable		Organizational self-esteem	
		M5-0	M5-1
Control variables	Gender	−0.064	−0.058
	Age	0.100	0.040
	Education level	−0.031	−0.001
	Company type	0.068	0.040
	Years of work	0.015	0.016
	Position	0.195***	0.113*
Independent variable	CL		0.523***
	R^2	0.086	0.342
	ΔR^2	0.072	0.331
	F	6.207***	29.295***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 8 Regression analysis of coaching leadership, organizational self-esteem, and employee engagement.

Dependent variable		Employee engagement	
		M5-2	M5-3
Control variables	Gender	−0.034	−0.008
	Age	0.094	0.022
	Education level	0.047	0.076
	Company type	0.084	0.043
	Years of work	0.035	0.030
	Position	0.199***	0.080
Independent variables	CL		0.325***
Mediating variable	OSE		0.347***
	R^2	0.077	0.396
	ΔR^2	0.063	0.384
	F	5.510***	32.245***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

subsequently expanded to include both the independent variable of coaching leadership and the mediating variable of organizational self-esteem, resulting in Model M6-1. Upon scrutinizing Model M6-1, we found that both coaching leadership and organizational self-esteem had positive and significant coefficients. The analysis thus demonstrates that organizational self-esteem positively predicts Vigor and serves as a partial mediator between coaching leadership and Vigor, substantiating Hypotheses H3a and H4a.

As detailed in Table 11, the total effect of coaching leadership on vigor is significant $\beta = 0.3822$, 95%CI = [0.2982, 0.4662]. Furthermore, the direct effect of coaching leadership on vigor remains robust even after including the mediating variable $\beta = 0.2030$, 95%CI = [0.1097, 0.2964]. Finally, the indirect effect of organizational self-esteem between coaching leadership and vigor is also significant $\beta = 0.1792$, 95%CI = [0.1061, 0.2627]. In sum, the Bootstrap analysis and the further regression models confirm that organizational self-esteem acts as a partial mediator in the relationships between coaching leadership and both employee engagement and vigor. This corroborates Hypotheses H3, H4, H3a, and H4a.

4.3.6 Exploration of the mediating effect on dedication

In line with the analytical steps used in previous models, we examined dedication as a dependent variable. Initially, control variables were added to create Model M7-0. Subsequently, Model M7-1 was formulated by including both the independent variable—coaching leadership—and the mediating variable—organizational self-esteem. These results are elaborated in Table 12. Upon analyzing Model M7-1, we observed that both coaching leadership and organizational self-esteem had positive and significant coefficients. This leads to the conclusion that organizational self-esteem has a positive influence on employee dedication and serves as a partial mediator between coaching leadership and dedication. This confirms Hypotheses H3b and H4b.

As detailed in Table 13, the total effect of coaching leadership on dedication is significant $\beta = 0.5319$, 95%CI = [0.4378, 0.6260]. Furthermore, even after accounting for the mediating effect of

TABLE 9 Bootstrap test of the mediation effect of organizational self-esteem.

	Path	Effect value	Standard error	Lower bound	Upper bound
Direct effect	CL → EE	0.2876	0.0423	0.2044	0.3708
Indirect effect	CL → OSE → EE	0.1611	0.0365	0.0953	0.2395
Total effect	CL → EE	0.4487	0.0382	0.3736	0.5237

TABLE 10 Regression analysis of coaching leadership and organizational self-esteem on vigor.

Dependent variable		Vigor	
		M6-0	M6-1
Control variables	Gender	−0.030	−0.004
	Age	0.114	0.053
	Education level	0.089	0.112*
	Company type	0.114*	0.077
	Years of work	0.007	0.002
	Position	0.204***	0.098*
Independent variables	CL		0.216***
Mediating variable	OSE		0.365***
	R^2	0.081	0.323
	ΔR^2	0.067	0.310
	F	5.792***	23.485***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

organizational self-esteem, the direct influence of coaching leadership on dedication remains significant $\beta = 0.3797$, 95%CI = [0.2723, 0.4870]. Moreover, organizational self-esteem shows a significant indirect effect between coaching leadership and dedication $\beta = 0.1522$, 95%CI = [0.0721, 0.2453]. In conclusion, organizational self-esteem partially mediates the relationship between coaching leadership and dedication, confirming H3b and H4b.

4.3.7 Examination of the mediating effect on absorption

Analysis of Model M8-1 in Table 14 indicates that the coefficients for coaching leadership and organizational self-esteem are positive and significant. Consequently, we infer that organizational self-esteem positively affects employee absorption and acts as a partial mediator between coaching leadership and absorption, corroborating Hypotheses H3c and H4c.

As reported in Table 15, the total effect of coaching leadership on absorption is noteworthy $\beta = 0.4457$, 95%CI = [0.3547, 0.5367]. In addition, the direct effect of coaching leadership on absorption remains robust even when the mediating role of organizational self-esteem is considered $\beta = 0.2954$, 95%CI = [0.1917, 0.3990]. Lastly, organizational self-esteem exerts a significant indirect influence between coaching leadership and absorption $\beta = 0.1503$, 95%CI = [0.0718, 0.2430]. In conclusion, our further analyses indicate that organizational self-esteem plays a partial mediating role in the relationship between coaching leadership and both dedication and absorption. These results solidify the support for Hypotheses H3b, H4b, H3c, and H4c, expanding the overall robustness of our theoretical framework (Figure 1).

4.3.8 Testing the moderating effect of learning goal orientation

To explore the moderating effects of learning goal orientation on the relationship between coaching leadership and organizational self-esteem, we employed linear regression with a product term approach. Prior to the analysis, the data were centered to facilitate the interpretation of interaction terms. The analysis aimed to test hypothesis H5 and the specific outcomes are presented in Table 16. After accounting for control variables, the main effects of coaching leadership and learning goal orientation, as well as their interaction term, were included in the model. Notably, the coefficient for the interaction term was positive and significant $\beta = 0.108$. This result suggests that learning goal orientation amplifies the positive influence of coaching leadership on organizational self-esteem, thereby confirming hypothesis H5.

To elucidate the moderation effect visually, this study employed Model 7 from SPSS Process v4.0 and executed 5,000 bootstrapped resamples for more robust results. The analysis was conducted within a 95% confidence interval. Figure 2 graphically presents the moderation effects at different levels of learning goal orientation. The analysis reveals two critical points: When learning goal orientation is low, the regression slope connecting coaching leadership and organizational self-esteem is relatively gentle, indicating a subdued positive influence. In contrast, at high levels of learning goal orientation, the regression slope becomes considerably steeper. This suggests a stronger, more substantial positive effect of coaching leadership on organizational self-esteem. In summary, learning goal orientation serves as a significant moderator that enhances the positive relationship between coaching leadership and organizational

TABLE 11 Bootstrap test of organizational self-esteem mediation effect (part one).

	Path	Effect value	Standard error	Lower bound	Upper bound
Direct effect	CL → Vigor	0.2030	0.0475	0.1097	0.2964
Indirect effect	CL → OSE → Vigor	0.1792	0.0403	0.1061	0.2627
Total effect	CL → Vigor	0.3822	0.0427	0.2982	0.4662

TABLE 12 Regression analysis of coaching leadership and organizational self-esteem on dedication.

Dependent variable		Dedication	
		M7-0	M7-1
Control variables	Gender	−0.043	−0.022
	Age	0.042	−0.025
	Education level	0.010	0.038
	Company type	0.084	0.047
	Years of work	0.034	0.031
	Position	0.154**	0.046
Independent variables	CL		0.352***
Mediating variable	OSE		0.269***
	R^2	0.049	0.323
	ΔR^2	0.034	0.310
	F	3.382**	23.485***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

self-esteem. This validates our hypothesis H5 and enriches the study's overall theoretical model.

5 Research conclusion and discussion

5.1 Findings

Our study, leveraging a sample of 402 valid responses from MBA and EMBA students at the School of Business, Guizhou University, aimed to dissect the nuanced interplay between coaching leadership, employee engagement, organizational self-esteem, and learning goal orientation. The findings largely substantiate our proposed hypotheses, illuminating several complex mechanisms that underlie the effectiveness of coaching leadership in fostering employee engagement.

5.1.1 Coaching leadership's positive impact on employee engagement

Firstly, in alignment with Hypotheses H1–H1c, we found compelling evidence through linear regression analysis that coaching leadership has a direct and significant positive impact on employee engagement. Particularly in today's VUCA (Volatile, Uncertain, Complex, Ambiguous) landscape, coaching leadership stands out as a transformative approach. This leadership style focuses less on providing direct solutions ("giving fish") and more on empowering employees to problem-solve independently ("teaching how to fish"). Our data affirm that such an approach better engages employees' intrinsic motivations, consequently enhancing their dedication and absorption in the workplace, which is precisely the synergistic effect of coach-based leadership on employee engagement highlighted in this research. Therefore, organizational leaders should prioritize caring for and nurturing employees, mastering team communication skills. They should increasingly employ encouraging, guiding, and inspirational communication methods to stimulate employees' intrinsic work motivation, thereby achieving mutual development between the organization and its employees.

5.1.2 Mediating role of organizational self-esteem

Secondly, our analysis supports Hypotheses H2–H4, which posited that organizational self-esteem serves as a pivotal mediating variable in this dynamic. We found that coaching leadership goes beyond merely influencing work-related behaviors; it also has a psychological ripple effect. Specifically, the coaching leadership style—which centers on positive communication, emotional support, and professional development—leads to heightened organizational self-esteem among employees. Elevated levels of organizational self-esteem subsequently translate into a more optimistic work attitude and increased dedication, further underscoring the multi-layered influence of coaching leadership. Furthermore, coaching leadership fundamentally emphasizes encouragement, support, positive communication interactions, and a focus on employees' career development. This leadership approach effectively improves employees' self-awareness, enhances their positive self-concept, and ultimately rewards the organization through dedication and focused work contributions.

5.1.3 Moderating effect of learning goal orientation

Lastly, as elucidated by Hypothesis H5, learning goal orientation functions as a key moderating variable. Our data suggest that the benefits of coaching leadership are most pronounced among employees with a high learning goal orientation. Compared with lower-level goal-oriented individuals, higher-level goal-oriented individuals spontaneously have a higher level of learning and improvement motivation. With the support of coaching leadership style, individuals will be aroused more positive goal orientation and strong self-drive. Therefore, the support and encouragement factors of coach leadership can induce the resonance of high-level learning goal-oriented individuals. Their strong affinity for this leadership style not only boosts their perception of organizational support but also bolsters their engagement and job performance. However, it is worth noting that those with low learning goal orientation might not be as responsive to the empowering elements of coaching leadership, revealing an area that warrants further managerial attention.

5.2 Management recommendations

5.2.1 Operationalizing coaching leadership

Organizations keen to cultivate a coaching leadership style should focus on three critical human resource pillars: recruitment,

TABLE 13 Bootstrap test of organizational self-esteem mediation effect (part 2).

	Path	Effect value	Standard error	Lower bound	Upper bound
Direct effect	CL → Dedication	0.3797	0.0546	0.2723	0.4870
Indirect effect	CL → OSE → Dedication	0.1522	0.0436	0.0721	0.2453
Total effect	CL → Dedication	0.5319	0.0479	0.4378	0.6260

TABLE 14 Regression analysis of coaching leadership and organizational self-esteem on absorption.

Dependent variable		Absorption	
		M8-0	M8-1
Control variables	Gender	−0.018	0.004
	Age	0.090	0.029
	Education level	0.026	0.051
	Company type	0.028	−0.007
	Years of work	0.049	0.046
	Position	0.167**	0.066
Independent variables	CL		0.290***
Mediating variable	OSE		0.282***
	R^2	0.057	0.289
	ΔR^2	0.043	0.275
	F	4.007**	20.007***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

TABLE 15 Bootstrap test of organizational self-esteem mediating effects (part three).

	Path	Effect value	Standard error	Lower bound	Upper bound
Direct effect	CL → Absorption	0.2954	0.0527	0.1917	0.3990
Indirect effect	CL → OSE → Absorption	0.1503	0.0436	0.0718	0.2430
Total effect	CL → Absorption	0.4457	0.0463	0.3547	0.5367

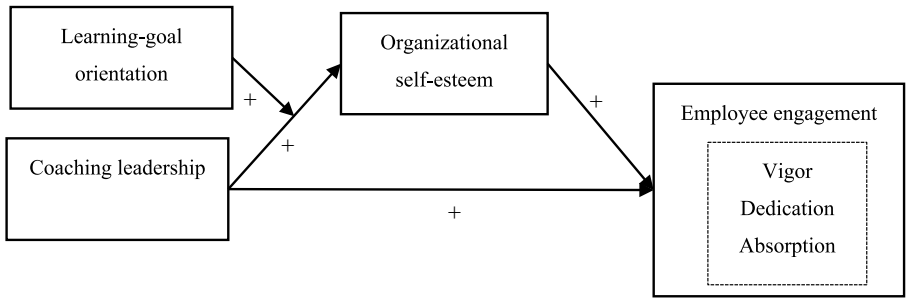

FIGURE 1
Research model. "+" represents a positive impact.

performance assessment, and continuous training. During recruitment, candidates should be assessed for their alignment with coaching leadership traits, employing psychometric tools, situational simulations, and in-depth interviews. Post-hiring, performance metrics need to be redefined to incentivize coaching-oriented behaviors. Assessment criteria should encapsulate leaders' effectiveness in nurturing employees' psychological potential and promoting positive workplace interactions. On the training front, a blend of experiential activities like role-playing can be used to refine existing managerial styles toward a coaching paradigm.

5.2.2 Elevating organizational self-esteem

Fostering a culture that bolsters employees' organizational self-esteem is paramount. Reward mechanisms should recognize and incentivize standout performances, thereby enhancing individual and collective psychological well-being. Additionally, fostering teamwork

and facilitating frequent knowledge exchange can provide employees the platform to feel integral to the organization's fabric, thereby enhancing their willingness to take on challenging tasks and exhibit innovative behaviors.

5.2.3 Strategizing around learning goal orientation

The utility of learning goal orientation in talent management cannot be overstated. During recruitment, personality tests can identify individuals with a predisposition toward a high learning goal orientation. Subsequent in-house training should be tailored to nurture this quality further. For example, employees with a high learning goal orientation can be assigned complex, challenging tasks that align with their intrinsic motivations, thereby benefiting both the individual and the organization.

TABLE 16 Regression analysis of learning goal orientation moderating effects on organizational self-esteem.

Dependent variable	Organizational self-esteem		
	M9-0	M9-1	M9-2
Gender	−0.064	−0.063	−0.066
Age	0.100	0.049	0.035
Education level	−0.031	0.001	0.003
Company type	0.068	0.023	0.026
Years of work	0.015	0.014	0.022
Position	0.195***	0.083	0.082
CL		0.420***	0.447***
LGO		0.269***	0.291***
CL*LGO			0.108*
R^2	0.086	0.401	0.411
ΔR^2	0.072	0.389	0.398
F	6.207***	32.944***	30.422***

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

5.3 Theoretical implications

Our findings contribute to a more comprehensive understanding of how coaching leadership, organizational self-esteem, and learning goal orientation interact to impact employee engagement and dedication. We integrate these diverse theoretical strands, providing a nuanced view of leadership effectiveness, particularly in the VUCA context.

Firstly, our research extends the theoretical framework regarding leadership efficacy, especially in modern complex organizational environments. By exploring the relationship between coaching leadership, organizational self-esteem, learning goal orientation, and employee engagement, we reveal a new leadership paradigm that helps address the constantly changing work environment. This theoretical contribution offers organizational managers a more comprehensive and adaptable leadership approach.

Secondly, our study enriches the theoretical framework concerning coaching leadership and employee engagement. By examining the impact of coaching leadership, organizational self-esteem, and learning goal orientation on employee engagement and loyalty, we gain deeper insights into the mechanisms underlying employee behaviors and attitudes in the workplace. This provides guidance for organizational managers to better motivate and cultivate employees, thus enhancing organizational performance.

Lastly, our research provides insights for addressing leadership challenges in the VUCA environment. In this environment of uncertainty and complexity, effective practices of coaching leadership

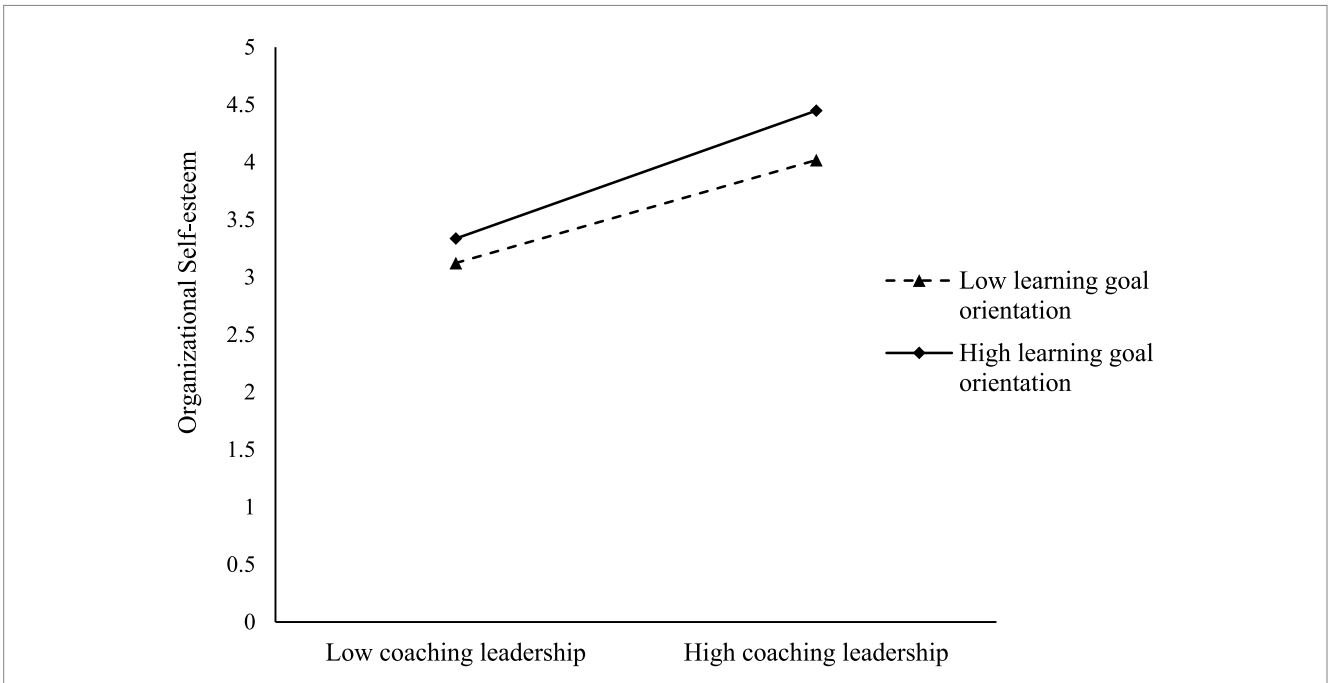

FIGURE 2
Moderating effect of learning goal orientation between coaching leadership and organizational self-esteem.

can assist organizations in building more flexible and adaptive teams. Furthermore, emphasizing the importance of learning goal orientation can encourage employees to maintain a mindset of learning and growth amidst constant change, facilitating better adaptation. Therefore, our study offers practical guidance and theoretical support for organizations in addressing VUCA challenges.

5.4 Practical implications

Practically, this study emphasizes the imperative for organizational leaders to embrace coaching leadership styles, considering their discernible influence on employee engagement. It suggests the development of training programs tailored to equip supervisors with the requisite skills. Furthermore, nurturing a culture of high organizational self-esteem and fostering learning goal orientation can serve as force multipliers in augmenting employee engagement. Expanding on this, organizations could implement comprehensive coaching leadership training modules that focus on enhancing communication skills, providing constructive feedback, and facilitating employee development. These programs should be designed to empower leaders to effectively mentor and guide their teams, fostering a supportive work environment conducive to continuous learning and growth. Additionally, organizational initiatives aimed at promoting a positive organizational culture, such as recognition programs and opportunities for skills enhancement, can reinforce the importance of organizational self-esteem and learning goal orientation. By aligning leadership practices with these principles and values, organizations can cultivate a workforce that is not only highly engaged but also motivated to contribute to the organization's success.

5.5 Research limitations and future outlook

The scope of this study is accompanied by specific limitations that merit acknowledgment while also opening avenues for future inquiry. In the context of sample distribution, this research opted for a generalist approach, forgoing an in-depth examination of industry-specific or group-focused dynamics. This choice might dilute the applicability of the findings across varying sectors and demographic clusters. As such, a sectoral focus—zeroing in on domains like education, healthcare, real estate, or the tech industry—could enrich the granularity of future investigations, offering more tailored insights.

Moreover, this study primarily emphasizes the positive variables that modulate the relationship between coaching leadership and employee engagement. While this focus yields valuable insights, there is a conspicuous absence of research concerning negative influences. Future studies should broaden the investigatory lens to encompass not only facilitative variables like learning goal orientation but also inhibitory factors such as abusive leadership, emotional exhaustion, and workplace loneliness. A more multidimensional analytical approach, potentially employing different hierarchical levels of variables, would offer a more nuanced understanding of the mechanisms through which coaching leadership impacts employee engagement.

Lastly, the methodological framework adopted for this research, while robust, could be further refined for enhanced scientific rigor. Future research endeavors could exploit a multifaceted methodological toolkit comprising paired research designs, controlled experiments, and detailed case studies. Such an integrative approach would substantially elevate the validity and reliability of the research outcomes.

5.6 Conclusion

Overall, our findings provide valuable insights into the multifaceted impact of coaching leadership on employee engagement, mediated by organizational self-esteem and moderated by learning goal orientation. These results not only further academic dialogue but also provide actionable insights for practitioners, emphasizing the symbiotic relationship between effective leadership and a committed workforce.

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 study involving humans in accordance with the local legislation and institutional requirements. Written informed consent to participate in this study was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and the institutional requirements.

Author contributions

LT: Conceptualization, Funding acquisition, Methodology, Writing – original draft. MS: Data curation, Formal analysis, Investigation, Methodology, Writing – original draft. YuL: Conceptualization, Data curation, Methodology, Writing – original draft. YiL: Conceptualization, Data curation, Formal analysis, Methodology, Supervision, Writing – original draft. BY: Conceptualization, Methodology, Supervision, Writing – original draft, 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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Quality culture, university-industry collaboration, and perceived employability among vocational students in China: a Yanpei Huang perspective

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Students' perceived employability (SPE) can be seen as one of the indicators of technical and vocational education and training (TVET) quality. However, less is known about the determining factors of SPE in vocational education. As the founder of modern vocational education in China, Yanpei Huang has written a large volume on ensuring students' employability and the quality culture of TVET. Nowadays, as the feature and nature of TVET, university-industry collaboration (UIC) has been promoted worldwide. The primary objective of this study was to investigate the influence of quality culture from Yanpei Huang's perspective (YHQC) on the SPE and the UIC role in the relationship between YHQC and SPE in a TVET university in China. Data were collected by questionnaire from 341 students from one vocational education university in China. The questionnaire included measures of quality culture, perceived employability, and UIC. The Structural Equation Modelling by AMOS 25 was used to test the proposed hypothesis. The results indicate that YHQC acts as a significant factor in enhancing SPE, and UIC is found to act as a partial mediator in this relationship. This study has contributed to the literature and practices by presenting a comprehensive quality culture from Yanpei Huang's perspective, confirming the above relationship, and providing practical suggestions for stakeholders to develop a quality culture in TVET institutes, promote UIC, and enhance SPE.

KEYWORDS

university quality culture, student's perceived employability, Yanpei Huang, China, university-industry collaboration

1 Introduction

The changing trends in the global education market have altered expectations of students seeking more than just skills and knowledge, i.e., ways to deal with other challenges, including labor market dynamics (Tomlinson, 2012) and employability prospects (Pitan and Muller, 2019). Nowadays, employee behaviors are guided by their perceptions rather than the objective elements of employability (Baluku et al., 2021). Employability indicates individual characteristics that foster adaptive cognition, behavior, and affect, enhancing the

individual-work interface (Fugate et al., 2004). From a more holistic view, McQuaid and Lindsay (2005) argued that employability should include individual factors, personal circumstances, and external factors, acknowledging the importance of supply- and demand-side factors. Employability is defined as "a set of attributes, skills, and knowledge that all labor market participants should possess to ensure they have the capability of being effective in the workplace to the benefit of themselves, their employer, and the wider economy (CBI, 2009, p. 8)." After its early inception into the mainstream literature in 1909, the concept of employability has commanded a central place in the U.K., European states, and many other nations (McQuaid and Lindsay, 2005; Bakar et al., 2013). Employability becomes even more crucial in highly populated countries like China, where vocational institutes release 10 million highly skilled professionals into the labor market annually (Li et al., 2023). In 2022, there were 7,201 secondary vocational schools with 3,392,900 students, 32 vocational schools at the undergraduate level with 228,700 students, and 1,489 higher vocational schools with 16.7 million students (Ministry of Education of the People's Republic of China, 2023). SPE depends on the context and evolves with society and people over time (Williams et al., 2016; Sánchez-Queija et al., 2023). Researchers have extensively explored the determinants of students' perceived employability (SPE) in different university settings (e.g., Clarke, 2018; Pitan and Muller, 2020). Even though vocational education is vital for socio-economic (Ekhalia et al., 2021; Olabiyi, 2023) and sustainable development (Paryono, 2017) and TVET institutes are different from traditional universities, less is known about the determining factors of SPE in vocational education (Sánchez-Queija et al., 2023).

Of available explanations, experts argue that quality culture fosters the development of high-quality assurance systems (Hildesheim and Sonntag, 2019; Thai et al., 2022) through permanent quality enhancement across the entire institution (EUA, 2006). Quality culture represents the collective mindset, values, and practices, prioritizing high standards of teaching, management, and overall program quality in vocational education. Graduates from reputable institutions have better employment prospects and are more employable than those graduating from less reputable institutions (Qenani et al., 2014; Chen et al., 2015; Drydakis, 2016; Ergün and Şeşen, 2021). Experts explain that high-ranking institutes nurture unobservable characteristics among students, such as self-efficacy, self-confidence, transferable skills, and commitment that employers need from potential employees (Oluwajodu et al., 2015; Drydakis, 2016). Thus, academic institutions worldwide strive to develop a robust and culturally aligned quality culture that facilitates an understanding of the roles and responsibilities of each stakeholder in institutional quality development (Thai et al., 2022). Since quality culture may vary across countries and institutes, empirical findings based on western quality culture or traditional university instruments are less likely to accurately capture the effects of quality culture on SPE, particularly in Chinese vocational education.

The debates on quality culture within vocational education in China can be traced back to the seminal work of Yanpei Huang (1878–1965), the founder of modern Chinese vocational education, who laid the ideological foundation of vocational education in China (Chen, 2016; Su et al., 2021). In 2004, the Ministry of Education published "Several Opinions on Deepening the Reform of Higher Vocational Education with Employment as the Orientation." Recently, President Xi stressed the need to "promote the integration of vocational education, industry education, and science education, and optimize the positioning of vocational education types; accelerate the development of national strategic human resources, and strive to train more experts, outstanding engineers, craftsmen, and highly skilled talents (Xi, 2022)." This viewpoint mirrors the key tenets of a robust quality culture in TVET institutes proposed by Yanpei Huang (hereafter YHQC). YHQC offers a comprehensive road map for TVET institutes to cultivate positive employability perception among students by promoting practical problem-solving and masters of hands-on skills and initiating university-industry collaboration (UIC) for superior outcomes (Zhang, 2021). Despite such theological influence, apart from a few concept papers, the effects and potential effects (e.g., SPE or UIC) of YHQC have not been empirically validated in China and beyond.

Importantly, as an intermediary mechanism, UIC promotes interactions (knowledge and technology exchange) between parts of the higher education system and industry (Ankrah and Al-Tabbaa, 2015). With UIC playing a significant role in improving vocational education quality in China (e.g., Artess et al., 2017; Jin, 2023; Li, 2023; Lu, 2023; Shi and Guo, 2024), universities and industries should join hands to enhance skills, abilities, and employability of students (Pinto and Ramalheira, 2017; Brachem and Braun, 2018). Currently, the low engagement of Chinese enterprises in UIC programs (Jin, 2023) reflects poor coupling and coordination. Some vocational institutes have failed to deliver quality graduates that meet enterprise standards (Jacob and Gokbel, 2018). With a few exceptions, previous studies on SPE mainly studied factors such as career development learning (Ho et al., 2023), mentoring (Niu et al., 2024), academic engagement and stress (Ma and Bennett, 2021), experiential learning activities (Pitan and Muller, 2019), academic engagement and stress (Ma and Bennett, 2021), generic skills, academic performance, personal circumstances, and external labor market (Ergün and Şeşen, 2021), the role of teaching staff (Petruzziello et al., 2023), students' perceived organizational support (Trullas et al., 2018), psychological capital (Ayala Calvo and Manzano, 2021), career ambition, university reputation, university commitment, technostress related to technology-enhanced learning, and mental well-being (Schettino et al., 2022). As discussed above, the intermediary role of UIC, particularly between YHQC and SPE in the vocational education setting in China, remains widely unexplored.

A critical review of the existing literature highlights the following knowledge gaps. Firstly, many scholars have compressively examined SPE in conventional university contexts. With the modern vocational education contexts being widely unattended, particularly in China (Sánchez-Queija et al., 2023), there is an imminent need for exploring the antecedents to SPE across different regions and cultural contexts (Pitan and Muller, 2020). Secondly, although the seminal works, philosophy, and contributions of Yanpei Huang have significantly influenced the theory and practice of TVET in China, there is a lack of empirical studies confirming the potential role of YHQC in shaping SPE (Su et al., 2021; Zhang, 2021), particularly in Chinese setting (Chen, 2016). Thirdly, many academics, educators, and institutions endorse UIC as a critical factor in the quality of vocational education, but only a few studies have empirically validated its mediating role in the quality culture-SPE nexus (Ankrah and Al-Tabbaa, 2015; Artess et al., 2017). Importantly, UIC is vital in equipping students with the technical skills and competencies different industries require (Cai and Kosaka, 2024). Since the majority of studies have adopted instruments

of quality culture designed for conventional and Western university settings, they are less likely to precisely capture the distinct features of quality culture in diverse cultural contexts (Hildesheim and Sonntag, 2019; Thai et al., 2022), e.g., Chinese TVET settings. Fourthly, the rapid shift (e.g., technological, social, and environmental) within the educational industry requires adopting an inclusive, interdisciplinary, and integrative approach to explaining various cognitive mechanisms and the interplay of factors. However, only a limited number of scholars have constructed integrative models combining multiple theories and concepts (e.g., Human Capital Theory, Total Quality Management, and the Triple Helix Model) to offer in-depth insight into factors impacting SPE (Becker, 1975; Deming, 1982; Etzkowitz and Leydesdorff, 2000), particularly in diverse and distinct TVET contexts worldwide.

Therefore, the primary purpose of this work is to empirically translate YHQC into a comprehensive quality assessment construct and then measure its direct and indirect effects (through UIC) on SPE among students in a Chinese vocational institute. The present inquiry is theoretically significant in the following ways. Firstly, the paper links the human capital theory (HCT) from labor economics to TVET, thereby inciting fresh debates in the SPE literature. Secondly, the paper bridges the gap between TVET and the total quality management (TQM) literature by providing measurable metrics (YHQC) to assess quality culture among vocational institutes while linking them to SPE and UIC. Huang stresses accessibility, social connection, equity, and employment in TVET, echoing TQM principles of providing quality products to meet stakeholder expectations of students and employers (Tarí et al., 2020) and continuous enhancement of education quality through certain practices, e.g., quality culture and UIC. Thirdly, the study builds on the triple-helix model (THM) (Etzkowitz and Leydesdorff, 2000; Etzkowitz and Zhou, 2017; Cai and Amaral, 2022) to empirically establish the mediating role of the UIC in linking institutions (academia and industry). The models support TVET's function as the bridge, preparing students for the labor market with industry partners' participation and government support.

2 Literature review and hypotheses development

2.1 Theoretical foundations

The current integrative framework is built on three influential paradigms and theories: (i) HCT (Becker, 1975); (ii) total quality management in education (TQM) (Deming, 1982); (iii) THM (Etzkowitz and Leydesdorff, 2000). The HCT provides critical insight into TVET institutes' role in cultivating quality human capital. Quality vocational institutes provide the economy with the most vital resources (human capital) by equipping students with specialized skills, improving their job prospects, and providing human resources for economic and industrial development. Next, applying TQM practices enables TVET institutes to cultivate high-quality human capital by providing quality education to meet the demands and expectations of different stakeholders, e.g., students, employers, industry, and governments. Therefore, TQM is central to the TVET strategic objectives in ensuring quality continuous improvement through various practices (e.g., maintaining high standards of program quality) to meet the changing needs of individuals (employability), industry, and the economy. For this purpose, TVET institutes must continuously interact and collaborate with related industries to guarantee high employment rates. Thirdly, the THM explains the enabling mechanism through which TVET institutes can proactively engage with industry and government stakeholders to fill gaps between industry requirements and TVET output. With robust UIC initiatives (e.g., improved curriculum and internship), students are more likely to satisfy skills and knowledge criteria set by the industry.

2.2 Yanpei Huang and his thoughts on quality culture

On May 6, 1917, Yanpei Huang (also named Yen-Pe'i Huang) and 48 others established the China Vocational Education Association, which extensively investigated the educational, economic, and social conditions at home and abroad and then provided modernized vocational education. On May 15, 1918, Huang and other patriots founded the "most experimental school," China Vocational School (*Zhonghua Zhiye Xuexiao*). It is the first school with the word "vocational" inside the name in modern China. Huang has produced many publications and documents to explain his thoughts on the quality of vocational education. Therefore, Huang advocated the ideal of "enabling the unemployed to have jobs and enabling the employed to enjoy their jobs" (Tian and Li, 2018, p. 298). Huang advocated that institutes should be concerned about students' future employment prospects from the beginning of enrollment, considering both students' individual needs and society's actual needs (Song, 2008). Besides, Huang mentioned the principles of conducting vocational education: vocational education must be tailored to local conditions and students' aptitude and oriented towards industry and society (Tian and Li, 2018). The only life of vocational education institutes is socialization (Huang, 2022a). Huang believed that the education sector must communicate with the professional sectors. The programs (majors) are to be established depending on the needs of the professional sectors; the selection of teaching materials needs to consult the professionals for their opinions.

Elaborating on Yanpei Huang's philosophy, Tang (2007) asserts that the characteristics of the professional world should be integrated into students' training, given that society and education reside in a connected system. If decoupled from society, education may not yield desirable and practical outcomes. Therefore, the author recommends that those who run vocational schools must communicate and simultaneously liaise with all educational and professional circles. Huang criticized that kind of vocational education, which only focused on cultivating skills but paid no attention to nurturing the spirit, thus turning a good education into an education that only makes students into instruments. Such an education system may create promising apprentices, but they are less likely to cultivate citizens with good cognitive ability, manners, and passion to serve society (Dong, 2007). All students at the China Vocational School were required to write an oath when they enrolled to develop respect for labor and show professional ethics: respect for labor (besides half-day work, all students perform all the cleaning, entertaining, and other work on campus on a rotating basis); abide by the rules (students form the autonomous association, set up all the rules and abide by them on campus); serve the community (students are engaged in services off-campus as well as on-campus services) (Tian and Li, 2018). Li (2024) argues that Yanpei Huang has constructed a vocational education quality culture aimed at achieving "Making a

living for oneself and serving the country" by emphasizing the socialization of program designing, scientific management, teaching that integrates work and learning, and cultivating moral literacy.

2.3 Quality culture and students' perceived employability

Graduates in TVET institutes will have better employment prospects if employers recognize their institutes with a good reputation for education quality (Bhorat et al., 2012). A report published by the Wilson (2009) showed a positive correlation between the graduation rate of four-year undergraduate universities in the United States and their competitiveness (Wu et al., 2016). Therefore, American companies can determine the quality of graduates by the university's graduation rate. Unlike American universities, the graduation rates of Chinese universities are all very high, above 90%. Chinese companies can only judge graduates' quality by the university's reputation. A university's reputation relies on stakeholders' perceptions of students' quality, social serviceability, research output, influence, and trustworthiness. Due to their excellent quality programs and interaction with alumina and industry (Drydakis, 2016), reputable TVET universities can develop stronger links with employers to provide internships, job fairs, or similar activities to co-develop students' professional experience and knowledge. Despite mixed findings in the literature (Finch et al., 2013; Clarke, 2018), evidence suggests that a university and its reputation affect students' employment and perceived employability (Rothwell et al., 2008; Okay-Somerville and Scholarios, 2017). It can be inferred that TVET universities with good reputations and quality cultures usually produce graduates who are more employable and preferred by employers. The more the students perceive their universities to be good in education quality, the more they become confident about their knowledge, attributes, skills, and abilities (Qenani et al., 2014). Drydakis (2016) finding is similar: graduates who studied in higher-ranked universities, which are guaranteed by institutional quality culture, receive more invitations to interviews and higher entry-level annual salaries. Huang believed the most considerable difficulty in running vocational schools is the way out for students after graduation (employment). No matter how well a school does, recruiting students later will be challenging if the first batch of graduates has no way out (Tian and Li, 2018). More specifically, Huang stated that vocational education aims to develop one's personality, prepare one to earn a living, serve society, and prepare the country and the world to enhance productivity (Huang, 2022b). It can be inferred that a TVET institute with this quality culture will be dedicated to improving students' employability. Thus, the first hypothesis of this research is:

> Hypothesis 1: Yanpei Huang's quality culture positively affects students' perceived employability.

2.4 Yanpei Huang quality culture and university-industry collaboration

The notion of quality culture extends beyond the technocratic perspective of quality assurance, focusing on an organizational-psychological paradigm along with structural-formal quality assurance methods. Quality culture emphasizes a shift from traditional perspectives in education (i.e., accountability, regulation, and quality control) to institutional freedom, quality enhancement, and reliability (Bendermacher et al., 2017). It involves a shared commitment to continuous improvement, stakeholder engagement, industry relevance, learner-centred approaches, and the integration of effective teaching methods, assessment strategies, and support systems. TVET universities with a quality culture usually provide good education and technology services, emphasizing and promoting more collaboration with the industry. Their graduates are believed to have acquired the needed knowledge and skills because of the university's quality culture. Thus, the industry could gain good quality employees after the co-educating programs, and they could have more new ideas from new talents. The faculty in universities with good reputations perform better in collaborative projects, which the industry needs for new products or technology upgrading. Besides, there has been a substantial increase in the literature on UIC (Ankrah and AL-Tabbaa, 2015), leading to pressures on industry and universities (Giuliani and Arza, 2009). Enterprises face challenges from technological development, intense global competition, and shorter product life cycles. Concerning TVET universities, pressures have included the need for practical professional knowledge and skills, funding, and the social responsibility to serve economic and societal growth (Philbin, 2008). Vocational education institutes need to provide high-quality education to students, supporting the development of a skill-based society. These pressures on both parties have led to an increasing impetus for developing UIC to enhance innovation and economic competitiveness at institutional levels through knowledge exchange between academic and commercial domains (Perkmann et al., 2013). From the above discussion, the following hypothesis is proposed:

> Hypothesis 2: Yanpei Huang's quality culture will positively influence university-industry collaboration.

2.5 University-industry collaboration and students' perceived employability

UIC and integrating industry and education are the most distinctive features of vocational education (Liu and Li, 2023), often resulting in knowledge creation and technology transfer, which are beneficial for the industry, academia, society, and government (Abbas et al., 2021). The university-industry collaboration has gained widespread interest because of the high degree of innovation and economic growth (Ivascu et al., 2016), and there is an excellent urge for robust partnerships between them. The collaboration between industry and academia promotes the interaction between the educational system and professional sectors, aiming to enhance the program quality. It helps professional sectors develop new products and services, train and develop employees, and recruit new talent, and TVET institutes (graduates) output acts as industry input. Considering the close relationship, the industry should participate in and collaborate with TVET institutes to achieve common objectives, like cultivating talents. UIC can benefit students through enhanced employability, awareness of industry trends, and research grants (Lutchen, 2018). UIC will promote industrial internships and other activities, thus

performing skill-based learning, blended learning, and experiential learning, which lead to workplace exposure. Internship and experiential learning activities include students' exposure to work experience and other real-world activities (industry visits, community service, and career exhibitions), enabling students to make connections between theoretical academic knowledge and practice in the workplace (Pitan and Atiku, 2017). Such initiatives enhance employability. Consistent with Ishengoma and Vaaland's (2016) statement, UIC includes training and education (e.g., cooperative education and industrial training), services and consulting (e.g., modernizing programs and sabbatical), research, activity-based sponsoring (e.g., shared equipment or facilities, equipment donations). Industrial involvement in designing curricula and industry-driven student–industry projects are the key drivers for students' practical skills development, which can significantly enhance students' employability attributes. Many employability studies (Qenani et al., 2014; Jackson and Wilton, 2017; Oliver and Jorre, 2018) established that students' participation in experiential learning activities gives them a competitive edge in terms of obtaining employment after graduation. For example, Qenani et al. (2014) revealed that SPE increased by 250% through participation in experiential learning activities, particularly internships in America. Anand et al. (2016) showed that South African graduates without work experience are less likely to find graduate-level positions. Assuming that students are aware of the positive link between UIC and employability, the greater their exposure to industry, the higher their level of SPE and vice versa. Based on the above debate, it is proposed that:

Hypothesis 3: University-industry collaboration has a positive influence on students' perceived employability.

2.6 The mediating role of university-industry collaboration

Evidence suggests that a few mediating factors can explain the effect of YHQC on SPE. The theory exists that UIC mediates the relationship between the quality management system and SPE (Abbas et al., 2021). Through the UIC, students get more opportunities to be exposed to the real professional world and gain more attributes needed by work. Thus, students have better expectations of their employability. In our common sense, a university with a quality management system comes with its quality culture. Therefore, it can be inferred that the UIC may mediate the relationship between quality culture and SPE. From the previous discussion on the influence of YHQC on UIC, it is apparent that students from universities with quality cultures can build their portfolios on experiences from the real world, enhancing their employment opportunities (Drydakis, 2016). Consequently, the current study investigates whether UIC mediates the relationship between YHQC and SPE and whether the effect of YHQC on SPE is meaningfully improved with the introduction of the mediator. Therefore, the fourth hypothesis is:

> Hypothesis 4: University-industry collaboration mediates the influence of Yanpei Huang's quality culture on students' perceived employability.

The relationships among the three variables proposed in the hypotheses above are illustrated in the theoretical framework shown in Figure 1.

3 Methodology

3.1 Participants and procedures

Three hundred sixty-six students from one TVET university in China participated in the study. Twenty-five questionnaires were incomplete. Three hundred and forty-one questionnaires were analyzed. From a contextual perspective, the selection of the university was based on convenient sampling and other criteria discussed hereafter. Originating in the 1950s, the university offers a three-year education to more than 9,000 students, upholding the belief of "born for the city, living for the city." The university is dedicated to "putting education as a foundation, promoting cross-border integration, servicing the demand, and pursuing excellence." It aims to cultivate high-level artisans and skilful talents who love craftsmanship and professional ethics. The students are mainly from the province where the university is located, as with other vocational universities. The university provides majors in finance, management, computer science, transportation, construction, tourism, education, designing. This vocational institute is located in an urban centre. After the Ministry of Education recognized it as "the Good Quality Vocational College" in 2019, it was certified as "the Exemplary Modern Higher Vocational College by the Department of Education" in 2020. Out of 50 TVET institutes in Fujian, the university has retained its rank among the top 6 TVET universities in the region. Follow the requirements of "Law on Vocational Education of the People's Republic of China" (2022), "Notice on Issuing the Work Plan for Vocational Education Reform in Fujian Province by Seven Departments including the Education Department of Fujian Province" (2019) and "Notice of the General Office of the People's Government of Fujian Province on Several Measures to Deepen the Integration of Industry and Education and Promote the High-quality Development of Vocational Education," this university have carried out many practices to accurately align with industry demands and cultivate high-quality technical and skilled talents. The above credentials, background, and passion for quality education make this institute an ideal candidate for a case study.

For data collection, information on participants' characteristics, perceptions of their university's quality culture, engagement in UIC, and perceived employability were collected through a questionnaire. The online questionnaires were distributed to targeted classes by the researcher team in January 2024. Although senior students' participation was encouraged because of their institutional experience, knowledge, and familiarity with the university culture, the completed survey document was representative of 89 first-year students, 107 s-year students, and 145 third-year students. Participants responded to the questionnaire after being informed of the research aims and voluntary participation. The summary characteristics of the respondents are shown in Table 1.

3.2 Measures

The construct details are as follows. The YHQC, the independent variable, was measured with a 5-point Likert scale containing 21 items, adopted and revised from Huang's writings (Huang, 2022a,b). The scale included five constructs: leadership, strategy, resources, people, and process. Students were asked to rate their perception of the university's quality culture by selecting 1 to 5: "1" indicated strong disagreement; "5" indicated strong agreement. The example items

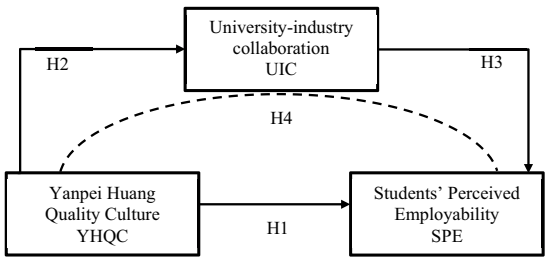

FIGURE 1
Proposed theoretical framework.

TABLE 1 Participants' demographic information.

Demographic	Gender	Number
Gender	Male	201
	Female	140
Grade	First-year	89
	Second year	107
	Third year	145
Discipline	Engineering and Construction	158
	Finance and Management	120
	Education	63

constitute "My university's leadership ensures vocational education is accessible and promotes inclusivity, reflecting our commitment to social responsibility," "My university's strategy emphasizes the practical application of knowledge and skills, aiming to solve real-world problems," and "Our teachers possess enough practical experience to prepare students for professional environments."

UIC, the mediator, comprised an empirically validated 5-point Likert scale, including 17 items adopted from the works of Ankrah and AL-Tabbaa (2015). These items can be categorized into five constructs: meeting and network, communication, training, personal mobility, and employment. Students were asked to rate their perception of the engagement in UIC by selecting a number on the scale. Some example items are "I have participated in academic and professional gatherings that align with my vocational discipline, including conferences and workshops," "There are (co) publications of research papers, reports, and booklets," "Communication with industry professionals through various channels (voice, email, conference calls) is a regular part of my academic experience," "Customized educational programs developed by industry partners have been a significant aspect of my training" and "The exchange program between our institute and industry facilities for staff and students has benefited my education."

SPE, the dependent variable, containing 16 items, was taken from Rothwell et al. (2008). Students were asked to rate their perception of their perceived employability in terms of the skills, knowledge, and abilities they have acquired through their university studies. They responded to the items on this scale by selecting a number on a 5-point Likert scale – with "1" indicating strong disagreement and "5" indicating strong agreement. The example items are "I achieve high grades in my studies," "I regard my academic work as a top priority," and "Employers are eager to employ graduates from my university."

3.3 Ethical clearance

The authors applied for ethical clearance from the sample university. The application was granted full ethical approval. All student participation was voluntary, and anonymity and confidentiality of the collected information were assured.

4 Results and findings

The study empirically examined the effect of YHQC on SPE while simultaneously estimating the mediating role of UIC in the same equation. EFA was tested. Then, the path model of the study was assessed using AMOS 25. The measurement model was evaluated, and then the structural model was examined.

4.1 Exploratory factor analysis

Prior to the confirmatory factor analysis, the exploratory factor analysis (EFA) on 54 items was conducted to explore the number of underlying factors among the selected items. Three factors were tentatively extracted using an EFA with principal axis factoring and varimax rotation. The Kaiser Meyer-Olkin (KMO) measure of sampling adequacy was 0.962, indicating a sample sufficient for factor analyses. Bartlett's test of sphericity (chi-square = 21767.420; $p < 0.001$; df = 4,131) suggested patterned relationships among the items. Several approaches have been proposed in the literature to determine the appropriate number of factors to extract from the dataset. The most common being eigenvalue and scree plot. The principal axis factoring with varimax rotation retained three significant factors of 54 items, representing the study's variables. Table 2 shows the 3-factor solution for 54 items derived from the principal axis factoring with varimax rotation, indicating a total variance of 72.132%. Examining the scree plot (*cf.* Figure 2) and Eigenvalues indicate a three-factor solution (*cf.* Table 2).

4.2 Measurement model

The measurement model shows the relationship between latent variables and their observable items. The confirmatory factor analysis (CFA) was used to estimate the model's reliability and validity. The estimates obtained through CFA were Cronbach Alpha, factor loading, and average variance extracted (AVE) (*cf.* Figure 3). In the present study, the measurement model comprised 21 items for YHQC, 17 observable items for UIC, and 16 items for SPE.

Per Hair et al. (2011) and Hair et al. (2019), for a model to be reliable, the values of Cronbach alpha shall be greater than 0.70. The results obtained through AMOS 25 revealed that all construct Cronbach Alpha values were above the minimum threshold of 0.70 (*cf.* Figure 3), suggesting that all constructs in the study were reliable. The values of factor loading and AVE were extracted to estimate convergent

TABLE 2 Eigenvalues and EFA outputs.

Total variance explained									
Factor	Initial eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	21.666	40.122	40.122	21.386	39.604	39.604	14.785	27.380	27.380
2	10.089	18.683	58.805	9.823	18.190	57.794	12.613	23.357	50.737
3	8.023	14.857	73.662	7.742	14.338	72.132	11.553	21.395	72.132

Extraction method: principal axis factoring.

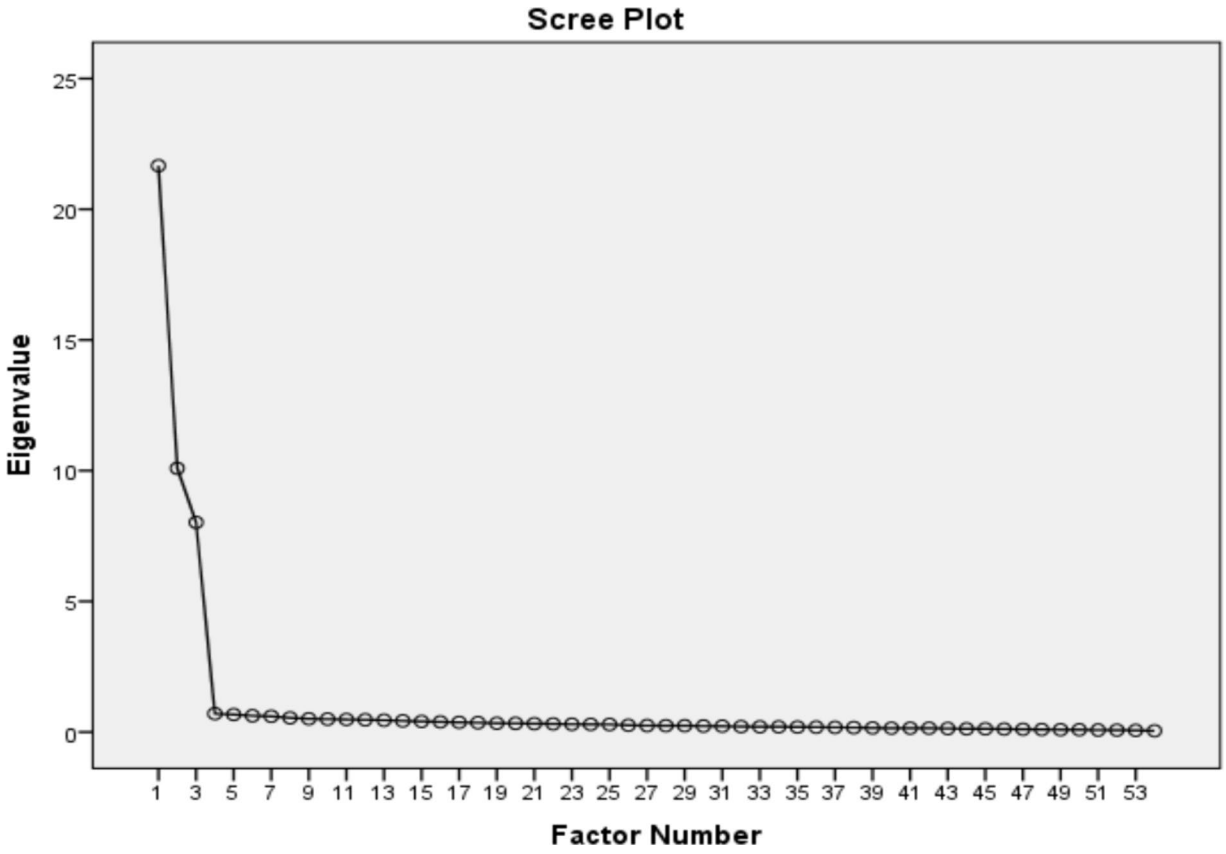

FIGURE 2
Scree plot.

validity. Consistent with Hair et al. (2022), for an item to be reliable, the values of the corresponding factor loading shall be greater than the minimum threshold of 0.70, whereas AVE for each construct shall be above 0.50. The results obtained in this study revealed that all items' factor loading and the AVE of each construct (*cf.* Table 3 below) were above the minimum thresholds stated above, reflecting acceptable convergent validity. In addition to the above, discriminant validity was estimated through Fornell and Larcker's (1981) criteria, which suggests that the constructs' variance with corresponding indicators shall be higher than its variance with other constructs. The study results revealed that the square root of the AVE of each construct was greater than the constructs' correlation with other constructs of the model.

After assessing the measurement properties, the model fit indices were examined. The measure of fit indices is normative fit index (NFI), goodness-of-fit index (GFI), comparative fit index, chi-square/degree of freedom (CMIN/DF), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). According to Bagozzi et al. (1998), for a model to fit, the chi-square/degree of freedom (CMIN/DF) values shall be less than 3. The results revealed that the (CMIN/DF) value was 1.592 (*cf.* Table 3), less than the acceptable threshold. The standardized root mean square residual (SRMR) value was equal to 0.0353, a statistically acceptable range. The results of the other fit indices, such as CFI = 0.963, NFI = 0.906, GFI = 0.810, and TLI = 0.961 (*cf.* Table 3), revealed that the model

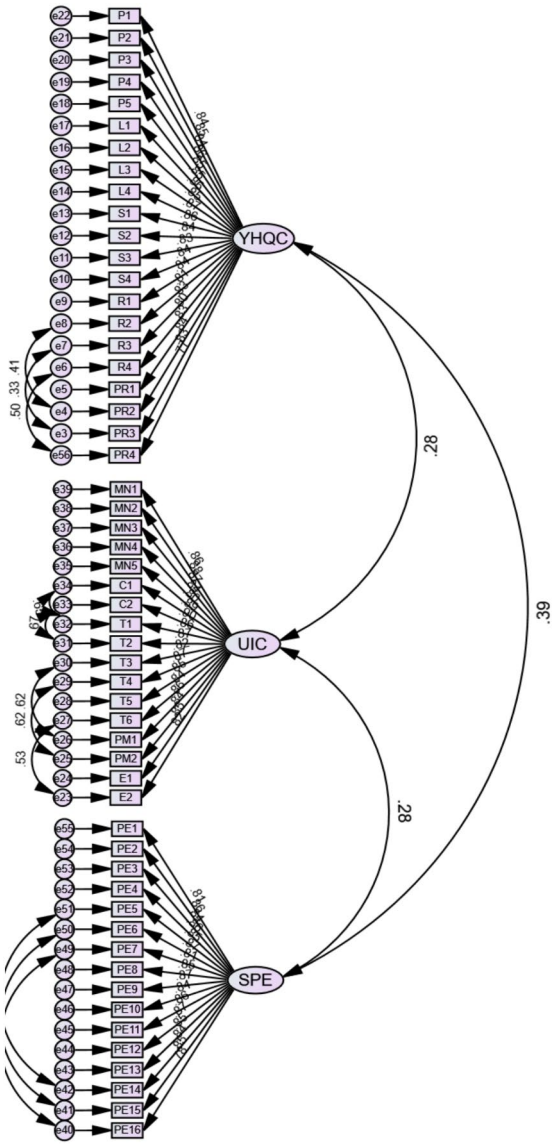

FIGURE 3
CFA factors load value.

fitted the data, where all values were in the acceptable range (Bagozzi et al., 1998; Hu and Bentler, 1999; Bryne, 2010). Also, the values of RMSEA = 0.042 (*cf.* Table 3) were in an acceptable range, supporting that the model fitted with the data well (Cudeck and Browne, 1992). In sum, the results of GFI, NGI, RMSEA, SRMR, and CFI in Table 3 complied with the minimum threshold value requirements recommended by several statisticians (Cudeck and Browne, 1992; Bagozzi et al., 1998; Hu and Bentler, 1999; Bryne, 2010).

4.3 Hypotheses evaluation

After assessing the measurement properties and goodness of fit of the measurement model, the study's hypotheses were examined through SEM using AMOS software. The study results revealed that YHQC's relationship with SPE was positive and significant, thus supporting H1. As predicted in the H1, YHQC enhanced favorable SPE among the sampled students ($\beta = 0.34$; S.E. = 0.044; composite reliability (C.R.) = 6.213; $p \leq 0.05$) (*cf.* Table 4). This result supported prior beliefs that quality management practices contribute to superior student-related outcomes, e.g., SPE (Papanthymou and Darra, 2017), learning (Martin, 2018), knowledge, skills, abilities, and personalities (Abbas et al., 2021). The above outcome is contrary to a Turkish study, which found that the university's contribution has no positive effects on the perception of employability (Ergün and Şeşen, 2021). That said, SPE is determined by personal (e.g., academic performance, skills and abilities to get a job) and contextual factors (e.g., labor market conditions, the strength of a university's brand, and demand of the subject area) (Rothwell et al., 2008; Vanhercke et al., 2014). Context is essential to forming perceptions of one's ability to obtain and maintain a job (Donald et al., 2018; Baluku et al., 2021). Students have better employability in institutes that make more efforts to train students with needed attributes, like thinking critically and creatively, communicating effectively (Brewer, 2013; Desai et al., 2016),

TABLE 3 CFA validity and reliability.

Constructs	C.R.	AVE	MSV	MaxR(H)	YHQC	UIC	SPE
YHQC	0.980	0.704	0.151	0.981	0.839		
UIC	0.979	0.732	0.080	0.980	0.278***	0.856	
SPE	0.975	0.713	0.151	0.976	0.389***	0.284***	0.844

Discriminant Validity: the AVE for Leadership is less than the MSV. The AVE for Resources is less than the MSV. ***$p < 0.001$. AVE, average variance extracted; C.R., composite reliability; MaxR(H), maximum reliability (H); MSV, maximum shared variance; SPE, student perceived employability; UIC, University-Industry Collaboration; YHQC, Yanpei Huang's Quality Culture.

TABLE 4 Goodness of fit of measurement and structural model.

Indices	GFI	NFI	CFI	TLI	RMSEA	CMIN/DF
Recommended values	≥0.8[2]	≥0.9[2]	≥0.9[2]	≥0.9[2]	≥0.8[3]	
Measurement model	0.810	0.906	0.963	0.961	0.042	1.592
Structural model	0.963	0.906	0.963	0.961	0.042	1.592

CFI, comparative fit index; CMIN/DF, chi-square minimum discrepancy divided by degrees of freedom; GFI, goodness of fit index; NFI, normed fit index; RMSEA, root mean square error of approximation; TLI, Tucker-Lewis index.

TABLE 5 Structural model results.

Path	Coeff.	S.E.	C.R.	*p*-value	Decision
H1: YHQC → SPE	0.34*	0.044	6.213	≤0.05	✓
H2: YHQC → UIC	0.28*	0.049	5.119	≤0.05	✓
H3: UIC → SPE	0.19*	0.048	3.578	≤0.05	✓
H4: YHQC → UIC → SPE	0.053*			≤0.05	✓

*$p \leq 0.05$. YHQC, Yanpei Huang's perspective; UIC,University industry collaboration; SPE, Students' perceived employability; CR, Critical ratio.

coordination skills (Hernandez-de-Menendez et al., 2020), learning and adapting, solving problems independently, using basic technology, and leading effectively (Brewer, 2013).

Furthermore, the data analysis revealed that YHQC's relationship with UIC was positive and significant ($\beta = 0.28$; S.E. = 0.049; C.R. = 5.119; $p \leq 0.05$); thus, H2 was supported. This output echoed Rybnicek and Königsgruber (2019) finding that institutional factors like resources, structure, willingness to change, and process are critical for successful collaboration between universities and industry. Also, the above results supported the idea that human resources (including leaders and people) play a vital role in the successful implementation of university-industry projects (*cf.* Myoken, 2013; Albats et al., 2020; Ćudić et al., 2022).

For intermediary factors, the data reflected that the link between UIC and SPE was positive and significant ($\beta = 0.171$; S.E. = 0.048; C.R. = 3.578; $p \leq 0.05$) (*cf.* Table 4). Thus, the H3 of the study was supported. This finding confirmed Ankrah and Al-Tabbaa (2015), Tran (2016), Huang and Chen (2017), Aliu and Aigbavboa (2021), Borah et al. (2021), and Otache (2022), finding that effective UIC improves graduates' employability competencies. Vocational education should closely connect with industry, and socialization is essential (Huang, 2022a). With the substantial technological, social, and economic changes in the modern era, the concepts and operations of industrial organizations and TVET institutes have significantly changed. One of the consistent challenges for TVET institutes is keeping pace with knowledge change and complying with industry requirements (Cacciolatti et al., 2017). The positive implications of UIC for SPE lie at the heart of the notion that the industry offers students multiple benefits: (i) extensive mentoring opportunities and exposure to relevant training; (ii) improved job market prospects and professional relevance (Aliu and Aigbavboa, 2021); (iii) enhanced access to a wide range of expertise in product development/commercialization and market knowledge (Sherwood et al., 2004); (iv) high employment opportunities for graduates (Lee and Win, 2004); (v) better professional qualities and contacts needed in the professional work; (vi) provision of experts (faculty) with needed industrial information to teaching which equip and benefit students in the long run. In addition, with more contact with the market, students adapt more to alternative opportunities (e.g., flexible employment, Forstenlechner et al., 2014), improving their perception of future jobs. Besides, UIC can help institutes design industry-oriented curricula and train students in pace with industry dynamics, which gives students a better industry perspective and career options. The more information about the industry and needed attributes students acquire, the more confident they are about employment.

Besides, the mediating role of UIC was tested using Preacher and Hayes's (2008) method. The results revealed that UIC mediated the relationship between YHQC and SPE; thus, H4 was supported ($\beta = 0.19$; S.E. = 0.048; C.R. = 3.578; $p \leq 0.05$) (*cf.* Table 5). As quality management is an essential part of quality culture, to some extent, quality management can be seen as quality culture. This finding is similar to that of Abbas et al. (2021), who found that UIC acts as a partial mediator in the positive relationship between quality

management and students' employability in higher education institutes. As employability is seen as one of the measures of an institute's performance (Knight and Yorke, 2003), TVET institutes have initiated many practices to pursue quality and suitable employment, for example, improving the adaptability of programs, setting a clear strategy of serving the society, providing resources and infrastructures for learning by experience and doing, and especially, building closely connection with industry. Such a university environment with positive industrial and real work-life exposure can promote students' attitudes toward teamwork, social skills, field knowledge, communication, information and technology, management, creativity and innovation, problem-solving, and critical thinking (Nugraha et al., 2020), intellectual abilities, and self-confidence (Papanthymou and Darra, 2017), ultimately improving their employability.

Overall, the results supported that YHQC positively and significantly shaped favorable SPE among the sampled Chinese TVET students, with UIC acting as a partial mediator (*cf.* Figure 4).

5 Discussion

Employability is one of the most significant factors that affect students' choice of where to study (Diamond et al., 2012). By collecting data from one vocational education institute in China, the current investigation empirically validated the positive, significant impact of YHQC on SPE while simultaneously establishing the mediating role of UIC. Facing the intense criticism that graduates could not find proper work due to their inability to develop professional knowledge, expertise, and required characteristics, Huang valued principles like good social interaction, scientific management, faculty with theory and experiences, and learning by doing. Huang preferred to hire faculty with experience, advocating that the programs and textbooks should align with professional practices (Huang, 2019c, 2022a,b). In line with Huang's philosophy, students valued the importance of hands-on learning, teaching of knowledge and skills required by industry, and learning while doing real work (*cf.* Huang, 2019c). As predicted, the sampled TVET institutes assigned significant importance to the quality of education maintained by the institute and its leadership. They agreed on setting the needed resources and proper procedures to develop practical competencies, skills, and values among students. Echoing Huang's beliefs, the respondents preferred practical education and competency-based and experiential learning through effective UIC for better employment prospects. As Gentry (1990) stated, experiential learning is mandatory because students may forget what they hear or see but are less likely to forget what they do. As reported by respondents, competency-based education, coupled with UIC experience, could develop and match their knowledge, skills, and abilities with employer demands (Lurie and Garrett, 2017), enabling them to meet the needs of their future job (*cf.* Makulova et al., 2015). As validated by results, students assigned significant value to the importance of dedicated leadership, strategy (socialization), people(teachers), resources, and processes (scientific management) in providing good vocational education. Therefore, it is not surprising that universities with all the above elements in the quality culture prioritize students' development so their students can have high expectations of their future employment.

5.1 Theoretical implications

Theoretically, the current conceptual and empirical framework has several implications. The proposed model connects HCT (labor economics) to TVET, setting a platform for further debates in the SPE literature. Such integration provides a novel viewpoint on how the quality of vocational education improves students' human capital through skills and knowledge focused on employability. Second, the study bridges the gap between previous literature on TVET and TQM by offering measurable context-specific quality culture metrics, i.e., YHQC. By doing so, the paper examines quality culture in a TVET institution and connects it to UIC and SPE. While affirming the philosophy of Huang for enhancing accessibility, employment, social connection, and equity in TVET education, the data-driven theoretical model aligns with the tenets of TQM, positing continuous emphasis on product quality as per stakeholder expectations and improving the quality of education through various initiatives, e.g., YHQC and UIC (Tarí et al., 2020).

Third, built on the THM (Etzkowitz and Leydesdorff, 2000; Etzkowitz and Zhou, 2017; Cai and Amaral, 2022), the paper establishes the complementary role of UIC in connecting two different sectors, i.e., industry and academia. The empirical framework supports the function of TVET institute as a bridge, equipping students to meet labor market demands with the partnership of industry and government support. Precisely, the THM integration offers an inclusive framework to understand the mechanism through which multi-stakeholder collaborations could improve TVET outcomes. Fourth, the theoretical model enriches existing vocational education literature by identifying and establishing two critical antecedents to SPE in the TVET context of China while simultaneously demonstrating the pertinence of YHQC philosophy and the role of UIC in contemporary TVET settings. Fifth, the paper not only utilizes robust statistical methods (SEM) to establish an integrative theoretical framework based on multiple theoretical concepts (i.e., HCT, TQM, and THM) to explain the YHQC-UIC-SPE nexus, but it also provides empirical support to context-specific (Chinese TVET) research tools (*cf.* Rothwell et al., 2008; Ankrah and Al-Tabbaa, 2015).

5.2 Practical implications

The construction of a quality culture needs organizational support and integration of quality commitment and rigid quality management (Xu and Ma, 2017). Quality culture enables institutes to understand the cause-and-effect relationship and to achieve and sustain excellent performance by meeting all stakeholders' expectations (Abbas et al., 2021). The paper draws from the empirical data to offer several actionable and practical insights for concerned stakeholders, including governments, TEVT institutes, and enterprises.

Governments should introduce more relevant policies to encourage and promote the integration of industry and education. Firstly, government policies and funding should further support the integration of the TVET and industry, aligning with national development plans and goals, like Made in China 2025. For example, the government can further improve the "1 + X" certificate system and give more students professional qualifications during their study period, increasing students' potential employability. Secondly, the government can establish an

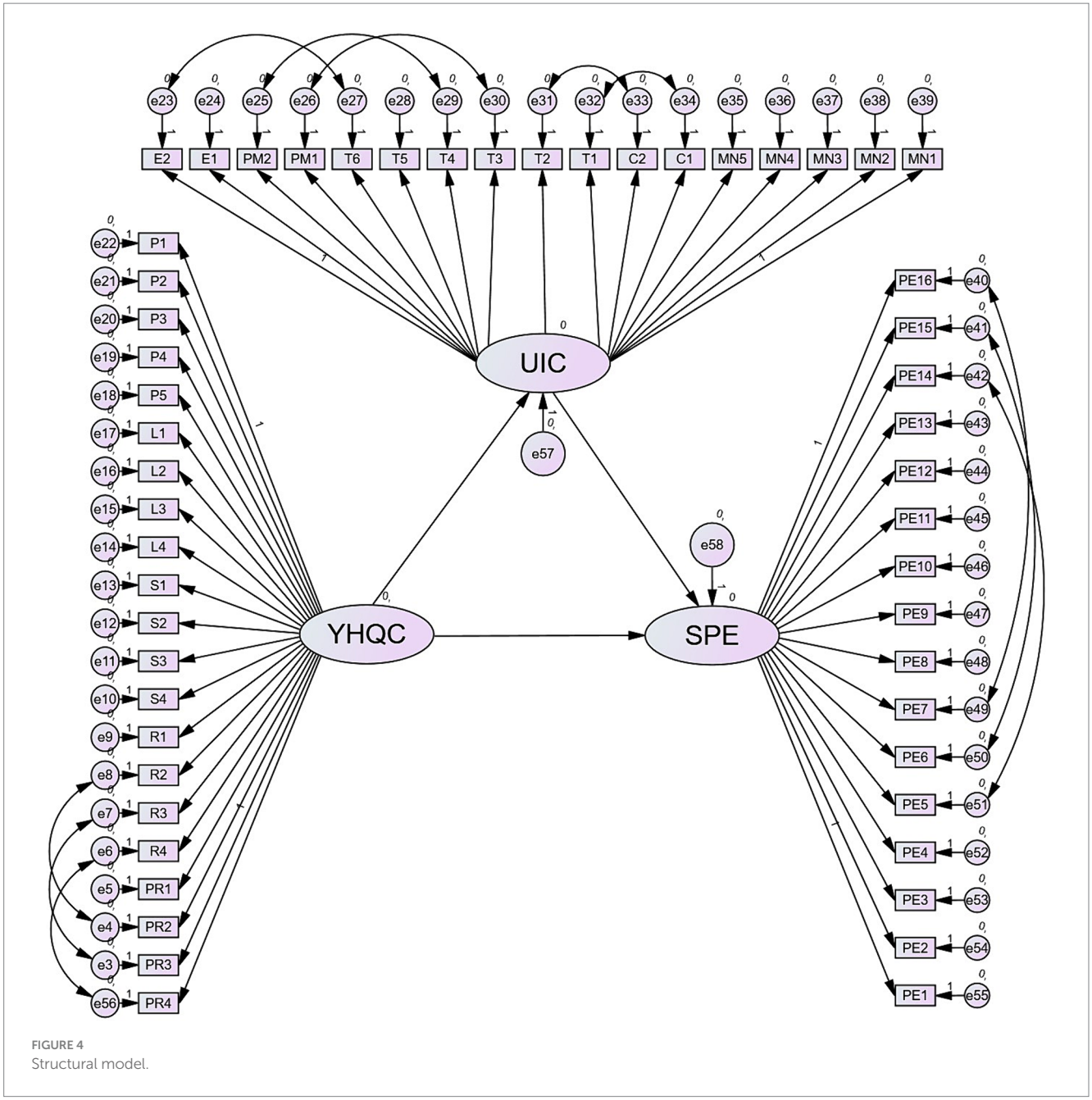

FIGURE 4
Structural model.

information platform to connect TVET schools and enterprises, exchange information, and dock demand between the two sides. Currently, the municipal industry and education consortium and the professional industry and education community have been in practice all over China, and they are expected to channel the academic and industry sides closely. Thirdly, governments can increase investment in TVET and provide more funds and resources to improve teaching facilities, ultimately enhancing student employability and encouraging enterprise active participation in education.

For TVET institutes, embracing a quality culture that focuses on employability is pivotal. Firstly, institutes can construct their quality management system or adopt core principles from Huang's philosophies, such as emphasizing socialization, respecting labor dignity, and social responsibility in the institute's ethos. This work encourages policymakers and educational leaders to promote specific initiatives to design, develop, and improve quality culture (i.e., YHQC) in all TVET institutes activities to enhance the readiness of TVET graduates for the Chinese labor markets (Chen et al., 2015; Drydakis, 2016; Government of China, 2022; Ministry of Education of the People's Republic of China, 2023). Integration of quality management systems in higher education institutes boosts the institutional as well as the performance of individual students (Manatos, 2017; Papanthymou and Darra, 2017; Abbas et al., 2021). The TQM can be a valuable tool for pursuing continuous improvement and adaptability. Activities like faculty development programs, industry engagement, feedback surveys, student service and activities, and work-based learning programs can incorporate those values, preparing students

for employment and cultivating responsible citizens for society. For example, the industry feedback seminars, industry visits, and questionnaires can facilitate direct communication between the institutes and industry partners, ensuring its curriculum stays aligned with the evolving tech industry needs.

Secondly, in the UIC context, vocational institutes should collaborate closely with local and national industry partners, integrate industry standards, and promote more employability-centric curricula and programs (Pitan and Atiku, 2017; Liu and Li, 2023). Specifically, UIC can include internships in industry, training teachers, joint cultivating students, collaborative research projects, curriculum co-development, and joint construction of training rooms. Thus, students and teachers can learn the knowledge and skills that meet the needs of the industry. This alignment with industry needs is essential for enhancing students' employability in the rapidly evolving job market. Thirdly, the institutes should develop more programs in new industry sectors, such as green and A.I. technology, emerging service, and green economy, and use the partners' help in curriculum design to include the latest technological advancements and market demands. In addition to the cultivation of professional skills, institutes should pay attention to the cultivation of communication, teamwork, innovation, and other comprehensive qualities to meet the needs of enterprises. Fourthly, institutes should take the initiative to engage enterprises to participate in universities' educating activities. Through enterprise visiting, internships, professional competitions, project cooperation, and other forms, students engage in hands-on projects directly. Then, they can learn and apply theoretical knowledge in the actual working environment to improve their career adaptability and employability. Lastly, the findings recommend cultivating and introducing full-time or part-time teachers with rich industry experience and good teaching ability and setting different faculty development programs to encourage teachers to participate in enterprise practice, understand the latest industry trends, and improve teaching quality.

For industry, the results assert the need for enterprises to take the social responsibility of educating skilled talents and actively collaborate with the TVET institutes. Firstly, the industry should actively provide internship and employment opportunities to provide students with a platform for practice and employment. At the same time, they select and cultivate suitable talents for the company's sake. Secondly, enterprises can provide relevant equipment and resources, participate in the course design and teaching process, introduce practical cases and experiences of the industry into teaching, and improve students' practical ability and professional skills. Thirdly, enterprises can collaborate and utilize the intelligence of faculty and students in TVET to update or create new products and techniques.

6 Conclusion

Vocational education is an integral part of the national education system and human resources development, and it is a crucial way to train diversified talents, inherit technical skills, and promote employment and entrepreneurship. The high-quality development of vocational education is essential for promoting national industrial upgrading and economic restructuring. TVET institutes are expected to train more high-quality technical and skilled personnel, skilled craftsmen, and artisans, and the mission is to improve people's ability to find employment and entrepreneurship, enhancing their ability to get rich. However, TVET graduates' poor performance in the industry is a long-lasting issue faced by industrialists. The industry still faces problems, such as ineffective teaching and learning in the real world, and TVET institutes face indifferent enterprise partners (Liu and Li, 2023). This study sheds light on the industry's role by incorporating UIC in the relationship between YHQC and SPE in vocational education. The finding showed that a significant positive impact of quality culture on SPE and UIC partially mediates their relationship.

Despite its significance, the current research has several limitations. For instance, the findings drawn from the sample data from students and faculty in one public TVET university are less generalizable and limited by geographical, institutional, and demographic biases. Of a few mitigation strategies, the paper describes the sample, context, and characteristics of the sample institution, in addition to robustness and sensitivity checks. Since the perception of students concerning quality culture in the sampled institute and their employability could be biased and not represent students in private institutes, future vocational experts can investigate multi-institutional research across different institutions, regions, and stakeholders, like employers. More so, future researchers could enhance sample diversity and longitudinal design to capture more intricate details about the effect of time, educational background, and demographics. The current sample limitation of using a small sample can be addressed by including a larger sample size and students from other institutes. Finally, factors that impact employability include fields of study and the profession's demand in the labor market (Rothwell et al., 2008). Future research should investigate the influence of other factors, like gender, field of study, and job demands. Future research can further explore the effects of different collaborations (e.g., internships, joint projects, curriculum development, academic and professional gatherings, co-publications, tailored educational programs, internships, and lectures by industry members at universities and vice versa) to enhance the UIC.

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 following institutional requirements and local legislations, no approval and ethical review were required for this work on human participants. All participants were provided a written informed consent form/statement. 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

HL: Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Software,

Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. SK: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. MS: Formal analysis, Methodology, Resources, Software, Validation, Visualization, Writing – original draft, 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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Organisational coaching to improve workplace resilience: a scoping review and agenda for future research

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In an increasingly demanding and pressured work environment, employee resilience is acknowledged as a critical element to navigate adversity. There has been increased focus and interest in studying the nature of resilience in the workplace, however the mechanisms of developing and sustaining resilience are still under debate. Coaching is a promising method organisations use to improve employee resilience and provides employees with support to deal with the challenging working environment. There has been significant interest in coaching for resilience in recent years, however there is no overarching, consolidated view on the nature and dynamics of resilience coaching. This scoping review seeks to fill this gap by making three contributions. Firstly, we present details on various types of coaching approaches used to improve resilience. Secondly, we review the specific coaching elements and processes that lead to improved resilience and finally, we provide an overview on the efficacy of resilience coaching interventions. We conclude this scoping review with a roadmap for future research to help position and strengthen organisational coaching as a pillar of resilience development. This scoping review followed a five-stage PRISMA-ScR methodology which entails formulating research questions; identifying studies; choosing studies; extracting and charting data; and summarising the findings.

KEYWORDS

resilience, organisational coaching, resilience coaching, scoping review, coaching

1 Introduction

The importance of resilience in the workplace has been increasingly recognised, with literature highlighting it as a crucial quality for employees (King et al., 2016; Hartwig et al., 2020). Resilience involves effectively utilising resources and skills to mitigate the adverse effects of negative experiences (Vanhove et al., 2016). It plays a significant role in how individuals cope with workplace stressors and is a key factor in preventing outcomes like anxiety, burnout, and compassion fatigue (Rees et al., 2015). Additionally, resilience encompasses the ability to adapt and endure stress, making it vital in today's challenging work environment (Schwartz, 2018).

Coaching has emerged as a method organisations use to enhance resilience, providing employees with development tools and frameworks (Turk and Saue, 2021; Ali and Aziz, 2018). Research shows that various coaching approaches positively influence resilience (Lawton-Smith, 2017), and there is growing interest in using coaching to support employees facing tough work conditions (Stark, 2021). Evidence indicates that coaching effectively enhances resilience (Gyllensten and Palmer, 2012; Moore and Jackson, 2014), with specific interventions helping leaders navigate challenging work environments (Bennett and Lemoine, 2014). Studies

by Grant et al. (2009) and Sherlock-Storey et al. (2013) demonstrated improvements in resilience following coaching interventions.

However, a significant gap in coaching research is the lack of studies examining the processes of change within coaching (Grover and Furnham, 2016), particularly in resilience coaching. Despite growing interest in this area, no systematic or scoping reviews specifically addressing coaching interventions aimed at increasing psychological resilience in the workplace. To address this gap, we conducted a scoping review of resilience coaching interventions, following a five-stage PRISMA-ScR methodology (Arksey and O'Malley, 2005). The review was guided by three research questions:

1 What coaching approaches are currently used in resilience coaching?
2 What processes are followed in resilience coaching?
3 What benefits do participants derive from resilience coaching?

This scoping review fills an evident gap in the literature by systematically compiling effective resilience coaching interventions, critically examining various coaching approaches, and deepening the understanding of the dynamic processes through which resilience develops in coaching. The findings aim to help coaches better design interventions that promote resilience in the workplace (Liu et al., 2019).

2 Conceptual and theoretical perspectives

2.1 Psychological resilience

The terminology surrounding psychological resilience lacks consistency, with various terms used interchangeably, such as personal resilience, mental resilience, emotional resilience, cognitive resilience, and individual resilience (IJntema et al., 2019). Scholars have offered different definitions of psychological resilience. Luthar et al. (2000) describe it as "a dynamic process encompassing positive adaptation within the context of significant adversity" (p. 20). Meanwhile, Paul and Garg (2014) define resilience as "a unique ability to endure and recover fully from extreme conditions, setbacks, trauma, and other adversity" (p. 72).

The inconsistency in the definition of resilience is the difference in conceptualisation of resilience by different researchers. Resilience is a complex concept, and research has conceptualised it as a trait, an individual's skills or abilities, or a capacity to function positively when exposed to adversity (Van Breda, 2018). Early studies suggested that resilience was characterised by static character traits, with the trait-oriented approach focusing on a hardy personality type (Chmitorz et al., 2018; Galazka and Jarosz, 2019). Later, it was viewed as an outcome, where psychological health is maintained or recovered despite challenges (Kalisch et al., 2017). The outcome-oriented approach emphasises psychological health being sustained or recovered despite adversity (Southwick et al., 2014). Resilience is flexible and influenced by various factors, including internal factors like genetics and resilience-conducive personality traits (Bonanno and Diminich, 2013; Masten, 2001). In this article, we align our conceptualisation of resilience with the emerging view in recent research suggests that resilience can also be viewed as a dynamic and interactive process (Southwick and Charney, 2012). This view is supported by literature indicating that resilience is a malleable epiphenomenon that can be developed, and that individuals can learn to deal with adversity (Neenan, 2018; Winwood et al., 2013; Liu et al., 2019).

2.2 Benefits of increased resilience in the workplace

Research underscores the significance of enhancing psychological resilience among employees, especially during organisational change, as it can protect against negative impacts (Brown and Abuatiq, 2020). Building resilience is associated with reduced burnout and its effects (Ghossoub et al., 2020) and contributes to improved mental health, positive emotions, self-efficacy, and coping skills (Ke et al., 2022).

The benefits of psychological resilience include greater wellbeing, higher self-efficacy, increased job satisfaction, and improved productivity (McEwen and Boyd, 2018). Resilient individuals experience less anxiety, demonstrate cognitive flexibility, and are more likely to view challenges positively (Baker et al., 2021). Other advantages include a sense of control, effective coping, and personal development opportunities (Fletcher and Sarkar, 2013). Overall, individuals with high resilience approach life with optimism and energy, making them less vulnerable to stress-related issues like depression and burnout (Young, 2014).

2.3 Coaching for resilience

Research emphasises the growing emphasis on resilience coaching within research and practice, highlighting its effectiveness in helping individuals navigate challenges in the workplace. Lawton-Smith (2015) suggests that coaching serves as a proactive strategy for enhancing psychological resilience. A meta-analysis by Vanhove et al. (2016) finds that coaching is more effective than traditional classroom-based approaches for building resilience. Coaching offers distinct advantages, such as providing a confidential space for discussing difficulties, proactively developing skills, and facilitating open conversations about challenges. Research indicates that coaching empowers individuals to manage their professional lives and make informed career choices (Dyrbye et al., 2019).

In the context of workplace coaching, the coach assists the coachee in developing a self-regulation process that enhances their wellbeing (Fontes and Dello Russo, 2021). Bozer and Jones (2018) describe workplace coaching as a personalised, collaborative intervention aimed at achieving the coachee's goals. Coaches create a supportive environment that encourages self-reflection, poses challenging questions, and work with coachees to devise solutions and action plans (Grant, 2014). This guided introspection fosters self-awareness, enhances self-control, and alleviates anxiety (Grant, 2017). Reflecting on one's strengths and weaknesses cultivates resilience-related skills, such as improved coping mechanisms and problem-solving abilities (Grant and Kinman, 2014).

3 Methods

Scoping review guidelines (Arksey and O'Malley, 2005, PRISMA-ScR: Tricco et al., 2018) were followed in conducting this

scoping review. The five stages of scoping review methodology, as outlined by Arksey and O'Malley (2005) were applied as follows: (1) formulating research questions; (2) identifying studies; (3) choosing studies; (4) extracting and charting data; and (5) summarising the findings.

3.1 Identification of studies

The Stellenbosch University multi-database search engine, Ebscohost, Scopus, and Web of Science were all targeted in a comprehensive search strategy that was developed using text words found in the titles and abstracts of pertinent papers as well as the index keywords used to describe the articles. Each identified keyword and index terms in the search strategy was modified for each database and/or information source that was used. We created an appropriate research string for each database by combining the terms "coaching for resilience," "resilience coaching," and "resilien∗ AND coach∗," and we searched inside titles, abstracts, and keywords.

3.2 Inclusion and exclusion criteria

The review examines psychological resilience coaching for adults in workplace settings. The search criteria included only peer-reviewed journal articles in English with available abstracts. In addition to database searches, the researchers employed a snowballing technique, exploring the reference lists of existing reviews and identified publications.

Studies were excluded based on several criteria, including:

- Non-peer-reviewed articles (e.g., book reviews, conference papers, theses, and dissertations).
- Focus on types of resilience other than psychological resilience.
- Non-adult populations.
- Publications in languages other than English.
- Textbooks, opinion pieces, or practitioner contributions lacking empirical data.
- Editorials or philosophical papers.
- Articles with substantial content overlap or exact duplicates.
- Non-accessible articles (i.e., those that were not open access or could not be accessed via the university library).

3.3 Selection of studies

After the search for relevant studies, duplicate citations were removed, and the remaining references were uploaded into EndNote 21/2023. Three reviewers convened to discuss the inclusion and exclusion criteria for studies, as outlined by Levac et al. (2010). Each reviewer independently assessed the abstracts from the search, refining the search strategy based on their findings.

We then reviewed full articles for inclusion, retrieving texts for potentially relevant studies and updating EndNote with citation details. The reviewers evaluated the complete texts against the inclusion criteria and resolved any disagreements through discussion. The outcomes of the search and selection process are illustrated in a PRISMA-ScR flow diagram (Tricco et al., 2018), shown in Figure 1.

3.4 Data extraction

A comprehensive set of information on the participants, concept, context, study methods, and significant findings pertinent to the review question are included in the extracted data. An Excel spreadsheet was used to keep a systematic data-extraction as well as analysis process. We extracted the pertinent data from each study, including the authors, year, study design, sample, and results. This phase gave a broad summary of resilience coaching programme elements from the literature and served as the basis for a more in-depth analysis.

3.5 Data analysis and presentation

In this scoping review, we employed qualitative content analysis to identify key qualities and factors associated with resilience coaching. This method, following the framework established by Kleinheksel et al. (2020), involved using frequency counts to assess the prevalence of specific codes within the text as an indicator of their significance. The analysis process began with an immersive reading of the text, alongside transcribing recorded data, which allowed us to become intimately familiar with the material and generate preliminary ideas about potential concepts or themes (Kleinheksel et al., 2020). The first step involved identifying units of meaning within the text. After recognising and condensing these units, we assigned codes to them, organizing the data for greater clarity. Next, we used two or more code categories to uncover or support broader underlying meanings, ultimately leading to the development of themes (Kleinheksel et al., 2020). This thorough examination of each publication was conducted over multiple rounds to ensure a comprehensive understanding of the material.

4 Results

4.1 General overview

We found 17 relevant papers, with a focus on resilience coaching interventions in business settings (see Table 1). The findings are presented in a narrative and tabular format, summarising the resilience coaching programmes, their characteristics, and the outcomes.

Figure 2 summarises the steps involved in the coaching sessions, linking the steps to approaches aimed at fostering resilience, elucidating how these approaches were measured and how their effectiveness was evaluated.

4.2 Coaching approach

The reviewed studies employed various coaching approaches, with the most common being the cognitive behavioural and

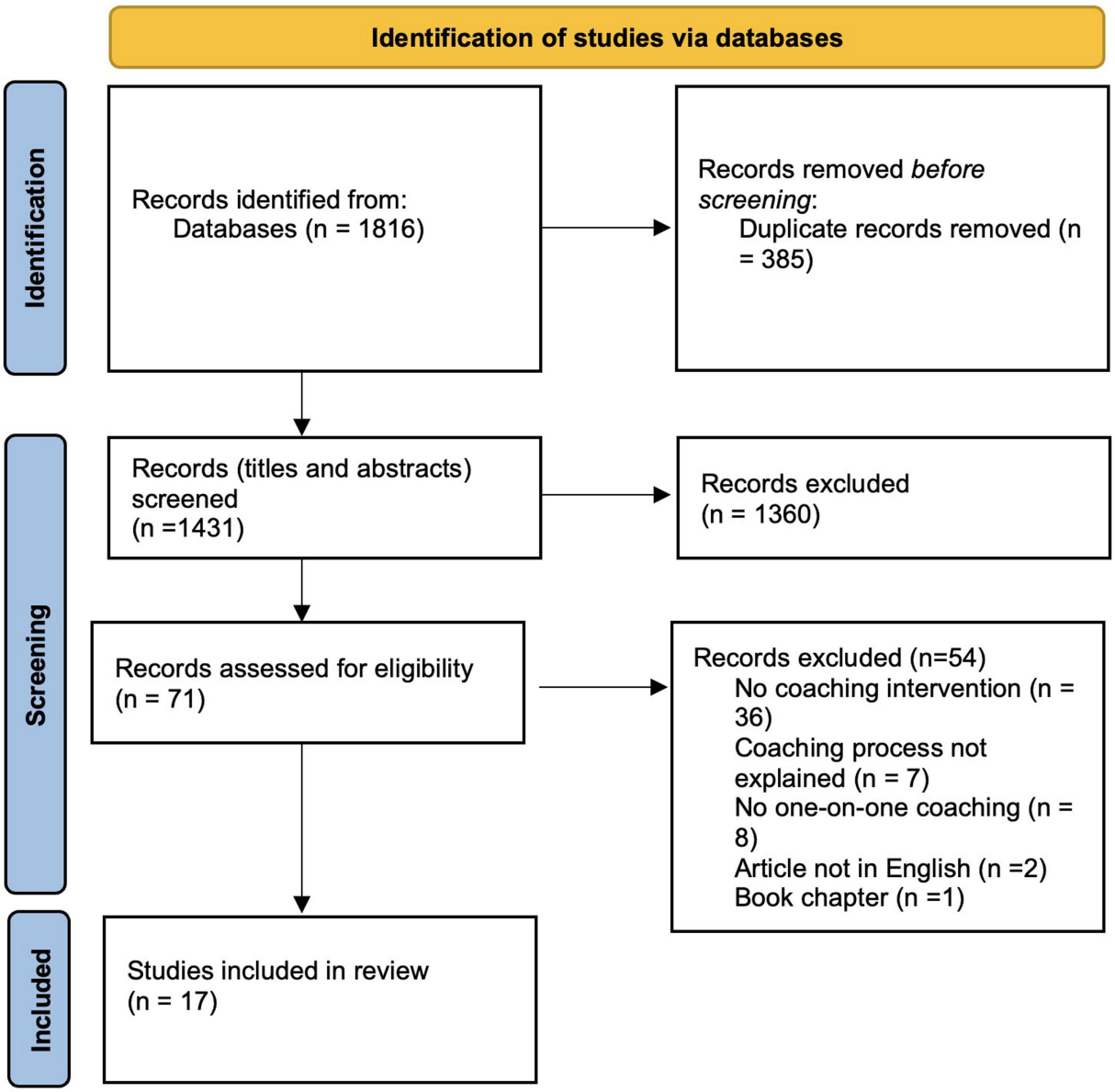

FIGURE 1
Paper selection process.

solution-focused framework, used in four studies (Grant et al., 2009; Grant et al., 2010; Grant, 2014; Grant et al., 2017). Two studies utilised a positive psychology approach (Archer and Yates, 2017; Song et al., 2020). Additionally, two studies combined multiple approaches. Brown and Yates (2018) applied a humanistic approach, integrating elements from positive psychology, solution-focused coaching, and cognitive behavioural coaching. Gray (2016) created a wellbeing coaching approach for individuals and teams facing organisational transitions, drawing on positive psychology, neuroscience, and pedagogy. However, nine studies (Auer et al., 2022; Dyrbye et al., 2019; De Haan et al., 2019; Fontes and Dello Russo, 2021; IJntema et al., 2021; Jeannotte et al., 2021; McKimm and Povey, 2018; Sherlock-Storey et al., 2013; Timson, 2015) did not specify the coaching approach used. Lastly, three studies (Fontes and Dello Russo, 2021; Grant et al., 2009; Grant et al., 2010) employed the GROW model (Goal, Reality, Options, Way forward) to ensure the coaching conversations were goal-oriented and structured.

4.3 Coaching delivery steps

4.3.1 Pre-coaching activities

In eight studies, participants engaged in various pre-coaching exercises before the first coaching session (Auer et al., 2022; De Haan et al., 2019; Fontes and Dello Russo, 2021; Grant et al., 2009; Grant et al., 2010; Grant et al., 2017; IJntema et al., 2021; Sherlock-Storey et al., 2013). These activities included:

- Assessments (IJntema et al., 2021; Jeannotte et al., 2021)

TABLE 1 Summary of included studies.

Authors and date of publication	Study design	Sample size	Number of sessions and duration of coaching programme	Coaching approach	Outcome measures	Data analysis	Measurement time points	Outcomes
Archer and Yates (2017)	Interpretative phenomenological analysis.	5	Four coaching sessions in 6 months	Positive psychology.	Semi-structured interviews a month after the intervention.	Qualitative—thematic analysis.	Two time points—Pre- and Post measures.	• Increased resilience.
Auer et al. (2022)	Mixed quasi-experimental design.	1,005	3–45 coaching sessions in 6–40 weeks.	Not specified.	A single Likert-type item "I recover quickly after stressful experiences."	Quantitative - series of linear mixed-effect models with random intercepts and fixed predictors.	Two time points—Pre- and Post measures.	• Increased resilience in the coaching group.
Brown and Yates (2018)	Action research study.	5	Three sessions in 3 months.	Humanistic approach drawing on Positive Psychology, solutions focused and cognitive behavioural.	Semi-structured interview.	Qualitative - Interpretative Phenomenological Analysis.	Qualitative data (1 time point).	• Increased resilience.
De Haan et al. (2019)	Randomised study design.	180	Maximum 12 sessions in 14 months.	Not specified.	Brief Resilience Scale.	Quantitative—*T*-tests.	Three Time Points (Pre-, Post-, and Follow-Up Measures).	• Coaching increased resilience
Dyrbye et al. (2019)	Pilot randomised clinical trial.	82	Five coaching sessions in 5 months.	Not specified.	10-item Connor-Davidson Resilience Scale.	Quantitative - SAS, Kruskal-Wallis or χ^2 tests	Two time points—Pre- and Post measures.	• Intervention group increased resilience.
Fontes and Dello Russo (2021)	Experimental field study.	56	Four sessions once a month.	Not specified.	Psychological Capital Questionnaire short form (PCQ-12).	Quantitative - ANOVA with repeated measures.	Three time points (Pre-, Post-, and Follow-Up Measures).	• Increase in PsyCap.
Grant et al. (2009)	Randomised controlled waitlist design.	41	Four sessions in 8–10 weeks.	Cognitive behavioural, solution focused framework.	18-item Cognitive Hardiness Scale.	Mixed methods- repeated measures ANOVA; thematic analysis (Spector, 1984).	Three time points (Pre-, Post-, and Follow-Up Measures).	• Enhanced resilience.
Grant et al. (2010)	Mixed experimental and quasi-experimental designs.	50	10 sessions in 20 weeks.	Cognitive behavioural, solution focused framework.	18-item Cognitive Hardiness Scale.	Quantitative—repeated measures ANOVA.	Three time points (Pre-, Post-, and Follow-Up Measures).	• The coaching group reported increased resilience.
Grant (2014)	Within-subjects (pre2post) design.	31	Four sessions.	Cognitive behavioural, solution focused framework.	10-item Cognitive Hardiness Scale.	Mixed methods—Paired *t*-tests; Open-question method.	Two time points—Pre- and Post measures.	• The coaching programme was effective at enhancing resilience.

(Continued)

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TABLE 1 (Continued)

Authors and date of publication	Study design	Sample size	Number of sessions and duration of coaching programme	Coaching approach	Outcome measures	Data analysis	Measurement time points	Outcomes
Grant et al. (2017)	Within-subjects (pre2post) design.	31	Six sessions in 6 months.	Cognitive behavioural, solution focused framework.	10-item cognitive hardiness scale	Mixed methods—Paired *t*-tests; Open-question method.	Two time points– pre- and post measures.	• Participants become more resilient.
Gray (2016)	Empirical phenomenological case study.	4	Four sessions	Custom wellbeing coaching model based on positive psychology, neuroscience, and pedagogy.	7 item Likert scale.	Qualitative - empirical phenomenological case study.	Three time points (pre-, post-, and follow-up measures).	• Participants experienced a transformational understanding of individual resilience at work. • Construction of new schema relating to resilience.
IJntema et al. (2021)	Quasi-experimental field study.	91	Four sessions in 13 weeks.	Not specified.	6-item brief resilience scale.	Quantitative - SPSS 24	Three time points (Pre-, Post-, and Follow-Up Measures).	• Positive immediate and long-term effects were found.
Jeannotte et al. (2021)	Longitudinal, observational within-subjects design.	391	At least eight coaching sessions.	Not specified.	Custom nine dimensions scale were newly developed for BetterUp.	Mixed study - self-report survey measures; questionnaires; ANOVA.	Three time points (pre-, post-, and follow-up measures).	• Increased resilience. • Larger resilience gains in the second half of the intervention ($\beta = 0.08–0.18$).
McKimm and Povey (2018)	Mixed-methods study.	52	Between 3 months and 1 year.	Not specified.	Robertson Cooper i-resilience online tool.	Mixed methods - survey questionnaire; semi-structured interviews; human function curve; Robertson Cooper's validated online i-resilience questionnaire	2 time points– Pre-and Post measures.	• Participants moved from "distress," "boredom" and excess pressure nearer to the "safe zone."
Sherlock-Storey et al. (2013)	Test/re-test design.	52	Three coaching sessions over 6 weeks.	Not specified.	Psychological capital (PsyCap) questionnaire PCQ.	Quantitative - Kolmogorov-Smirnoff tests, sample *t*-tests.	2 time points– pre-and post measures.	• Increased personal resilience.
Song et al. (2020)	Mixed-methods study.	25	Eight sessions over an academic year.	Positive psychology approach.	6-item brief resilience scale.	Qualitative - reformulated grounded theory.	2 time points—pre-and post measures.	• Improved resilience.
Timson (2015)	Qualitative.	6	Not specified.	Not specified.	Thematic analysis.	Qualitative—thematic analysis.	Qualitative data (1 time point)	• Coaching provided time and space for reflection and learning.

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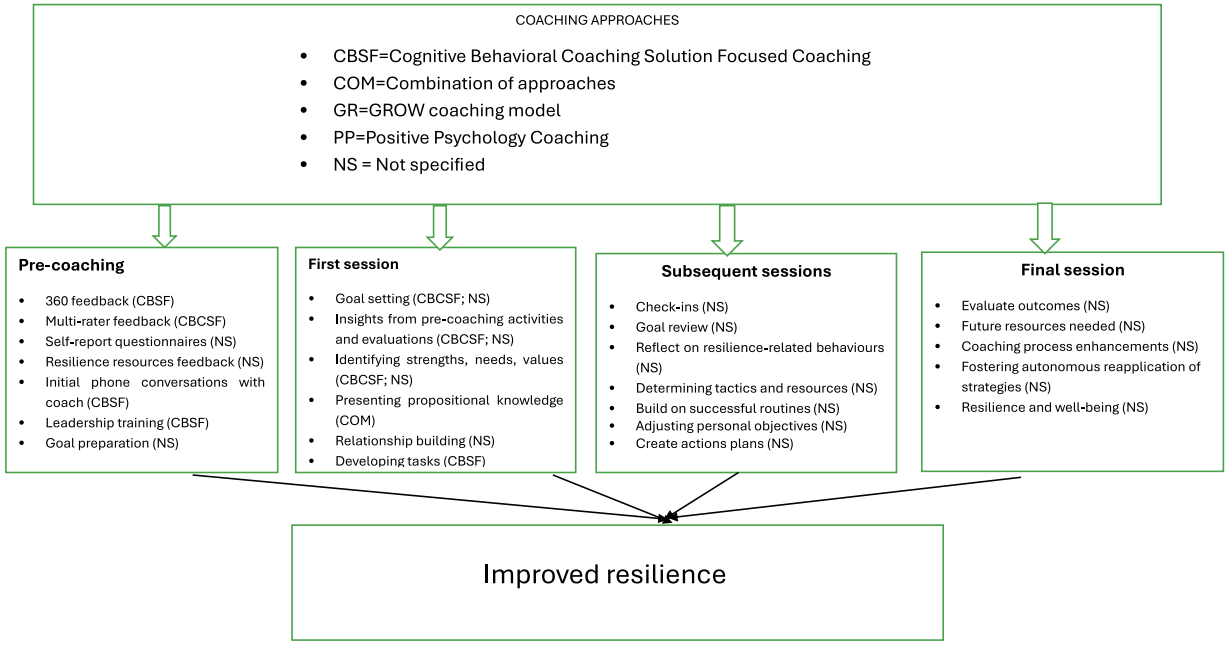

FIGURE 2
Summary of the coaching approaches and steps.

- 360-degree feedback (Grant et al., 2009)
- Multi-rater feedback (Grant et al., 2010)
- Initial phone conversation with their coach (Grant et al., 2017)
- Online questionnaires (De Haan et al., 2019)
- Self-report questionnaire (Fontes and Dello Russo, 2021)
- Pre-COVID-19 surveys (Auer et al., 2022)
- Pre-coaching activities (Sherlock-Storey et al., 2013)

In six studies (Archer and Yates, 2017; Grant et al., 2009, 2010, 2017; IJntema et al., 2021; Sherlock-Storey et al., 2013), additional activities beyond assessments were included. For example:

- In Grant et al. (2009), participants received 360-degree feedback on their leadership styles and attended a half-day leadership training course.
- In Grant et al. (2017), participants had an introductory phone conversation with their selected coach.
- In IJntema et al. (2021), participants received individual feedback reports on their resilience resources before the first session.
- Archer and Yates (2017) collected an initial written description of participants' career confidence prior to coaching.
- Grant et al. (2010) involved an orientation meeting before coaching.
- Sherlock-Storey et al. (2013) included pre-coaching activities where participants set preliminary goals related to resilience and wellbeing, with a workbook providing reflective exercises.

These preparatory activities helped participants reflect on their resilience, leadership styles, and personal goals, thereby enhancing the effectiveness of the coaching interventions.

4.3.2 Typical coaching session

Seven studies discussed the roles of both the coach and coachee during coaching sessions (Dyrbye et al., 2019; Grant, 2014; Grant et al., 2009; Grant et al., 2010; Grant et al., 2017; Gray, 2016; Jeannotte et al., 2021), emphasizing their collaborative dynamic.

Coachee's role:

- *Self-led development*: Coachees took the lead in conversations, steering their own growth and progress at their own pace (Jeannotte et al., 2021).
- *Schemata identification and replacement*: Participants identified and replaced harmful thought patterns through guided inductive reasoning and co-construction during coaching sessions (Gray, 2016).
- *Session preparation*: Before each session, coachees completed a readiness document, outlining their objectives, progress, and challenges faced (Grant, 2014).
- *Documentation of insights and actions*: Coachees were responsible for documenting personal insights and agreed-upon action plans during coaching (Grant, 2014).

Coach's role:

- *Facilitating introspection and collaboration*: Coaches provided a private space for reflection, asked challenging questions, and collaborated with coachees to generate ideas, find solutions, and create action plans (Grant, 2014).
- *Monitoring progress*: Coaches guided coachees through the self-regulation cycle, helping them develop action plans, monitor

progress, and evaluate it between sessions (Grant et al., 2009; Grant et al., 2017).

- *Self-reflection*: Coaches maintained self-reflection notebooks after each session to ensure they adhered to best practices and maintained the fidelity of the coaching program (Dyrbye et al., 2019; Grant et al., 2010).
- *Encouraging behaviour change*: At the end of each session, coaches helped create a list of specific action steps for the coachees to complete before the next session, aiming to facilitate meaningful behavioural changes (Grant, 2014).

This balance between the coachee's proactive involvement and the coach's structured guidance was key in fostering resilience and personal development.

4.3.3 First coaching sessions

In four of the reviewed studies (Fontes and Dello Russo, 2021; Grant et al., 2009; IJntema et al., 2021; Sherlock-Storey et al., 2013), the insights from pre-coaching activities and evaluations were revisited and assessed during the first coaching session. According to four studies (Archer and Yates, 2017; Dyrbye et al., 2019; Grant et al., 2010; Sherlock-Storey et al., 2013), participants focused on identifying their strengths, needs, values, and areas of resilience during this initial session. This helped set a foundation for the coaching process by ensuring the participants had a clear understanding of their personal capacities and challenges. Goal setting was a key activity in the first session across six studies (Dyrbye et al., 2019; Fontes and Dello Russo, 2021; Grant et al., 2009, 2010; IJntema et al., 2021; Sherlock-Storey et al., 2013), where participants collaboratively established specific objectives that would guide their coaching journey.

In the Gray (2016) study, the first session was slightly different as it focused on presenting propositional knowledge about workplace stress and explaining the coaching model and procedure to the participants. This educational aspect ensured that participants had a clear understanding of how the coaching would proceed and what the expected outcomes might be.

In the Dyrbye et al. (2019) study, the goal of the first session was to build a relationship between the coach and coachee, while also developing an action plan. The establishment of trust and rapport was seen as a critical step in enabling successful coaching outcomes.

Finally, in two instances (Grant et al., 2009; Grant et al., 2010), coachees were tasked with developing between-session action steps during the first session. These tasks were designed to be completed before the next meeting, allowing participants to actively engage with their goals and make early progress in their development.

4.3.4 Subsequent coaching sessions

In the reviewed studies, a variety of activities were noted to take place during subsequent coaching sessions:

1. *Checking in and reviewing progress*: Participants frequently reviewed any strategic actions they had taken since the previous session, monitored their progress towards set goals, and discussed accountability for their actions (Dyrbye et al., 2019; IJntema et al., 2021; Sherlock-Storey et al., 2013).
2. *Determining tactics and resources*: In some sessions, participants explored potential strategies and resources that could help them meet their objectives (Fontes and Dello Russo, 2021).
3. *Fostering resilience and self-efficacy*: Participants focused on enhancing their resilience by reflecting on and replicating successful episodes and routines, thereby building their self-efficacy (Fontes and Dello Russo, 2021).
4. *Adjusting personal objectives*: As participants progressed, they adjusted their personal goals as needed to reflect their evolving challenges and achievements (IJntema et al., 2021).
5. *Creating action plans*: Participants developed action plans during each session to guide their efforts in achieving goals and developing the necessary resources between sessions (IJntema et al., 2021).

These activities reinforced continuous reflection, adaptation, and accountability, all of which were integral to building resilience and achieving the desired outcomes in the coaching process.

4.3.5 Between the coaching sessions

Two studies highlighted activities that coachees could engage in between coaching sessions:

1. In the Jeannotte et al. (2021) study, an algorithm based on the topic of the coaching session suggested various resources to the coach, which were then shared with the coachees. These resources included readings, audio or video content, guided or self-directed exercises, and other materials to support the coachees' development between sessions.
2. In the IJntema et al. (2021) study, participants were required to complete two Psyfit modules as "homework" to enhance their resource-building efforts between coaching sessions. Coachees could choose from six different modules, including mastering life skills, improving self-esteem and relationships, practicing mindfulness, fostering positive thinking, and setting personal goals.

These activities were designed to extend the benefits of coaching beyond the sessions by encouraging continuous learning and self-development.

4.3.6 Final coaching sessions

Four studies described the activities conducted in the final coaching sessions:

1. In the IJntema et al. (2021) study, participants evaluated their level of objective achievement, developed an action plan for future resource development, and assessed the overall coaching process.
2. The Fontes and Dello Russo (2021) study focused on evaluating participants' progress, enhancing their self-confidence, and encouraging them to independently reapply the strategies they had learned during coaching.
3. In the final session, participants gained a clearer understanding of the resources available to them for building resilience, which was a central focus of the coaching program.

4 The Sherlock-Storey et al. (2013) study aimed to help participants plan for continued resilience and wellbeing maintenance without the need for ongoing coaching. Coachees were encouraged to set future goals extending beyond the coaching programme to ensure long-term development.

These final sessions were designed to ensure that participants could apply their learning independently, assess their progress, and create plans for continued growth and resilience.

4.4 Study design elements of the coaching interventions

The goals of the coaching programmes were diverse, with only a few studies focusing solely on resilience (IJntema et al., 2021; Sherlock-Storey et al., 2013). Other programmes aimed to improve wellbeing (Dyrbye et al., 2019), facilitate workplace transitions (Grant, 2014), or enhance leadership development (Grant et al., 2017). The methodologies used also varied, with experimental and quasi-experimental designs being most common, and data collected at different intervals, typically before and after the interventions, with follow-up measures in some cases. These differences in design, objectives, and data collection methods further contribute to the challenge of comparing the effectiveness of these coaching programmes.

Coaching interventions in the reviewed studies also showed significant variation in both duration and structure. The length of programmes ranged from 6 weeks (Sherlock-Storey et al., 2013) to over a year (McKimm and Povey, 2018), with some studies offering flexible timeframes (Auer et al., 2022; McKimm and Povey, 2018). The number of sessions also varied, from a minimum of three (Brown and Yates, 2018) to up to 45 sessions (Auer et al., 2022). Intervals between sessions ranged from weekly (Grant et al., 2010) to every 4–6 weeks (Archer and Yates, 2017), and session lengths fluctuated between 30 and 90 min, further highlighting the absence of a standardised approach across studies.

The delivery and expertise of the coaches also varied significantly. While most studies used external, certified professional coaches (Auer et al., 2022), some employed internal coaches (De Haan et al., 2019). The coaches' qualifications ranged from short formal training programmes to PhDs, and their experience varied widely. This inconsistency in coach experience, along with differences in delivery methods (in-person, virtual, or hybrid), adds another layer of complexity to assessing the impact and success of coaching interventions across the reviewed studies. Standardising coach qualifications, delivery methods, and programme structure could enhance future research and practice in the field.

4.5 Outcomes of the coaching interventions

Participation in coaching has been shown to improve resilience in all the reviewed studies, with both qualitative and quantitative measures supporting these findings. A key theme across seven studies was that the intervention group, which received coaching, experienced greater resilience improvements compared to the control group (Auer et al., 2022; Dyrbye et al., 2019; Grant, 2014; Grant et al., 2009; Grant et al., 2010; Grant et al., 2017; Song et al., 2020). For instance, in Auer et al. (2022), those receiving coaching had significantly larger resilience gains than those without coaching. Fontes and Dello Russo (2021) found that coaching was associated with increases in Psychological Capital, while Grant et al. (2010) also reported increased resilience in the coaching group compared to the control. Similarly, Grant (2014) found that coaching enhanced resilience, with a one-tailed t-test showing significant increases [$t_{(1, 30)} = 1.79$, $p < 0.05$]. Grant et al. (2017) demonstrated that participation led to significant increases in resilience [$t_{(1, 30)} = 2.50$, $p < 0.05$]. In Sherlock-Storey et al. (2013), post-intervention resilience levels were significantly higher [$t_{(10)} = 3.24$, $p = 0.045$], while in Dyrbye et al. (2019), resilience scores improved more in the intervention group than the control group [mean (SD) = 1.3 (5.2) vs. 0.6 (4.0)]. Song et al. (2020) reported significant improvements in mean BRS scores, though the lack of a control group limited conclusions about the direct effects of the coaching intervention.

Qualitative findings also showed enhanced resilience following coaching (Archer and Yates, 2017; Brown and Yates, 2018; Grant et al., 2009; Gray, 2016; Timson, 2015). Brown and Yates (2018) identified emotional changes during and after coaching as a dominant theme. IJntema et al. (2021) found that resilience components like hope, self-efficacy, and stress recovery had both short- and long-term positive impacts. Gray (2016) reported a transformative awareness of resilience and workplace wellbeing, suggesting that new resilience-related schemata can be developed through cognitive and behavioural repetition. Archer and Yates (2017) observed deliberate shifts in participants' thinking, leading to greater resilience and self-reflection. Timson (2015) highlighted the value of the individualised coaching sessions in fostering self-reflection and insight, which were key to developing behavioural changes. De Haan et al. (2019) also found correlations between resilience, psychological wellbeing, self-efficacy, and social support as indicators of coaching effectiveness. Jeannotte et al. (2021) noted that resilience development took longer, with the most significant gains occurring in the latter half of the intervention.

5 Discussion

The objectives of this scoping review were to examine:

- The coaching approaches are currently used in coaching for resilience,
- The processes that are followed in resilience coaching.
- The efficacy of the resilience coaching interventions

5.1 The coaching approaches that are currently used in coaching for psychological resilience

This scoping review has shown that various approaches have been successfully used to coach for resilience, including the positive psychology approach (Archer and Yates, 2017; Song et al., 2020) and a humanistic approach incorporating positive psychology, solution-focused, and cognitive-behavioural coaching (Brown and Yates, 2018). This is consistent with the research, wherein a number of academics have shown that resilience can be enhanced by various coaching strategies

(Pemberton, 2015). However, the most used approach is the cognitive-behavioural coaching (CBC) framework (Grant et al., 2009, 2010; 2014; 2017), which focuses on identifying internal resources and overcoming negative thinking (Skews et al., 2018). Resilience is dependent on flexibility in thoughts and actions when reacting to adverse situations (Neenan, 2018). CBC helps coachees reframe irrational beliefs (David et al., 2016) and develop resilient emotions (Skews et al., 2018).

5.2 The coaching elements that need to be present in the psychological resilience coaching process

5.2.1 Development of resilience resources

The creation of resilience resources by the coachees was another element that the scoping review emphasised. It is highlighted that coachees are cognizant of the resources at their disposal to cultivate resilience (Archer and Yates, 2017). Resilience is shaped by the availability of resilience-promoting resources (Joyce et al., 2018). Resilient individuals can effectively access current, latent, or new resources to overcome adversity (Young, 2014). Optimal resilience interventions focus on maximising personal resources to manage stress (Fletcher and Sarkar, 2016; Forbes and Fikretoglu, 2018). Access to resources helps mitigate stress and shields against its negative effects (Skews et al., 2018). Both external and internal resources, particularly psychological ones, play a key role in resilience (Luthans et al., 2006). Developing psychological resources, such as psychological capital, strengths, and mental toughness, is vital for enhancing resilience (Skews et al., 2018).

5.2.2 Coach and coachee relationship

An additional component that was identified as crucial to the development of the coachee's resilience was the coach-coach relationship. The coaching relationship plays a crucial role in fostering resilience by helping coachees expand their perspectives and interpret events more flexibly (Neenan, 2018). This aligns with research indicating that sustaining the coachee's attention and connection between coaching sessions and managing relationships are crucial. The coachee could easily lose interest in the coach and the process without the relationship (Koortzen and Oosthuizen, 2010). Transformation and growth occur within the context of a strong coach-coachee relationship, which is a key variable in the coaching process (Mosteo et al., 2016). This relationship involves collaboration, setting clear objectives, and developing action steps for goal attainment (Grant et al., 2009). A supportive coaching relationship can alleviate stress and anxiety (Grant, 2014), and feedback from the coach reinforces positive outcomes and resilience (Fontes and Dello Russo, 2021).

5.2.3 Homework between the coaching sessions

It is essential for coachees to engage in work between coaching sessions, often referred to as "homework," to facilitate resource development (IJntema et al., 2021). Coaches should assist coachees in creating actionable steps to be completed between sessions (Grant et al., 2009). One effective method for this is to have coachees fill out a preparation sheet before each session (Grant, 2014). This paperwork allows participants to outline their goals for the upcoming sessions, document their progress, and identify specific challenges they have faced (Grant, 2014).

5.2.4 Positive adaptation and appraisal of events is required to enhance resilience

The literature emphasises that positive adaptation is essential in building resilience (Van Breda, 2018). Resilience is linked to positive adaptation, recovery, and psychological growth, helping individuals thrive through adversity (Baker et al., 2021). Positivity during crises has been shown to foster resilience (Grant and Kinman, 2014; Ke et al., 2022), and resilience involves the processes that enable individuals to adapt positively (Britt et al., 2016). Resilience as a concept encompasses both the resources that support positive adaptation and the adaptive processes themselves (Galazka and Jarosz, 2019).

The way individuals appraise stressful events is a key factor in how they respond to adversity (Young, 2014). Resilience goes beyond coping and recovery, influencing both event appraisal and one's capacity to manage the adverse event (Baker et al., 2021). As a process, resilience involves adapting based on feedback and experiences (Liu et al., 2019), with success often determined by how individuals respond to challenges, not just the challenges themselves (Jackson and Watkin, 2004). Attitude plays a central role in resilience (Palmer, 2013), and when confronting stress is ineffective, coaches help coachees reappraise conditions and find new coping strategies (Fontes and Dello Russo, 2021).

5.2.5 Reflection by the coachee enhances resilience

Research shows that reflection by coachees enhances resilience. Coaching provides a space for reflection, allowing coachees to express their concerns and emotions (Lawton-Smith, 2017). Socratic questioning promotes problem-solving and reflection (Neenan, 2018), while this reflective process helps coachees expand their psychological resources (Fontes and Dello Russo, 2021; Hobfoll et al., 2018). Coaches facilitate reflection through questioning, feedback, and insight into strengths and barriers, aiding goal achievement (Gregory et al., 2011). Reflection on personal strengths and limitations fosters resilience (Grant and Kinman, 2014), reduces stress (Grant, 2014), and is crucial for developing psychological capital (PsyCap) (Fontes and Dello Russo, 2021).

5.3 Key steps required to deliver effective coaching

5.3.1 A coach should assist the coachee to set goals

A key element in coaching programmes, regardless of the theoretical approach, is goal setting, where the coach assists the coachee in defining objectives and creating an action plan (Fontes and Dello Russo, 2021; Dyrbye et al., 2019). Effective resilience coaching involves setting personally meaningful goals, focusing on the coachee's current traits and circumstances, and systematically working towards those goals with the coach's support (Grant, 2014). Coaches help coachees overcome setbacks and customise the program to their unique needs by guiding them in setting personal goals for enhancing resources and resilience (IJntema et al., 2021; Grant, 2014).

5.3.2 A coach should use coaching techniques to guide the coaching process

Facilitating coachee reflection and insight into their strengths and weaknesses is crucial for achieving goals, with coaches using

questioning, challenging, and feedback to guide this process (Fontes and Dello Russo, 2021). Instead of presenting information, coaches draw it out from coachees (Neenan, 2018) and help monitor and evaluate progress, providing an intellectual platform for brainstorming and self-reflection (Grant et al., 2009). Reflection helps individuals gain insights into events and generate knowledge for future situations (Jackson et al., 2007). Coaches support coachees in re-examining external conditions and exploring coping strategies (Fontes and Dello Russo, 2021). Socratic questioning clarifies and stimulates coachee thinking (Neenan, 2018). Feedback from coaches fosters resilience by helping coachees identify alternative pathways when facing setbacks (Fontes and Dello Russo, 2021), and positive feedback can enhance psychological capital (Luthans et al., 2006).

5.3.3 A coach should provide a challenging and reflective space

An adequately supported yet challenging environment is essential for developing resilience (Fletcher and Sarkar, 2016; Forbes and Fikretoglu, 2018). Resilience is fostered when coaches facilitate coachee reflection on their thoughts, feelings, and behaviours during sessions (Fontes and Dello Russo, 2021; Jones et al., 2016). By understanding their emotional needs and reactions, coachees learn to cope with adversity (Jackson et al., 2007). Psychological resilience emphasises the connection between an individual's behaviour, thoughts, and emotions within a specific context (IJntema et al., 2019, 2021). A cognitive-behavioural, solution-focused framework highlights the bidirectional link between thoughts, feelings, behaviours, and the environment (Grant, 2003; Grant et al., 2009). Reflection in coaching raises coachees' awareness of their current resources and prompts a resource spiral (Hobfoll et al., 2018), encouraging exploration of psychological resource enhancement and identification of potential helpers (Fontes and Dello Russo, 2021). Coaches guide coachees to appraise both internal and external challenges while helping them alter negative emotional and behavioural responses (Neenan, 2018).

5.4 The efficacy of the resilience coaching interventions

This scoping review highlighted that participation in coaching consistently improves resilience, corroborating previous research on the efficacy of coaching in resilience development. As coaching research evolves, it incorporates various techniques to build resilience (Grant et al., 2009; Green and Humphrey, 2012; Pemberton, 2015). Coaching has been suggested as a preventive measure for fostering resilience, particularly for individuals facing adversity (Lawton-Smith, 2015). A meta-analysis by Vanhove et al. (2016) found that coaching is more effective at building resilience than traditional classroom-based methods.

Both qualitative and quantitative studies demonstrated positive outcomes in resilience following coaching interventions. Quantitative results, including studies by Dyrbye et al. (2019), Fontes and Dello Russo (2021), and others, showed measurable improvements in resilience. Qualitative feedback also highlighted enhanced resilience, with participants reporting growth in areas like hope, self-efficacy, and stress recovery (Archer and Yates, 2017; Gray, 2016; IJntema et al., 2021).

Several factors explain the success of coaching in improving resilience. First, coaching offers a confidential and proactive space for discussing challenges, which encourages openness (Lawton-Smith, 2015). This emotionally supportive environment promotes cognitive flexibility and learning (Mosteo et al., 2016). Second, coaches help coachees identify patterns and manage emotions, serving as thought partners (Crawford, 2017; Auerbach, 2006). Third, workplace coaching is a tailored, non-hierarchical partnership aimed at fostering goal achievement and wellbeing (Bozer and Jones, 2018; Fontes and Dello Russo, 2021). Through reflective questioning and strategy development, coaches help coachees enhance self-regulation and coping skills, leading to reduced stress and improved resilience (Grant, 2014; Grant and Kinman, 2014).

5.5 Measures and instrument currently used to evaluate effectiveness of resilience coaching

This scoping review highlights various tools for measuring resilience.

1. *Single item measure*: A simple Likert-type item, "I recover quickly after stressful experiences," is used (Auer et al., 2022).
2. Brief resilience scale (BRS): This 6-item tool uses a 5-point Likert scale, including items like "I tend to bounce back quickly after hard times." Adapted for work-related recovery, it has a 6-point scale where higher scores indicate better recovery (De Haan et al., 2019; IJntema et al., 2021; Song et al., 2020).
3. *Cognitive hardiness scale*: Used in various studies, this scale has 10 to 18 items assessing resilience through cognitive hardiness (Grant, 2014; Grant et al., 2009, 2010, 2017).
4. *Robertson Cooper i-resilience tool*: An online tool that evaluates resilience through four components: Confidence, Purposefulness, Adaptability, and Social Support, providing detailed interpretations (McKimm and Povey, 2018).
5. *Connor-Davidson resilience scale*: This 10-item scale uses a 0–4 scale, with higher scores indicating greater resilience (Dyrbye et al., 2019).
6. *Psychological capital questionnaire (PCQ-12)*: This 12-item tool measures psychological capital, including resilience, on a 7-point Likert scale (Fontes and Dello Russo, 2021).
7. *PCQ (Self-report)*: A 24-item version measuring self-efficacy, resilience, optimism, and hope, using a 6-point Likert scale (Sherlock-Storey et al., 2013).

5.6 Additional tools that should be developed or implemented to enhance resilience assessment

To enhance resilience assessment, we encourage coaching programmes to develop tools that will fit the requirements of their programmes. Some studies (e.g., Gray, 2016; Jeannotte et al., 2021) have custom develop scales for their coaching programmes. In the Jeannotte et al. (2021) the nine-dimensional scale set was created and verified after an extensive multiphase examination. The wellbeing model was used in the coaching sessions in Gray (2016) study, and the

findings were documented as individual participant coaching profiles. Data on "best self" and "periphery" comments, as well as individual pathway descriptions found during the coaching session, were included in the profiles (Gray, 2016).

We also suggest that it is important to include qualitative measures in order to elicit the views of the coachees on how the coaching programmes have helped to improve their resilience. Semi-structured interviews could be used to gather qualitative data and to establish an in-depth understanding of the participants' experiences (Archer and Yates, 2017). Participants can also be encouraged to respond to open-ended questions order to gather some qualitative data on participants' experience of the coaching programmes (Grant, 2014; Grant et al., 2017). Thematic analysis techniques can then be used to analyse the data.

5.7 A critical evaluation of the study design elements of the coaching interventions

Theeboom et al. (2014) highlight the importance of research design as a moderating factor in coaching outcomes. The way coaching interventions are studied can influence the results, with more rigorous designs likely to show more reliable outcomes. RCTs are regarded as the "gold standard" for establishing causality because they control for confounding variables and minimise selection bias. While other designs are considered less robust than RCTs due to potential biases (e.g., maturation effects or selection bias), they still offer valuable insights, especially when it is difficult to randomly assign participants.

Athanasopoulou and Dopson (2018) emphasise that studies incorporating multiple data sources—such as multicourse feedback, assessment tools, and repeated measures—are of higher quality than those relying solely on self-reported outcomes. Some of the reviewed coaching studies fall short here, as they rely on subjective evaluations by participants, without triangulating the data through objective measures. Studies that incorporate repeated measures, particularly during and after the coaching process (Rekalde et al., 2017), are better able to track the longitudinal effects of coaching, though few do this comprehensively.

The number of coaching sessions, format, and delivery method (e.g., face-to-face or blended coaching) were found to have no significant effect on outcomes in some studies (Jones et al., 2016; Theeboom et al., 2014). However, Blackman et al. (2016) note that customised, individual programmes tend to yield better results, suggesting that the quality and adaptability of the coaching intervention may be more critical than the number of sessions or the specific delivery format. Moreover, Grover and Furnham (2016) provide evidence supporting the long-term impact of coaching, noting that studies examining coaching effects months after the intervention report sustained positive outcomes. We argue that the lack of longitudinal data in some of the reviewed studies limits our understanding of how long the coaching effects on resilience last and under what conditions they might fade.

The coaching literature is also criticised for its weak theoretical foundation, as many studies lack a clear framework explaining why coaching works (Bozer and Jones, 2018; Grant, 2013; Theeboom et al., 2014). The absence of a unifying approach in coaching for resilience impedes the ability to generalize findings. Bozer and Jones (2018) argue that studies should be evaluated not only on methodological rigor but also on how well they explain the underlying theoretical constructs that make coaching effective.

6 Limitations of the study

When extrapolating from the study's findings, certain limitations need to be taken into account. First, studies that addressed the larger context of resilience coaching were eliminated from our search since it was restricted to English-language literature and only included interventions related to resilience coaching in the workplace. Second, the restricted number of studies included in the review scope limits the scope of this investigation. Third, the study did not include any grey literature, which would have limited the study's findings. Last, the contextual background of the coaching interventions was restricted to a few settings, which begs the question of whether the findings are applicable in other contexts.

7 Agenda for future research

Research on the coaching impact on resilience has not been fully developed yet (Grant, 2017). Psychological resilience is a complex and multi-faceted construct (Grant and Kinman, 2014). The results of this review indicate that personal representations of resilience are extremely varied, and the concept is believed to encompass a wide range of skills and abilities. Notwithstanding some consensus on defining psychological resilience as well as clear findings of its connections to various critical personal outcomes, there is currently no leading, amalgamated theoretical model of individual workplace resilience which is able to be used in all organisational contexts and industries (Rees et al., 2015). Research in resilience coaching still requires a nuanced understanding of its complex elements so as to understand, predict and design suitable interventions in order to improve personal resilience (Liu et al., 2019). Lawton-Smith (2017) suggests a broader conceptualisation of resilience that incorporates both capabilities (skills or strategies) as well as the capacity (more transient resource) for resilience. As resilience encompasses a broad range of abilities and skills and to develop programmes to increase resilience, it is important to understand the competencies that reinforce resilience as well as the strategies that can be employed to improve it, using an evidence-based, rigorous approach (Grant and Kinman, 2014).

More studies are needed on the resilience coaching in order to understand how change occurs during the coaching for resilience process. Resilience has been described as the potential to show resourcefulness through utilisation of available internal and external resources (Pooley and Cohen, 2010). However, Lawton-Smith (2017) suggests that coaching for resilience may have limited impact if it is based only on a defined list of assets, arguing that an attempt to deconstruct, list and quantify a list of attributes may not be an appropriate manner in which resilience can be addressed. She bases her argument on complex adaptive system's evaluation of a leadership coaching programme (O'Connor and Cavanagh, 2013), where goal achievement, wellbeing as well as transformational leadership behaviours were improved after coaching. A "ripple effect" was shown by that evaluation and secondary gains were clear from the coachees.

She then argues that simple linear connections of cause and effect are not adequate to address resilience and wellbeing (Lawton-Smith, 2017). We argue that future research should therefore focus on the change process in resilience coaching interventions and more studies are needed on the resilience coaching approaches, antecedents, distal and proximal coaching results (Mosteo et al., 2016). Moreover, research is needed in order to contribute to better understanding of the dynamic processes under which resilience develops and impacts outcomes in the workplace at various analysis levels. We suggest that this can be achieved by integrating cross-disciplinary understandings of as well as approaches to resilience and resilience coaching so as to have a better understand of the mechanism that enable improved resilience (Rook et al., 2018).

There is a need for more research on how coaching for resilience can respond to an emerging view that resilience should be conceptualised as a dynamic and interactive process whereby an individual experiences adversity and, utilising resources and skills is able to adapt and recover (Kelly et al., 2019). It has been suggested that resilience should no longer be regarded as a static concept but rather as a dynamic process by which people adapt to stressful events or circumstances they are exposed to (IJntema et al., 2019, 2021) as well as positive adaptation within the context of major adversity (Sarkar and Fletcher, 2016). It has also been argued that resilience is fundamentally underpinned by the concept that it is not so much the hard times we face that determine our success or failure as the way in which we respond to those hard times (Jackson and Watkin, 2004). To add further complexity to current discussions of resilience, Fletcher and Sarkar (2016) have argued that a sufficiently supported but challenging environment is required for resilience to develop. What determines the level of resilience is the experiences of the individual, their qualities, as well as each individual's balance of risk and protective factors (Jackson et al., 2007). There is a need for empirical research to determine and test the various elements in the dynamic process of developing resilience through coaching.

Moreover, consensus is also rising regarding the importance of the environment as well as systemic factors in modern views of resilience (Cusack et al., 2016). The perspective of resilience as a process conceptualises resilience as a function of individuals' conscious interaction with their external environment (Winwood et al., 2013). Resilience is a process in which the influences of the environment and individuals reciprocally interact, allowing them to adapt, despite the stressors (Menezes et al., 2023). Literature suggests that as an ability, resilience develops over time resulting from many elements that characterise the interaction between an individual and their environment (Baker et al., 2021). Moreover, it has been argued that resilience can be developed and determined by factors that act at the social as well as the individual level, and that the environment in which an individual must survive may support or undermine their personal resilience (Howe et al., 2012). Research is needed to see how coaches help coachees to navigate this interaction between the individual and their external environment as part of the coaching process.

The impact of biological and genetic factors is an area of resilience coaching research that needs further exploration. It has been suggested that psychological resilience entails the interaction between cognition, behaviour, as well as affect in a specific time and context (IJntema et al., 2019). The "fourth wave" of resilience research places more emphasis on a focus on multifaceted dynamics and processes that connect genes, brain development, neurobiological adaptation, behaviour as well as context at various levels (Wright et al., 2013). More research in resilience coaching is needed in order to understand the impact of the interaction between cognition, behaviour, time and context as multifaceted factors in achieving positive resilience coaching outcomes.

The importance of social support in enhancing psychological resilience, particularly in the context of coaching for resilience requires further inquiry. Research has demonstrated that one of the fundamental elements of resilience is social support, and maintaining relationships is an element of social support (Jackson et al., 2007). It has been posited that resilience can be built and determined by elements that operate at both individual and social levels, and that the context whereby a person must survive may provide support or undermine their individual resilience (Howe et al., 2012). Empirical research is needed to explore how coaches can integrate social relationships in assisting coachees to improve resilience.

To help to develop a more effective coaching approach, future research studies should also explore how cross-disciplinary insights into resilience can inform coaching practices. Despite the widespread use of the term "bounce-back," its exact meaning—whether it refers to emotional stability, performance, or something else—remains unclear (Lawton-Smith, 2017). Neenan (2018) critiques the notion that resilience merely involves returning to a pre-adversity state, arguing it oversimplifies the complex emotional struggles individuals may face during recovery. Resilience is fundamentally about how individuals respond to adversity rather than the adversity itself (Jackson and Watkin, 2004). This perspective suggests that resilience should not be framed merely as bouncing back; instead, it should encompass the appraisal of both adverse events and one's ability to manage them (Baker et al., 2021). Conceptualising resilience in terms of sustainability may be more relevant to coaching, emphasizing the importance of resilience in both current and future contexts (Lawton-Smith, 2017). Oversimplifying resilience as a return to a previous state risks overlooking the transformations, growth, and learning that occur following challenging experiences (Crawford, 2017). Thus, a critical goal of resilience coaching should be to establish a balance between encountered adversities and the available resources. Future research in resilience coaching should focus on this balance, exploring how coaches can effectively support coachees in navigating challenges while fostering growth and resilience (Skews et al., 2018).

The fragmented nature of the literature, reliance on self-reporting, and inconsistent methodological rigor limit the generalizability of the findings. Nevertheless, studies with stronger designs—such as those that include control groups, pre/post measures, and theoretical frameworks—offer valuable insights into the efficacy of coaching. Future research should aim to integrate more robust theoretical models, longitudinal data, and larger, more diverse samples to build a more coherent understanding of coaching's long-term impacts.

8 Conclusion

This scoping review shows that coaching is a useful intervention for enhancing resilience and helping people who are experiencing adversity. Specifically, the scoping review

highlighted three crucial aspects. First, the scoping review demonstrated that a variety of coaching philosophies can be effectively employed to support resilience coaching programmes. Second, the scoping review highlighted various factors that are key in coaching for psychological resilience, including: goal setting; the creation of coachee resilience resources; the coach-coach relationship; the coach's role as helping coachees go through the self-regulation cycle; and the importance of the coachee working between coaching sessions. Third, the scoping review demonstrated the efficacy of coaching interventions as participation in coaching resulted in improved resilience for the participants in the coaching interventions. However, the scant number of studies that surfaced from the literature search indicates that more study on resilience coaching is required. Although coaching theories, research, and practice that focus on coachees gaining resilience through a range of strategies and tools are growing, research on the influence of coaching on resilience has not reached its full scope.

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Do conscientious employees have a high level of work engagement? The roles of presenteeism and perceived organizational support

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In recent years, work engagement garnered significant attention from both the business community and academia. Drawing on conservation of resources (COR) theory, this study investigates the mechanisms and boundary conditions through which conscientiousness influences work engagement. Through an empirical survey of 376 employees, the study found that, first, conscientiousness positively predicts employees' work engagement; second, presenteeism partially mediates the relationship between conscientiousness and work engagement; third, perceived organizational support (POS) negatively moderates the relationship between conscientiousness and presenteeism while positively moderating the relationship between presenteeism and work engagement; fourth, POS moderates the indirect effect of conscientiousness on work engagement via presenteeism, whereas the mediated relationship is weakened when employees exhibit a higher POS. These findings advance our theoretical and practical knowledge of how personality traits and situational factors jointly affect employees' work engagement, providing empirical data for a dialectical perspective on conscientious employees and enhancing their work engagement.

KEYWORDS

conscientious employees, work engagement, presenteeism, perceived organizational support, conscientiousness

1 Introduction

Work engagement is a hot topic for researchers and managers, as it is a crucial indicator of employee enthusiasm and involvement at work (Malinowska and Tokarz, 2020). Particularly, as the market competition environment becomes increasingly dynamic and blurred, as well as the rapid changes in information technology, the question of how to keep employees passionate and energetic, maintaining high levels of work engagement requires systematic and sustained consideration.

As a crucial component of the Big Five personality traits, conscientiousness is a personal resource that may predict employees' proactive organizational behavior and serve as an important factor in stimulating individual work engagement (Tu et al., 2020). Conscientiousness has always been regarded as a highly respected personality trait in traditional business management. Therefore, academics conducted extensive research on its positive impacts, including higher subjective well-being among employees (Anglim et al., 2020), higher job satisfaction (Huo and Jiang, 2021), fewer work-related accidents

(Postlethwaite et al., 2009), a lower likelihood of ostracizing the workplace (Rudert et al., 2020), and higher LMX quality (Lapierre and Hackett, 2007). Do conscientious employees experience high work engagement?

Tu et al. (2020) indicated that conscientious employees are more inclined to exert effort toward their organization. Harshleen Kaur Sethi and Barclays Shared Services Pvt. Ltd. (2017) suggested that conscientiousness positively influences work engagement. However, recent research in personality theory introduced the "too-much-of-a-good-thing effect" in the relationship between conscientiousness and ideal outcomes, challenging the "more is better" view that has been dominating research on this trait for a long time (Dupré et al., 2022). Consistent with this, some studies indicate that conscientiousness also has a "dark side," which can have negative impacts on employees, primarily manifested in lower life satisfaction (Boyce et al., 2010) greater work stress (Lin et al., 2015), and greater performance pressure (Liu et al., 2022).

A review of the relevant literature identified two research gaps. First, previous studies mostly emphasized the positive effects of conscientiousness on organizations and employees, with little research on the negative impacts of this trait (Liu et al., 2022). Presenteeism can also be defined as working while sick (Johns, 2010). The culture in China emphasizes values such as diligence, hard work, and perseverance, presenteeism is considered an important virtue (Chen et al., 2021). Recent research examined the prevalence of presenteeism, revealing that this attendance behavior is widespread among employees (Côté et al., 2021). Presenteeism can have numerous negative impacts on organizations (Côté et al., 2021), such as productivity losses, leading to more absences (Johns, 2011). In Chinese society, where hard work is highly valued and overtime is prevalent, employee presenteeism may be more common, drawing widespread attention from scholars of organizational behavior, human resources, organizational psychology, and health psychology (Li et al., 2020). Clarifying the mechanism through which presenteeism elucidates the negative impact of conscientiousness on employees' work engagement has great practical significance. COR theory suggests that individuals tend to protect existing resources and acquire new ones (Hobfoll, 1989, 2001). When individuals gain resources, they are more likely to invest in and acquire additional resources, and when they lose resources, they tend to protect existing resources to prevent further depletion. Conscientious employees are more inclined to work despite their illnesses, especially when their physical health is compromised. Consequently, they may suffer from cumulative health effects, triggering a spiral of resource loss and consequently weakening their willingness to engage in work. Second, they may view conscientiousness as a stable personality trait while overlooking the influence of environmental factors on their expression (Funder, 2006). POS refers to the degree to which employees perceive that an organization values their job contributions and cares about job happiness (Chiaburu et al., 2021), which is a key variable in the psychological connection between employees and organizations. Previous research found that POS moderates outcomes related to stress, individuals, and work. Therefore, this study introduces POS as a moderating variable in the research model.

The main contributions of this study are as follows. First, based on COR theory, this study examines the mediating effect of presenteeism and explores POS as a boundary condition, revealing the negative impact mechanism of conscientiousness on employee work engagement. This result contributes to a dialectical understanding of the influence effects of conscientiousness in the theoretical circle. Second, this study suggests that managers should stimulate employees' conscientiousness efficacy, enhance employees' POS, and mitigate the negative impact of conscientiousness to improve employees' level of work engagement. Third, this research contributes to a deeper understanding of the personality traits (such as conscientiousness) and situational factors (such as POS) that influence work engagement, providing important insights for human resource management (HRM) practices in enterprises.

2 Theory and hypothesis

2.1 The impact of conscientiousness on employee work engagement

Conscientiousness has been discussed as the most important personality trait in work-related contexts (Zell and Lesick, 2022). Conscientiousness is related to being dependable, achievement-striving, hardworking, persistent, planning-oriented, and task-oriented (Anglim et al., 2020; Barrick et al., 2005). Work engagement refers to the sustained positive state exhibited by individuals at work, reflecting their degree of involvement in the roles they undertake. It specifically encompasses three aspects: vigor, dedication, and absorption (Schaufeli et al., 2006).

As an important personal resource, conscientiousness is a positive predictor of work engagement. First, according to COR theory, individuals tend to acquire and maintain the resources they value. Conscientious employees consider diligence, focus, and adherence to rules as important resources for completing work tasks. They believe that demonstrating diligence, focus, and adherence to rules in their work makes it easier to earn the trust of supervisors and colleagues, thereby gaining their support to help achieve work goals (Zellars et al., 2006). Therefore, to protect (or sustainably acquire) the various resources brought about by conscientiousness, employees typically exert greater effort in their work. Second, the resource investment principle of COR theory advocates that individuals need to invest and develop resources to prevent resource loss. Conscientious employees are achievement-oriented (McCrae and Costa, 1991). To achieve desired performance, conscientious employees are willing to invest in various resources for organizational development. They typically set clear goals for themselves, develop detailed plans for goal attainment, and dedicate a considerable amount of time to achieve their objectives (Barrick et al., 1993). Third, according to the COR theory, individuals tend to invest more resources to protect their existing resources (Hobfoll, 1989). Conscientious employees consider difficulties in pursuing goals as challenges to be solved. To address this challenge, they are likely to participate conscientiously in training programs and apply the knowledge and skills acquired during training to their actual work. They integrate job demands and resources with their own abilities and needs, and obtain necessary work resources, thereby enhancing their work engagement. Chen et al. (2017) indicated that highly conscientious employees are more committed to their work and engage in voluntary helping behaviors.

Therefore, we proposed the following hypothesis:

> *H1*: Conscientiousness positively influences work engagement.

2.2 The mediating effect of presenteeism

Presenteeism refers to the behavior of coming to work when ill, even though an individual feels unwell and should call in sick (Aronsson and Gustafsson, 2005). It reduces organizational productivity, increases the frequency of employee mistakes, and leads to increased medical insurance costs borne by both the company and employees owing to recurrent or worsening illness. In addition, it negatively affects employees' families and work environments.

Bierla et al. (2013) found that individuals with a strong sense of conscientiousness are more likely to engage in presenteeism. According to COR theory, individuals' valuable resources for survival and development include their time and energy. To achieve a sense of meaningfulness in work and fulfill their self-worth, individuals with high conscientiousness tend to invest considerable time and effort in their work to ensure the smooth operation of the organization. At this point, high conscientiousness may become a source of pressure for individual resource loss. Increased expectations of responsibilities and goals compel them to devote more time and energy even when they are sick or in poor health (Funk, 2024).

The COR theory posits that individuals' work behaviors and attitudes are related to their perceived resources. If the depletion of one resource is not replenished by another resource, individuals may experience negative work outcomes (Halbesleben et al., 2014). Negative experiences quickly deplete resources. And once resource loss occurs, individuals may fall into a loss spiral, further accelerating future resource depletion (Hobfoll, 2001).Under normal conditions, recovery occurs when individuals are no longer confronted with work demands or when stress is reduced (Geurts and Sonnentag, 2006). When individuals become ill, or their health deteriorates, they require resources for recovery. These resources include time for rest and temporary relief from work. However, presenteeism deprives them of the opportunity to recover from illness and reduces their access to recovery resources. Failing to fully recover while still going to work, workers may suffer the cumulative health impairments. In turn, emotional responses toward their work in general may be lessened or become negative, resulting in increased fatigue, tension, and anxiety, which in turn leads to a decrease in employee work capacity (Karanika-Murray et al., 2015). Presenteeism prevents individuals from fully dedicating themselves to work, thereby reducing their work engagement. Côté et al. (2021) pointed out that presenteeism has a significant negative predictive effect on work engagement.

Sun et al. (2015) demonstrated that highly conscientious employees are aware that absenteeism may result in economic losses for the organization, disrupt organizational operations, or harm their own reputation; therefore, they are more likely to come to work while sick. However, this behavior may lead to various negative consequences, such as a decrease in work engagement.

Therefore, we proposed the following hypothesis:

> *H2*: Presenteeism mediates the relationship between conscientiousness and work engagement.

2.3 Moderating effect of POS

Employees' workplace behaviors are influenced by the interaction between individual and situational factors, meaning that the relationship between conscientiousness and presenteeism may be actuated or restrained by environmental factors. As a situational factor, POS supplements the emotional resources provided by the organization at the organizational level (Zhao and Xi, 2017). It is the perception of employees regarding whether the organization values their contributions and cares about their well-being (Eisenberger et al., 1986).

Previous research indicated that POS helps reduce employee presenteeism (Jiang et al., 2023; Gerlach et al., 2024). According to COR theory, in the pathway of conscientiousness's influence on presenteeism, POS can assist employees in overcoming resource scarcity as an external supplementary resource. As the context of resource loss amplifies the value of resource acquisition, resources obtained during resource loss situations have a greater positive potential (Hobfoll et al., 2018). Conscientiousness drives the occurrence of presenteeism, depriving employees of the opportunity to recover from illness and stress and forcing them to deplete their own resources to cope with work. POS provides employees with the opportunity to reduce or eliminate this negative impact. Compared with employees with lower POS, those with higher POS have more frequent and closer interactions with their leaders and colleagues (Wei, 2022). The sense of care and support from supervisors and the organization reminded them to control their behavior and cut losses in time. When they perceive that their physical health is not sufficient to meet job demands or they believe that coming to work while ill will affect productivity, they are more inclined to seek help from their organization or colleagues, ask colleagues to cover their shifts, or swap shifts until they recover enough to meet job demands before returning to their work positions. At this point, the positive relationship between conscientiousness and presenteeism weakened.

Empirical research suggests that POS can foster positive psychological states among employees, enhance their confidence and motivation to overcome difficult periods, and reduce the negative emotions caused by adverse effects (Eisenberger et al., 2001). In the pathway of presenteeism's impact on work engagement, according to the Job Demands-Resources model, job resources not only lead to high work engagement, low cynicism, and high job performance but also have a mitigating effect on the health damage caused by job demands (Bakker and Demerouti, 2007). Compared with employees with lower POS, those with higher POS believe that they have received sufficient resources from the organization (Melchiorre et al., 2013). These resources can buffer the depletion caused by negative factors, mitigate the impact of job demands on work pressure (Bakker et al., 2005; Viswesvaran et al., 1999), and help employees better cope with the pressure of working while ill, thereby increasing their work engagement.

Therefore, we proposed the following hypotheses:

> *H3*: POS moderates the relationship between conscientiousness and presenteeism such that this relationship weakens as POS increases.

> *H4*: POS moderates the relationship between presenteeism and work engagement such that this relationship weakens as POS increases.

In line with Hypotheses 2, 3 and 4, this study proposes a moderated mediation model. POS weakens the positive impact of

conscientiousness on presenteeism and strengthens the negative impact of presenteeism on work engagement, while presenteeism plays a mediating role in the relationship between conscientiousness and work engagement. Therefore, we proposed the following hypotheses:

> *H5*: POS moderates the indirect effect of conscientiousness on work engagement through presenteeism.

The theoretical model of this study is illustrated in Figure 1.

3 Methods

3.1 Participants and procedures

The sample for this study was drawn from 10 enterprises located in four provinces of China: Jiangsu, Zhejiang, Henan, and Liaoning. To dispel respondents' concerns about the survey, the research team contacted the responsible persons or HRM departments of the enterprises to clarify the purpose, research questions, and subjects of the survey before the survey occurred. They assured all respondents that their answers would be used solely for academic research purposes, and guaranteed the confidentiality of personal privacy. To reduce the common method bias, data collection for this study was conducted at two time points. At the first time point, employees' conscientiousness, POS, and demographic variables (gender, age, education level, and organizational tenure) were measured. Presenteeism and work engagement were measured at the second time point (1 month later). A total of 480 questionnaires were distributed in the first phase, with 438 returned; 480 questionnaires were distributed in the second phase, with 425 returned. After matching the questionnaires according to pre-assigned numbers and excluding invalid questionnaires due to regular pattern responses, multiple selections, and so on, 376 valid questionnaires were paired.

Of the valid questionnaires, 238 were from females, which accounted for 63.29% of the sample. The majority of respondents were within the age ranges of 31–40 years (36.97%) and 41–50 years (27.93%). Those with a bachelor's degree or higher accounted for 68.35% of the sample. Most respondents had 1–10 years of work experience and 11–20 years of work experience, accounting for 38.83 and 31.91% of the sample, respectively. Regarding education, most participants held a bachelor's degree (68.35%). In terms of organizational tenure, the primary ranges were 1–10 years (38.83%) and 11–20 years (31.91%).

3.2 Measures

All the measurement scales used in this study were mature scales from domestic and international sources. Except for the presenteeism questionnaire, all the other questionnaires were measured using a Likert 5-point scale, as follows:

3.2.1 Conscientiousness

Conscientiousness was measured using a 12-item scale developed by McCrae and Costa (1991). Sample items include "I can effectively manage my time to ensure that various tasks are completed on time".

3.2.2 Presenteeism

We used Lu et al. (2013) two-item scale to measure presenteeism. Some sample items are "Even though you feel unwell, you still force yourself to go to work" and "Even though you have physical symptoms such as headache or backache, you still force yourself to go to work." We adopted a four-point Likert scale ranging from "1 = Never" to "4 = More than 5 times."

3.2.3 Work engagement

We used Schaufeli et al. (2006) 17-item scale to measure work engagement. A sample item is "I am absorbed in my work".

3.2.4 Perceived organizational support

We used Eisenberger et al. (1997) 17-item scale to measure POS. A sample item is "Help is available from the organization when I have a problem".

3.2.5 Control variables

To avoid possible confounding effects, we controlled for sex, age, education, and organizational tenure in all analyses.

3.3 Ethical approval

Ethical review and approval was not required for this study on human participants in accordance with the local legislation and

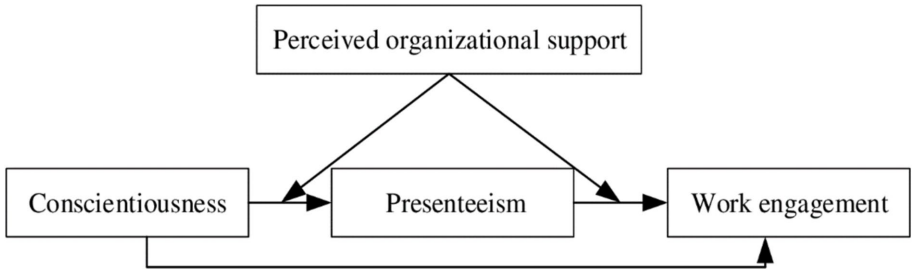

FIGURE 1
Theoretical model.

institutional requirements. The patients/participants provided their written informed consent to participate in this study.

4 Data analysis and results

4.1 Confirmatory factor analysis and common method bias control

To assess the discriminant validity of the variables involved in this study, the Amos 23.0 software package was used to conduct a confirmatory factor analysis of the four main research variables: conscientiousness, presenteeism, work engagement, and POS. The results indicated that the four-factor model provided the best fit. All fit indices were above acceptable levels (χ^2/df = 1.95, CFI = 0.93, TLI = 0.92, RMSEA = 0.05, SRMR = 0.05), and the four-factor model demonstrated significantly better fit than other nested models. Therefore, the discriminant validity of the four main constructs in this study was good. Additionally, the Harman's single-factor analysis showed that the variance explained by the first extracted factor was 23.59%, which is less than the empirical threshold of 40%. Hence, it can be concluded that common method bias in this study was relatively low.

4.2 Descriptive statistics and correlation analysis

Table 1 reports the descriptive statistics and correlation coefficients of the research variables. Conscientiousness is significantly positively correlated with work engagement ($r = 0.42, p < 0.001$); conscientiousness is significantly positively correlated with presenteeism ($r = 0.39$, $p < 0.01$); presenteeism is significantly negatively correlated with work engagement ($r = -0.32$, $p < 0.01$). These results provide preliminary evidence for further hypothesis testing.

4.3 The mediating effect of presenteeism

To test the mediating effect of presenteeism on the relationship between conscientiousness and work engagement, Model 4 of the PROCESS was employed. The results (Table 2) indicate that after controlling for the variables, conscientiousness has a significant positive impact on work engagement [$\beta = 0.44$, 95% CI (0.38, 0.59)]. Thus, H1 is supported. In addition, conscientiousness has a significant positive impact on presenteeism [$\beta = 0.25$, 95% CI (0.18, 0.30)], and when conscientiousness and presenteeism simultaneously predicted work engagement, the influence coefficient for the former was 0.48,

TABLE 1 Correlation coefficient and descriptive statistical analysis of variables.

Variables	1	2	3	4	5	6	7	8
1. Gender	1							
2. Age	−0.08	1						
3. Education Level	−0.02	0.14	1					
4. Organizational tenure	0.16	0.42**	0.07	1				
5. Conscientiousness	0.02	−0.11	0.03	0.18	1			
6. Presenteeism	0.11	0.19	−0.04	0.07	0.39**	1		
7. Work Engagement	0.13	0.05	0.02	0.21	0.42***	−0.32**	1	
8. POS	0.17	−0.14	−0.07	0.14	0.21*	−0.24*	0.29**	1
M	1.63	2.53	2.48	2.75	3.35	3.33	3.42	3.53
SD	0.50	0.84	0.65	0.89	0.37	0.62	0.46	0.52

$N = 376$, ***$p<0.001$**; $p<0.01$; *$p<0.05$, two-tailed test.

TABLE 2 Mediation effect test of presenteeism.

Variables	Outcome variable: Presenteeism		Outcome variable: Work Engagement		Outcome variable: Work Engagement	
	β	*CI*	*β*	*CI*	*β*	*CI*
Gender	0.08	[−0.06,0.14]	0.11	[−0.04,0.18]	0.08	[−0.05,0.14]
Age	0.10	[−0.05,0.17]	0.02	[−0.03,0.04]	0.01	[−0.02,0.03]
Education Level	−0.02	[−0.01,0.04]	0.01	[−0.05,0.02]	0.01	[−0.03,0.03]
Organizational tenure	0.07	[−0.08,0.12]	0.13	[−0.01,0.21]	0.11	[−0.01,0.20]
Conscientiousness	0.25	[0.18,0.30]	0.44	[0.38,0.59]	0.48	[0.41,0.64]
Presenteeism					−0.17	[−0.29,-0.11]
R^2	0.06		0.20		0.26	
F value	12.21**		73.24***		83.97*	

$N = 376$; ***$p<0.001$**; **$p<0.01$; *$p<0.05$.

95% CI [0.41, 0.64], while that for the latter was −0.17, 95% CI [−0.29, −0.11]. These results indicate that presenteeism partially mediates the relationship between conscientiousness and work engagement, supporting H2.

4.4 Moderation effects and moderated mediation test

To test the moderating effect of organizational support, Model 58 from PROCESS was employed in the analysis. The specific data are presented in Table 3.

Table 3 indicates that the interactive effects of conscientiousness and POS on presenteeism were negative and significant [$\beta = -0.10$, 95% CI (−0.15, −0.04)]. The absence of zero in CI indicates that H3 is supported. Additionally, the interactive effects of presenteeism and POS on work engagement were positive and significant [$\beta = 0.18$, 95% CI (0.06, 0.17)]. The absence of zero in CI indicates support for H4.

To illustrate the moderating effect of POS better, a simple slope analysis was conducted. Figure 2 shows that under low POS (M-1SD), conscientiousness positively predicts presenteeism significantly [$\beta = 0.20$, 95% CI (0.10, 0.21)], whereas under high POS (M + 1SD), conscientiousness does not significantly predict presenteeism [$\beta = 0.02$, 95% CI (−0.03, 0.03)].

Figure 3 indicates that under low POS (M-1SD), presenteeism negatively predicts work engagement significantly [$\beta = -0.32$, 95% CI (−0.35, −0.20)]; and under high POS (M + 1SD), presenteeism also significantly predicts work engagement [$\beta = -0.13$, 95% CI (−0.18, −0.09)], but to a lesser extent.

In order to analyze the mediation effect of moderated mediation models, this study conducted a simple slope analysis on the mediation effect (Fang et al., 2014). Using the mean ± 1SD as the standard, distinguish the high and low levels of moderating variables, and perform a simple slope analysis on the mediating effect. The results (Table 4) showed that under the average POS(M), the mediating effect of presenteeism on conscientiousness and work engagement was significant [mediation effect size $\beta = -0.12$, 95% CI (−0.20, −0.11)]; Under low POS (M-1SD), the mediating effect of presenteeism on conscientiousness and work engagement was also significant [mediation effect size $\beta = -0.17$, 95% CI (−0.26, −0.13)], but the mediating effect size of presenteeism has increased by about 41.67%

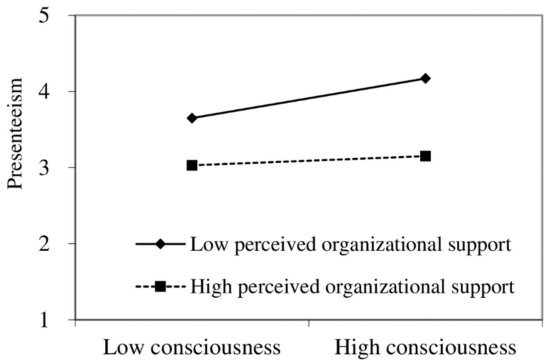

FIGURE 2
Moderating role of POS in the relationship between consciousness and presenteeism.

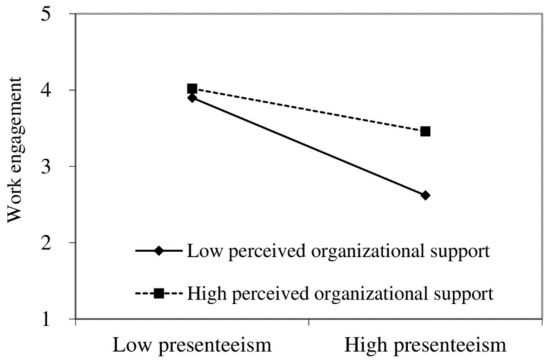

FIGURE 3
Moderating role of POS in the relationship between presenteeism and work engagement.

TABLE 3 Moderation effect test of POS.

Variables	Outcome variable: Presenteeism		Outcome variable: Work engagement	
	β	95%*CI*	*β*	95%*CI*
Gender	0.08	[−0.09,0.20]	0.12	[−0.01,0.25]
Age	0.11	[−0.02,0.26]	0.01	[−0.02,0.10]
Education Level	−0.00	[−0.03,0.10]	0.02	[−0.02,0.11]
Organizational tenure	0.09	[−0.05,0.31]	0.15	[−0.01,0.33]
Conscientiousness	0.16	[0.08,0.34]		
Presenteeism			−0.46	[−0.58，-0.29]
POS	−0.41	[−0.54,-0.23]	0.24	[0.13,0.22]
Conscientiousness *POS	−0.10	[−0.15，-0.04]		
Presenteeism *POS			0.18	[0.06，0.40]
R^2	0.23		0.73	
F value	19.18**		64.26**	

N = 376; ***p<0.001**; **p<0.01; *p<0.05.

TABLE 4 The results of simple slope analysis of mediation effect.

	β	Estimate(SE)	95% CI
Low POS(M-1SD)	−0.17	0.14	[−0.26, −0.13]
Average POS(M)	−0.12	0.13	[−0.20, −0.11]
High POS (M + 1SD)	−0.09	0.10	[−0.17, −0.04]
Estimate difference	0.08	0.04	[0.03, 0.18]

compared to when the POS is the mean; Under high POS (M + 1SD), the mediating effect of presenteeism on conscientiousness and work engagement was also significant [mediation effect size $\beta = -0.09$,95% CI (−0.17, −0.04)], but the mediating effect size of presenteeism has decreased by 25% compared to the mediating effect size when POS was the mean. Moreover, there was a significant difference in the mediating effect size between high and low POS [$\beta = 0.08$, 95% CI (0.03, 0.18)]. These results indicate that POS moderates the indirect effect of conscientiousness on work engagement through presenteeism, whereas the mediated relationship is weakened when employees exhibit a higher POS. Therefore, H5 was supported.

5 Discussion

Based on COR theory in the Chinese context, this study explored the impact of conscientiousness on employees' work engagement and examined the mediating effect of presenteeism and the moderating effect of POS. Results showed that conscientiousness significantly and positively predicted work engagement. Presenteeism partially mediated the relationship between conscientiousness and work engagement. POS negatively moderated the relationship between conscientiousness and presenteeism, and positively moderated the relationship between presenteeism and work engagement. Consciousness has a negative indirect effect on work engagement via presenteeism, and the indirect effect is weaker when POS is higher than when it is lower.

5.1 Theoretical contributions

First, we are aware of very little about how conscientiousness leads to negative outcomes (Liu et al., 2022). This study investigated the negative impact of conscientiousness on employee work engagement in terms of the negative aspect of presenteeism. The results indicate that although conscientiousness may be associated with many positive outcomes, it can also be costly (e.g., increased presenteeism). By investigating the negative effects of conscientiousness, this study compensates for the shortcomings in research on the influence of conscientiousness, responds to the academic community's call for exploration of situational variables affecting individual traits(Judge et al., 2014), and provides insights and references for further investigations into the impact of conscientiousness.

Second, our study extends the literature on work engagement by revealing that individual traits may lead to high presenteeism and low work engagement. Prior studies on individual traits and work engagement focused only on one perspective: how individual traits promote work engagement, such as core self-evaluations and proactive personality (Kleine et al., 2019). Hence, our finding that conscientiousness, a relatively bright trait, can inhibit work engagement suggests a new perspective to explore how individual traits affect work engagement.

Third, POS was introduced as a moderating variable to explore the boundary conditions of conscientiousness in employee work engagement. POS enhances employees' trust in their supervisors or organizations because of perceived support, understanding, and recognition of their abilities by colleagues and leaders (Chen and Liao, 2006). Accordingly, the study found that the higher the POS of employees, the weaker positive effect of conscientiousness on presenteeism and the negative impact of presenteeism on work engagement, meanwhile, the weaker the mediating effect of presenteeism between conscientiousness and work engagement. This study not only deepens scholars' understanding of the context in which conscientiousness affects employee work engagement but also provides new insights for future research on the boundary conditions of other personality traits influencing employee behavior and work outcomes.

5.2 Practical implications

First, the results should prompt managers of the potentially negative impacts of conscientiousness on work engagement. Organizations must take a dialectical view of the mechanisms by which conscientiousness affects employees' work engagement. Attention should be paid to the influence of conscientiousness on employees' presenteeism, reminding employees to be aware of resource depletion and dynamically managing employees' conscientiousness.

Second, resource support should been provided to employees to improve their POS. This empirical research demonstrates that POS not only effectively mitigates the positive impact of conscientiousness on presenteeism, but also alleviates the negative impact of presenteeism on work engagement. Therefore, managers should focus on caring for organizational members, valuing their life and psychological needs, and providing comprehensive work support from both material and spiritual perspectives. Constructing a conducive work environment that weakens employee presenteeism can reduce the negative impact of conscientiousness on work engagement.

Third, constructively manage presenteeism to improve employees' work engagement. Managers need to be aware that, whether in the short or long term, sickness presenteeism is harmful to employees' work engagement and performance. To solve the problem at its root, managers should invest in health promotion programs and work-oriented interventions, encouraging sick employees to fully utilize the organization's sick leave regulations and arrange their workload reasonably.

5.3 Limitations and future research

First, questionnaires were administered over different periods. Although the homology variance can be controlled, it still exists objectively. Subsequent research could employ multiple methods such as case studies and experiments to cross-validate the robustness of our conclusions. Second, this study verified that employee presenteeism plays a partial mediating role between conscientiousness and

employee work engagement. Subsequent research could explore other mediating effects from different perspectives (e.g., individual motivation and self-efficacy). Third, Gelfand et al. (2011) noted that cultural tightness–looseness varies widely across the world. It plays a crucial role in organizational development, influencing individuals' information and cognitive processes, and changing the perception of psychology and behavior in organizations (Song et al., 2023). This study was conducted in China, a representative country of a tight culture (have many social norms and a low tolerance of deviant behavior). Future research should consider expanding this research to other countries with loose cultures (have weak social norms and a high tolerance of deviant behavior) to enhance sample diversity and improve the generalizability of the research results. Finally, this study explores the moderating role of POS from the perspective of employees' perceptions. Future research could shift the focus to managers' perspectives and explore other moderating factors such as humor-oriented and inclusive leadership, which provide positive emotional resources. This approach could comprehensively clarify the relationship between conscientiousness and work engagement, and offer deeper theoretical insights and practical guidance.

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 this study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

HS: Writing – original draft, Writing – review & editing. SW: Validation, Writing – original draft, Writing – review & editing. WZ: Writing – original draft, Writing – review & editing. LS: 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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Secure Base Leadership in military training: enhancing organizational identification and resilience through work engagement

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Introduction: This study examines the relationships between secure base leadership, organizational identification, and resilience among military cadets, utilizing the Job Demands-Resources (JD-R) model as a theoretical framework. Specifically, it explores the mediating role of work engagement in these associations within the context of military training.

Methods: A cross-sectional study was conducted with 363 cadets from the General Military Academy of the Army in Zaragoza, Spain. The sample comprised second-year cadets ($n = 170$; 46.8%) and third-year cadets ($n = 193$; 53.2%), with a gender distribution of 84% male and 16% female. Participants evaluated their section chief captains using the Leader as Security Provider Scale and completed validated questionnaires measuring work engagement, organizational identification, and resilience. Data were analyzed using partial least squares structural equation modeling (PLS-SEM) to test the hypothesized relationships and mediation effects.

Results: The findings revealed that secure base leadership is positively associated with work engagement among cadets. Work engagement significantly mediated the relationships between secure base leadership and both organizational identification and resilience. The structural model explained a substantial proportion of variance in the outcome variables, supporting the applicability of the JD-R model in this context.

Discussion: These results underscore the importance of secure base leadership in promoting work engagement, which in turn enhances organizational identification and resilience among military cadets. The study highlights the role of leaders as secure bases in fostering personal and organizational well-being. Implications suggest that incorporating secure base leadership principles in military training programs could contribute to the professional development and overall well-being of military personnel.

KEYWORDS

JD-R, Secure Base Leadership, work engagement, resilience, organizational identification, military leadership, military school, cadets

1 Introduction

Military academies are exceptionally challenging environments, requiring cadets to demonstrate extraordinary levels of discipline and engagement. Military training is known to be stressful, pushing cadets' physical and mental capacities to the limit and testing their endurance (Chen et al., 2022; Gibson and Myers, 2006; Myers and Bechtel, 2004). Within these institutions, cadets are also expected to strictly adhere to established codes of conduct and assimilate into a well-defined hierarchical structure. This integration often leads to a blurring of personal and professional life, making the clear delineation of boundaries a challenge (Soeters, 2018). It is within this context that cadets' work engagement becomes critical, especially as they navigate job demands where personal and professional realms are intertwined (Hall, 2011). The formal learning in the Military academies provide important role models and references where the character gets forged (Díez et al., 2023).

The Job Demands-Resources (JD-R) model (Bakker and Demerouti, 2007) offers a comprehensive framework for understanding individual variations in work engagement and its role in invigorating organizational identification and performance. This model suggests that the interplay between job demands and resources is key to driving employee motivation. Whereas, job demands may pose challenges for employees' motivation, the presence of adequate resources, such as social support and professional development opportunities, plays a significant role in enhancing work engagement. According to the JD-R model, work engagement thrives when employees are equipped with resources that effectively counterbalance their job demands, and heightened engagement fosters dedication, vigor, and absorption in their work. Within this framework, leadership is identified as a key resource (Mazzetti et al., 2023), particularly in military settings (Bates et al., 2013). Leadership not only influences the challenges faced by service members but also impacts their autonomy, available support, and commitment to their duties (Alarcon et al., 2010). Furthermore, research has shown that positive leadership styles, such as authentic leadership, are crucial in fostering work engagement within military environments (Moreno et al., 2021; Pastor et al., 2019).

Secure Base Leadership (SBL), drawing from attachment theory, represents a paradigm shift in positive leadership styles (Molero et al., 2019). This approach parallels the functions of attachment figures and emphasizes leader's provision of felt security (i.e., confidence that support will be available when needed) to subordinates. Effective leaders under this model are characterized by their keen responsiveness to and alignment with their members' needs, offering targeted guidance, emotional support, and encouragement. Secure Base Leadership plays a critical role in cultivating self-esteem, competence, autonomy, and resilience among organizational members. This fosters an environment where individuals are encouraged to embrace challenges and develop new competencies, catalyzing personal growth (Haslam et al., 2015). In the context of military academies, SBL is particularly effective in empowering cadets by providing a stable foundation of support. This support is essential for their full engagement in rigorous training and encourages risk-taking as an integral part of their development.

Hence, to support the implementation of SBL, our study aims to investigate the personal and organizational benefits of SBL within a military setting while examining the role that military cadets' work engagement play in mediating the contribution of SBL to two pivotal outcomes—organizational identification and resilience. Our primary objectives are to examine (a) how SBL, as a distinct job resource informed by attachment theory, enhances cadets' engagement in their roles and responsibilities within the military academy setting, and (b) whether this engagement contributes to cadets' organizational identification and resilience. We hypothesize that increased work engagement, nurtured by the supportive and empowering environment characteristic of SBL, will lead to a more profound organizational identification. Furthermore, we aim to explore the impact of this enhanced engagement, facilitated by SBL, on the development of resilience in cadets, enabling them to manage the inherent challenges and stressors of their rigorous training more effectively. By delving into these dynamics, our study seeks to contribute valuable insights into the transformative effects of SBL on cadets' professional growth and wellbeing, all within the JD-R model's conceptual boundaries.

2 Literature review

2.1 Work engagement

Work engagement (WE) is conceptualized as a positive, fulfilling, work-related state of mind that is characterized by vigor, dedication, and absorption (Schaufeli et al., 2002). Vigor reflects persistent energy and mental resilience while working, the willingness to invest effort in job tasks, and persistence even in the face of difficulties. Dedication is characterized by a sense of significance, enthusiasm, inspiration, pride, and challenge. Absorption is described as being fully concentrated and happily engrossed in one's work, whereby time passes quickly, and one has difficulties detaching oneself from work (Bakker, 2011). Work engagement is a persistent affective-cognitive state rather than a momentary state. It is not focused on a particular object, event, individual, or behavior (Salanova et al., 2005). Work engagement differs from job satisfaction in that it involves a dynamic state of work-related wellbeing that features not only a positive affective-motivational state of fulfillment (enthusiasm, pride, and inspiration) but also a high level of activation and energy (vigor, absorption; Bakker, 2011). This makes it a clearly motivational construct due to its elements of activation, energy, effort, persistence, and focused aim at achieving work-related goals.

Work engagement is fundamental for military personnel as it instills a deep-rooted commitment to superior performance. This psychological investment acts as a protective factor, enabling soldiers to withstand the challenges of military life, such as severe environmental conditions, separation from family, and restricted rest. Past findings indicated that soldiers with high levels of work engagement exhibit greater psychological robustness and show lower increases in stress under demanding situations, thereby highlighting the critical role of fostering work engagement for soldiers' welfare and proficiency in military operations (Britt and Bliese, 2003; Britt et al., 2004).

2.2 Secure Base Leadership

Secure Base Leadership (SBL) is a positive leadership style rooted in Bowlby's Attachment Theory (Bowlby, 1969) emphasizing the promotion of autonomy in subordinates, provision of supportive guidance during challenges, and nurturing of close, responsive relationships with followers. Hazan and Shaver (1990) initially noted that functions typical of attachment figures could be reflected in the workplace, with leaders serving as attachment figures for their employees. Expanding upon this foundation, Popper and Mayseless (2003) identified significant parallels between the characteristics of leaders and traditional attachment figures. They proposed that effective leaders, like caregivers that enhance their offspring's felt security, play an essential role in guiding, directing, and nurturing those who are less powerful or dependent on them. This includes being sensitive and responsive to the needs of organization members; providing advice, guidance, and emotional reassurance; assisting in the development of self-worth, competence, and autonomy; supporting the undertaking of new challenges; and encouraging personal growth (Haslam et al., 2015).

Building upon this groundwork, Molero et al. (2019) developed the Leader as a Security Provider Scale (LSPS) to evaluate subordinates' perceptions of their leaders as security-enhancing attachment figures within an organizational setting. The LSPS is based on three definitional criteria of a security-enhancing attachment figure: First, as a "secure base," a leader supports and encourages followers to pursue goals within a safe environment while fostering their independence. Second, in the role of a "safe haven," a leader provides calm, comfort, protection, and reassurance to followers during times of need. Third, "proximity maintenance" refers to a leader's ability to maintain a close relationship with followers, ensuring accessibility and minimizing the impact of separations. As a result, followers are more inclined to seek guidance, remain close to, and seek support from, their leader in challenging times, developing positive feelings toward them, and feeling protected in difficult situations.

Empirical evidence from studies employing the LSPS consistently shows a positive relationship between SBL and essential organizational and personal outcomes. These include enhanced work engagement, organizational citizenship behaviors, a positive psychological safety climate, and improved team performance (Lisá et al., 2021; Lisá and Greškovičová, 2023; Molero et al., 2019; Moriano et al., 2021). Additionally, SBL has been identified as a vital factor in reducing burnout and job stress (Lobato et al., 2023; Moriano et al., 2021), contributing to the maintenance of high levels of work engagement. The foundation of this relationship lies in the sense of safety and support SBL provides to employees, enabling them to perform optimally. In the absence of such support, employees may become consumed with concerns about threats to their wellbeing, which negatively impact their work output. In military contexts, leaders who enable environments that are psychologically safe (Lobato et al., 2023), in which subordinates can take reasonable risks without fear of retribution or negative consequences to self-image, status, or career, can increase engagement (Bates et al., 2013). Based on this evidence, we present the following hypothesis:

Hypothesis 1 (H1). Secure Base Leadership will be positively related to work engagement.

2.3 Organizational identification

Social Identity Theory examines how individuals perceive themselves as part of social groups (Tajfel, 2010; Turner, 1981). Central to this theory is the notion of organizational identification, a form of social identity that leads organization members to integrate their organizational membership and ties within their self-concept (Haslam, 2004). This integration is manifested both cognitively (e.g., internalization of organizational values) and emotionally (e.g., feelings of pride in being a member of the organization). In the military context, it is evident in the efforts of military institutions to foster a deep sense of unity among their members. These efforts are based on the anticipation that a strong identification with the organization will drive professional conduct, successful mission completion, and a higher likelihood of service members committing to long-term careers in uniform (Squires and Peach, 2020). This approach underscores the importance of a solid sense of belonging and adherence to military values in influencing personnel's attitudes and behaviors, thereby enhancing the effectiveness and unity of the military as an institution.

The transformation of cadets into officers within military academies is significantly shaped by their level of identification with the organization. Such identification cultivates a strong sense of belonging and commitment, essential in military environments that prioritize teamwork, discipline, and adherence to institutional values (Griffith, 2009; Topa et al., 2009). As this connection with the military deepens, cadets internalize its values, ethos, and standards of conduct, which are vital for effective leadership in challenging situations (Jennings and Hannah, 2011). This alignment not only fosters their organizational identity but also bolsters their capacity to lead with confidence and integrity, attributes that are indispensable for military officers. Therefore, the promotion of organizational identification during training is not merely advantageous but fundamental to nurturing competent and committed military leaders.

Secure Base Leadership (SBL) has been found to be positively associated with organizational identification, a key factor in the intention of military personnel to remain with the service (Squires and Peach, 2020). This leadership style, underpinned by its nurturing and supportive approach, seems to enhance the alignment of individual and organizational values. Molero et al. (2019) further substantiate this association by demonstrating that SBL not only strengthens organizational identification but also surpasses other positive leadership styles, such as authentic leadership, in achieving this aim. The effectiveness of SBL in fostering organizational identification is linked to its role in enhancing meaningful engagement, commitment, and the sense of challenge faced by members, thereby potentially improving their affiliation with the organization's goals. Based on this evidence, we formulate the following hypothesis:

Hypothesis 2 (H2). Secure Base Leadership will be positively related to organizational identification.

2.4 Resilience

Resilience research, whose roots can be found in the aftermath of the Second World War, was initially centered on the profound traumas experienced during that tumultuous period. In those times,

resilience was understood as the ability to endure and thrive amidst a spectrum of adversities over a prolonged duration (Masten and Barnes, 2018). In the contemporary context, the prevalence of adverse and stressful situations in critical occupations such as the military (but also in emergency services and public safety professions) cannot be overemphasized (Bartone et al., 2007; Chérif et al., 2021). The nature of these workplaces exposes personnel to events and conditions that critically affect their wellbeing (e.g., extensive working hours, unusual schedules, dangerous tasks, and demanding environments).

Over time, resilience has been defined and conceptualized in multiple ways, especially within the behavioral sciences. In the context of this study, resilience is defined as the capacity to adapt to adversity or to recover from challenging circumstances (Bonanno et al., 2006). This definition is especially relevant to the military domain, where soldiers and officers are required to navigate not only the intrinsic challenges of military operations but also to endure and prevail in demanding and often austere deployment settings (Simmons and Yoder, 2013).

In military training, the emphasis on developing resilience in cadets transitioning to officers is vital. This stage of military education goes beyond mastering tactical skills and encompasses the cultivation of psychological resilience. Skills such as cognitive reframing, emotion regulation, and energy management are integral to this process. These skills, trainable and significantly influential, facilitate calm, solution-focused responses under stress (Zueger et al., 2023). By fostering resilience, cadets may be better equipped to manage the uncertainties and pressures of military life, rendering it a critical component not only for their initial training but also for their enduring effectiveness as military leaders who can adeptly navigate and excel in complex, high-stress environments (Chérif et al., 2021; Valor-Segura et al., 2020).

Studies involving military cadets suggest that leadership may influence subordinates' resilience, potentially guiding them to perceive and approach challenges with greater hardiness (Bartone et al., 2002, 2007). It is conceivable that SBL could play an important role in this aspect. Secure Base Leadership may facilitate the cognitive reframing of stressful experiences by empowering subordinates to perceive challenges as opportunities for growth and learning, with the assurance that support will be available when needed. In the context of military units, the ability of leaders to model and communicate positive reinterpretations of shared challenges could be crucial. Leaders who provide a secure base might be particularly influential under stressful conditions, possibly inspiring soldiers to see stressful events as manageable challenges that offer valuable learning opportunities. Given this potential, we propose the following hypothesis:

Hypothesis 3 (H3). Secure Base Leadership will be positively related to resilience.

2.5 Work engagement as a mediator

In the JD-R model, work engagement is a crucial mediating variable, linking job resources to positive outcomes both organizationally and personally. Job resources are believed to boost work engagement, which then enhances performance, job satisfaction, and wellbeing (Mazzetti et al., 2023). Leadership, including SBL, is typically viewed as a job resource in this model (Moriano et al., 2021). However, leadership might also be seen as an independent element within the JD-R model, as leaders can both reduce job demands and increase job resources. Thus, leadership might optimize working conditions for engagement by enhancing the positive effects of a work environment where cognitive demands and resources are both substantial (Decuypere and Schaufeli, 2020).

Applying this perspective to military academies, we argue that the supportive and empowering environment fostered by SBL significantly increases cadets' engagement with their roles. This heightened state of engagement may not only align their personal values and objectives more closely with those of the military organization but also cultivates a deep sense of belonging. This heightened sense of connection and identification with the organization is fostered by the positive experiences and satisfaction derived from being engaged in meaningful and fulfilling work supervised by a security-enhancing leader. Furthermore, meta-analytic studies have shown a positive relationship between work engagement and organizational commitment, a construct closely related to organizational identification (Mazzetti et al., 2023). Therefore, we propose the following hypothesis:

Hypothesis 4 (H4). Work engagement will be positively related to organizational identification.

Furthermore, this research extends the JD-R model by examining the influence of work engagement on resilience among officer cadets, a topic previously understudied. Unlike the traditional research direction, which often focuses on the impact of resilience on work engagement, this study hypothesizes the inverse relationship. Specifically, we propose that engagement, manifested through vigor, enthusiasm, and energy, is a critical determinant in enhancing resilience. Drawing on the principles outlined by Bakker et al. (2023), it can be inferred that engagement may lead individuals, such as cadets, to demonstrate a greater propensity to confront and endure challenging tasks. Such heightened engagement facilitates the development and effective use of personal and job resources, resulting in a "positive gain spiral" (Bakker, 2011). This dynamic process not only bolsters adaptability and the capacity to overcome difficulties but also promotes essential skills like advanced problem-solving, effective stress management, and fortified social networks within the organizational context. These elements are pivotal in cultivating resilience in demanding settings like military training. Based on these considerations, we propose the following hypothesis:

Hypothesis 5 (H5). Work engagement will be positively related to resilience.

Figure 1 outlines our theoretical model and hypotheses, offering a visual guide to the mediational process explored in this study. It illustrates the interplay between SBL and its effects on organizational identification and resilience, mediated by work engagement. On this basis, we propose the following mediation hypothesis:

Hypothesis 6 (H6). The impact of Secure Base Leadership on organizational identification and resilience is mediated by work engagement.

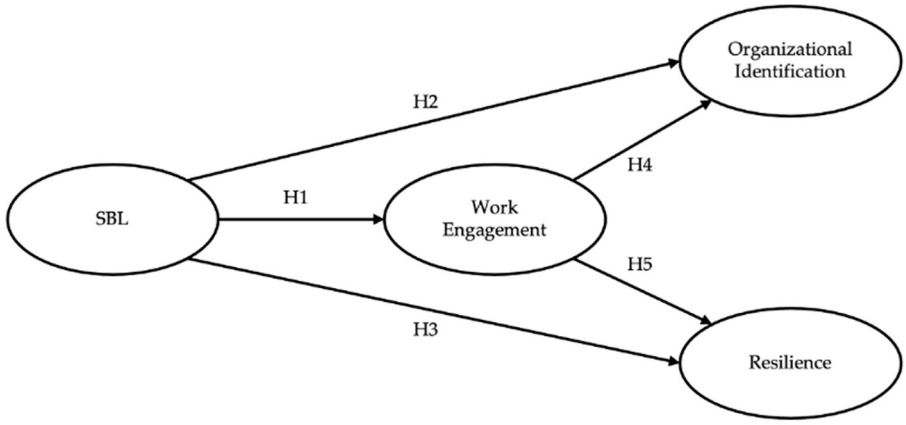

FIGURE 1
Research model. SBL, Secure Base Leadership.

3 Materials and methods

3.1 Procedure and participants

This study is part of a larger research project funded by the Ministry of Science and Innovation of Spain, titled "The Leader as a Secure Base in the Military Context" (PID 2020-117780GB-100). Data collection was carried out in collaboration with the commanders of the General Military Academy of the Army in Zaragoza, Spain. The General Military Academy, incorporating the University Center of Defense affiliated with the University of Zaragoza, is the leading institution for higher military education in Spain, where cadets are trained to become officers in the Spanish Army. This program includes university-level academic studies in addition to general military training.

Prior to participation, the officer cadets were informed about the scientific objectives of the study and assured that their involvement was voluntary and anonymous. The participating cadets ($N = 363$) were primarily from the second ($n = 170$; 46.8%) and third ($n = 193$; 53.2%) years of their officer training. Their average age was 21 (SD = 2.4), with a gender distribution of 84% male and 16% female. They were required to evaluate the leader of their section (platoon chief captain) and complete self-report scales tapping their work engagement, organizational identification, and resilience. The average time of service under the assessed commander (leader) was 5.47 months (SD = 1.64), with 90% of these officers being male.

3.2 Measures

Upon obtaining participant consent, a questionnaire was administered to measure the following variables.

3.2.1 Secure Base Leadership

Cadets' perceptions of their section chief captain as a secure base were assessed using the 15-item Leader as Secure Provider Scale (LSPS; Molero et al., 2019). Participants rated their agreement with each statement on a Likert scale from 0 (Strongly Disagree) to 4 (Strongly Agree), with items such as "When I need help at work, I turn to my leader."

3.2.2 Work engagement

This variable was measured using the three-item Spanish short version of the Utrecht Work Engagement Scale (UWES-3; Schaufeli et al., 2017). The items cover three dimensions: Vigor (e.g., "At my job, I feel full of energy"), Dedication (e.g., "I am enthusiastic about my job"), and Absorption (e.g., "I am immersed in my job"), rated on a Likert scale from 0 (Never) to 4 (Always).

3.2.3 Organizational identification

The seven-item scale by Topa et al. (2009), adapted from Mael and Ashforth (1992) Organizational Identification Scale (OIS), was used. Responses were provided on a Likert scale from 0 (Strongly Disagree) to 4 (Strongly Agree). An example item is "When I talk about this organization, I usually say 'we' instead of 'they'."

3.2.4 Resilience

This variable was assessed using the five-item measure developed by Hardy et al. (2010) and validated in Spain by Valor-Segura et al. (2020). It measures the ability to maintain confidence in the face of challenges and dissatisfaction (e.g., "Bounce back from performing poorly and succeed"), with responses recorded on a five-point Likert scale from 0 (Low) to 4 (High).

3.3 Data analysis

In this study, descriptive statistics, including means, standard deviations, and correlations, were calculated using the SPSS software v.27. For further analysis, we employed Partial Least Squares Structural Equation Modeling (PLS-SEM). PLS-SEM is a non-parametric technique particularly effective for complex mediation models and for exploring advanced options such as the

assessment of multiple mediators (Hair et al., 2017; Henseler et al., 2015). This method offers two key advantages for our study. Firstly, like other SEM techniques, PLS-SEM accounts for measurement error, providing more accurate estimates of mediation effects compared to regression analyses. Secondly, PLS-SEM is designed to handle smaller sample sizes and non-normal data distributions (Henseler et al., 2015). Analyses were conducted using SmartPLS v4.0 software (Ringle et al., 2024). Statistical significance was evaluated using the bootstrapping method with 10,000 samples of 363 cases, applying a critical t-value of 1.96 to determine significance at a $p < 0.05$ level. The model analysis was conducted in two phases (Hair et al., 2017). First, the reliability and convergent and discriminant validity of the measurement model were analyzed. Second, the hypothesized structural model was assessed, that is, to what extent SBL predicted organizational identification and resilience, considering work engagement as a mediator.

4 Results

4.1 Reliability and construct validity

In the initial phase of our analysis, we rigorously evaluated the validity, reliability, and internal consistency of the employed scales, including Cronbach's Alpha, Composite Reliability (CR), McDonald's Omega, and Average Variance Extracted (AVE). All the results exceeded the recommended cut-off values (Hair et al., 2017). Alpha, Omega, and CR coefficients exceeded the threshold of 0.70, and AVE values were >0.50 (see Table 1).

Our preliminary model comprised 30 indicators, collectively forming four latent constructs. Each indicator's reliability was assessed based on its factor loadings or correlations with the respective construct λ. It was anticipated that a factor loading of more than 0.60 for each indicator would be sufficient to effectively represent a latent variable, thereby accounting for a significant proportion of the variance (Hair et al., 2017). Our analysis revealed that the majority of the factor loadings across all scales were robust. However, two indicators from the SBL scale (Item 6 "I believe my platoon chief captain would support my growth and promotion at work" and item 10 "When I need help at work, I look for my platoon chief captain") and two indicators from the organizational identification scale (Item 6 "I largely act as a typical member of my section" and item 7 "If the media criticized my section, I would be embarrassed") fell short of this threshold and were consequently removed. This led to a refined model with 26 indicators, each exhibiting high factor loadings. The exclusion of these four items did not detract from the overall model's integrity, as shown in Table 1. Given the reflective nature of the model, a strong correlation among the indicators was maintained, with each indicator representing a unique aspect of the same underlying phenomenon.

Having established the reliability and internal consistency of our model's scales, we next turned our attention to evaluating discriminant validity. According to Fornell and Larcker's criterion, the Average Variance Extracted (AVE) values for each construct should surpass the squared correlations among the constructs to ensure adequate discriminant validity (Hair et al., 2017). This requirement is critical to confirm that each scale is distinct and measures unique constructs. In addition, the Heterotrait Monotrait Ratio (HTMT) serves as an additional check for discriminant validity. Henseler et al. (2015) suggest that HTMT values below 0.85 are indicative of acceptable discriminant validity among scales. Our model satisfactorily meets both these critical criteria for discriminant validity (see Table 2).

After establishing the reliability and validity of the measures, we utilized SmartPLS for the subsequent model fit assessment. This process incorporated both classic and modern indices. The Standardized Root Mean Square Residual (SRMR), a traditional measure of fit, showed a value of 0.067, indicating good model fit as values below 0.08 are generally considered acceptable (Hu and Bentler, 1999). In addition, we applied the unstandardized (d_ULS) and geomin (d_G) discrepancy measures. These indices assess the congruence between the proposed model and the observed data. The d_ULS values were 1.562 and 1.569, and the d_G value was 0.438, suggesting that the model adequately represents the data and therefore fits well (Ringle et al., 2024). Employing these indices enabled a comprehensive and robust evaluation of the model's fit.

4.2 Descriptive statistics and correlational analysis

Table 2 presents the descriptive statistics and Pearson correlation coefficients for the variables under investigation. Secure Base Leadership reveals a relatively low mean score (M = 1.87) but exhibits the highest standard deviation (0.77), signifying significant variability in scores among leaders in the respective sections to which the officer cadets belong. Conversely, the remaining variables in our study display relatively high scores, surpassing the midpoint of the Likert-type response scale set at 2. Notably, resilience stands out with the highest mean score (M = 3.12) and a lower standard deviation (0.60). Furthermore, we observed significant positive correlations between SBL and organizational identification ($r = 0.34$, $p < 0.01$), resilience ($r = 0.23$, $p < 0.01$), and work engagement ($r = 0.37$, $p < 0.01$). Additionally, work engagement exhibits positive correlations with organizational identification ($r = 0.35$, $p < 0.01$) and resilience ($r = 0.45$, $p < 0.01$). These findings align with our theoretical framework and offer initial support for our hypothesis.

4.3 Hypothesis testing

Figure 2 depicts the interplay between SBL and both organizational identification and resilience, scrutinized both directly and through the intermediary role of work engagement. The model assessing direct effects corroborates hypothesis 1, unveiling a positive and significant linkage between SBL and work engagement ($\beta = 0.39$, $p < 0.01$), which accounts for 16% of the variance in work engagement. In alignment with hypothesis 2, SBL had a statistically significant positive association with organizational identification ($\beta = 0.25$, $p < 0.01$). Hence, an elevation in SBL correlates with heightened levels of work engagement and identification with the organization among officer cadets. Regarding our hypothesis 3, we are observing

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TABLE 1 Evaluation of the measurement models.

Construct	Indicators	λ	*t*	α	ω	CR	AVE
Work engagement	WE01	0.85	50.41**	0.78	0.80	0.87	0.70
	WE02	0.90	73.84**				
	WE03	0.75	20.24**				
Secure Base Leadership (SBL)	SBL01	0.60	14.51**	0.92	0.92	0.93	0.51
	SBL02	0.76	29.15**				
	SBL03	0.77	29.63**				
	SBL04	0.59	12.93**				
	SBL05	0.72	24.30**				
	SBL07	0.67	20.73**				
	SBL08	0.68	20.73**				
	SBL09	0.69	23.54**				
	SBL11	0.71	25.60**				
	SBL12	0.72	23.47**				
	SBL13	0.77	31.02**				
	SBL14	0.74	27.62**				
	SBL15	0.81	45.20**				
Organizational identification	OI01	0.81	28.17**	0.74	0.75	0.83	0.50
	OI02	0.64	12.93**				
	OI03	0.69	15.46**				
	OI04	0.65	9.49**				
	OI05	0.70	13.37**				
Resilience	R01	0.84	39.72**	0.86	0.85	0.90	0.64
	R02	0.79	28.58**				
	R03	0.70	19.33**				
	R04	0.84	36.44**				
	R05	0.83	44.61**				

**$p < 0.01$.

λ, factor loadings; t, t-statistics; α, Cronbach's alpha; ω, McDonald's omega; CR, composite reliability coefficient; AVE, Average Variance Extracted.

TABLE 2 Descriptive results, correlations, and discriminant validity.

	Pearson correlation coefficients						HTMT			
	M	*SD*	1	2	3	4	1	2	3	4
1. Work engagement	2.99	0.66	*0.83*				-			
2. Secure Base Leadership	1.87	0.77	0.37**	*0.71*			0.41			
3. Organizational identification	2.84	0.75	0.35**	0.34**	*0.70*		0.45	0.39		
4. Resilience	3.12	0.60	0.45**	0.23**	0.20**	*0.79*	0.26	0.54	0.20	-

1: Work Engagement; 2: Secure Base Leadership (SBL); 3: Organizational Identification; 4: Resilience. The diagonal elements marked in italics in the correlations are the square root of the Average Variance Extracted (AVE) for each construct.

**$p < 0.01$.

a full mediation, as initially the relationship between SBL and resilience was significant ($\beta = 0.24$, $p < 0.01$). However, this direct effect disappears when the mediating variable, work engagement, is included ($\beta = 0.07$, $p = 0.20$). Moreover, work engagement is shown to have significant direct relationships with both organizational identification ($\beta = 0.27$, $p < 0.01$) and resilience ($\beta = 0.43$, $p < 0.01$), supporting hypothesis 4 and 5, respectively.

The examination of indirect effects, as presented in Table 3, provides empirical validation for Hypothesis H6. First, the indirect positive effect of SLB on organizational identification mediated by work engagement was statistically significant ($\beta = 0.10$, $p < 0.01$). However, because the direct effect of SLB on organizational identification was still significant after controlling for work engagement (see Figure 2), we can speak here of a partial mediation

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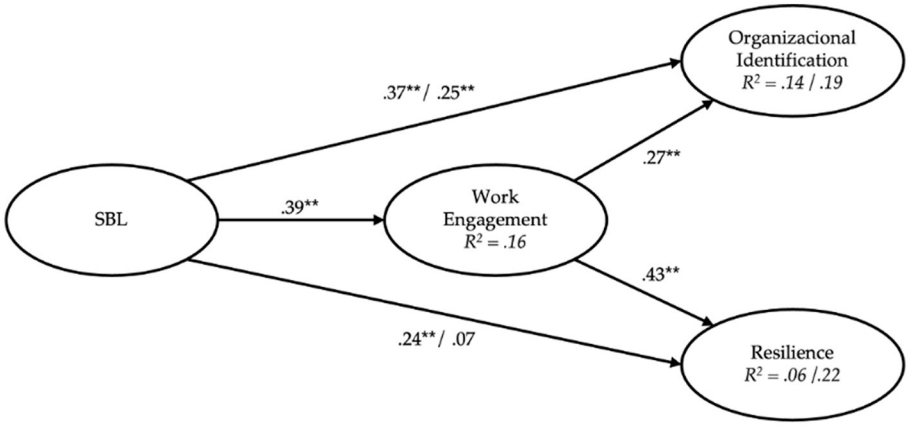

FIGURE 2
Standardized regression coefficients for the full structural model. SBL, Secure Base Leadership. Values preceding the "/" (slash) symbol denote standardized coefficients and explained variance for direct effects model. Values following the slash represent standardized coefficients and explained variance within the mediated model. $^{**}p < 0.01$.

TABLE 3 Structural equation model and hypothesis test results.

	Estimate	SD	*t*-value	Hypothesis
Direct effects				
SBL -> Work engagement	0.39	0.05	8.38**	H1 accepted
SBL -> Organizational identification	0.37	0.05	8.00**	H2 accepted
SBL -> Resilience	0.24	0.05	4.75**	H3 accepted
WE -> Organizational identification	0.27	0.06	4.21**	H4 accepted
WE -> Resilience	0.43	0.06	7.76**	H5 accepted
Indirect effects				
SBL -> Work engagement -> Organizational identification	0.10	0.03	3.67**	H6 accepted
SBL -> Work engagement -> Resilience	0.16	0.03	5.21**	

SBL, Secure Base Leadership; WE, Work Engagement.
**p < 0.01.

through work engagement. Second, the indirect positive effect of SLB on resilience mediated by work engagement was also statistically significant ($\beta = 0.16$, $p < 0.01$). In this case, because the direct effect of SLB on resilience was no longer significant after controlling for work engagement (see Figure 2), we can speak here of full mediation of work engagement. This in-depth analysis highlights the critical mediating role of work engagement in the relationship between SBL, organizational identification, and resilience.

5 Discussion

The primary aim of this study was to examine the role of work engagement in mediating the contributions of Secure Base Leadership to organizational identification and resilience. According to the JD-R model, work engagement functions as a pivotal mediating construct, bridging the gap between job-related demands and personal resources, and subsequently influencing a spectrum of organizational and personal outcomes (Bakker and Demerouti, 2007). More specifically, we have posited a theoretical model (Figure 1) wherein Secure Base Leadership (SBL), as a fundamental job-related resource rooted in attachment theory, exerts its influence on work engagement, which, in turn, contributes to both organizational identification as an organizational-level outcome and resilience as a personal-level outcome.

Our findings support the proposed hypotheses. A significant and positive association was identified between SBL and work engagement in officer cadets at the Spanish General Military Academy, aligning with the JD-R model and supporting Hypothesis 1. This underscores SBL's integral role as a vital job resource, fostering motivation and enhancing engagement levels. Furthermore, SBL's nurturing and empowering effects are found to considerably strengthen organizational identification among the cadets, thereby supporting Hypothesis 2.

The study further revealed a statistically significant direct effect of SBL on resilience, in line with the expectations of Hypothesis 3. Nevertheless, it is noteworthy that SBL accounts for merely 6% of the variance in resilience. This limited explanatory power may be attributed to the demographic characteristics of our sample, which includes relatively young cadets at the preliminary stages of their

military careers. Given that resilience is a characteristic that evolves and strengthens over time, reflecting personal development and maturity, it is plausible that these early-stage cadets have not yet faced sufficiently challenging experiences to significantly influence or assess their resilience (Masten, 2001; Pietrzak and Southwick, 2011).

Our analysis also supports Hypothesis 6, suggesting that work engagement acts as a mediator between SBL and both organizational identification and resilience. Specifically, we found a partial mediation in the relationship between SBL and organizational identification, indicating that while SBL directly influences organizational identification, work engagement also plays a significant mediating role. We also found that the relationship between SBL and resilience is characterized by full mediation through work engagement, meaning the contribution of SBL to resilience is entirely conveyed through its positive impact on work engagement, without a direct effect of SBL on resilience itself.

Incorporating the JD-R model within the military academy context enriches our understanding of motivational dynamics critical for military education and leadership development (Bartone et al., 2007; Bates et al., 2013). According to the JD-R model, high engagement occurs when provided resources effectively counterbalance the job-related demands cadets might face during their military training. These resources include supportive leadership, a constructive organizational culture, and role clarity. Collectively, these resources assist cadets in addressing challenges, advancing their personal development, and enhancing their learning. This model highlights a mutually beneficial relationship between resources and engagement within the military academy context, where resources derived from a security-enhancing leader not only enable cadets to effectively engage with military tasks but also promote their sense of belongingness and personal development (heightened organizational identification and resilience).

Moreover, it is important to emphasize that SBL should not be regarded as just another leadership style. Instead, we prefer to view it as a common factor that underpins the diverse range of positive leadership models (e.g., transformational leadership, empowering leadership, and servant leadership). The overarching objective of SBL is to foster interpersonal relations in which individuals feel both close and free, aligning perfectly with attachment theory's concept of a secure base that facilitates exploration and growth with the confidence that support will be available when needed.

By integrating the JD-R model and attachment theory, our study provides a comprehensive understanding of the intricate interplay between leadership, resources, engagement, and personal development within the context of military academies. This holistic approach underscores the significance of not only addressing job demands but also nurturing a supportive and secure environment that empowers cadets to excel in their roles, identify with the organization, and develop resilience. Our study contributes valuable insights to the broader discourse on leadership in high-stress environments and offers practical implications for leadership development programs within military education.

While our study sheds light on several important aspects, it is essential to acknowledge its limitations. First, the cross-sectional nature of this research limits our ability to infer causality. While high correlations between leadership and work engagement have been noted (Gutermann et al., 2017; Pastor et al., 2019), longitudinal studies are needed to better understand this relationship in military contexts. Second, the use of self-report measures, albeit with adequate psychometric properties and validated in Spain, may introduce response biases. Future research should thus consider mixed methods approaches to triangulate findings. Finally, our study focused on subordinates' perceptions of their supervisors as secure bases. Future research could explore the long-term effects of SBL on cadet development and its applicability in other high-stress professional environments. Subsequent studies could also incorporate supervisors' self-assessments to provide a more valid understanding of Secure Base Leadership and its impact on burnout in military environments. Additionally, further investigation into the interaction between different leadership styles within the JD-R model could provide a more nuanced understanding of employee engagement in various organizational contexts.

The view of SBL as a significant job resource within the JD-R framework not only carries practical implications for leadership training and development in military academies but also highlights the theoretical nuances of applying such models across different organizational contexts. This finding underscores the imperative for leadership styles that adeptly address job demands while furnishing the requisite resources to foster engagement, resilience, and organizational identification. From a theoretical standpoint, it suggests the potential for extending the JD-R model, traditionally applied in civilian organizations, to military settings, thereby enriching our understanding of leadership dynamics across diverse organizational landscapes. Furthermore, the role of work engagement as not merely an outcome but also a precursor in the relationship between leadership and resilience adds a compelling layer to the discourse, echoing the reciprocal relationships discussed in the theoretical framework. This nuance invites a deeper exploration of the bidirectional nature of engagement within leadership paradigms, offering both theoretical and practical insights into the development of more resilient and engaged military personnel.

6 Conclusion

In conclusion, the integration of SBL within military academies represents a significant paradigm shift in leadership approaches. It emphasizes the pivotal role of supportive and responsive leadership in enhancing work engagement, organizational identification, and resilience among cadets. Our study not only validates the JD-R model within a military context but also highlights the transformative impact of SBL on cadets' professional growth and wellbeing.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, upon reasonable request.

Ethics statement

This study was reviewed and approved by the Research Ethics Committee of the National University of Distance Education (Reference: 16-PSI-2021). Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

MN-J: Writing – original draft, Methodology, Formal analysis, Conceptualization. AL: Writing – original draft, Methodology, Data curation, Conceptualization. PR: Writing – original draft, Methodology, Formal analysis, Data curation. CG-G: Writing – original draft, Resources, Methodology, Conceptualization. AP: Writing – original draft, Methodology, Conceptualization. SE-V: Writing – original draft, Data curation, Conceptualization. FM: Writing – original draft, Resources, Data curation, Conceptualization. MM: Writing – original draft, Methodology. JAM: Writing – original draft, Resources, Methodology, Conceptualization.

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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.

Publisher's note

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The relationship between impostor phenomenon and emotional exhaustion among Chinese nurses: the mediating role of bi-directional work-family conflict

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Aims: The study aims to explore the relationship between impostor phenomenon and emotional exhaustion among nurses and to examine the potential mediating role of bi-directional work–family conflict.

Methods: A cross-sectional survey using convenience sampling was conducted from January to April 2023, involving 4,088 Chinese nurses. Of those, 3,977 nurses across 43 public hospitals completed the web-based survey that included a sociodemographic information questionnaire, the short Clance Impostor Phenomenon Scale, the Bi-directional Scale of Work–Family Conflict, and the Emotional Exhaustion Scale. SPSS with Hayes's PROCESS v4.2 Macro was employed to examine the mediation model using bootstrap techniques.

Results: After controlling for confounding factors, impostor phenomenon was found to have a direct positive effect on emotional exhaustion (β = 0.134, 95% CI [0.122 to 0.145]); the two dimensions of work–family conflict, work interfering with family (β = 0.099, 95% CI [0.090 to 0.109]) and family interfering with work (β = 0.017, 95% CI [0.012 to 0.022]), served as parallel mediators in the relationship between impostor phenomenon and emotional exhaustion. Compared to family interfering with work, impostor phenomenon had a greater influence on emotional exhaustion through the mediation of work interfering with family, with a difference in the mediating effects of 0.082 (95% CI [0.073 to 0.096]). (The symbol β denotes the regression coefficient, estimated through mediation analysis using a bias-corrected bootstrapping procedure. CI represents the confidence interval for the specified parameter).

Conclusion: This study reveals that impostor phenomenon not only directly affects emotional exhaustion but also exerts parallel mediation effects through bi-directional work–family conflict, with work interfering with family exerting a stronger mediating effect than family interfering with work. The findings elucidate the complex interplay between impostor phenomenon, an intrapersonal psychological factor, and work–family conflict, an interpersonal stressor, in contributing to emotional exhaustion among Chinese nurses,

providing valuable insights to guide efforts aimed at safeguarding nurses' mental health and well-being.

KEYWORDS

impostor phenomenon, emotional exhaustion, work–family conflict, Chinese nurses, mediation effect analysis

1 Introduction

Nurses play a pivotal role in delivering quality patient care, yet they are frequently plagued by high levels of occupational stress and burnout. In China, a nationwide survey revealed that over a third of nurses (33.8%) suffer from emotional exhaustion (1), a rate three times higher than the global average (11.23%) (2). Emotional exhaustion, a core component of burnout, has been associated with numerous negative consequences, such as reduced job satisfaction, impaired quality of care, and increased intention to leave and actual turnover (3–5). The prevalence of turnover intention among Chinese nurses has reached an alarming 42.8% (6). In response to this pressing concern, the Chinese government has implemented a series of policies and initiatives to promote nurses' well-being and mitigate burnout. The "Healthy China 2030" blueprint, launched in 2016, emphasized the imperative to enhance the working environment and mental health of healthcare professionals[1]. Subsequently, the "Nursing Development Plan (2021–2025)" further reinforced the importance of safeguarding nurses' occupational health and preventing job burnout[2]. These policy measures underscore the critical need for effective strategies to support nurses' well-being and alleviate emotional exhaustion.

While previous studies have investigated the impact of work-related stressors and individual characteristics on nurses' emotional exhaustion (1, 7, 8), research into the psychological mechanisms underpinning this phenomenon, particularly those incorporating both intrapersonal and interpersonal factors, remains limited. As the largest nursing workforce in the world[3], Chinese nurses' well-being and retention have significant implications for global healthcare delivery. Therefore, unraveling the mechanisms that shape Chinese nurses' emotional exhaustion is crucial for formulating evidence-based strategies to promote nurse well-being and mitigate burnout, which in turn has far-reaching implications for the quality and stability of healthcare systems worldwide.

2 Background

One intrapersonal factor that has gained emerging attention in the nursing literature is impostor phenomenon[4]. Impostor phenomenon refers to the persistent belief that one's success is undeserved and the fear of being exposed as a fraud, despite objective evidence of competence (9). Individuals with impostorism often exhibit a range of interconnected traits including the impostor cycle, perfectionism, superheroism, atychiphobia (fear of failure), achievemephobia (fear of success), and denial of competence (9). For example, these individuals may find themselves trapped in the impostor cycle, a self-perpetuating pattern of anxiety, overwork, and self-doubt (10). Perfectionism prompts them to set unattainably high goals, leading to self-criticism over any perceived shortfall (11). This maladaptive perfectionism can engender a vicious cycle of overexertion and potential burnout, as individuals strive to prove their worth with "superheroic efforts" (11). Moreover, the constant fear of making mistakes, being exposed as incompetent, or facing higher expectations upon success can trigger chronic anxiety and stress, further depleting emotional reserves (9, 12). Impostorism also leads to a denial of competence, where individuals attribute their successes to external factors, thereby fuelling feelings of recurrent self-doubt and intellectual phoniness (9). These behavioral patterns render individuals with impostorism particularly prone to mental health disorders, such as burnout, depression, and anxiety, and can exacerbate other psychological conditions (10, 13).

Within nursing populations, the prevalence of impostor phenomenon is notably high, with estimates ranging between 36 and 75% (14). This heightened prevalence among nurses may be attributed to their unique professional context: the requirement for continuous competency development, high-stakes decision-making responsibilities, and the constant pressure to maintain impeccable performance in life-or-death situations (14, 15). Impostor phenomenon manifests uniquely in nursing practice, where the need for precise clinical judgment intersects with the emotional demands of patient care. Nurses experiencing impostorism often doubt their clinical competence despite demonstrated expertise, leading to excessive double-checking of decisions and emotional detachment as coping mechanisms (14, 15). According to the Conservation of Resources (COR) theory (16), this persistent self-doubt and hypervigilance depletes nurses' psychological reserves, directly contributing to emotional exhaustion. This proposition aligns with the Job Demands-Resources (JD-R) model (17), which posits that an imbalance between job demands and personal resources can precipitate burnout. As impostorism consumes nurses' cognitive and emotional resources, it may intensify the perceived demands of their work environment, thereby increasing the risk of exhaustion (14). Empirical studies have corroborated these theoretical assertions, demonstrating significant associations between impostor phenomenon and emotional exhaustion among nursing populations (14, 15, 18, 19) and other healthcare professionals (20, 21). Consequently, impostor phenomenon could be identified as a potent intrapersonal factor that contribute to emotional exhaustion and other adverse psychobehavioral outcomes among nurses, yet the pathways through which this relationship manifests remain poorly understood.

1 https://www.gov.cn/zhengce/2016-10/25/content_5124174.htm
2 https://www.gov.cn/zhengce/zhengceku/2022-05/09/content_5689354.htm
3 https://www.who.int/publications-detail-redirect/9789240003279
4 https://www.aacn.org/blog/imposter-syndrome-in-nursing-a-barrier-to-personal-growth

In addition to intrapersonal factors like impostor phenomenon, interpersonal factors such as work–family conflict have also been pinpointed as significant contributors to emotional exhaustion, with both work interfering with family (WIF) and family interfering with work (FIW) showing significant associations (22–25). Work–family conflict occurs when the demands of work and family roles are incompatible (26), a scenario frequently encountered by nurses due to the profession's high demands and irregular schedules. In fact, over 40% of nurses have reported experiencing high levels of work–family conflict (25, 27). Nurses grappling with impostorism may find their WIF exacerbated, as they tend to overcommit to work in an attempt to validate their competence (28). On the other hand, the deep-seated self-doubt and psychological strain associated with impostor phenomenon can also undermine their family functionality, thereby elevating FIW (29). Accordingly, both WIF and FIW could serve as critical pathways through which impostor phenomenon contributes to emotional exhaustion in nurses. However, existing studies have not explicitly explored how impostor phenomenon interacts with work–family conflict to influence emotional exhaustion.

Moreover, the primary behavioral patterns associated with impostorism, such as excessive dedication to work and prioritizing occupational obligations, may lead to a greater spillover of work-related stress into the family domain than vice versa (30, 31). Reichl et al.'s meta-analysis (32) further revealed that the relationship between work–nonwork conflict and emotional exhaustion was more potent than that between nonwork–work conflict and emotional exhaustion, a trend observed among working adults from different cultural backgrounds. These findings resonate with the JD-R model (17), which highlights job demands as the foremost catalysts for exhaustion, with emotional resources being predominantly depleted by occupational rather than family demands. Based on the empirical and theoretical underpinnings, WIF may serve as a more salient mediator than FIW in the relationship between impostor phenomenon and emotional exhaustion.

Taken together, we proposed the following three research hypotheses:

> *H1*: Impostor phenomenon has a direct positive effect on emotional exhaustion.
>
> *H2*: Bi-directional work–family conflict, specifically WIF and FIW, parallelly mediates the relationship between impostor phenomenon and emotional exhaustion.
>
> *H3*: The mediating effect of WIF is stronger than that of FIW in the relationship between impostor phenomenon and emotional exhaustion.

3 Methods

3.1 Aims

The current study aims to explore the relationship between impostor phenomenon and emotional exhaustion among a large multicenter sample of Chinese nurses and examine the potential parallel mediating roles of the two dimensions of work–family conflict.

3.2 Design

A multicenter cross-sectional design was employed in this study, adhering to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (33).

3.3 Settings and participants

Participants were recruited from 43 public hospitals, primarily located in the western and middle regions of China. Public hospitals serve as the primary healthcare service providers in China. The western and middle regions are comparatively less developed than the eastern and southern regions. Participants were eligible to participate if they met the following inclusion criteria: (i) being an active registered nurse; (ii) having over 1 year of experience in clinical nursing, and (iii) voluntarily agreeing to participate. Nurses on rotation, intern nurses, and nurses who had taken continuous leave for more than 6 months within the last year were excluded.

3.4 Measurements

3.4.1 Demographic questionnaire

The study employed a succinct questionnaire to collect demographic and occupational details from the participating nurses. This questionnaire solicited information regarding their gender, age, marital status, educational level, working experience, and professional title. Additionally, to evaluate the socioeconomic status of the participants, we posed a single question: 'Considering your income, education, and occupation, where would you rank your family within the broader social hierarchy?' Responses were gaged on a 10-point scale, with 1 being the lowest and 10 being the highest position.

3.4.2 Impostor phenomenon

Impostor phenomenon was assessed using the short Clance Impostor Phenomenon Scale (CIPS-10) (34). This version is a refined adaptation of the full-length CIPS (35), by selecting 10 essential, nonredundant items and incorporating important enhancements (34). An illustrative item is, "I'm afraid people important to me may find out that I'm not as capable as they think I am." The CIPS-10 consists of 10 items rated on a 7-point frequency scale from '1 = never' to '7 = always' (34). The total score on the scale ranges between 10 and 70, where higher scores correspond to more severe instances of the impostor phenomenon. The CIPS-10 demonstrated excellent reliability in our study with a Cronbach's alpha coefficient of 0.974.

3.4.3 Work–family conflict

Work–family conflict was appraised using the Bi-directional Scale of Work–Family Conflict (36, 37). The scale consists of 6 items measuring work interfering with family (WIF; e.g., my job keeps me from spending time with my family members), and another 5 items measuring family interfering with work (FIW; e.g., my family demands make it hard for me to do my job well) (37). Participants' responses were collected on a 7-point Likert-type scale, anchored with '1 = strongly disagree' and '7 = strongly agree' (38). The total scores on the subscales vary from 6 to 42 for WIF, and from 5 to 35 for FIW. The higher the score, the stronger the degree of work–family conflict. The

reliability coefficients for the two subscales and the overall scale in our study were 0.968, 0.728, and 0.896, respectively.

3.4.4 Emotional exhaustion

The level of emotional exhaustion among participants was evaluated with the 6-item Emotional Exhaustion Scale (EES) (39), derived from the Maslach Burnout Inventory (40). The scale is well-recognized for its extensive application and validation within the Chinese context (41). A representative item from the scale is, 'I feel emotionally drained from my work,' with response options that range on a 5-point Likert scale from '1 = strongly disagree' to '5 = strongly agree' (39). The aggregate score on the EES varies from 6 to 30, with higher scores denoting greater emotional exhaustion. The EES displayed satisfactory reliability in the present study, as indicated by a Cronbach's alpha coefficient of 0.957.

3.5 Data collection

The data collection for this study was conducted from January to April 2023, utilizing a convenience sampling method. Initially, the principal investigator reached out to the heads of nursing departments in targeted hospitals to gain their consent. Subsequently, a QR code, which linked to the survey hosted on www.wjx.cn, was provided to these department heads for distribution to potentially eligible participants in their hospitals. Participation in the study was at the discretion of each individual respondent. To ensure response uniqueness, the questionnaire was configured to allow only one submission per IP address. The questionnaire was designed in a page-flipping format, requiring participants to respond to all questions online and complete the entire survey before submission.

3.6 Statistical analysis

We utilized IBM SPSS Statistics 26 along with Hayes's PROCESS v4.2 Macro (Model 4) within IBM SPSS to perform data analysis. Initially, Harman's one-factor method was applied to test for common method bias (42). Subsequently, we performed descriptive statistics, *t*-tests, analysis of variance (ANOVA), and Pearson correlation analysis. Continuous variables were described using mean ± standard deviation (SD), while categorical variables were presented in terms of frequency and percentage. The *t*-tests and ANOVA were used to investigate the differences in the level of emotional exhaustion among participants with diverse general characteristics. Bivariate Pearson correlation coefficients were calculated to assess correlations between impostor phenomenon, work–family conflict, and emotional exhaustion. Finally, we proceeded with the mediation effect analysis. The bias-corrected bootstrapping technique with 5,000 bootstrap samples was used to compute the 95% confidence intervals (CI). A statistically significant mediating effect was confirmed if the upper limit and the lower limit of a 95% CI excluded zero (43).

4 Results

A total of 4,088 nurses participated in the survey by completing the questionnaires. The final sample for analysis excluded respondents who either provided identical answers to a series of questions or completed the survey in under 180 s (minimum time required for careful completion). The number of valid questionnaires stood at 3977, yielding an effective response rate of 97.3%. The Harman's one-factor test identified 6 factors with eigenvalues exceeding 1. The first factor accounted for 37.97% of the total variance (< 40%), thus indicating no serious common method bias in this study (42).

4.1 Descriptive statistics and group differences

The demographic characteristics of the participants are provided in Table 1. Females represented a significant 95.2% (n = 3,786) of the study population, and approximately half of the participants were aged 29–36 years. Among all participants, 71.8% (n = 2,856) were married. Only a small percentage (0.4%; n = 16) held a graduate degree or higher. Work experience among the participants was fairly evenly distributed, and most possessed junior nursing titles, with 62.9% of them (n = 2,503) self-rating their socioeconomic status as being in the middle tier of the overall social hierarchy.

The analysis of group differences in emotional exhaustion of the participants based on their demographic characteristics, as shown in Table 1, revealed significant differences in emotional exhaustion levels across different groups, with the exception of gender. Specifically, higher levels of emotional exhaustion were observed in nurses aged between 29 to 36 and 37 to 44 years, those who were married, possessed an undergraduate degree, with over 6 years of work experience, held an intermediate or senior nursing title, and those from lower or middle socioeconomic tiers.

4.2 Bivariate Pearson correlation analyses

Table 2 illustrates means, SD, composite reliability (CR) (44), average variance extracted (AVE), and bivariate Pearson correlations for the examined variables. The CR and AVE values for the variables exceeded their respective thresholds of 0.7 and 0.5, thus confirming the reliability and validity of the measurement scales utilized. Our analysis revealed a positive correlation between impostor phenomenon and WIF ($r = 0.405$, $p < 0.01$), FIW ($r = 0.372$, $p < 0.01$), and emotional exhaustion ($r = 0.536$, $p < 0.01$). A positive correlation was also observed between WIF and both FIW ($r = 0.392$, $p < 0.01$) and emotional exhaustion ($r = 0.690$, $p < 0.01$). Moreover, the relationship between FIW and emotional exhaustion was positively correlated ($r = 0.409$, $p < 0.01$). Given the statistically significant bivariate correlations among the variables specified in the hypothesized pathways, analysis of subsequent mediation effects was pursued.

4.3 Parallel mediation analyses

4.3.1 The direct effects of impostor phenomenon on emotional exhaustion

Multiple linear regression analyses controlling for significant demographic variables are detailed in Table 3. The initial univariate analysis showed that impostor phenomenon positively predicted WIF ($\beta = 0.302$, $p < 0.001$), FIW ($\beta = 0.167$, $p < 0.001$), and

TABLE 1 Demographics of the participating nurses and group differences in emotional exhaustion (N = 3,977).

Characteristics	n (%)	Mean ± SD	t/F	p
Gender			−1.532	0.126
Male	191 (4.8%)	16.68 ± 6.67		
Female	3,786 (95.2%)	17.43 ± 6.59		
Age (years)			13.845	< 0.001
≤ 28	1,037 (26.1%)	16.41 ± 6.67		
29–36	1951 (49.1%)	17.79 ± 6.32		
37–44	642 (16.1%)	18.12 ± 6.35		
≥ 45	347 (8.7%)	16.76 ± 6.29		
Marital status[†]			−2.334	0.020
Single	1,121 (28.2%)	17.00 ± 6.58		
Married	2,856 (71.8%)	17.55 ± 6.60		
Educational level			12.953	< 0.001
Junior college and below	1761 (44.3%)	16.81 ± 6.82		
Undergraduate	2,200 (55.3%)	17.87 ± 6.50		
Postgraduate or above	16 (0.4%)	16.13 ± 6.27		
Working experience (years)			14.384	< 0.001
1–5	980 (24.6%)	16.21 ± 6.62		
6–10	1,033 (26.0%)	17.73 ± 6.77		
11–15	1,128 (28.4%)	17.92 ± 6.51		
≥ 16	836 (21.0%)	17.65 ± 6.32		
Professional title			5.066	0.006
Junior	2,865 (72.0%)	17.19 ± 6.73		
Intermediate	908 (22.8%)	17.85 ± 6.13		
Senior	204 (5.1%)	18.20 ± 6.56		
Socioeconomic status[‡]			29.589	< 0.001
Lower	933 (23.5%)	18.47 ± 6.83		
Middle	2,503 (62.9%)	17.35 ± 6.37		
Upper	541 (13.6%)	15.75 ± 6.90		

[†] Single indicated separated, divorced, widowed, or never married, and married indicated married or partnered.
[‡] Socioeconomic status indicated lower tier for choices between 1 ~ 3, middle tier for 4 ~ 7, and upper tier for 8 ~ 10.

emotional exhaustion ($\beta = 0.250$, $p < 0.001$). Subsequently, including WIF and FIW as independent variables in the regression model, the multivariate analysis demonstrated a reduction in the predictive power of impostor phenomenon on emotional exhaustion, with the regression coefficient dropping from 0.250 to 0.134, but still maintaining statistical significance ($p < 0.001$). Therefore, Hypothesis 1 was supported by our data.

4.3.2 The parallel mediating effects of WIF and FIW

The results of the parallel mediation effects analysis using the bias-corrected bootstrapping procedure are illustrated in Figure 1 and Table 4. This analysis revealed that in the model pathway from impostor phenomenon to emotional exhaustion mediated by WIF, the indirect effect was 0.099 (95% CI [0.090 to 0.109]). Similarly, the pathway mediated by FIW showed an indirect effect of 0.017 (95% CI [0.012 to 0.022]). The Bootstrap 95% CIs for both pathways did not cross zero, confirming the significance of these paths. The effect sizes represented 39.6 and 6.8% of the total effect, respectively, for the WIF and FIW mediated pathways. Thus, Hypothesis 2 was verified, affirming that WIF and FIW acted as parallel mediators in the relationship between impostor phenomenon and emotional exhaustion.

4.3.3 Comparison of the mediating effects of WIF and FIW

The difference in the mediating effects of WIF and FIW was 0.082 (95% CI [0.073 to 0.096]), indicating that the mediating effect of WIF on the relationship between impostor phenomenon and emotional exhaustion was stronger than the mediating effect of FIW. In comparison to FIW, impostor phenomenon had a greater influence on emotional exhaustion through the mediation of WIF. Accordingly, Hypothesis 3 was substantiated by the finding.

TABLE 2 Psychometric indicators of the measurement scales and bivariate Pearson correlation analyses.

	CR	AVE	Mean ± SD	IP	WIF	FIW	EE
Impostor phenomenon (IP)	0.948	0.648	28.01 ± 13.85	1			
Work interfering with family (WIF)	0.973	0.858	24.94 ± 10.76	0.405**	1		
Family interfering with work (FIW)	0.843	0.561	14.87 ± 6.20	0.372**	392**	1	
Emotional exhaustion (EE)	0.965	0.822	17.39 ± 6.60	0.536**	690**	0.409**	1

CR, composite reliability; AVE, average variance extracted.
**At the 0.01 level (two tails), the correlation is significant.

TABLE 3 Results of multiple linear regression analysis.

Variables	Work interfering with family (WIF)			Family interfering with work (FIW)			Emotional exhaustion (EE)		
	Coeff.	*SE*	*p*	*Coeff.*	*SE*	*p*	*Coeff.*	*SE*	*p*
Constant	16.041	0.921	<0.001	12.715	0.538	<0.001	3.820	0.445	<0.001
IP	0.302	0.011	<0.001	0.167	0.007	<0.001	0.134	0.006	<0.001
WIF	—	—	—	—	—	—	0.328	0.007	<0.001
FIW	—	—	—	—	—	—	0.103	0.013	<0.001
Age	−0.781	0.320	0.015	−0.223	0.187	0.235	0.137	0.143	0.337
Marital status	−0.267	0.396	0.501	−0.279	0.231	0.229	−0.015	0.177	0.934
Working experience	0.627	0.252	0.013	0.526	0.148	<0.001	0.166	0.113	0.142
Professional title	0.335	0.355	0.346	−1.341	0.208	<0.001	0.310	0.160	0.052
Educational level	2.024	0.320	<0.001	−0.735	0.187	<0.001	−0.177	0.144	0.219
Socioeconomic status	−1.384	0.261	<0.001	0.029	0.153	0.85	−0.358	0.117	0.002
R^2	0.181			0.157			0.566		
F-value	125.005			105.329			574.365		
p	<0.001			<0.001			<0.001		

SE, standard error; IP, impostor phenomenon.

5 Discussion

The present study explored the relationship between impostor phenomenon and emotional exhaustion among a large multicenter sample of Chinese nurses and examined the parallel mediating role of bi-directional work–family conflict. The findings confirmed our first hypothesis, revealing a direct positive association between impostor phenomenon and emotional exhaustion. Furthermore, the results supported our second and third hypotheses, indicating that WIF and FIW parallelly mediated the pathway linking impostor phenomenon to emotional exhaustion, with WIF exhibiting a more pronounced mediating role compared to FIW. This research represents one of the pioneering efforts to uncover the potential mechanisms underlying the association between impostor phenomenon and emotional exhaustion within the Chinese nursing profession. By elucidating the mediating pathways, our study offers valuable insights for nursing managers to develop targeted interventions aimed at enhancing nurses' psychological well-being, ultimately improving patient care outcomes and organizational performance.

The first main finding identified that impostor phenomenon had a direct positive effect on emotional exhaustion among nurses, which aligns with previous studies conducted in various populations, including healthcare professionals (9, 12, 13). This direct effect can be attributed to the behavioral characteristics associated with impostorism, such as perfectionism, overworking, and self-criticism (9). Individuals with high levels of impostorism often set excessively high standards for themselves, experience a constant fear of failure or being exposed as frauds, and tend to discount their accomplishments and attribute their success to external factors such as luck or timing (10, 11). Consequently, they may invest a disproportionate amount of time and energy into their work to prove their competence and avoid detection, leading to physical and emotional depletion over time (11). In the context of nursing, the high-stakes nature of the profession, coupled with the intense emotional demands and heavy workload, may amplify the impact of impostor phenomenon on emotional exhaustion (15). The current study's findings contribute to the growing body of research highlighting the detrimental effects of impostor phenomenon on the mental well-being of nurses, particularly in the Chinese context, underscoring the importance of addressing this psychological vulnerability to promote their emotional well-being and resilience. This finding suggests that healthcare organizations should implement regular psychological screening and support programs specifically targeting impostor phenomenon among nurses, and nurse educators could incorporate impostor phenomenon awareness into professional development initiatives to help nurses better recognize and manage these feelings.

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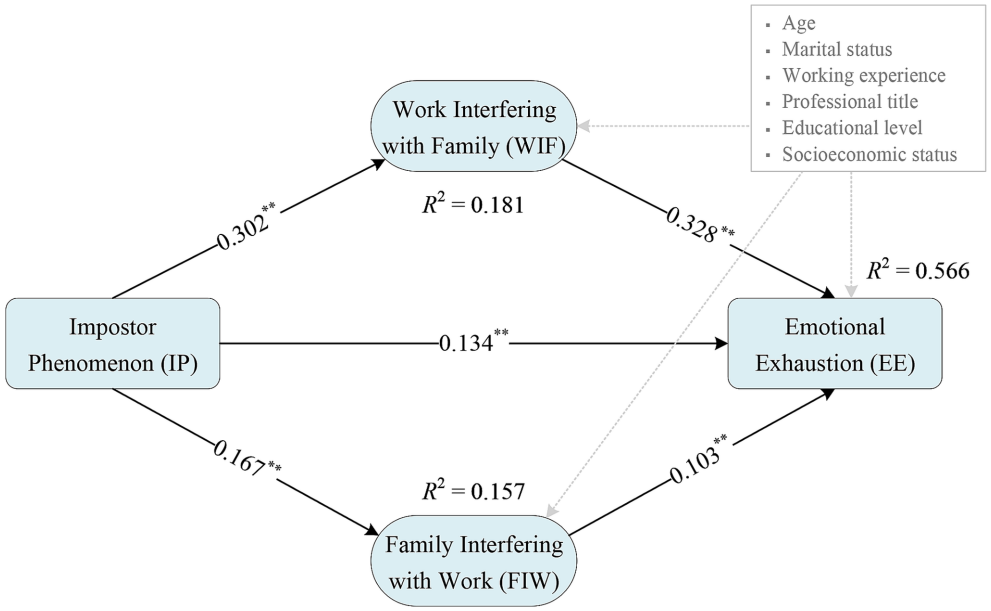

FIGURE 1
The parallel mediation model with path coefficients for emotional exhaustion. Age, marital status, working experience, professional title, educational level, and socioeconomic status were controlled as confounding factors. R^2 representing the proportion of variation in each dependent variable that can be explained in the model.

TABLE 4 Results of parallel mediation effects analysis with bias-corrected bootstrapping procedure.

Model pathways	Effect	Effect ratio	*SE*	Bootstrap 95% CI	
				Lower	Upper
Total effect	0.250	—	0.006	0.237	0.262
Direct effect: IP → EE	0.134	53.6%	0.006	0.122	0.145
Indirect effect 1: IP → WIF → EE	0.099	39.6%	0.005	0.090	0.109
Indirect effect 2: IP → FIW → EE	0.017	6.8%	0.003	0.012	0.022
Diff (Indirect effect 1–2)	0.082		0.006	0.073	0.096

SE, standard error; CI, confidence interval; IP, impostor phenomenon; EE, emotional exhaustion; WIF, work interfering with family; FIW, family interfering with work. Significant demographic characteristics (age, marital status, working experience, professional title, educational level, and socioeconomic status) were controlled for as confounding factors.

In addition to the direct effect, our study also indicated significant indirect effects of impostor phenomenon on emotional exhaustion, with bi-directional work–family conflict acting as parallel mediators. The indirect effect through WIF can be explained by the behavioral patterns characterizing impostorism, such as overworking and prioritizing occupational demands to validate competence and capability (10). This may lead to a neglect of family responsibilities and heightened WIF, which, in turn, contributes to emotional exhaustion, as the strain of managing competing work and family demands can deplete emotional resources and lead to feelings of overwhelm and burnout. Simultaneously, the indirect effect through FIW can be ascribed to the psychological distress and diminished self-efficacy linked to impostorism (9, 10). The chronic self-doubt, anxiety, and fear of being exposed as incompetent may spill over into the family domain, resulting in increased FIW. Moreover, individuals affected by impostorism may struggle to derive a sense of accomplishment from their personal lives (9), leading to increased FIW and, consequently, exacerbating emotional exhaustion. This is because the burden of attending to family responsibilities while grappling with internal insecurities can drain emotional resources and result in feelings of inadequacy and burnout (14, 29). The findings are consistent with previous research demonstrating the associations between impostor phenomenon, work–family conflict, and emotional exhaustion in other occupational contexts (12, 28, 29). In contrast, the present study extends the existing literature by examining the specific roles of WIF and FIW as parallel mediators and by focusing on the nursing profession in the Chinese context, which has received limited attention in this regard.

Moreover, the stronger mediating effect of WIF compared to FIW in the relationship between impostor phenomenon and emotional exhaustion was observed in our study. This finding can be attributed to the high emotional labor and intense work pressure inherent to the healthcare context in China (45, 46), which may exacerbate the spillover of work-related stress into the family domain. Apart from that, deeply ingrained cultural values of collectivism, respect for authority, and "face-saving" in Chinese society may intensify the

pressure on nurses to maintain a flawless image and avoid mistakes in the workplace, thereby increasing their vulnerability to WIF. Such occupational and cultural challenges uniquely predispose Chinese nurses to the detrimental effects of impostorism, further amplifying the impact of WIF on emotional exhaustion. Our study is novel in comparing the mediating effects of WIF and FIW in a large multicenter sample of Chinese nurses, providing insights into the distinct challenges faced by this population and emphasizing the importance of tailoring interventions to address work–family conflict, particularly WIF, in this cultural context. Accordingly, nursing managers should prioritize strategies that help nurses maintain a healthy work-life balance to foster a more resilient and emotionally healthy nursing workforce. Specific interventions could include implementing structured mentorship programs, establishing flexible scheduling options, and developing clear policies limiting overtime work. Organizations should also consider providing practical support services such as childcare assistance and regular professional development workshops focusing on self-efficacy enhancement. These targeted interventions, particularly addressing work interference with family, are crucial given the unique cultural and occupational challenges faced by Chinese nurses.

6 Limitations

This study presents several limitations worth noting. First, relying solely on quantitative methods may not fully capture the complexities of nurses' experiences. Future research could integrate qualitative approaches to provide a more comprehensive understanding of the studied phenomena. Second, the cross-sectional design precludes the establishment of causal relationships among the variables, necessitating longitudinal studies to elucidate the causal associations and temporal dynamics. Third, the sample's limited representation of male nurses and those with postgraduate education, given their potential impact on the impostor phenomenon, work–family conflict, and emotional responses, calls for further investigation into how these demographic factors influence the studied variables. Fourth, the study's focus on the relationship between the impostor phenomenon and emotional exhaustion, mediated by work–family conflict, may disregard other relevant mediators or moderators, warranting further exploration of additional pathways and potential factors influencing the associations. Finally, as the multicenter study focused solely on Chinese nurses, caution should be exercised when interpreting and applying the findings to other cultural contexts, underscoring the importance of conducting larger-scale replications in diverse settings to establish generalizability.

7 Conclusion

The current study reveals that impostor phenomenon not only directly affects emotional exhaustion but also exerts parallel mediation effects through bi-directional work–family conflict, with WIF exerting a stronger mediating effect than FIW. The findings elucidate the complex interplay between impostor phenomenon, an intrapersonal psychological factor, and work–family conflict, an interpersonal stressor, in contributing to emotional exhaustion among Chinese nurses. T These findings underscore the imperative for healthcare organizations to implement dual-focused interventions that address both impostor phenomenon and work-family dynamics, with particular emphasis on mitigating work-to-family interference. Such evidence-based approaches could enhance nurses' psychological well-being and workforce sustainability in healthcare settings.

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 authors.

Ethics statement

This study was conducted as an anonymous investigation, adhering to ethical guidelines without involving any unethical behaviour or human clinical trials. The Biomedical Ethics Committee of West China Hospital, Sichuan University, thoroughly reviewed and granted approval for this study [Approval number: 2023(2207)]. Additionally, consent was obtained from each participating hospital. All respondents were clearly informed about the voluntary nature of their participation in the survey, with the understanding that completion of the questionnaire constituted their implied consent.

Author contributions

YL: Conceptualization, Data curation, Formal analysis, Funding acquisition, Methodology, Software, Validation, Visualization, Writing – original draft, Writing – review & editing. FQ: Conceptualization, Data curation, Methodology, Writing – original draft, Writing – review & editing. BL: Funding acquisition, Methodology, Supervision, Writing – original draft, Writing – review & editing. YH: Methodology, Supervision, Writing – original draft, Writing – review & editing. JL: Methodology, Software, Writing – original draft, Writing – review & editing. YXL: Funding acquisition, Investigation, Writing – original draft, Writing – review & editing. PH: Conceptualization, Investigation, Supervision, Writing – original draft, Writing – review & editing. JF: Conceptualization, Investigation, Supervision, Validation, Writing – original draft, 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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A cross-sectional study to explore the relationship between the technology acceptance model and burnout and depression among pharmacists working with a pharmacy robotic dispensing system

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Objectives: This study compares hospitals using a pharmacy robotic dispensing system (RPDS) with those using manual dispensing systems regarding burnout and depression among pharmacists in Emirates Health Services (EHS) hospitals. Furthermore, this study aims to bridge the gap in the literature concerning the relationship between burnout and the technology acceptance model (TAM).

Methods: A cross-sectional survey was conducted to determine whether burnout and TAM differed between hospitals with RPDS and those with manual dispensing system. The study was carried out in ten hospitals governed by the EHS.

Results: A total of 256 respondents completed the survey. Burnout and depression levels among pharmacists working with RPDS did not differ significantly from those using manual dispensing systems. However, the median of personal burnout levels in female pharmacists (Mdn = 50) differed significantly from those using manual dispensing systems (Mdn = 25; U = 3497.5, $z = -7.8$, $p < 0.001$, $r = -0.49$). In contrast, male pharmacists exhibited higher levels of technology acceptance (U = 11,357, $z = 5.58$, $p < 0.001$, r = 0.35; U = 10,391, $z = 4.0$, $p < 0.001$, $r = 0.25$).

Conclusion: This study explored the differences in burnout, depression levels, and TAM among employees working in public hospitals in the United Arab of Emirates. Overall, automation had both positive and negative effects on workplace stressors experienced by pharmacy staff.

KEYWORDS

pharmacy robotic dispensing system, technology acceptance model, burnout, depression, pharmacists

1 Introduction

1.1 Pharmacy robotic dispensing system

The use of advanced technology in the healthcare sector has increased. Robots have the potential to support various aspects of healthcare and assist humans in diverse environments. Their applications span across multiple specialties and settings. Morgan et al. (2022) reviewed the use of robots in healthcare, identifying their roles and deployment in various clinical settings, such as surgical theaters to rehabilitation units, hospital wards, and inpatient pharmacies. Robotic systems aim to enhance patient experiences, increase satisfaction, and reduce dispensing errors (Boyd and Chaffee, 2019). While advanced technology is essential in healthcare, there is limited evidence regarding its impact on the mental health of healthcare professionals, particularly concerning burnout and depression. This study explores the relationship between work-related well-being and the acceptance of advanced technology and is among the first to highlight the history of robotic use in healthcare.

The first documented robot-assisted surgical procedure occurred in 1985. Since then, technological advancements have rapidly enhanced the capabilities of robots (Kyrarini et al., 2021). Healthcare organizations worldwide are investing in expensive technologies to improve care delivery and patient safety. The Emirates Health Services (EHS) introduced a pharmacy robotic dispensing system (RPDS) in five major hospitals to expand the pharmaceutical service automation. RPDS are autonomous systems designed to dispense medications to inpatient and outpatient departments and manage medication storage and inventory (Boyd and Chaffee, 2019). By reducing the need for human intervention, these systems aim to minimize the risk of human error (James et al., 2013). However, studies have found that some staff members underuse or misuse these technologies (Holden and Karsh, 2010).

The RPDS mimics human behavior through algorithms that map and analyze the environment. These algorithms allow the system to adapt to its surroundings, which is crucial for its effectiveness. Accurate mapping is essential for the practical applications performed by pharmacy robots. Consequently, RPDS is set to influence the evolution of traditional medical dispensing practices (Barrett et al., 2012; James et al., 2013). A RPDS is considered an intelligent agent, either virtually or mechanically, operating under human supervision through automation. Recent advancements have increased its applications, including in Middle Eastern facilities. However, empirical studies on the impact of RPDS on employees' well-being and technology acceptance with EHS hospitals is lacking.

Healthcare providers are constantly challenged to engage in advanced technical functions (Shanafelt et al., 2015). Many healthcare organizations have introduced automation tools, including RPDS, to address medication incidents and deficiencies. Although automation is claimed to improve working conditions and ease prescription processing, some technicians still face physical and mental challenges (James et al., 2013; Boyd and Chaffee, 2019). A case study in the United Kingdom (UK) aimed to determine the effect of installing a RPDS and reported that automation has enabled the expansion of pharmacists' roles (James et al., 2013). James et al. (2013) suggested that automation positively impacted staff experiences related to stress, illogical workload allocation, work-life balance, and overall working conditions.

Researchers are increasingly interested in exploring connections between technology and mental health. Pinto et al. (2024) conducted a systematic review to investigate the relationship between emerging workplace technologies and employee mental health, focusing on burnout. Their findings revealed that burnout among staff is linked to inadequate training and feelings of insecurity when using advanced technology. Additional studies have shown that health information technology, especially electronic medical records, can significantly contribute to clinician burnout (Wu et al., 2021). However, there is limited understanding of the relationship between RPDS and staff burnout.

Few studies have assessed the relationship between the Technology Acceptance Model and burnout and depression among pharmacists working with a pharmacy robotic dispensing system. We believe our study aims to contribute to this growing area of research through its novel examination of the role of TAM in predicting burnout and depression amongst pharmacists working with RPDS in the United Arab Emirates (UAE).

1.2 Burnout

Job burnout occurs in every occupation. In healthcare, burnout has been studied more frequently among physicians and nurses; some studies have shown that it can also affect pharmacists (Prasad-Reddy et al., 2021). Burnout is characterized by feelings of emotional exhaustion and depersonalization (Maslach and Jackson, 1981). Previous research has demonstrated that organizational risk factors, such as increased or decreased workload, lack of job control, ineffective reward systems, and insufficient social interaction with colleagues and supervisors, can affect staff burnout levels (Maslach et al., 2008). Hobfoll and Shirom (2001) proposed a mechanism for burnout through the Conservation of Resources Theory. They suggested that burnout occurs when individuals excessively invest their resources without receiving sufficient returns. Individuals become cautious with future resource allocation when there is a lack of investment return. This may lead to distancing from the newly added technology or developing negative attitudes toward it.

Many researches have shown that workload is associated with work-related stress, which is recognized as a significant psychosocial hazard (Harvey et al., 2017). Understanding this relationship is essential, as workers may face an overload or underload of tasks affecting their stress level. Additionally, undergoing organizational changes can negatively impact employees' mental health (Harvey et al., 2017). A change in the work system includes introducing new and different work aspects designed to enhance productivity or improve services within the workplace (Murphy et al., 2002). The addition of new technology (i.e., RPDS) can increase pharmacists' experience of stress and burnout. Indeed, organizational culture can influence burnout. Negative culture can be stressful, mainly when managers or supervisors do not communicate appropriately with subordinates. Evidence suggests organizational culture could affect individuals' health and well-being (Cox and Howarth, 1990).

Burnout is associated with higher job turnover, reduced productivity, and quality concerns regarding patient safety and satisfaction. A growing body of literature has investigated the impact

Abbreviations: UAE, United Arab of Emirates; EHS, Emirates Health Services; RPDS, pharmacy robotic dispensing system; TAM, Technology Acceptance Model.

of burnout on pharmacists' well-being and patient safety (Babal et al., 2020; Holden and Karsh, 2010; Ortmeier and Wolfgang, 1991). For example, Holden et al. (2010) found that external demands, including interruptions, divided attention, and increased work pace, negatively impacted medication safety and employee well-being outcomes. Therefore, investigating the level of burnout among pharmacists working in EHS is essential. This study examines the relationship between burnout and pharmacists' acceptance of the RPDS using the technology acceptance model (TAM) (Davis, 1989). Based on our literature review, no previous study in the UAE has explored burnout among pharmacists working with a RPDS compared to those using manual dispensing systems.

The rapid development of healthcare technologies necessitates more professional devotion, leading to burnout. Therefore, the fatigue and complexity of newly introduced technology (i.e., RPDS) may result in burnout among pharmacists. Previous studies on TAM and burnout have shown that TAM is linked to staff's ability to perform their work responsibilities without unnecessary complexity, potentially reducing their sense of burnout (Davis, 1989; Kamel, 2024). Kamel (2024) examined the impact of TAM on job burnout among employees in travel agencies. The study showed that TAM moderates the relationship between technology-related demands and burnout. Consequently, pharmacists with high burnout levels are less likely to accept new technologies. Therefore, our primary objective is to compare hospitals using RPDS with those using manual dispensing systems regarding burnout and depression among pharmacists in EHS.

Sex also plays a role in burnout. It is reported that females are more likely than males to experience burnout and exhaustion at work (Artz et al., 2022). Female workers often face potential conflicts between family and work, leading to burnout and reduced job and life satisfaction. Therefore, this study is vital because it assesses the role of sex in working with manual dispensing systems in the UAE, a Middle Eastern country.

> Hypothesis 1 (H1): *Pharmacists working with RPDS have different burnout levels compared to pharmacists working with manual dispensing system.*

> Hypothesis 2 (H2): *Female pharmacists have different burnout levels compared to male pharmacists working at EHS hospitals.*

1.3 Technology acceptance model

Despite advancements in healthcare technology, healthcare organizations continue to face challenges of underutilization. In the 1980's, Davis (1989) developed the technology acceptance model (TAM) to reliably predict the actual use of a new technology. He hypothesized that users' attitudes towards a new technology will determine if an individual will use or reject a technology (Holden et al., 2010). By understanding the factors that influence employees' intention to use new technologies, organizations can then manipulate these factors to increase acceptance and use of those technologies. TAM has two main variables, perceived ease of use and perceived usefulness, which are precursor factors affecting technology acceptance (Granić and Marangunić, 2019).

Perceived ease of use (PEOU) refers to the belief a person has that using a new system would be free of effort (Davis, 1989). PEOU evaluates different aspects, including whether the new technology is easy to use, clear and understandable, and capable of quickly training staff (Holden et al., 2010). Perceived usefulness (PU), in contrast, is the extent to which staff think using the system will enhance their performance at work (Davis, 1989; Venkatesh and Davis, 2000). PU was typically assessed by inquiring about the health technologies' usefulness for specific tasks, their impact on productivity, and their effect on job significance (Holden et al., 2010). Perceived usefulness is a strong determinant of usage intention and can be influenced by other factors, including staff burnout. More research highlighting the role of staff burnout in the acceptance of new technologies is needed.

In healthcare, most studies focused on the acceptance of using electronic medical records (EMR) (Simon et al., 2009). Also, the literature on TAM pays particular attention to learning technology, such as blended and virtual learning (Granić and Marangunić, 2019). Previous studies have suggested introducing new technologies can create unexpected tasks for pharmacists (Holden et al., 2010; James et al., 2013; Boyd and Chaffee, 2019; Siska and Tribble, 2011).

Some studies have reported that RPDS improves staff satisfaction and work experience while reducing stress (Hogan et al., 2020). Other studies found adverse outcomes associated with such technologies, including challenges in implementing RPDS (Boyd and Chaffee, 2019). Therefore, this study investigates the factors influencing hospital pharmacies' acceptance of RPDS using the technology acceptance model (TAM) (Venkatesh and Davis, 2000). Therefore, this study compares pharmacists working with RPDS and those working with manual dispensing systems based on PEOU and PU. We operationalized PEOU in RPDS as easy to use, clear, and understandable, whereas PU is operationalized as helpful in completing RPDS tasks. Our hypothesis is as follows:

> Hypothesis 3 (H3): *Pharmacists working with RPDS have different PEOU and PU levels compared to pharmacists working with manual dispensing system.*

Finally, we hypothesized that burnout negatively correlates with TAM. Although automation improves working conditions and eases prescription processing, some technicians continue to experience physical and mental demands (James et al., 2013). Based on this information, our final hypothesis is as follows:

> Hypothesis 4 (H4): *Burnout is correlated with TAM factors (i.e., perceived ease of use and perceived usefulness).*

2 Methods

2.1 Study design, settings, and participants

A cross-sectional survey was used to examine whether burnout and TAM differed between hospitals with RPDS and those with a manual dispensing system. The survey also investigated the relationships between burnout, acceptance of RPDS, and sex of participants. The study was conducted in ten hospitals governed by the EHS. The sample included five hospitals with RPDS and five with a manual dispensing system. Hospitals with manual dispensing systems were selected because they were similar to those with RPDS in size and scope of service. These hospitals were selected to represent

key aspects of the changes in the EHS that the study aimed to capture. Ethical approval was granted by the MOHAP (MOHAP/DXB-REC/MMM/No.53/2023).

Data were collected from pharmacists in hospitals with RPDS, including Fujairah (MFH), AL Qassimi (AQH), AL Qassimi Women and Children (AQW), Ibrahim Bin Hamad and Obaidullah (MOH), and Abdalla Bin Omran (MOW) hospitals. Furthermore, pharmacists in hospitals with a manual dispensing system included Dibba AL Fujairah (MDH), Khorfakkan (MKF), Saqr (MSQ), Kalba (MKH), and AL Dhaid (MAD) hospitals.

Access to participants was gained by approaching staff working in the pharmacy department at the EHS headquarters and sending them direct invitations to avoid coercion. The email invitation outlined the aims of the study. Invitation were sent by a co-investigator to all pharmacists with a link to the online survey, which included the participant information sheet, consent form, demographic form, and the questionnaire. Reminder emails were sent weekly for four weeks to encourage participation. Data collection started on October 1, 2023, and ended on November 1, 2023.

The sample size was calculated using Statulator, an online tool. Two independent means were compared, determining the sample size based on the effect size (ρ), power (i.e., the chance of getting a significant result), and the significance level (α) required in the study. Considering that the study design involved a mean difference, the sample size was calculated using an independent t-test average model. The statistical power chosen was 0.80 for a medium effect size (ρ) of 0.3 with a significance value (α) of 0.05. The required sample size was 244 patients (122 in each group). For example, to detect an actual difference in means between RPDS and manual dispensing systems, 122 participants from hospitals with RPDS and 122 participants from hospitals with manual dispensing systems were needed. Participation was voluntary, and pharmacists had to work under the EHS and be at least 18 years old.

2.2 Measures

As the cross-sectional study aimed to compare burnout and TAM (i.e., perceived ease of use and perceived usefulness) in pharmacists working with RPDS and manual systems, relevant questionnaire items were informed by a literature review and gap analysis. The questionnaire attempted to measure the constructs experienced by staff in hospitals with RPDS or manual dispensing systems. Self-report questionnaires have been widely used to measure work-related risks due to their cost effectiveness. All necessary items were reverse coded in accordance with the author's suggestions for each scale.

2.2.1 Burnout

Burnout was measured using the Copenhagen Burnout Inventory (CBI) (19 items) (Kristensen et al., 2005). The study included a personal burnout construct (six items), work-related construct (seven items), and patient-related construct (six items). Personal burnout measures psychological exhaustion experienced by individuals without a specific cause. Items were measured using a Likert scale ranging from a high score of 100 (always) to a low score of 0 (never or hardly ever). The reliability of the personal burnout scale was 0.92.

2.2.2 Patient health questionnaire-9

The PHQ-9 is a self-administered screening tool used to assess the severity of depressive symptoms. Unlike other depression scales, the PHQ-9 includes nine items based on the Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV) for Major Depressive Disorder. The questionnaire assessed how often the subjects were disturbed by any of the nine items during the preceding two weeks. Each item of the PHQ-9 was scored on a scale of 0 to 3 (0 = not at all, 1 = several days, 2 = more than a week, 3 = nearly every day). The PHQ-9 total score ranges from 0 to 27 (scores of 5–9 indicate mild depression; 10–14, moderate depression; 15–19, moderately severe depression; ≥ 20, severe depression) (Kroenke et al., 2001).

2.2.3 Technology acceptance model

TAM consists of two major constructs, perceived ease of use (PEOU) and perceived usefulness (PU), which assess attitudes toward technology and its actual use (Shamsi et al., 2021; Venkatesh and Davis, 2000). TAM was adapted from RPDS (Hogan et al., 2020). Perceived usefulness (PU) was measured using four items, such as, "Using the robot would enhance my efficiency." PEOU was assessed with items such as, "Learning to use the robot will be easy for me." For both constructs, participants responded on a five-point scale ranging from strongly disagree (1) to strongly agree (5).

2.2.4 Demographic data

The study included demographic variables such as participant age (numeric variable), sex (binary variable), nationality, and job category.

2.2.5 Data analysis

The questionnaire items were presented to participants in the official languages, including Arabic and English. A reliability test (i.e., Cronbach's alpha) was performed using SPSS Statistics software (version 28). Before testing the hypotheses, several tests were conducted to assess the suitability of the assumptions for the *t*-test and Pearson's correlation. Although the variables are continuous and randomly sampled from a population, the underlying assumption of equal population variance was not met (Ruxton, 2006). A series of histograms was generated to assess the normality of the distribution. Deviations from normality were observed, as the bell-shaped curve was not normally distributed for the dependent variables. Outliers were identified using a scatterplot and were present in the plots. Missing data were treated using the listwise deletion method because data imputation could introduce bias, potentially affecting relationships between variables. Accordingly, the listwise deletion method was chosen to minimize loss of data (Hughes et al., 2019). Therefore, non-parametric tests including Mann–Whitney (*U*), median (Mdn), and Spearman correlation were conducted to test the study hypotheses (Field, 2018).

3 Results

A total of 256 surveys were completed during the data collection phase. Most respondents were male, accounting for 55.1% (n = 141). Furthermore, 52.7% (n = 135) of the respondents worked in hospitals with RPDS, whereas 47.3% (n = 121) worked in hospitals with manual dispensing systems. Of the respondents, 31.3% were in the age group 31–35 years. Table 1 displays the frequency table for the demographic data.

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All scales showed acceptable internal reliability (personal burnout, $\alpha = 0.92$; work-related burnout, $\alpha = 0.91$; patient-related burnout, $\alpha = 0.83$; depression (PHQ-9), $\alpha = 0.87$; perceived ease of use, $\alpha = 0.80$; perceived usefulness, $\alpha = 0.92$) (Table 2).

To test the first hypothesis (H1), an independent Mann–Whitney U test was conducted. Burnout and depression levels in pharmacists working with RPDS did not differ significantly from those in pharmacists working with manual dispensing systems. Personal burnout in RPDS users (Mdn = 33.3) did not differ significantly from that in manual dispensing users (Mdn = 33.3), U = 7,822, z = −0.585, $p = 0.558$, r = −0.037. Work-related burnout in RPDS users (Mdn = 21.43) did not differ significantly from that in manual dispensing users (Mdn = 21.43), U = 8245.5, z = 0.236, $p = 0.813$, r = 0.015. Patient-related burnout among RPDS users (Mdn = 16.6) did not differ significantly from that in manual dispensing users (Mdn = 16.6), U = 8012.5, z = 0.503, $p = 0.615$, r = 0.032. Finally, depression in RPDS users (Mdn = 3) did not differ significantly from that in manual dispensing users (Mdn = 2), U = 7807.5, z = −0.618, $p = 0.536$, r = −0.039. These results reject Hypothesis 1 (Figure 1).

However, when testing the technology acceptance model (H3), perceived usefulness in RPDS users (Mdn = 16) differed significantly from that in manual dispensing users (Mdn = 12), U = 6257.5, $z = 3.6$, $p < 0.001$, $r = 0.23$, thus rejecting the null hypothesis. Perceived ease of use in RPDS users (Mdn = 12) did not differ significantly from that in manual dispensing users (Mdn = 11), U = 5,287, $z = 1.44$, $p = 0.15$, $r = 0.09$.

Furthermore, differences in burnout and depression between sexes were tested to address the second hypothesis (H2). Personal burnout levels in females (Mdn = 50) differed significantly from those in males (Mdn = 25), U = 3497.5, $z = -7.8$, $p < 0.001$, $r = -0.49$. Work-related burnout levels in females (Mdn = 39.29) differed significantly from those in males (Mdn = 14.29), U = 3,937, $z = -7.03$, $p < 0.001$, $r = -0.44$. Patient-related burnout levels in females (Mdn = 20.83) differed significantly from those in males (Mdn = 12.5), U = 5,257, $z = -4.29$, $p < 0.001$, $r = -0.27$. Depression levels in females (Mdn = 5) differed significantly from those in males (Mdn = 1), U = 4,625, $z = -6.0$, $p < 0.001$, $r = -0.38$ (Figure 2).

In contrast, male pharmacists reported higher levels of technology acceptance. Perceived usefulness in males (Mdn = 16) differed significantly from that in females (Mdn = 12), U = 11,357, $z = 5.58$, $p < 0.001$, $r = 0.35$. Perceived ease of use in males (Mdn = 12) also differed significantly from that in females (Mdn = 12), U = 10,391, $z = 4.0$, $p < 0.001$, $r = 0.25$ (Figure 3).

4 Discussion

This study aimed to compare hospitals using RPDS with those using manual dispensing systems regarding burnout among pharmacists. The use of RPDS has substantially increased over the past few years. However, empirical studies on the EHS are yet to be conducted to assess the impact of RPDS on pharmacists' mental health. In this cross-sectional study, based on the responses received ($n = 256$), the majority of HCPs were male (55.1%), pharmacists (53.9%), and aged between 31 and 35 years (31.3%). An unequal ratio of males to females is common in the healthcare sector.

These findings suggest that the median levels of personal burnout, work-related burnout, patient-related burnout, and depression are significantly higher in females. However, such differences were not observed when comparing these variables across the different dispensing systems; and thus, the first hypothesis was not supported.

TABLE 1 Frequency table of the demographic variables.

Demographic variable		Frequency (*n*)	Percent (%)
Gender	Female	115	44.9
	Male	141	55.1
Working with RPDS	No	121	47.3
	Yes	135	52.7
EHS facility	MOW	22	8.6
	MSQ	14	5.5
	AQH	39	15.2
	AQW	16	6.3
	MFH	9	3.5
	MOH	49	19.1
	MAD	21	8.2
	MDH	27	10.5
	MKH	24	9.4
	MKF	35	13.7
Age group	<=25	12	4.7
	26–30	31	12.1
	31–35	80	31.3
	36–40	55	21.5
	41–45	44	17.2
	46–50	13	5.1
	51–55	11	4.3
	56–60	10	3.9
Profession	Assistant Pharmacist	54	21.1
	Other	5	2
	Pharmacist	138	53.9
	Principal Pharmacist	2	0.8
	Senior Pharmacist	16	6.3
	Specialist Clinical Pharmacist	26	10.2
	Technician	15	5.9
Shift duties	No	44	17.2
	Yes	212	82.8
Job contract	Contracted services	15	5.9
	EHS employee	241	94.1
Years of experience	< 5 years	40	15.6
	> 10 years	119	46.5
	5–10 years	97	37.9

TABLE 2 Correlation matrix for the constructs of TAM and CBI and depression.

Variable	Mean	SD	α	1	2	3	4	5	6
1. Total perceived usefulness	12.7	6.6	0.92	1					
2. Total perceived ease of use	9.9	4.6	0.79	0.64**	1				
3. Total patient health 4. questionnaire	4.1	4.7	0.86	−0.35**	−0.25**	1			
4. Average personal burnout	35.4	23.5	0.92	−0.42**	−0.28**	0.66**	1		
5. Average work-related burnout	29.2	22.8	0.91	−0.36**	−0.21**	0.69**	0.82**	1	
6. Average patient-related burnout	19.1	17.7	0.83	−0.27**	−0.12	0.50**	0.55**	0.67**	1

** Correlation is significant at the 0.01 level (2-tailed).

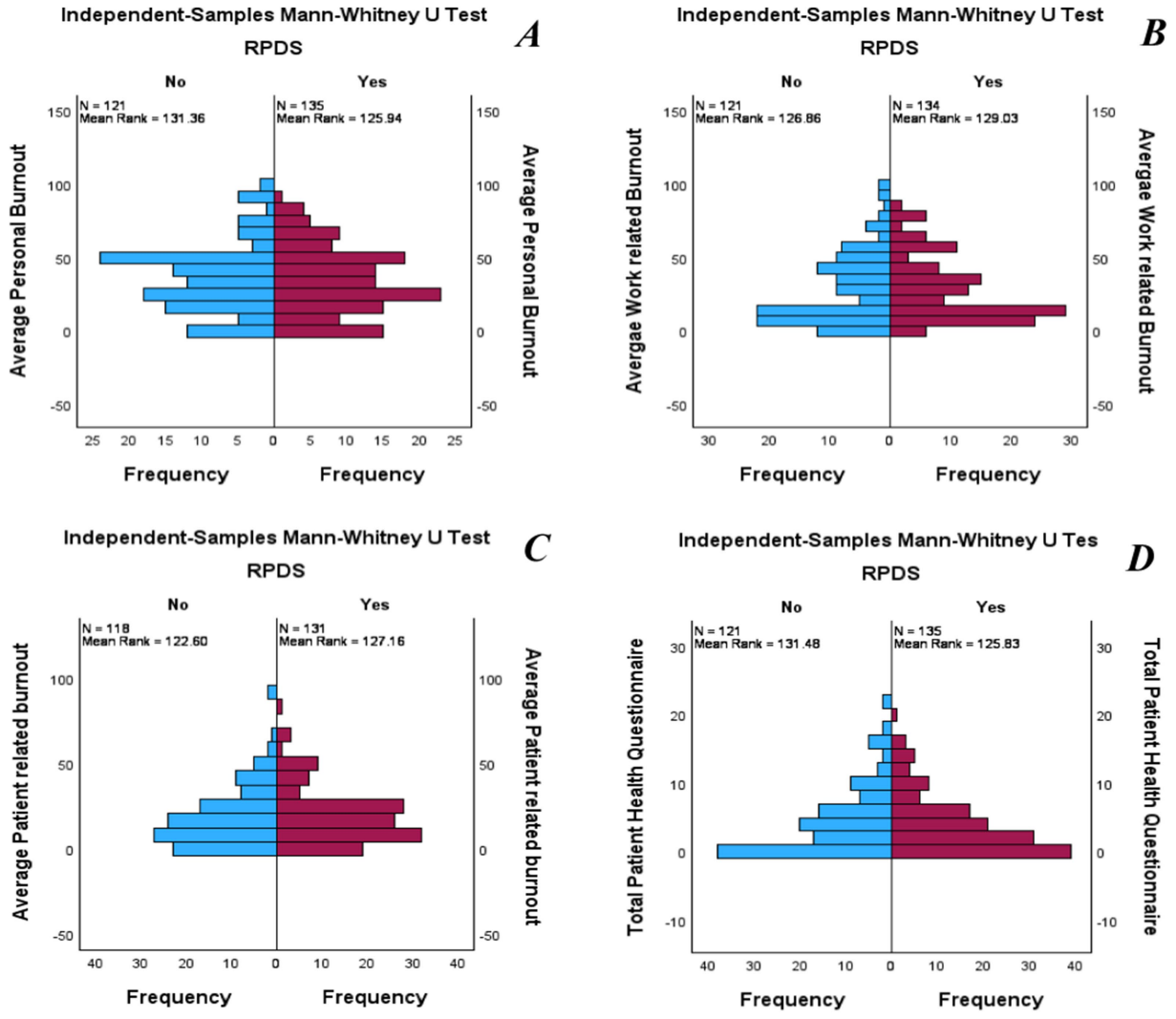

FIGURE 1
Independent-sample Mann–Whitney U test for burnout and depression level in pharmacists working RPDS and manual dispensing system. **(A)** Shows the difference in personal burnout; **(B)** Shows the difference in work-related burnout; **(C)** Shows the difference in patients-related burnout; and **(D)** Shows the difference in depression.

Therefore, the implementation of automation should be accompanied by the identification and rectification of occupational stressors to ensure a balanced work environment. Factors such as workload management, work-life balance, and logical workload allocation should be addressed (James et al., 2013).

Additionally, TAM, which includes perceived usefulness and perceived ease of use, was significantly higher among pharmacists working with RPDS. This finding supports the work of Hogan et al. (2020), who identified the factors influencing staff acceptance of robotic pharmacies. Furthermore, male pharmacists showed lower

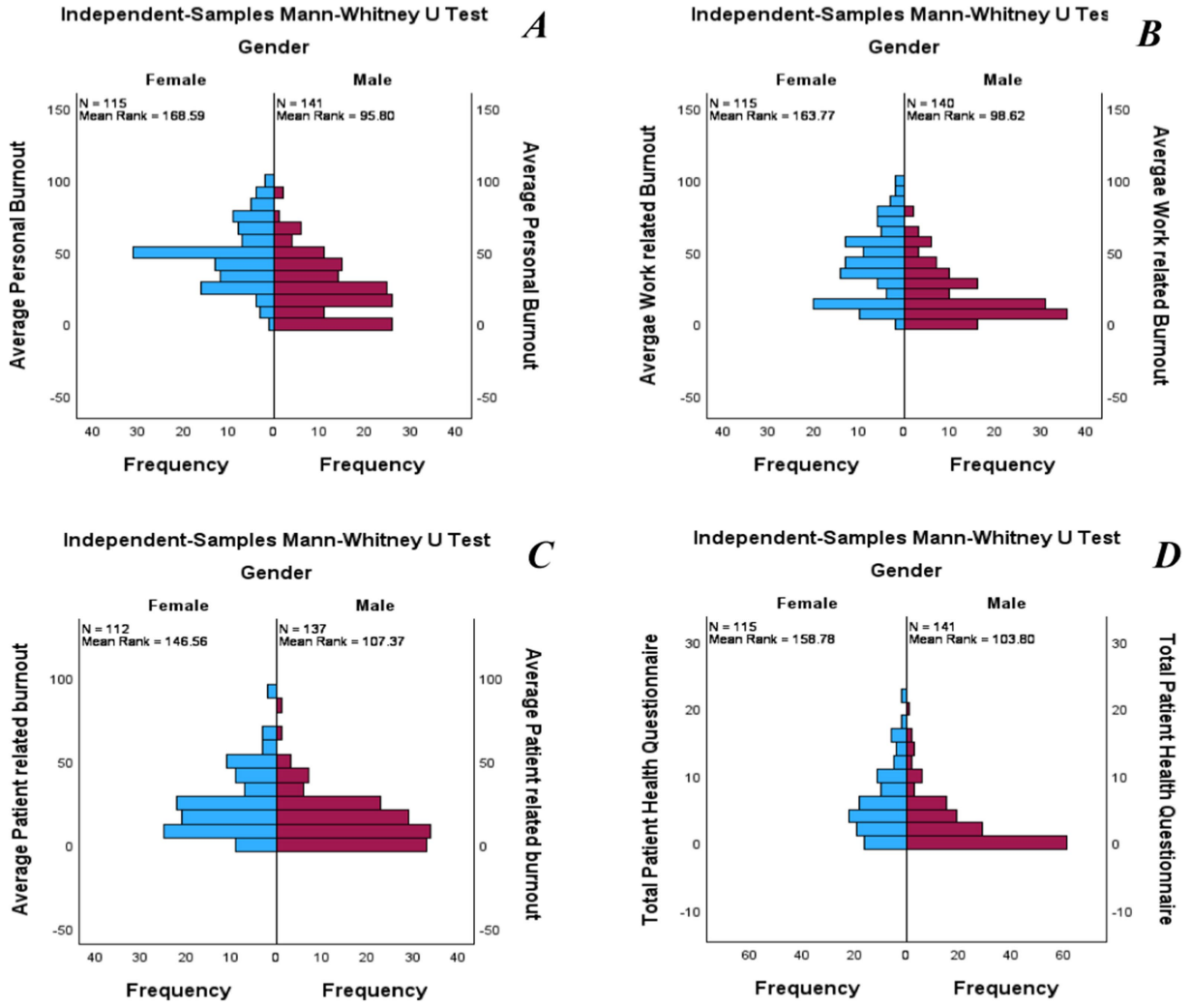

FIGURE 2
Independent-sample Mann–Whitney U test for burnout and depression level in gender. **(A)** Shows the difference in personal burnout; **(B)** Shows the difference in work-related burnout; **(C)** Shows the difference in patients-related Burnout; and **(D)** Shows the difference in depression.

levels of burnout and higher acceptance of technology than female pharmacists. This indicates that female pharmacists may be less inclined to adopt technology due to their higher levels of burnout (Teo et al., 2015).

The second objective was to address the gap in the literature on the relationship between burnout and TAM. The study found that factors related to TAM (i.e., perceived usefulness and perceived ease of use) were significantly negatively associated with burnout and depression levels, supporting the third hypothesis (H3). These results align with Kamel's (2024) findings, which highlight that technology overload and complexity contribute to burnout. Some users encounter new technologies and platforms that are complex and unfamiliar, resulting in system failures and reduced employee performance. To address these challenges, managers should support employees by providing effective guidance on using new technologies. This includes offering autonomy for workload management and sufficient training.

Although this study yielded significant findings, it has limitations. First, we could not conclude the causality of the reported relationship between EHS staff burnout and acceptance of RPDS. This study used a cross-sectional design with a total sample of 256 pharmacists, meaning the findings apply only to pharmacists working in the hospitals selected for this study. Future studies should explore the effects of RPDS on staff and the work environment using longitudinal designs. We could not evaluate the impact of specific psychosocial work hazards on pharmacists and burnout levels. For instance, female workers exhibited higher burnout levels than their male counterparts, indicating a potential work–family conflict. Additionally, further assessments of the reliability and validity of the Arabic version of the measures in a broader population are needed to enhance their applicability. As the study showed that female reported higher burnout level compared to male, studying psychosocial hazards Despite these limitations, the consistency of this study's findings with existing literature strengthens its validity.

This study contributes to the existing literature by exploring the relationship between staff mental health and TAM. The findings revealed that factors related to TAM, specifically perceived usefulness and perceived ease of use, are significantly negatively correlated with

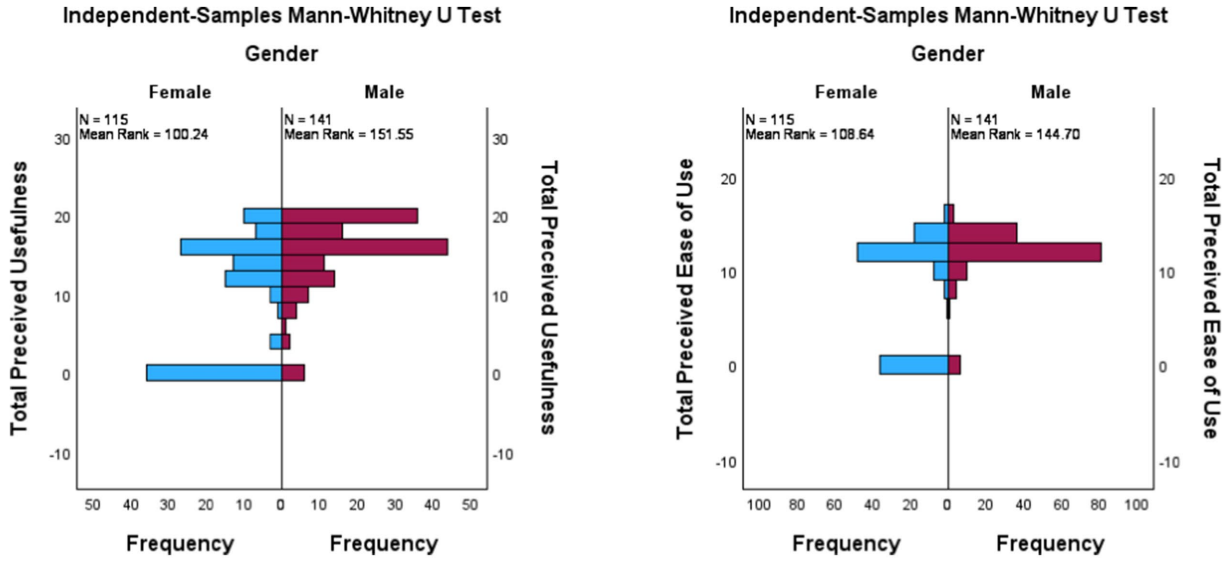

FIGURE 3
Independent-sample Mann–Whitney U test for TAM. The left graph shows the difference in perceived usefulness. The right graph shows the difference in perceived ease of use.

burnout and depression. This study deepens understanding of technology acceptance, particularly in the UAE healthcare sector, by focusing on robotic pharmacies.

In addition, this study highlights the need to recognize the effects of technology on staff well-being. EHS leaders are encouraged to develop strategies to reduce stressors associated with advanced technologies (e.g., robotic pharmacies). These strategies should include maintaining a balanced workload and offering professional development opportunities for healthcare staff.

In conclusion, the current study explored differences in burnout, depression levels, and TAM among employees working in public hospitals in the UAE. Overall, automation had both positive and negative effects on workplace stressors experienced by pharmacy staff. It improved certain aspects, such as stress levels, workload allocation, and work-life balance, but also posed challenges, such as devaluing technician skills and increasing pressure on remaining staff. The findings indicate that sex plays a role in determining the level of technology acceptance and work-related well-being among pharmacists.

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 Ministry of Health and Prevention Research Ethics Committee (approval number: MOHAP/DXB-REC/MMM/No.53/2023). 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

AA: Conceptualization, Formal analysis, Methodology, Project administration, Software, Supervision, Writing – original draft, Writing – review & editing. MaA: Conceptualization, Investigation, Methodology, Writing – original draft. HA: Investigation, Methodology, Writing – original draft, Writing – review & editing. PC: Investigation, Writing – original draft. SA: Investigation, Methodology, Writing – original draft. MuA: Conceptualization, Investigation, 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.

Publisher's note

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Bridging the gap: aligning physical work capacity testing with actual endurance performance in military settings

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Physical fitness tests are essential for evaluating the endurance capabilities of military personnel. In many armed forces, including the Czech Republic's, the Physical Working Capacity at a heart rate of 170 beats per minute (PWC 170) test is used to predict performance on the 12-min Cooper run, a widely accepted measure of endurance. However, concerns exist regarding the accuracy of the currently used conversion between PWC 170 test results, specifically W170/kg (watts per kilogram of body weight), and actual 12-min run performance. This study directly investigates the relationship between W170/kg and 12-min run times among military recruits and students (military personnel) from a university with a military program. Utilizing regression analysis, we found a significant positive correlation between W170/kg and 12-min run performance. However, the currently used conversion significantly underestimated actual 12-min run performance across all analyzed groups. These findings highlight a critical need to revise the existing conversion standard between W170/kg and 12-min run performance to ensure a more accurate and effective assessment of endurance capabilities in military personnel.

KEYWORDS

PWC 170, Cooper test, 12-min run, physical fitness, recruitment, endurance, prediction

1 Introduction

Military personnel are expected to perform physically demanding tasks under challenging conditions. A high level of physical fitness is therefore essential for operational effectiveness, reducing injury risk, and ensuring the overall wellbeing of soldiers. To assess and maintain these standards, armed forces worldwide employ rigorous physical fitness assessments during recruitment and throughout a soldier's career. These assessments typically evaluate various aspects of physical capacity, including aerobic endurance, muscular strength and endurance, flexibility, and body composition (Sedlačík et al., 2023).

The Cooper test, a 12-min run designed to measure maximal aerobic endurance, is a widely recognized and implemented assessment tool in military contexts globally (Cooper, 1968). This test measures the maximum distance an individual can run in 12 min, providing a simple and practical way to estimate their aerobic fitness level. The test's simplicity, cost-effectiveness, and ability to assess a large number of individuals simultaneously have contributed to its widespread adoption. While frequently used by the Czech Army, the 12-min run holds significance in fitness evaluations for both potential and serving soldiers in numerous other militaries as well (Maksud and Coutts, 2013).

Similarly, the Physical Working Capacity Test (PWC 170 test), often conducted on a cycle ergometer, is another common assessment tool used to gauge cardiorespiratory fitness. This graded exercise test determines an individual's physical work capacity (W170) at a heart rate of 170 beats per minute, expressed relative to body weight (W170/kg). This metric is considered a reliable indicator of VO_{2max}, which represents the maximum amount of oxygen an individual can utilize during intense exercise (Cherepov et al., 2017; Harymawan, 2020).

In fact, W170 represents the estimated power output in watts, corresponding to a heart rate of 170 beats per minute (Stork et al., 2016). For interindividual comparisons, it is recommended to adjust this power output relative to body weight [W/kg]. The obtained values indirectly indicate the degree of adaptation, primarily of the cardiovascular system, to endurance performance. A heart rate of 170 beats per minute, in a young and healthy individual, typically represents the upper limit of the circulatory system's functional response to progressively increasing exercise intensity, where a balance can still be maintained between the energy demands of physical activity and the ability to meet those demands aerobically. At this heart rate, an optimal stroke volume is still maintained. W170 is considered a general indicator of fitness and performance for healthy untrained individuals, recreational athletes, and competitive athletes. However, this indicator is not sensitive enough for elite athletes.

The maximum amount of oxygen an individual can utilize during intense exercise VO_{2max} is a globally recognized physiological marker of aerobic fitness and endurance capacity. A higher VO_{2max} indicates a greater ability of the cardiovascular system to deliver oxygen to working muscles, translating to better performance in endurance-based activities like running, swimming, and cycling. As a key determinant of aerobic endurance, VO_{2max} is inherently linked to performance in endurance-based activities like the 12-min run (Stocker and Leo, 2020).

Recognizing the potential correlation between W170/kg and 12-min run performance, some militaries, including the Czech Army, have adopted conversion tables to predict an individual's potential run distance based on their W170/kg score. This approach provides a convenient way to estimate endurance capabilities without requiring every individual to undergo the 12-min run, which can be physically demanding and time-consuming, especially when assessing a large pool of recruits.

However, recent studies have raised concerns about the accuracy and relevance of this conversion table in reflecting actual 12-min run performance across different populations and fitness levels (Stork et al., 2016). An inaccurate prediction tool can have significant implications for both recruitment and training programs within the armed forces. Overestimating an individual's endurance based on W170/kg could lead to inadequate training regimens or potentially dangerous situations in operational settings. Conversely, underestimation could result in the exclusion of otherwise qualified candidates during recruitment (Stork and Novak, 2023).

This study aims to directly address these concerns by conducting a comprehensive analysis of the relationship between PWC 170 test results (W170/kg) and actual performance on the 12-min run within the context of the Czech Army. Utilizing data collected from both male and female recruits, as well as students of the University of Defence, we will employ robust statistical methods to:

- Determine the strength and nature of the correlation between W170/kg and 12-min run performance.
- Evaluate the accuracy of the existing conversion standard used by the Czech Army in predicting 12-min run distances based on W170/kg scores.
- Explore the potential need for a revised prediction model that more accurately reflects the observed relationship between these two fitness assessments.

By addressing these objectives, this study seeks to contribute valuable insights into the validity of current physical fitness assessment protocols within the Czech Army and potentially inform the development of more accurate and reliable prediction models for endurance performance across militaries globally. This, in turn, can lead to more effective recruitment strategies, tailored training programs, and ultimately, a more capable and resilient military force. However, a crucial question arises: Is the PWC 170 test truly a reliable predictor of 12-min run performance among recruits and students at the University of Defence, and how accurate is the existing conversion standard employed by the Czech Army? This study aims to address this question.

2 Literature review

Physical fitness stands as a cornerstone for effective military service. Soldiers must be equipped to handle demanding tasks in extreme environments, and a high level of fitness demonstrably reduces injury risk and contributes to overall combat effectiveness (Knapik et al., 2006). To assess the physical capabilities of both potential and serving personnel, armed forces worldwide employ a variety of physical fitness tests (Hauschild et al., 2017). These assessments typically target areas such as aerobic endurance, muscular strength and endurance, flexibility, and body composition.

The Cooper test, a 12-min run designed to measure maximal aerobic endurance, ranks among the most recognized and widely implemented assessments (Cooper, 1968). Its simplicity, minimal equipment requirements, and suitability for testing large groups simultaneously contribute to its widespread adoption. In many armed forces, including the Czech Army, the Cooper test holds significant weight in evaluating potential recruits (Šmíd, 2009; Ministry of Defence of the CR, 2023).

Another test frequently utilized for assessing cardiorespiratory fitness, also employed by the Czech Army, is the PWC 170 test. This graded exercise test, typically conducted on a cycle ergometer, determines an individual's physical work capacity (W170) at a heart rate of 170 beats per minute, expressed relative to body weight (W170/kg). This metric is considered a reliable indicator of VO_{2max}, a key determinant of performance in aerobic activities (Klymovych et al., 2020; Wang et al., 2023).

Given the strong correlation between VO_{2max} and performance in the 12-min run, the PWC 170 test presents itself as a potential predictor of Cooper test results. Consequently, some armed forces, including the Czech Army, employ conversion tables to estimate Cooper test performance based on PWC 170 results (Šmíd, 2009). This approach offers a way to streamline the assessment process, potentially eliminating the need for every recruit to undergo the Cooper test.

However, the accuracy of predicting Cooper test performance based solely on the PWC 170 test remains a subject of debate (Alvero-Cruz et al., 2019). Studies investigating this relationship have yielded mixed results, with prediction accuracy varying depending on the population studied, research methodology, and other factors (Kekäläinen et al., 2024). Some research indicates instances of systematic overestimation or underestimation of Cooper test performance when relying solely on PWC 170 scores (Stocker and Leo, 2020; Hauschild et al., 2017).

Clearly, predicting Cooper test performance based on the PWC 170 test represents a complex issue deserving of further exploration. To ensure the most accurate and effective evaluation of recruit fitness, it's crucial to validate the existing conversion tables and potentially develop more precise prediction models accounting for the specific characteristics of the target population (Preti et al., 2019).

3 Data and methods

This study draws upon data from two distinct groups. The first group consists of 187 male Czech Army recruits, divided into two age categories: those under 30 years old (n = 158) and those over 30 years old (n = 29). These recruits represent a convenience sample, reflecting individuals undergoing standard Czech Army physical fitness assessments during their recruitment process. The second group comprises 299 cadets from the University of Defence, all under 30 years old, with 250 males and 49 females. These cadets, also active-duty soldiers, were conveniently sampled from those participating in mandatory fitness assessments within their military training program. Participants in this study were recruited through a random selection process from ongoing recruitment drives and from the student body of the University of Defence. While this represents a specific cohort, the random selection ensures that each recruit or student had an equal opportunity to be included, irrespective of their individual fitness levels or training backgrounds. This diversity within the sample reflects the reality of military settings where individuals with varying levels of experience are integrated. To ensure maximum objectivity and comparability of results, all tests were conducted under standardized conditions. These conditions were consistent for all participants and included controlled climate settings, a calibrated cycle ergometer, and standardized instructions provided before each test.

For both samples, the following data were measured:

- performance in the Cooper test (12-min run), measured as the distance covered in meters within 12 min;
- physical work capacity at a heart rate of 170 beats per minute (W170), measured in watts (W) using a cycle ergometer;
- and W170/kg, calculated by dividing W170 by the participant's body weight in kilograms (kg).

Regression analysis, specifically linear regression, was employed to analyze the relationship between W170/kg and Cooper test performance. This method allows for modeling a linear relationship between two variables. The general form of the linear regression equation is:

$$Y_i = \beta_0 + \beta_1 x_i + \varepsilon_i, i = 1, 2, \ldots, n,$$

where n represents the sample size, Yi are the values of the dependent variable (performance in the 12-min run), x_i are the values of the independent variable (W170/kg), β_0 and β_1 are the unknown real parameters (intercept and slope of the regression line, respectively), and ε_i is the error term assumed to be normally distributed with a mean of zero and constant variance (Montgomery and Runger, 2011). Further analyses included: a general linear hypothesis test (Montgomery and Runger, 2011) and a test for the equality of two regression lines (King et al., 1991).

4 Results

This section presents the results of the analysis examining the relationship between W170/kg and performance in the 12-min run, utilizing data from both Czech Army recruits and University of Defence students.

4.1 Approximate conversion vs. observed data

Table 1 presents the approximate conversion standard used by the Czech Army to predict 12-min run performance based on W170/kg scores (Šmíd, 2009; Ministry of Defence of the CR, 2023).

To assess the validity of this conversion standard, we first analyzed the relationship between W170/kg and 12-min run performance within each subgroup defined by sex and age as presented in Table 1: male recruits under 30 years old, male

TABLE 1 The approximate conversion standard used by the Czech Army to predict 12-min run performance based on W170/kg scores.

	Sex	Age	Unit	Comparison			
l_{12}	Males	Under 30	Meter	2,100	2,400	2,700	3,000
W170/kg			W/kg	1.8	2.2	2.7	3.2
l_{12}	Females	Under 30	Meter	1,600	2,100	2,400	2,700
W170/kg			W/kg	1.3	2	2.5	3
l_{12}	Males	Over 30	Meter	1,900	2,100	2,400	2,700
W170/kg			W/kg	1.6	2.8	2.2	2.7
l_{12}	Females	Over 30	Meter	1,400	2,100	2,100	2,400
W170/kg			W/kg	1.1	1.3	2.5	2.2

FIGURE 1
Performance in the 12-min run on W170/kg—males, recruits under 30 years of age.

recruits over 30 years old, female cadets under 30 years old, and male cadets under 30 years old. This approach allows for a more nuanced examination of potential differences in the predictive validity of the conversion standard across these demographic categories.

4.2 Regression analysis

For male recruits under 30 years old, the predicted relationship based on the approximate conversion presented in Table 1 is represented by the following equation:

$$l_{12} = 974.5 + 636.6\ \mathrm{W170/kg} \quad (1)$$

where l_{12} is the distance covered in 12 min, measured in meters. The approximate conversion presented in Table 1, represented by the equation, is derived from empirical studies examining the relationship between work capacity, performance in various physical tests, and maximal oxygen consumption (VO_{2max}). This conversion reflects a generalized model based on research correlating running performance, work on a cycle ergometer, and cardiovascular capacity.

Our analysis of data from 158 male recruits under 30 years old yielded a different regression equation:

$$l_{12} = 2005.8 + 250.8\ \mathrm{W170/kg} \quad (2)$$

This difference highlights that while the approximate conversion reflects broader physiological principles, it may not accurately represent the specific relationship between W170/kg and 12-min run performance within this particular subgroup.

This model explained approximately 26.4% of the variance in 12-min run performance ($R^2 = 0.264$), with the slope of the regression line being statistically significant ($p < 0.001$). Figure 1 illustrates the observed data points for this subgroup, alongside the fitted regression line (Equation 2) and the line representing the approximate conversion standard (Equation 1).

A similar discrepancy was observed for male recruits over 30 years old, with the approximate conversion equation:

$$l_{12} = 786.6 + 717.3\ \mathrm{W170/kg} \quad (3)$$

differing significantly from the regression equation derived from our data:

$$l_{12} = 2301.1 + 104.4\ \mathrm{W170/kg} \quad (4)$$

The coefficient of determination (R^2) of the estimated model is 0.098. The model, specifically the slope of the regression line, is not statistically significant at the $\alpha = 0.05$ level ($p = 0.099$). Figure 2 displays the results for male recruits over 30 years old. The black line represents the trend estimated from the data (Equation 4), while the red line represents the relationship described by Equation 3 (approximate conversion). This indicates that the newly estimated relationship is significantly different (p-value of the test for the hypothesis that the intercept in Equation 2 equals 786.6 and the slope equals 717.3 is less than 0.001).

Next, we focus on the sample of University of Defence students, which includes 250 males and 49 females, all under 30 years old. The analysis of the male student data ($n = 250$) yielded the following regression equation:

$$l_{12} = 2460.1 + 130.2\ \mathrm{W170/kg} \quad (5)$$

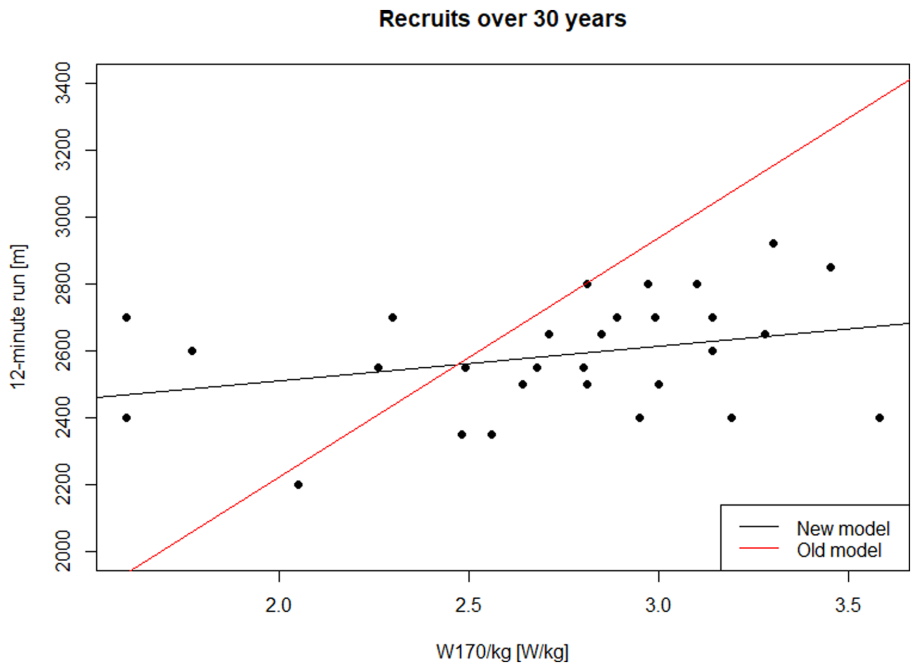

FIGURE 2
Performance in the 12-min run on W170/kg—males, recruits over 30 years of age.

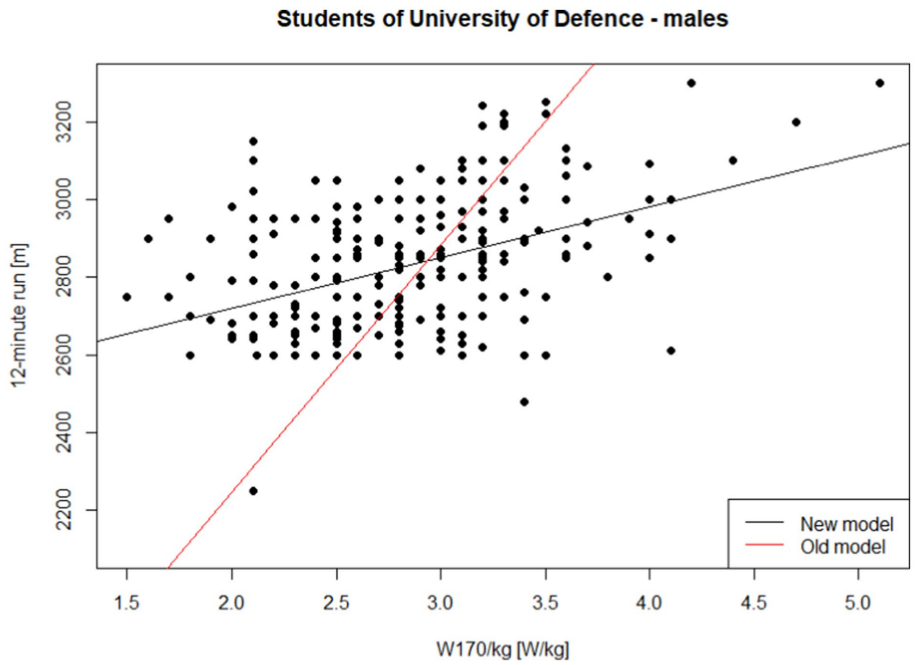

FIGURE 3
Performance in the 12-min run on W170/kg—males, students of University of Defence under 30 years of age.

The coefficient of determination (R^2) for this model is 0.183. The model, specifically the slope of the regression line, is statistically significant at the $\alpha = 0.05$ level ($p < 0.001$). Figure 3 displays the results for male University of Defence students. The black line represents the trend estimated from the data (Equation 5), while the red line shows the relationship based on the approximate conversion standard (Equation 1). Similar to previous models, the estimated relationship differs significantly from the relationship expressed by Equation 1 ($p < 0.001$).

Finally, we analyze the results for female students at the University of Defence. The relationship under investigation is depicted in

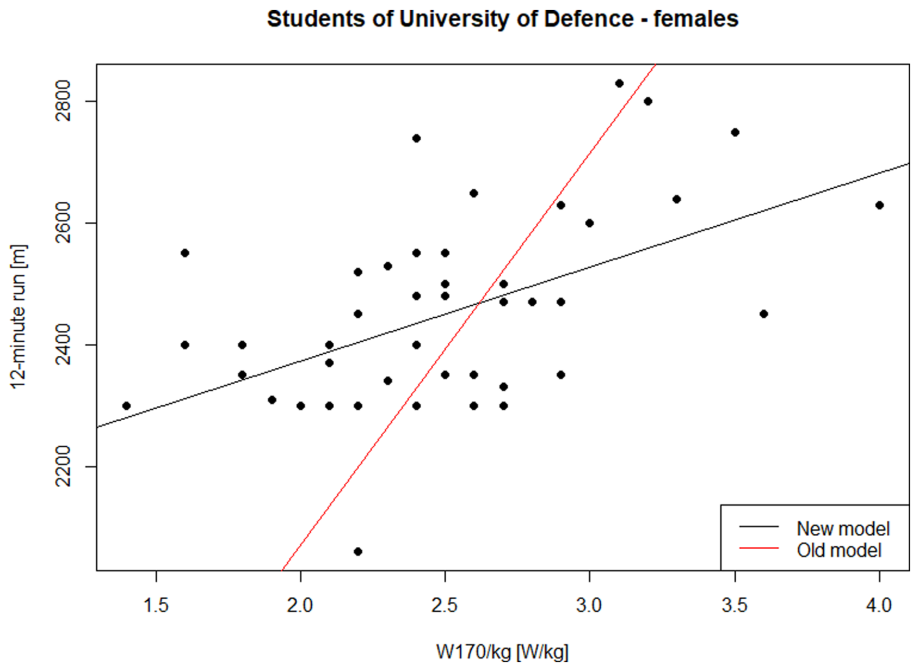

FIGURE 4
Performance in the 12-min run on W170/kg—females, students of University of Defence under 30 years of age.

Figure 4. For females under 30 years old, the following equation can be derived from Table 1:

$$l_{12} = 779.7 + 645.6\ \mathrm{W170/kg} \quad (6)$$

However, the analysis of our measured data resulted in a different estimated regression equation:

$$l_{12} = 2063.5 + 154.5\ \mathrm{W170/kg} \quad (7)$$

This model demonstrates a coefficient of determination (R^2) of 0.265. The model, specifically its slope, is statistically significant at the $\alpha = 0.05$ level ($p < 0.001$). Figure 4 presents the findings for female University of Defence students. The black line corresponds to the trend estimated from the data (Equation 7), while the red line illustrates the relationship based on the approximate conversion standard (Equation 6). Again, we observe a significant difference between the estimated relationship and the relationship depicted by Equation 6 ($p < 0.001$).

A pertinent question arises whether the relationships observed for recruits under 30 years old and University of Defence students are comparable. To address this, we employed a test for the equality of two regression lines (King et al., 1991). Both regression models are graphically depicted in Figure 5. Based on this test, the estimated models cannot be considered equal ($p < 0.001$).

Our analyses consistently demonstrate that the approximate conversion currently utilized to translate W170/kg scores into 12-min run performance does not accurately reflect the relationships observed in our data from both recruits and University of Defence students. Nevertheless, our analyses do confirm a significant positive correlation between measured W170/kg values and 12-min run performance. However, the specific nature of this relationship differs notably from the one suggested by the approximate conversion standard presented in Table 1.

5 Discussion and conclusion

This study sought to evaluate the accuracy of using the PWC 170 test as a predictor of performance in the 12-min Cooper run, a key assessment tool for Czech Army recruits. Currently, the Czech Army employs the PWC 170 test during the recruitment process, relying on a conversion standard to predict Cooper test scores. This approach stems from the logistical challenges of administering the 12-min run to a large number of potential recruits. However, as our findings demonstrate, the existing conversion standard fails to accurately reflect the observed relationship between W170/kg and actual 12-min run performance across different subgroups.

While our study shows a significant correlation between W170/kg and 12-min run performance, it also highlights the limitations of directly translating cycle ergometer performance to running performance. This discrepancy arises primarily from the distinct physiological and biomechanical demands of each activity. While the PWC 170 test primarily assesses cardiorespiratory fitness within a lower-body cycling motion, running involves a more complex interplay of muscle groups, coordination, and proprioception.

Running economy, the efficiency of energy utilization during running, plays a crucial role in this context. An individual with excellent running economy may achieve a superior 12-min run time even with a moderate W170/kg. Conversely, an individual with a high W170/kg but inefficient running biomechanics may underperform in the 12-min run.

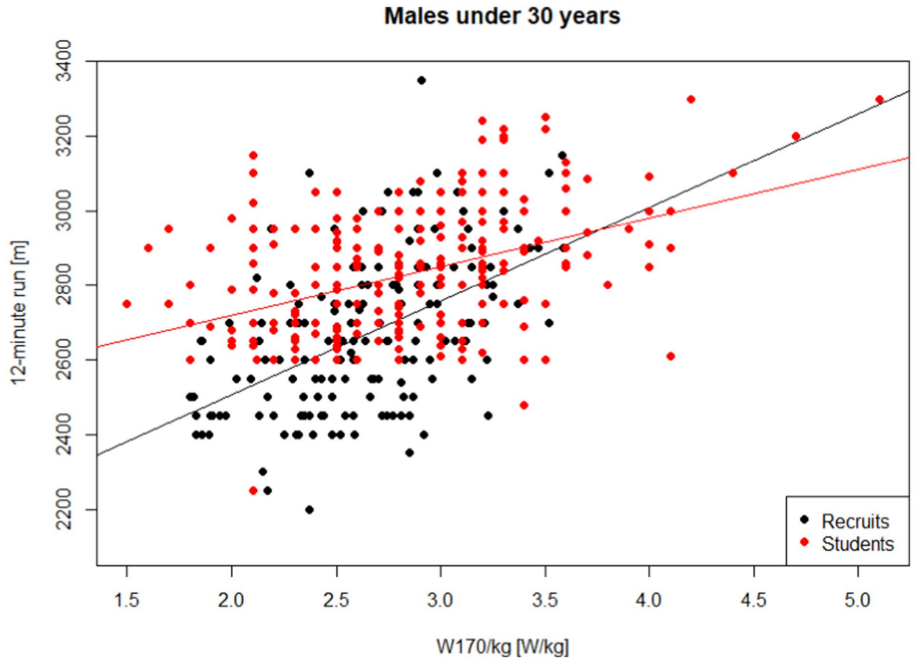

FIGURE 5
Performance in the 12-min run on W170/kg—comparison of recruits and students of University of Defence.

Furthermore, biomechanical factors like limb length, muscle fiber type composition, and running technique can significantly influence running performance independent of aerobic capacity as measured by the PWC 170 test. These multifaceted aspects underscore the need for a more comprehensive understanding of the factors contributing to endurance performance in military personnel beyond isolated cardiorespiratory fitness.

This discrepancy presents a significant concern because the Cooper test holds considerable weight in the overall evaluation of potential recruits, reflecting the importance of aerobic endurance in fulfilling demanding military tasks. The inability to administer the Cooper test directly during the recruitment process necessitates a highly accurate prediction tool to ensure that individuals with sufficient aerobic capacity are selected. Overestimating endurance based on the current, flawed conversion standard could lead to recruits entering service inadequately prepared for the physical demands of training and deployment, potentially increasing injury risk and hindering operational effectiveness. Conversely, underestimation could lead to the exclusion of otherwise qualified candidates, jeopardizing recruitment goals and potentially overlooking individuals with the necessary physical capabilities.

The logistical constraints associated with conducting the Cooper test during large-scale recruitment are undeniable. However, our findings highlight the critical need for a more accurate and reliable method for predicting Cooper test performance during this phase. This need is underscored by the significant discordance we observed between the existing conversion standard and the actual relationship between W170/kg and 12-min run times. While the PWC 170 test does provide valuable insights into an individual's aerobic capacity, its translation to run performance is complex and influenced by various factors not captured by the test itself, such as running economy, biomechanics, and pacing strategies.

This challenge underscores the need for further research into more accurate and logistically feasible methods for predicting Cooper test performance, particularly within large-scale recruitment settings. Future investigations could focus on validating Alternative Field-Based Assessments. Field tests like the Multi-stage fitness test ("beep test") (Băiţan, 2020) and the Yo-Yo Intermittent Recovery Test offer practical advantages for mass assessments, requiring minimal equipment and efficiently evaluating aerobic capacity within a group setting (Schmitz et al., 2018). Moreover, their intermittent nature may better reflect the demands of actual military tasks compared to a cycle ergometer test. Research should prioritize validating the predictive accuracy of these tests against actual Cooper test performance.

There are also possibilities to develop integrated prediction models incorporating additional physiological metrics, such as heart rate recovery or lactate threshold, alongside data from field-based assessments, holds potential for developing more robust and accurate prediction models. Such models could provide a more comprehensive assessment of endurance capabilities within the constraints of large-scale recruitment procedures. Further exploration into incorporating other relevant physiological metrics, such as heart rate recovery or lactate threshold, alongside data from these alternative field tests, could further enhance the accuracy of predicting 12-min run times. This multi-faceted approach holds the potential to provide a more comprehensive assessment of endurance capabilities within the constraints of large-scale recruitment procedures. Ultimately, investing in research to refine assessment strategies and ensure a highly capable and prepared force is paramount for the Czech Army.

This study, while providing valuable insights into the relationship between PWC 170 and 12-min run performance in a specific cohort of Czech military personnel, acknowledges the need for further research to enhance its novelty and broaden its implications. As suggested by the reviewer, future studies should aim for a larger and more representative sample encompassing various military roles and experience levels. Furthermore, incorporating additional physiological metrics such as body composition analysis, heart rate recovery, and lactate threshold, alongside data from field-based assessments, could lead to the development of more robust and comprehensive predictive models for endurance performance. Such models would be invaluable for optimizing recruitment procedures and tailoring training programs within a military context.

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 based on the local legislation and institution 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

JD: Conceptualization, Funding acquisition, Methodology, Writing – original draft, Writing – review & editing. JN: Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, Writing – review & editing. JS: Conceptualization, Methodology, Supervision, Writing – original draft, Writing – review & editing. MS: Data curation, Formal analysis, Investigation, Methodology, Writing – original draft, 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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Employability resources of unemployed adults: longitudinal effects of a group career intervention

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Introduction: This study evaluates the efficacy of a group-based career intervention designed to promote employability resources among unemployed individuals conducted in face-to-face and online modalities.

Methods: Employing a longitudinal quasi-experimental design, with two intervention groups and a control group, data was collected pre-, post, and two months post-intervention.

Results: Conditional Latent Growth Curve analysis revealed a significant decline in employability resources over time, mitigated by both intervention groups. Human capital and professional development were key at baseline and follow-up, while social capital and networking were crucial post-intervention. Career identity self-career management, and environmental monitoring resources significantly contributed to employability post-intervention.

Discussion: These findings highlight the intervention's effectiveness in counteracting the negative trend among the general population, underscoring the critical role of ongoing participation in career development activities for unemployed individuals. More empirical research on this type of initiative is encouraged, along with civil society taking responsibility for addressing the psychological challenges of unemployment.

KEYWORDS

career intervention, employability, unemployed individuals, group modality, face-to-face intervention, online intervention, conditional latent growth curve

1 Introduction

Unemployment has pervasive implications for economies, social dynamics, and the mental well-being of individuals (Thompson et al., 2017). Beyond financial hardships, unemployment significantly affects psychological well-being and the cultivation of career resources (Blustein et al., 2020; Lent et al., 2022). Economic challenges and varying unemployment rates across nations are influenced by factors such as low educational attainment and regional work patterns (OECD, 2019; United Nations, 2023). This highlights the need for country-specific analyses and targeted policies (OECD, 2020).

Portugal faces unique challenges, with unemployment rates consistently exceeding the OECD average [National Statistics Institute of Portugal (INE), 2024; OECD, 2024]. Studies indicate a mismatch between the qualifications, interests, and expectations of job seekers and the profiles sought by employers (De Menezes and Sciulli, 2022). Common governmental policies, including job creation initiatives, unemployment benefits, and retraining programs,

often overlook the psychological impact of unemployment on career development (Blustein et al., 2020). These policies depend on the prevailing context and vary based on the governance approach (Caleiras and Carmo, 2024).

Given Portugal's socio-economic context, addressing the psychological impact of unemployment is crucial. Innovative methodologies are necessary to empower individuals with employability resources for sustained career development (Blustein et al., 2020). Career interventions, particularly when led by trained psychologists or career counsellors, can be pivotal in assisting individuals in crafting enduring career trajectories (Maree and Fabio, 2018; Blustein et al., 2019).

Career interventions involve a comprehensive set of actions designed to foster career growth and facilitate well-informed career choices throughout one's lifespan (Chen, 2021). These interventions aid in making informed decisions, implementing those decisions, and deriving benefits from them (Brown and McPartland, 2005). To address these challenges, a psychological career intervention named "Employability and Career Self-Management" was developed in Portugal. Grounded in Social Cognitive Career Theory (SCCT), this intervention aims to enhance employability resources and career self-management skills among unemployed individuals. By focusing on career development, the intervention provides the necessary tools for individuals to reflect on their careers and take proactive steps.

This study examines the variation of employability resources over time for individuals who participated in the intervention, offered in both face-to-face and online modalities. The objectives are to explore changes in employability resources among participants and assess the effectiveness of the intervention in enhancing these resources.

1.1 Employability and social cognitive career theory

Employability resources play a pivotal role in addressing the multifaceted challenges of unemployment. Initially defined as active work-specific adaptability (Fugate et al., 2004), the concept of employability has evolved into a consensus of multidimensionality, acknowledging its dependency on both individual attributes and contextual factors (Guilbert et al., 2015; Hora, 2023).

Lo Presti and Pluviano (2015) proposed a comprehensive redefinition of employability as a personal resource encompassing skills, abilities, formal and informal career networks, and the capacity to navigate social environments. This model posits that work experiences, individual dispositions, life circumstances, and external events serve as antecedents, ultimately leading to career success and influencing outcomes such as job search behavior, job satisfaction, and commitment to work (Lo Presti and Pluviano, 2015). Such a comprehensive view positions employability as a dynamic personal resource influenced by diverse life circumstances and career experiences, resonating with broader career theories such as Social Cognitive Career Theory (SCCT) (Lent and Brown, 2013).

SCCT emphasises the interactive roles of individual characteristics such as age, personal resources like career self-efficacy, and external influences such as employment policies (Lent and Brown, 2013). Gunawan et al. (2024) demonstrated the connection between employability and SCCT by illustrating how perceived future employability, self-efficacy, and outcome expectations interact to influence adults' career behaviors and aspirations. This framework provides a comprehensive understanding of how individuals navigate their career development within a larger system influenced by personal agency and societal factors. Furthermore, unemployment as a phenomenon can also be interpreted through the lens of SCCT, highlighting the interplay between internal and external factors. SCCT has framed various studies that found self-efficacy and other socio-cognitive variables are associated with the ability to cope with anxiety, stress, and depression resulting from unemployment, as well as with the motivation to seek employment among the unemployed, with this association being mediated by socioeconomic factors (Lent et al., 2022). Additionally, SCCT has been useful in designing and testing hypotheses about reemployment factors (Thompson et al., 2017), the personal career management of unemployed individuals (Taveira et al., 2017), and one of the most widely used theories to support interventions with unemployed individuals (Carvalho et al., 2024). This perspective prevents the oversimplification of attributing career outcomes solely to individual attributes, promoting instead an integrated view where responsibility for career development is shared. This broader understanding of employability reinforces the socio-cognitive perspective on unemployment, illustrating how both internal and external factors contribute to these challenges. Individuals can effectively manage their careers by strategically integrating and leveraging various resources in response to these dynamics, emphasising the need for a holistic approach to career development interventions.

Employability as a personal resource underscores the importance of heightened awareness of career goals, expectations, work experiences, and professional networks. This interactive process also involves acquiring skills, identifying opportunities, and overcoming environmental barriers, thereby integrating employability resources into broader career development strategies (Cheng et al., 2020). A positive interaction between the above dynamics should then result in resources that prompt the achievement of a valued career path and improve one's career development (Di Fabio, 2017; Fuertes et al., 2021; Guilbert et al., 2015; Hora, 2023; Lo Presti and Pluviano, 2015; Lo Presti et al., 2019). This broader perspective positions employability resources as an integral part of career development itself (Cheng et al., 2020). Effective utilisation of these resources supports the creation of proactive career strategies essential for navigating diverse career transitions and challenges, including unemployment (Hora, 2023; Lo Presti et al., 2019).

In this context, employability resources include developing awareness of one's career identity, assuming personal career management, taking responsibility for professional development, becoming aware of the need to monitor the environment, and engaging in networking activities (Lo Presti and Pluviano, 2015). These developmental processes are crucial during unemployment, contributing significantly to enhanced employability outcomes, such as positive core self-evaluations and a proactive approach (Lo Presti et al., 2019).

1.2 Career interventions in the unemployment context

Psychological career interventions represent a vital approach to mitigating the profound psychological impact of unemployment on

individuals' career trajectories (Carvalho et al., 2024). These interventions are designed to equip participants with essential tools, encouragement, and support necessary to navigate the complexities of the job market (Drosos et al., 2021; Panari et al., 2020). Effective interventions for unemployed individuals should be meticulously tailored to cultivate a proactive and resilient mindset (Carvalho et al., 2024), integrating techniques that address behavioral, emotional, and cognitive aspects critical for enhancing employability (Lo Presti et al., 2022).

Guidelines for designing and implementing psychological career interventions are crucial for optimising their effectiveness (Lent and Brown, 2020). These guidelines not only refine intervention content but also inform their implementation and research design. However, despite increasing relevance in evaluating the effectiveness of career interventions (Whiston et al., 2017) and identifying features tailored for the unemployed population (Carvalho et al., 2024), there remains a critical need for empirical evidence supporting the efficacy of interventions with this population (Lent and Brown, 2020).

The evaluation of career intervention efficacy necessitates employing rigorous methods to analyse outcomes, including pre- and post-intervention assessments (Whiston et al., 2017; Lent and Brown, 2020) and long-term evaluations (Perdrix et al., 2012). Follow-up assessments conducted post-intervention provide valuable insights into intervention sustainability, identify ongoing participant needs, and offer opportunities for intervention enhancement (Sadler, 1984). These assessments should incorporate self-reported measures tailored to assess the impact of career resources targeted by the intervention (Lent and Brown, 2020). Moreover, it is imperative to consider the influence of intervention modalities on efficacy research (Carvalho et al., 2024; Santilli et al., 2021). Face-to-face interventions are noted for their direct communication, personalised strategies, immediate feedback, supportive atmosphere, and enhanced participant motivation, establishing robust therapeutic relationships (Herman, 2010). Conversely, online interventions address accessibility barriers (e.g., time, place, cost), promoting inclusivity by engaging diverse audiences (Pordelan and Hosseinian, 2020; Seabra et al., 2018). While evidence supporting online interventions is growing (Nota et al., 2016; Richards and Vigano, 2013; Sampson et al., 2019), further research is needed to fully understand and optimise their effectiveness, particularly in the context of unemployment (Richards and Vigano, 2013; Whiston et al., 2017).

1.3 Present study

This study examines the efficacy of an employability career intervention grounded in the Social Cognitive Career Theory (SCCT) approach. The primary objectives are: (1) to analyse the trajectory of changes in employability resources among participants over three assessment points; (2) to assess whether participation in the intervention leads to significant improvements in employability resources; (3) to investigate how participation in different modalities (face-to-face and online) affects the trajectory of employability resources; and (4) to evaluate how each dimension of employability contributes to overall employability at each assessment point.

The study hypotheses are grounded in the demonstrated effectiveness of psychological career interventions among unemployed individuals, as evidenced by previous research (e.g., Maree, 2022; Maree et al., 2019). These interventions have consistently enhanced career adaptability (e.g., Santilli et al., 2021), career self-efficacy (e.g., Drosos et al., 2021), and overall employability (Maree, 2022; Panari et al., 2020; Whelan et al., 2018). However, the necessity to substantiate ongoing funding initiatives and demonstrate to society the significant impacts and advantages of such interventions remains crucial (Blustein et al., 2020). Despite potential initial constraints imposed by participants' unemployment status on their employability resources (Panari et al., 2020), it is expected that (H1) participation in a career psychological intervention rooted in established guidelines for designing and implementing such interventions (Lent and Brown, 2020), will positively influence the trajectory of these resources over the assessment points, thereby indicating its effectiveness.

Research on career intervention modalities for the unemployed population is emerging, with increasing interest in online interventions (Pordelan and Hosseinian, 2020; Sampson et al., 2019). Contrary to traditional studies suggesting that face-to-face modalities were likely to achieve better outcomes than online modalities (Herman, 2010), recent studies suggest comparable efficacy between face-to-face and online modalities (e.g., Amundson et al., 2018). Therefore, considering the consistency of the intervention adaptation procedures for this online modality (American Psychological Association, 2013; Ordem dos Psicólogos Portugueses, 2020; Pordelan et al., 2018), along with recent positive findings for online modalities (Santilli et al., 2021), it is expected that (H2) participating in the intervention in either the face-to-face or online intervention groups similarly affects the trajectory of employability resources over the three-time points, indicating a similar efficacy between the two intervention modalities.

Given that the intervention aims to support participants in reflecting, exploring, and developing an individual career action plan and recognizing that overall employability is a composite measure influenced by multiple interrelated dimensions (Gamboa et al., 2023), it is crucial to hypothesise the specific contributions of each employability resource at different time points. By integrating the sociocognitive approach (Lent and Brown, 2013) with the model of employability resources (Lo Presti and Pluviano, 2015), the interaction and contributions of employability dimensions in people facing unemployment can be better understood. Studies on the characteristics, personal resources, and external influences of the unemployed (e.g., Lent et al., 2022; Taveira et al., 2017; Thompson et al., 2017) provide empirical support for this integration. This approach highlights that the four employability resources collectively enhance overall employability and can be analysed in light of individuals' experiences at each time point of the sociocognitive intervention.

For instance, developing and implementing a career plan requires individuals to evaluate their current knowledge, skills, and competencies and identify areas for improvement (Lo Presti et al., 2019). As participants engage in career planning activities, they may become more aware of their professional strengths and weaknesses, leading to a proactive approach to upskilling and professional development. As the development of a career plan is one of the last activities of the interventions, participants may only be ready to engage more deeply with their career plan after the intervention. Therefore, it is expected that (H3) Human Capital and Professional Development (HCPD) resources may contribute significantly to explaining global employability at T2 compared to T0 and T1.

Social relationships play a crucial role for individuals confronting unemployment (Bhat, 2010; Lent et al., 2022). The group format within career interventions facilitates social interactions and fosters the development of professional networks or the importance of having one (Carvalho et al., 2024). Within the intervention, participants leverage these interactions to build social capital, expand their career networks, seek mentorship, and access valuable resources. This process suggests that (H4) Social Capital and Networking (SCN) resources may contribute significantly to explain global employability at T1 compared to T0 and T2.

Participants are expected to clarify their career identities and develop effective self-management strategies, aligning goals with personal values and interests through intervention modules focused on self-awareness (Maree et al., 2019). The first intervention module primarily focuses more on self-awareness, and all other modules were designed to use and reinforce this self-awareness. Therefore, (H5) Career Identity and Self-Management (CISM) resources may contribute significantly to explain global employability at T1 compared to T0 and T2.

Staying informed about labour market trends and job opportunities is crucial for career planning (Lent et al., 2022; Taveira et al., 2017). Developing environmental monitoring skills helps individuals regularly track the professional environment, research job prospects, and adjust their career strategies (Lo Presti et al., 2022). This continuous engagement enhances employability by keeping individuals aware of market dynamics (Littman-Ovadia et al., 2014). Since the second intervention module focuses on reinforcing exploration practices, it is hypothesised that (H6) Environmental Monitoring (EM) resources may contribute significantly to explain global employability at T1 and T2 compared to T0.

The study followed a longitudinal quasi-experimental design, with two intervention groups (face-to-face and online group) and a control group, and the data were collected pre-, post and two months after the intervention.

2 Method

2.1 Settings and intervention design

The Employability and Career Self-Management intervention was developed by a university in Northern Portugal under the scope of the Careers Project (ALG-06-4234-FSE-000047), a collaborative initiative to promote employability in the Southern region. The university's ethics committee that developed the study approved the intervention and its evaluation protocol (CEICSH 002/2022).

The intervention goal was to promote reflection and decision-making among unemployed adults regarding their educational, professional, and life paths. This group intervention used a career sociocognitive approach and was designed to support participants in: (1) exploring their employability resources and self-career management skills through the identification, recognition, and reflexion of their strengths, personal resources, and experiences; (2) exploring, accessing, and organising structured and reliable information about their context; and (3) developing an individual career action plan.

The face-to-face intervention consists of a set of six in-person sessions, with each session lasting two hours. These sessions took place biweekly, totaling 12 h of intervention. The online intervention consists of three synchronous sessions, each lasting two hours, within a one-week timeframe, resulting in a total of six hours of intervention. The differences in the intervention structure (i.e., reduction in duration and the number of sessions) were made in order to ensure the quality parameters of online interventions (American Psychological Association, 2013; Ordem dos Psicólogos Portugueses, 2020; Pordelan et al., 2018). Both modalities were conducted by two Psychologists in group settings, with a maximum of 10 participants per group. All professionals received 42 h of training on career intervention with unemployed adults and were trained to deliver this specific intervention. Participants were given the flexibility to choose their preferred session schedule (i.e., morning, afternoon, and evening), and every session happened in the same schedule and location to prompt participant's commitment. The intervention groups actively participated in the entire intervention, while the control group did not benefit from any kind of career intervention until the end of the research project, where they were then offered the intervention. Intervention' participants provided their written informed consent for the different phases of the research (i.e., in intervention and evaluation) in accordance with the Declaration of Helsinki, and were informed that the study poses no risk, cost or harm to them.

The intervention sessions followed a fixed structure, organised in three stages: (1) Being ME+: Self-reflection and Personal Values; (2) Engaging with the World: Communication, Exploration, and Personal Accountability; and (3) Taking Action and Moving Forward: Support for Considering Alternatives and Decision Criteria. Table 1 presents a comprehensive overview of the intervention, outlining the specific objectives and activities carried out in each session for both face-to-face and online modalities.

2.2 Participants

The career intervention had 212 participants: 58 in the face-to-face intervention group, 85 in the online intervention group, and 69 in the control group. For an overview, see the CONSORT Flow Diagram, Figure 1.

In the face-to-face modality, of the 58 participants, 40 (69%) identified themselves as female and 18 (31%) as male. The participants were aged between 19 and 64 (M = 44.6; SD = 10.319). Of these, 8.5% were aged between 19 and 30, 24% between 31 and 40, 35.9% between 41 and 50 and 30.7% between 51 and 64. With regard to nationality, 52 (89.7%) of the participants were Portuguese, and 6 (10.3%) were Brazilian. In terms of education level, eight (13.7%) had not completed elementary school, nine (15.5%) had completed elementary school, 18 (31%) had completed secondary school, 17 (29.3%) had completed a bachelor's degree and six (10.3%) a master's degree.

In the online modality, of the 85 participants, 68 (80%) identified themselves as female and 17 (20%) as male. The participants were aged between 19 and 67 (M = 42.1; SD = 10.291). Of these, 13.2% were aged between 19 and 30, 31.6% between 31 and 40, 34.2% between 41 and 50, and 21.4% between 51 and 67. With regard to nationality, 63 (74.1%) of the participants were Portuguese, 17 (20%) were Brazilian, one (1.2%) was French, one (1.2%) was Colombian, one (1.2%) was São Toméan, one (1.2%) was Venezuelan and one (1.2%) was Guinean. In terms of education level, three (3.5%) had completed elementary school, 36 (42.4%) had completed secondary school, 42 (49.4%) had completed a bachelor's degree, three (3.5%) a master's degree and one (1.2%) a doctorate.

TABLE 1 Intervention overview.

Stages	Online modality	Face-to-face modality	Session goals	Session activities
Being ME+	Session 1	Session 1	Administer the pre-test. Facilitate participants' understanding of the general aspects of the intervention (e.g., structure, duration, goals). Establish a group contract based on individual reflections to ensure a collaborative and respectful environment. Co-create a code of ethics and promote interaction and collaboration within the group (only in face-to-face modality). Foster participants' awareness of the importance of self-awareness in the career development process. Enhance participants' understanding and integration of the concept of career and its relationship with life roles. Support participants in reflecting on allocating of time to different life roles and its impact on overall well-being. Facilitate participants' contemplation on the level of satisfaction associated with different life roles. Promote personal growth by assisting participants in identifying, recognizing, and clarifying their individual life values. Strengthen personal identity by acknowledging participants' personal resources, characteristics, and past experiences that shape their sense of self and decision-making abilities.	Pre-test. Participant introductions with expectations and motivations setting. Intervention presentation. Signing and reflecting on the group contract (only in face-to-face modality). "Life Values and My Career"—Part A and Part B.
		Session 2	Raise participants' awareness about the role of self-awareness in career development Facilitate participants' identification and exploration of personal attributes and interests that contribute to clarity and of a positive self-concept, including self-appreciation and personal branding, and foster optimism and confidence towards the future. Enhance participants' recognition of their social support network by guiding them to identify, acknowledge, and clarify their contacts and personal and professional experiences. Enhance participants' positive attitude towards lifelong learning by valuing individual agency, interactive learning opportunities, and leveraging one's skills and social support network. Assist participants in setting career goals for each area of their lives, aligning them with their values and aspirations.	"Competence +" "My Career Network" "Goals for Life Roles" "Identity Narrative"
Engaging with the World	Session 2	Session 3	Raise participants' awareness about the concept of career exploration and other related notions. Empower individuals to explore available resources and opportunities by collecting, analysing, and organising relevant information for future career planning. Enable and raise participants' awareness of efficient utilisation of new technologies in accessing career-related information. Support participants' identification and recognition of career information, including occupation, education and training, employment, as economic aspects and the range of available career information resources. Foster participants' personal agency in information exploration, alternative selection, and opportunity optimization. Support participants' reflection on information related to the world of education, work, and employment.	"Exploration Planning" Exploring online platforms "My Exploration Summary"
		Session 4	Raise participants' awareness about career exploration methods and career self-management strategies. Support participants' deepening knowledge about individual agency impact in adapting to unpredictable and uncertain contexts. Foster participants' personal agency in information exploration, alternative selection, and opportunity optimization. Foster participants' assertiveness and effective communication skills regarding beliefs, emotions, career aspirations, and goals in interpersonal, group, and network contexts. Promote participants' positive attitude towards lifelong learning, recognizing the roles, phases, and life contexts that enhance the learning and development process.	"Alternative Selection" "Identity Narrative" Presentation of curriculum vitae and cover letter templates for reflection at home
Taking Action and Moving Forward	Session 3	Session 5	Raise participants' awareness about the concept of career planning and the inherent principles of its implementation. Support participants' delineation of personal goals that enable the optimization of an action plan. Aid participants' recognition of personal goals and preferred decision criteria that facilitate opportunity optimization (integrating changing employment trends, social needs, and economic conditions into career plans).	"SMARTE Goals"
		Session 6	Raise participants' awareness about the concept of a career action plan. Empower participants to anticipate barriers and identify available supports in plan implementation. Encourage participants' consideration of a preferred action plan and alternative plans. Promote participants' reflection on how the action plan aligns with personal conceptions of work-related dignity and its relationship with other life domains that contribute to personal well-being and life satisfaction. Conclude the intervention sessions and administer the post-test.	"Action Timeline" "Identity Narrative" Post-test.

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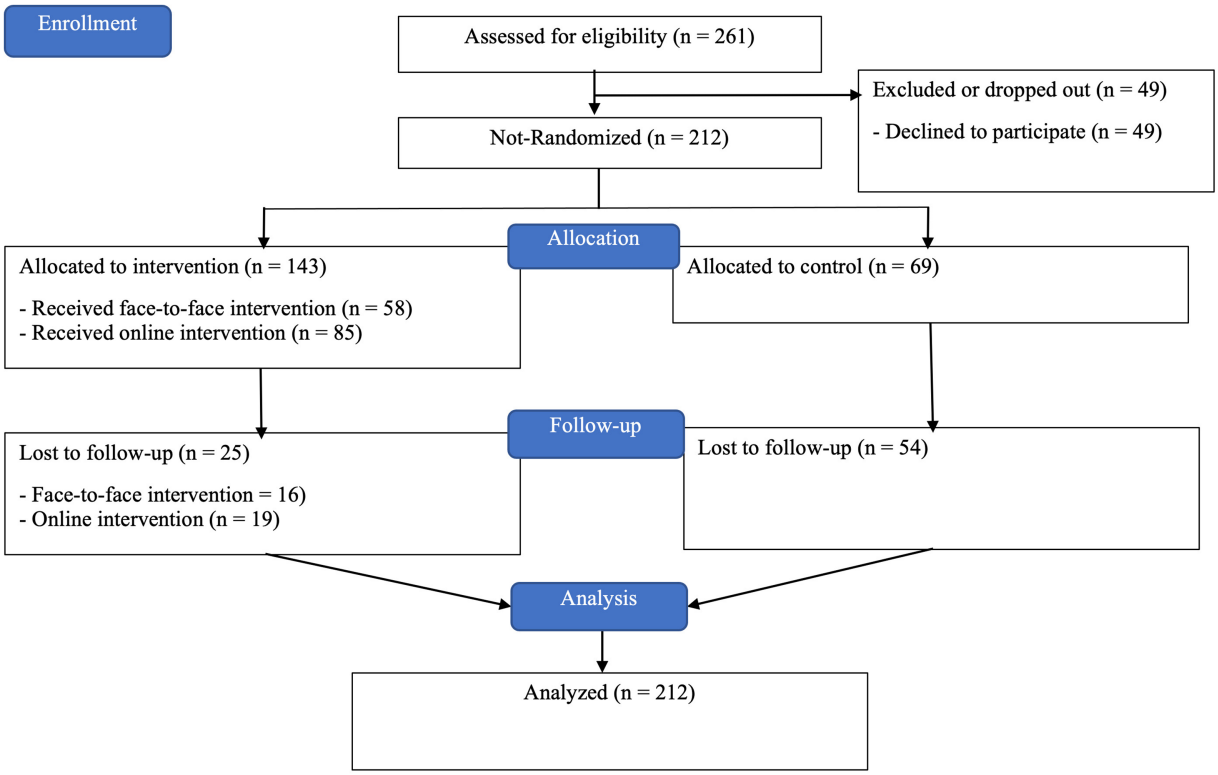

FIGURE 1
CONSORT flow diagram (Moher et al., 2001).

The control group consisted of 69 participants. Of these, 54 (78.3%) identified themselves as female and 15 (21.7%) as male. The participants were aged between 20 and 67 (M = 39.5; SD = 10.513). 21.3% were aged between 20 and 30, 35.9% between 31 and 40, 27.4% between 41 and 50, and 114.2% between 67 and 64. With regard to nationality, 55 (78.3%) participants were Portuguese, 11 (15.9%) were Brazilian, one (1.4%) French, one (1.4%) Italian, one (1.4%) Colombian and one (1.4%) Angolan. In terms of education level, seven (10.1%) had completed elementary school, 25 (36.2%) had completed secondary school, 32 (46.3%) had completed a bachelor's degree, four (5.8%) a master's degree and one (1.4) a doctorate.

2.3 Data collection

Data collection took place immediately before the intervention (pre-test), immediately after the intervention (post-test), and two months after the intervention (follow-up). The questionnaires were created in an online platform (Qualtrics) and shared with the participants through a link or QR code. The research team confirmed and, if necessary, articulated with the psychologist team to ensure that all participants completed them.

2.3.1 Sociodemographic data

Participants' gender, age, nationality, and level of education were collected.

2.3.2 Employability resources data

The Multidimensional Measure of Employability (MME) (Lo Presti et al., 2019), validated for unemployed people (Lo Presti et al., 2022; Silva et al., 2023) was used to assess employability resources. The MME original version has 28 items answered on a 5-point scale varying from 0 ('not at all') to 4 ('at all') (Lo Presti et al., 2019). The MME evaluates employability in terms of (1) Human capital and Professional development, encompassing knowledge, skills, and competencies acquired or potentially acquired through formal and professional training that can be useful in the workplace (Items 1 to 9; e.g., "If needed, I think I could adapt to more complex or demanding tasks than the ones previously done"); (2) Social capital and networking, representing the support individuals can benefit from based on the social relationships they have developed or will develop, given their social skills (Items 10 to 16; e.g., "When a decision within a team must be made, I am usually able to convince other people about the goodness of my proposals."); (3) Career identity and self-career management, reflecting individuals' perception of their career (Items 17 to 20; e.g., "I believe I have a clear plan for my career"); (4) Environmental monitoring, referring to individuals' knowledge and awareness of the job market (Items 21 to 28; e.g., "I'm able to gather useful information about a potential employer before a job interview"). Lo Presti et al. (2019) found good reliability indices among employed people ($0.81 < \alpha < 0.92$), Lo Presti et al. (2022) reported similar results in Italian job seekers ($\alpha = 0.94$), as well as Silva et al. (2023) with Portuguese unemployed people ($0.85 < \alpha < 0.92$). In this study, in order to find a good fit to the longitudinal data, the scale was simplified—the goodness of fit and its statistical procedures could be consulted in the data analysis section.

2.4 Data analysis

All data analyses were done with the IBM SPSS Statistics, version 29, and with R 4.0 (R Core Team, 2020), through RStudio (R Core Team, 2020) (v. 26).

Confirmatory Factor Analysis (CFA) was performed to assess the psychometric properties of the MME (Lo Presti et al., 2019) in the present longitudinal sample. CFA used Robust Maximum Likelihood estimation as implemented in the lavaan package (v.0.6.17) for the R statistical system (Rosseel, 2012). The adequacy of the measurement model was assessed at three different time points using statistical indicators and reference values (CFI and TLI > 0.9; RMSEA ≤0.05; and SRMR <0.08; Marôco, 2021). To achieve a good fit, the first-order factor measurement model was simplified. Thus, respecting the original factor structure, only 3–4 items with the highest factor weight (>0.7) were used per factor (Marôco, 2021). Modification Indices were also used to find significant correlations between items. The simplified model assured the applicability of the MME in the three time points (pre-, post-test, and two months follow-up) for the unemployed sample ($X2$ (502) = 702.115; CFI = 0.939; TLI = 0.931; RMSEA = 0.057; SRMR = 0.066). The simplified version of the MME model is depicted in Figure 2.

Second, the evolution of employability resources among the participants of face-to-face and online psychological career intervention over three-time points (pre- and post-intervention, and two months follow-up) was evaluated through the specification of a conditional Latent Growth Model (LGM), incorporating longitudinal error correlations with statistical significance at $p < 0.05$ (Marôco, 2021; Spurk et al., 2020). LGMs are a class of models used for modelling longitudinal data within the framework of structural equation modelling to examine inter-individual differences in intra-individual growth trajectories (Marôco, 2021). The LGM incorporated latent intercepts and slopes for each time point (T0, T1, T2) corresponding to the employability indicators, including human capital and professional development (HCPD), social capital and networking (SCN), career identity and self-career management (CISM), and environmental monitoring (EM). The model's latent intercepts at each time point reflected the initial levels of the employability resources, while the slope indicated the rate of change over time. Specifically, the intercepts and slopes of the MME variables were regressed on themselves and previous time points to capture their evolving trajectories. Moreover, conditional effects were incorporated into the model, wherein the intercepts and slopes of MME were regressed on two predictor variables—the intervention groups (face-to-face and online). These predictors were utilised to explore potential differences in the initial levels and developmental trajectories of employability indicators among distinct participant groups. Additionally, the model accounted for residual covariances between certain latent variables and included the correlation from the intercept to the slope, thereby accounting for additional relationships within the model.

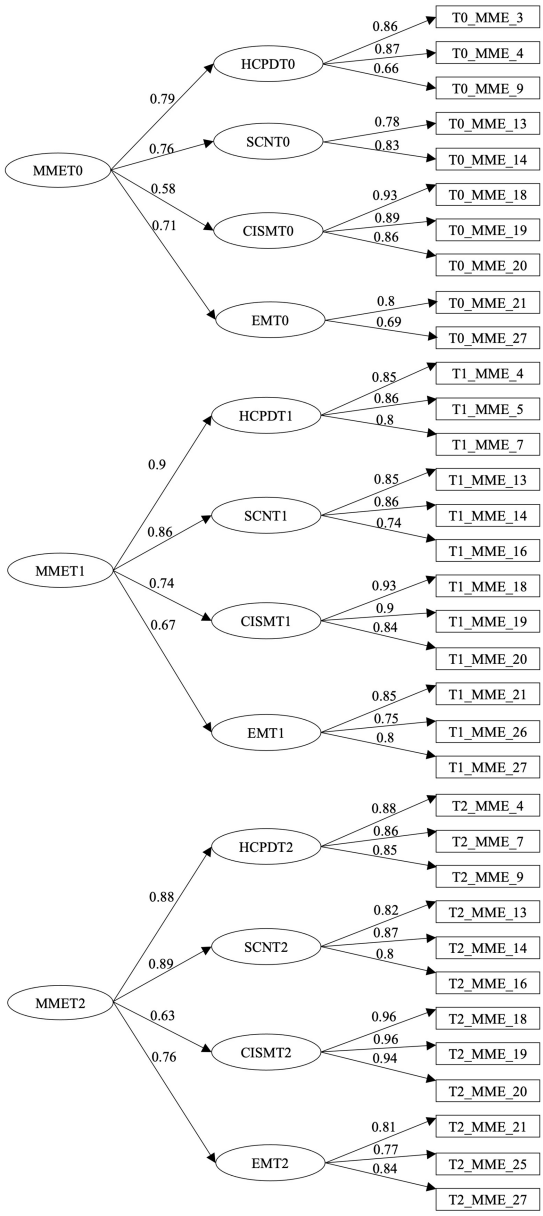

FIGURE 2
Simplified version of the MME model.

3 Results

In this study, a conditional Latent Growth Curve analysis was employed to examine the longitudinal trajectories of employability indicators, including human capital and professional development, social capital and networking, career identity and self-career management, and environmental monitoring, across three-time points (pre-test, post-test, and two months follow-up) following unemployed individuals' participation on a career psychological intervention. The LGM revealed an excellent fit to the variance, covariance, and mean structure of the study sample ($X2(597) = 929.747$; $p = 0.000$; CFI = 0.924; TLI = 0.920; RMSEA = 0.051; SRMR = 0.081). Figure 3 displays the standardised estimates of the parameters of the conditional model.

3.1 Trajectory of changes in employability resources

The average intercept was 4.016 (SE = 0.089; $p < 0.001$). This indicates that the baseline employability level significantly differs from the minimum value on the scale (0), showing that all

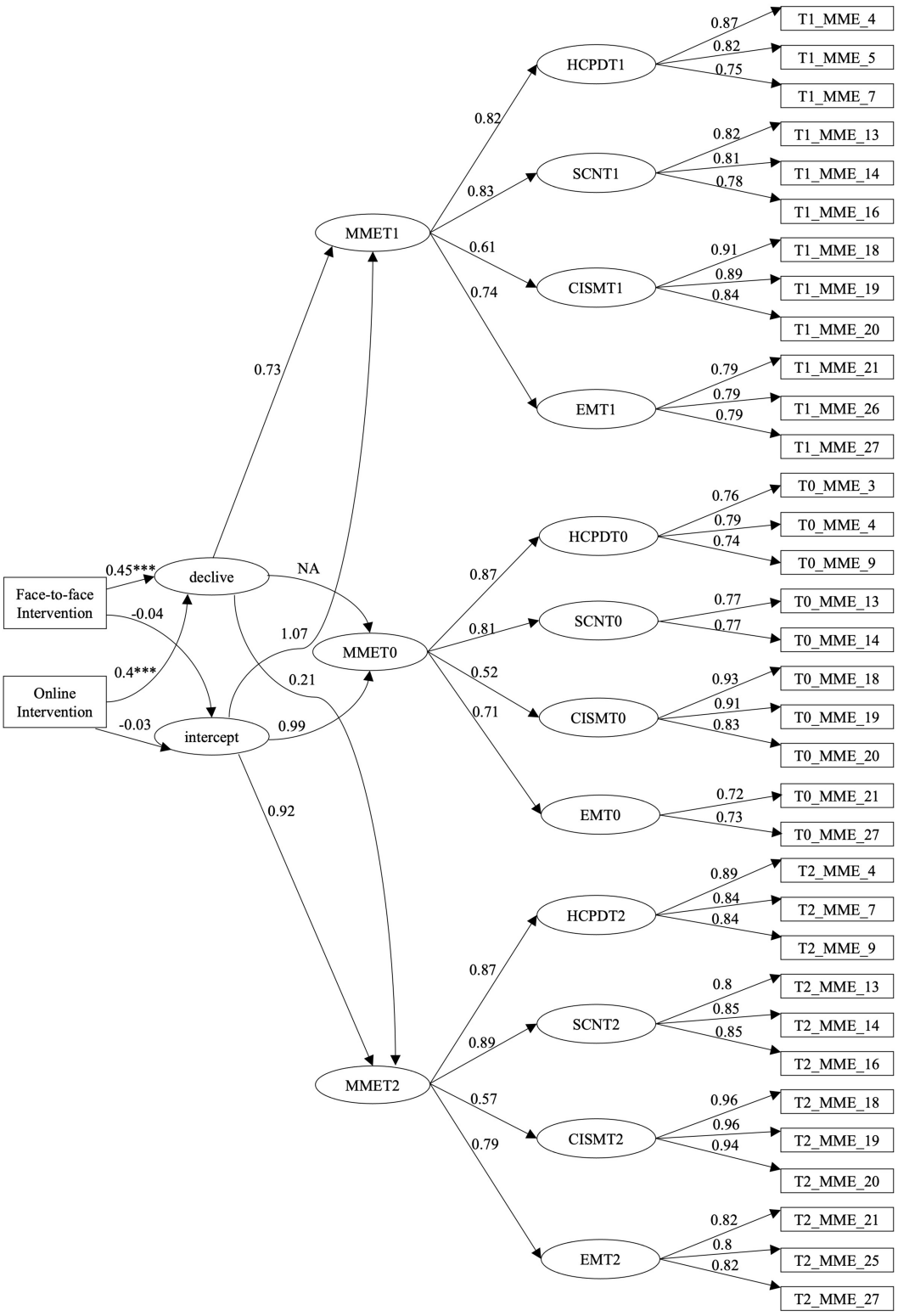

FIGURE 3
Standardised estimates of the parameters of the conditional model.

participants start with a certain level of employability resources. Furthermore, the intercept variance was 0.338 (SE = 0.045; $p < 0.001$). This indicates that there was variability among participants in terms of their baseline employability values, indicating that individuals start at different levels of employability resources.

The average slope was −0.240 (SE = 0.088; $p < 0.001$), indicating a negative and significant average decline in employability resources

among the study participants. In addition, the slope variance was 0.128 (SE = 0.079; $p = 0.106$). The data shows that the trajectory of employability growth was homogeneous among study participants, indicating that the rate of decline in employability is consistent across individuals. The correlation between the intercept and slope was −0.141 (SE = 0.032; $p < 0.001$), which shows that individuals with a higher baseline value of employability have lower growth of employability.

3.2 Efficacy of the two intervention modalities (face-to-face and online)

The conditional LGM results for the intercept variable showed that the predictor face-to-face intervention group variable had an estimated coefficient of −0.057 (SE = 0.119; $p = 0.631$), and that the predictor online intervention group variable had an estimated coefficient of −0.039 (SE = 0.107; $p = 0.716$). This indicates that both face-to-face and online intervention groups have no significant differences on employability resources at the baseline.

For the slope variable, the regression results indicated that the face-to-face intervention variable had an estimated coefficient of 0.397 (SE = 0.105; $p < 0.001$) and that the online intervention variable had an estimated coefficient of 0.323 (SE = 0.097; $p = 0.001$). This indicates that being part of one of the intervention groups, in comparison to being part of the control group, had a significant positive effect on the employability resources trajectory over time factor. These findings highlight the importance of face-to-face intervention and online intervention groups in explaining variations in the changes in employability resources. Therefore, H1, which stated that participating in the intervention would positively influence the trajectory of employability resources over the three time points, is supported by the data. Furthermore, H2, which stated that being part of the face-to-face or online intervention group similarity would explain the changes in the employability resources over time, is also supported.

3.3 Employability dimensions strength

The strength of the relationships between the employability resources and their respective indicators (HCPDT, SCNT, CISMT, EMT) in each time point (T0, T1, and T2) reveals that all of them are positive and significant ($p < 0.001$).

For HCPD, the standardised loadings were 0.875 at pre-test, 0.820 at post-test, and 0.872 at 2-months follow-up. Although HCPD resources better explain global employability at T0, when compared with T1 and T2, these resources greatly explain global employability at T2, when compared with T1. Therefore, H3, which stated that HCPD resources would greatly explain the improvements in global employability at T2 compared to T0 and T1, is partially supported by the data.

For SCN, the standardised loadings were 0.810 at pre-test, 0.829 at post-test, and 0.890 at 2-months follow-up. Although SCN resources better explain global employability at T2, when compared with T0 and T1, these resources greatly explain global employability at T1, when compared with T0. Therefore, H4, which stated that SCN resources would largely explain the improvements in global employability at T1 compared to T0 and T2, is partially supported.

For CISM, the standardised loadings were 0.523 at pre-test, 0.611 at post-test, and 0.567 at 2-months follow-up. CISM resources better explain global employability at T1, when compared with T0 and T1. Therefore, H5, which stated that CISM resources would greatly explain the improvements in global employability at T1 compared to T0 and T2, is supported.

For EM, the standardised loadings were 0.710 at pre-test, 0.742 at post-test, and 0.785 at 2-months follow-up. EM resources better explain global employability at T1 and T2, when compared with T0. Therefore, H6, which stated that EM resources would greatly explain the improvements in global employability at T1 and T2 compared to T0, is supported by the data.

4 Discussion

The aim of this study was to assess the efficacy of a career intervention designed for unemployed adults, grounded in the Social Cognitive Career Theory (SCCT) framework. This was achieved by analysing alterations in the participants' employability resources across three distinct time points, with some participants receiving the career intervention either through face-to-face or online modalities. The main objectives of the research were as follows: (1) to track changes in study participants' employability resources over three-time points (pre-test, post-test, and two months follow-up); (2) to determine if participating in the intervention leads to greater improvements in employability resources; (3) to analyse how participation in each modality (face-to-face and online modalities) affects the trajectory of employability resources for intervention participants; and (4) to examine how each employability resource contributed to overall employability at each assessment point.

The conditional latent growth curve analysis findings indicate a decline in employability resources for all participants, regardless of group assignment. This underscores the pervasive challenges faced by the unemployed population (Drosos et al., 2021) and prompts further investigation into potential explanations and contextual factors driving these trends. Before the intervention, participants exhibited heterogeneous yet generally positive employability conditions. Those with initially robust employability may have had limited opportunities for further enhancement in these resources, particularly without additional stimuli (Hora, 2023). Consequently, some participants may have perceived themselves as already proficient in proactive career strategies to navigate life challenges (Lo Presti et al., 2019), potentially leading to a lack of the need to develop these resources further.

Broader external factors also need consideration. SCCT indicates that employability resources depend on dynamic interactions between individual features (e.g., gender), personal resources (e.g., outcome expectations), and external factors (e.g., job market) (Lent and Brown, 2013). Control group participants, by virtue of not receiving the intervention, may have lacked the supportive framework and resources to navigate both their internal resources and external influences effectively. Without targeted guidance and resource-building activities, they may have been more susceptible to the negative impacts of external factors such as economic downturns, limited job opportunities, and societal pressures (Lent et al., 2022). Additionally, the absence of proactive career strategies emphasised in the intervention may have left control group participants less equipped to adapt to changing market demands or capitalise on available

opportunities (Lo Presti et al., 2019). This suggests a need for comprehensive research that addresses both individual characteristics and contextual factors influencing employability of unemployed adults (Blustein et al., 2020; Thompson et al., 2017).

When analysing the effects of being part of the intervention group, it appears that participants in both the face-to-face and online modalities did not experience the same decline as those in the control group. Instead, they showed a more positive trajectory in employability resources over time. Therefore, while the general trend showed a decline in employability resources among all participants, being part of either intervention group served as a protective factor against this decline, resulting in positive changes in employability resources over time for intervention participants. These results align with expectations regarding the effectiveness of career psychological interventions for unemployed clients (e.g., Maree, 2022). By addressing the pervasive challenges of unemployment, these interventions offer a proactive solution to empower individuals with the resources and support needed to enhance their employability (Lo Presti and Pluviano, 2015; Panari et al., 2020). Empowerment can increase individuals' chances of developing proactive career strategies (Lo Presti et al., 2022), and have broader societal impacts, such as significant economic benefits from investing in high-quality career development programs (Carvalho et al., 2024). Empirical guidelines on intervention design and evaluation (Lent and Brown, 2020), along with previous research (Carvalho et al., 2024), should serve as foundational resources for designing career interventions and ensuring their effectiveness.

Moreover, it is noteworthy that both face-to-face and online intervention modalities produced similar positive effects on employability resources, supporting the idea that online interventions can be as effective as traditional face-to-face interventions (e.g., Amundson et al., 2018). The success of this intervention highlights the effectiveness of adaptations made to the original face-to-face intervention. To ensure quality parameters of online interventions, adaptations such as reducing session quantity and duration were implemented (Pordelan et al., 2018; Sampson et al., 2019). Selecting appropriate applications or platforms that support secure communication and ensuring data privacy and protection were crucial steps in facilitating the transition to online interventions (American Psychological Association, 2013; Ordem dos Psicólogos Portugueses, 2020). Establishing guidelines to maintain a private and distraction-free environment during sessions should also be considered to optimise the therapeutic process and ensure confidentiality (Ordem dos Psicólogos Portugueses, 2020). These measures collectively demonstrate that with careful planning and implementation, both face-to-face and online interventions can be equally effective. This highlights the advantages of incorporating online modalities to enhance accessibility and participation (Pordelan and Hosseinian, 2020), while also acknowledging the continued benefits of traditional face-to-face interventions, particularly in fostering personal connections (Carvalho et al., 2024). Moreover, the effectiveness of the intervention can also be ascribed to the training received by the psychologists who implemented it, highlighting the crucial role of training professionals for this type of initiative (Blustein et al., 2019).

Although the LGC analysis did not distinguish specific growth tendencies between time points, the significant positive growth tendency suggests that the intervention had a lasting impact on participants' employability resources, indicating its promising long-term effectiveness. This underscores the potential of psychological interventions to foster sustained improvements in employability outcomes, extending beyond the immediate post-intervention period (Perdrix et al., 2012). However, it's not possible to guarantee that the growth in employability resources among the study participants led to re-entry into the job market or educational outcomes, as seen in other studies (Littman-Ovadia et al., 2014). Nonetheless, it can be speculated that given the employability positive curve, intervention participants are more likely to engage in job search behavior (Lo Presti and Pluviano, 2015). Further insights into intervention sustainability will be gained through the analysis of each dimension's strength at the follow-up moment, identifying participants' additional needs, and providing opportunities to enhance future interventions (Sadler, 1984).

At the beginning of the study, Human Capital and Professional Development (HCPD) was the employability dimension that better explained global employability resources, followed by Social Capital and Networking (SCN), Environmental Monitoring (EM), and finally Career Identity and Self-Management (CISM). This suggests that participants already initially placed a strong emphasis on their existing perceptions of knowledge, skills, and competencies, and in recognising the importance of social relationships and networks as key determinants of their employability (Lo Presti et al., 2019). Even before any stimulus, individuals already seemed to be aware of the importance of staying informed about changes in the labour market, industry trends, and potential employment opportunities as something very important to enhance their employability (Lent et al., 2022). Furthermore, awareness of one's own career resources was seen as less important in explaining participants' employability, which is consistent with the expected lack of career self-awareness of unemployed individuals who may not have the confidence and opportunity to reflect on their career values, interests and goals (Taveira et al., 2017).

After the intervention, the Social Capital and Networking (SCN) dimension emerged as the most influential in explaining global employability resources, closely followed by the Human Capital and Professional Development (HCPD) dimension. This shift suggests that the intervention likely promoted social interactions and the recognition of career networks among participants, allowing them to leverage social capital for career advancement (Carvalho et al., 2024). The emphasis on building social relationships and expanding career networks within the intervention likely promoted participants' employability during the post-test period, highlighting the crucial role of social support for individuals facing unemployment (Bhat, 2010; Lent et al., 2022). Furthermore, the recognition of career goals and the ability to develop an individual career action plan emerged as significant factors in explaining participants' employability following the intervention (e.g., Drosos et al., 2021; Rezaei et al., 2017). Participants' drive to achieve their career aspirations, supported by their ability to envision their next steps and implement their career plans, likely played a fundamental role in this outcome. The structured approach to career planning provided by the intervention appeared to empower participants to take proactive steps towards their career goals (Carvalho et al., 2024). Furthermore, the ability to interpret one's context and navigate environmental factors (Lo Presti et al., 2019) emerged as another important contributor to participants' employability post-intervention. This is consistent with the intervention's focus on enhancing participants' environmental

monitoring skills, which appeared to resonate with participants and positively impact their employability outcomes. Participants demonstrated an increased ability to explore and understand their professional environment, enabling them to adapt their career strategies accordingly (Littman-Ovadia et al., 2014). However, while participants demonstrated an increased awareness of their career identity compared to previous points in time, this dimension remained less salient in explaining overall employability. This should simultaneously highlight the power of career interventions to stimulate self-awareness (Drosos et al., 2021), but also the demands of developing one's career and employability through self-reflection (e.g., Maree, 2022).

Two months after the intervention, the post-intervention pattern remained consistent, with slightly higher loadings observed for every dimension except CISM. In the follow-up assessment, SCN and HCPD were the dimensions that most significantly explained global employability resources, followed by EM, and lastly CISM. This suggests that at a long-term level, the effects of the intervention persisted, with certain dimensions exhibiting sustained influence on participants' employability. The role of social networks continued to be highly significant for participants even two months post-intervention. This unexpected finding underscores the enduring impact and importance individuals in vulnerable situations place on their social networks (Lent et al., 2022; Taveira et al., 2017). Similarly, participants' commitment to career planning activities persisted beyond the immediate post-intervention period. The establishment of long-term career plans during the intervention likely appeared to foster a sense of commitment among participants, leading to continued engagement in career development activities (Carvalho et al., 2024). This aligns with the expectation that participants would remain focused on their career goals after the intervention (Drosos et al., 2021; Littman-Ovadia et al., 2014). Furthermore, the sustained ability to interpret one's environment and adapt career strategies accordingly highlights the effectiveness of the intervention in fostering long-term skills development (Taveira et al., 2017). Participants' proactive engagement in monitoring labour market dynamics likely contributed to their sustained employability outcomes over time. Following the same pattern as the previous time points, individual resources that promote career self-awareness and enable one to make sense of past experiences and anticipate the future (Lo Presti et al., 2019) remained the less powerful dimension explaining participants' employability. This suggests that while career self-awareness is important for career development (Cheng et al., 2020), in the longer term, other practical tasks such as career planning and networking might prevail, especially in a situation of unemployment where individuals are faced with numerous challenges and competing priorities (Drosos et al., 2021). It is therefore understandable that participants may prioritise more immediate and tangible tasks that directly contribute to their career success (Lo Presti et al., 2019), such as developing a career plan and expanding their social networks.

5 Limitations and future directions

Despite the valuable insights gained from this study, several limitations warrant consideration and suggest avenues for future research. Firstly, it is important to consider some factors related to the study sample that may influence the results. The major innovation of using a longitudinal sample also posed some challenges. Due to sample limitations, especially at the follow-up assessment, the study's measurement instruments may not have captured employability resources as accurately as expected. Future research designs should use strategies to retain study participants after the intervention (e.g., Poongothai et al., 2023). In addition, assuming the sample size can be maintained, longer-term follow-up assessments beyond the 2-month period could provide a more comprehensive understanding of the ongoing effectiveness of the intervention. Furthermore, results may be influenced by sample demographic characteristics. In line with SCCT principles (Lent and Brown, 2013), future studies should explore how factors such as age, gender, level of education, and previous and current work and training experience interact with intervention outcomes. In addition, process and qualitative information should be considered, as this is considered critical to understanding how participants engage with the intervention components, identifying potential areas for improvement and ensuring fidelity to the intervention protocol (Lent and Brown, 2020).

Secondly, although this study presents a robust solution for evaluating the intervention using a latent growth model, which has been recommended for the career intervention research line (Spurk et al., 2020), there were some limitations to highlight. Due to the sample size, it wasn't possible to include more variables in the model (e.g., socio-demographic, other career variables such as life satisfaction, perceived social support, career self-efficacy, etc.), which could have helped to better understand the employability trajectory. Additionally, the sole reliance on self-report measures limits the robustness of the findings. Future research should incorporate objective data, such as employment status post-intervention, how the employment status changed, and satisfaction with new roles, to provide a more comprehensive evaluation of the intervention's impact. Finally, future research could also explore sensitivity analyses to further validate the robustness of the findings.

6 Conclusion

The study aimed to evaluate the effectiveness of a career intervention for unemployed adults within the framework of Social Cognitive Career Theory (SCCT). By analysing changes in employability resources over three time points and comparing the effects of intervention modalities on employability trajectories, several key findings emerged. There was a general decline in employability resources among participants, highlighting the pervasive challenges faced by the unemployed. Despite this decline, both intervention groups showed positive trajectories. By focusing on developing skills and resources across multiple dimensions, interventions can be effective in improving overall employability and supporting individuals to manage career transitions and challenges. The success of career interventions also highlights the need to invest in high-quality programmes and adhere to empirical guidelines. In addition, both face-to-face and online interventions showed similar positive effects, highlighting the adaptability of online modalities and reinforcing the effectiveness of traditional face-to-face modalities. The positive growth trend observed suggests a lasting impact of the intervention on employability resources, while further research is needed to understand long-term sustainability and outcomes. The shift in influential dimensions at the three time points showed that prior to any intervention stimuli, participants appeared to prioritise tangible skills

and social connections in their perceptions of employability resources. The intervention could have focused more explicitly on improving social connections and professional skills. In the longer term, it highlighted the need for further intervention in participants' self-awareness to ensure comprehensive support for participants in all aspects of their employability journey. Overall, the study provides valuable insights into the effectiveness of career interventions for unemployed adults, offering an innovative research design and statistical approach, proactive solutions with potential societal impact, and highlighting the need for further research to refine intervention strategies and maximise effectiveness in supporting individuals' careers.

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 Commission for Ethics in Social and Human Sciences Research (CEICSH 002/2022). 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

CLC: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Visualization, Writing – original draft, Writing – review & editing. JM: Formal analysis, Methodology, Software, Supervision, Validation, Writing – review & editing. MCT: Conceptualization, Writing – review & editing, Funding acquisition. ADS: Conceptualization, Writing – review & editing, Funding acquisition, Methodology, Project administration, Supervision, Validation.

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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.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

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Emotional resiliency and life satisfaction among teachers of Chinese as a foreign language: mediating chain model with grit and employability and gender moderation

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Objective: To investigate the relationships between emotional resilience, grit, employability, and life satisfaction among Chinese as a Foreign Language (CFL) teachers in China, with a focus on gender differences.

Methods: A sample of 1,003 CFL teachers participated in a survey assessing emotional resilience, grit, employability, and life satisfaction. Data were analyzed using descriptive statistics, correlation analyses, and mediation and moderation models with the PROCESS macro.

Results: Emotional resilience did not have a significant direct effect on life satisfaction but showed substantial indirect effects through grit and employability. Emotional resilience positively influenced grit, which in turn enhanced employability and increased life satisfaction. Gender differences were observed grit was a more critical mediator for males, while employability was a stronger mediator for females.

Conclusion: The study highlights the importance of grit and employability in enhancing life satisfaction among CFL teachers. Gender-specific interventions to bolster these mediating factors are recommended to support the wellbeing and professional success of CFL teachers.

Implications: Educational institutions should develop professional development programs and support systems that foster emotional resilience, grit, and employability, with attention to gender-specific needs, to improve job satisfaction and effectiveness among CFL teachers.

KEYWORDS

Chinese as a foreign language (CFL) teachers, emotional resilience, grit, employability, life satisfaction

Introduction

Teaching Chinese as a Foreign Language (CFL) has gained significant importance due to China's expanding global influence and the strategic role of Mandarin in international communication (Hsiang et al., 2023; Xu and Stahl, 2023). As key facilitators of linguistic and cultural exchange, CFL teachers play a critical role in promoting language acquisition and fostering cross-cultural understanding (Liang and Apedoe, 2025). However, despite the rising

demand for CFL programs globally, many CFL teachers face substantial challenges, including professional stress, role overload, and limited support networks (Wang H. et al., 2023).

Existing research has explored some of these challenges, focusing on general stress factors, gender dynamics, and teaching effectiveness in various contexts. However, few studies have investigated how psychological traits such as grit and employability interact with emotional resilience to influence teachers' life satisfaction, particularly in the case of CFL teachers operating in diverse cultural environments (Fu, 2025; Yang et al., 2025). Moreover, the literature often neglects how gender-specific factors mediate these relationships, leaving a critical gap in understanding the unique experiences of female teachers.

This study aims to fill these gaps by examining the mediating roles of grit and employability in the relationship between emotional resilience and life satisfaction among CFL teachers. The novelty of this research lies in its emphasis on gender differences, providing a more nuanced understanding of how male and female teachers navigate professional challenges. By addressing this overlooked dimension, the study contributes to the development of targeted support strategies to enhance teachers' wellbeing and career satisfaction, ultimately improving the quality of CFL instruction.

Theoretical framework and hypotheses development

Teaching Chinese as a foreign language (CFL) in China: a gender perspective

Teaching CFL has garnered significant attention in recent years, reflecting China's growing global influence and the increasing importance of the Chinese language in international communication (Chan et al., 2022; Jiang, 2025). The role of CFL teachers is pivotal in this cultural and linguistic exchange, as they serve as the primary facilitators of language acquisition for non-native speakers. These educators not only impart linguistic skills but also play a crucial role in promoting Chinese culture and fostering cross-cultural understanding, as well as in supporting international trade and economic development (Xu, 2024).

The relevance of CFL has surged alongside China's economic ascendancy and its expanding geopolitical footprint. Mandarin Chinese, as the most spoken language globally, has become a strategic asset, prompting a rise in demand for CFL programs both domestically and internationally (Smith, 2023). Institutions ranging from primary schools to universities have incorporated Chinese language courses into their curricula, while international schools and Confucius Institutes worldwide have bolstered this trend. Consequently, CFL teachers are increasingly sought after, with their expertise becoming a critical component in educational and professional arenas (Wang, 2023).

Despite the growing demand and recognition, CFL teachers face a myriad of challenges that contribute to professional stress and difficulties. One of the primary stressors is the high expectation placed on them to deliver effective language instruction while simultaneously promoting cultural awareness. The dual responsibility of language teaching and cultural ambassadorship can be overwhelming, especially for those working in multicultural and multilingual environments (Zhang, 2025).

Another significant challenge is the need for constant adaptation to diverse learner needs. CFL teachers often encounter students with varying levels of language proficiency, learning styles, and cultural backgrounds (Ma et al., 2017). This diversity requires teachers to employ a wide range of pedagogical strategies and resources, which can be demanding and time-consuming. Moreover, the lack of standardized teaching materials and methodologies for CFL can exacerbate this issue, forcing educators to develop customized curricula and teaching aids (Hsiang et al., 2023).

Gender plays a crucial role in the stress and difficulties experienced by CFL teachers (Xiao and Asadullah, 2020). Female educators, in particular, often face unique challenges that can compound their professional stress. Studies indicate that women in teaching positions are more likely to experience role overload, balancing their professional responsibilities with societal expectations related to family and caregiving roles. This dual burden can lead to higher levels of stress and burnout among female CFL teachers (Zhou, 2023).

Additionally, gender-based expectations and biases can influence the professional experiences of CFL teachers. Female teachers may encounter gender stereotypes that undermine their authority and professional competence, further exacerbating their stress levels (Peng et al., 2023). They might also have fewer opportunities for career advancement and professional development compared to their male counterparts, contributing to job dissatisfaction and feelings of isolation (Horta and Tang, 2023).

CFL teachers frequently experience professional isolation, particularly those working in regions with limited support networks or access to professional development opportunities. This isolation can lead to feelings of burnout and decreased job satisfaction. Furthermore, the administrative burdens associated with their roles, such as curriculum planning, student assessment, and institutional reporting, add to their workload and stress levels (Ogbari, 2024).

The rapid technological advancements and the integration of digital tools in language teaching also present both opportunities and challenges for CFL educators. While technology can enhance language learning experiences, it requires teachers to continuously update their digital literacy skills and adapt to new teaching platforms and tools, which can be a source of additional pressure (Hoque and Atheef, 2024).

Hence, while the role of CFL teachers is crucial and increasingly relevant in today's globalized world, the stress and difficulties they face, particularly from a gender perspective, cannot be overlooked. Addressing these challenges through research specific focused on their professional development could help to ensure the wellbeing and effectiveness of CFL educators.

Emotional resilience as teachers' capability and employability

Emotional resilience is defined as the ability to adapt to, recover from, and thrive in the face of adversity and stress. For teachers of Chinese as a Foreign Language (CFL), this capability is crucial as it allows them to manage the emotional demands of teaching, maintain a positive outlook, and sustain their passion for educating diverse student populations. Resilient CFL teachers can effectively handle

classroom challenges, maintain constructive relationships with students and colleagues, and bounce back from setbacks (Smaliukienė et al., 2024).

Employability refers to the set of skills, knowledge, and attributes that make an individual desirable to employers and capable of securing and maintaining employment. For CFL teachers, employability encompasses not only pedagogical skills and subject matter expertise but also emotional resilience. Teachers with high employability can adapt to changing educational environments, incorporate new teaching methods, and continually develop professionally. Emotional resilience significantly enhances employability by enabling teachers to cope with job-related stress, embrace new challenges, and demonstrate reliability and stability in their roles (Bagdžiūnienė et al., 2023).

The interrelationship between emotional resilience and employability is evident in the teaching profession. Teachers who possess emotional resilience are better equipped to navigate the complexities of their roles, which enhances their employability. This resilience allows them to manage stress effectively, maintain high performance, and remain committed to their professional growth. Consequently, they become more attractive candidates for employment and are better positioned to advance in their careers (Lin and Felipe, 2023).

Teaching CFL presents unique challenges that test teachers' emotional resilience and employability. High proficiency in Mandarin and deep cultural knowledge require continuous learning and adaptation. Creating engaging and effective learning experiences for students with different language backgrounds and learning styles demands innovation and flexibility, which can be mentally and emotionally taxing. Additionally, the pressure to achieve high educational outcomes and meet expectations from students and institutions contributes to considerable stress (Wang et al., 2024).

Investing in empirical research on emotional resilience is crucial for enhancing CFL teachers' capabilities and employability. Hence, the present study that focus on understanding the factors contributing to CFL teachers' Wellbeing through mediational variables could improve teachers' employability and impact, in turn, their Wellbeing. The final aim is identifying effective practices and interventions through empirical research, that educational institutions can apply to support their staff in achieving long-term career success and job satisfaction (Smaliukienė et al., 2024).

Mediating role of grit and employability in predicting life satisfaction

Grit, defined as perseverance and passion for long-term goals, is a significant psychological trait that influences both employability and life satisfaction. For teachers of Chinese as a Foreign Language (CFL), grit is essential in navigating the demanding and evolving educational landscape (Fu, 2025). This perseverance helps them continually develop professionally and personally, leading to higher employability and job satisfaction (Cayupe et al., 2023).

For CFL teachers, key employability attributes include career agility, cultural ingenuity, and proactive career resilience. Career agility involves adapting to new opportunities and challenges in the educational field. Cultural ingenuity refers to the ability to effectively interact with and teach students from diverse cultural backgrounds. Proactive career resilience is the capacity to remain confident and proactive in career development despite setbacks (Ismail et al., 2023).

Grit enhances employability by fostering self-regulatory behaviors such as continuous learning and adaptation. Teachers with high levels of grit are more likely to persist in improving their skills and competencies, thus meeting the evolving demands of their profession. This persistent effort not only makes them more employable but also contributes to their overall life satisfaction by achieving long-term career goals and personal fulfillment (Cabaron and Oco, 2023).

Life satisfaction, as a relevant Wellbeing indicator, is significantly influenced by the successful integration of grit and employability. Teachers who demonstrate high levels of grit tend to navigate professional challenges more effectively, leading to greater job stability and satisfaction. This stability and sense of achievement in their professional lives translate into higher overall life satisfaction. The ability to overcome obstacles and achieve career goals through perseverance directly impacts their sense of purpose and wellbeing, along all the lifetime (Hu et al., 2024).

Gender moderation of the indirect effects of emotional resilience on teachers' wellbeing through grit and employability

Emotional resilience is crucial for teachers, enabling them to manage the complex demands of their profession. Grit, characterized by perseverance and sustained passion for long-term goals, serves as a vital mediating factor between emotional resilience and life satisfaction. Teachers with high emotional resilience are likely to exhibit higher levels of grit, which in turn enhances their life satisfaction. This indirect effect suggests that resilience fosters a persistent and passionate approach to teaching, leading to greater personal and professional fulfillment (Simonton et al., 2023).

Employability, encompassing skills, knowledge, and personal attributes that facilitate securing and maintaining employment, is another mediator in the relationship between emotional resilience and life satisfaction. Teachers with high emotional resilience are better equipped to develop and sustain employability attributes such as adaptability, continuous learning, and effective interpersonal skills. This enhancement in employability contributes to greater job stability and career satisfaction, ultimately leading to higher overall life satisfaction. Emotional resilience thus indirectly boosts life satisfaction by improving teachers' employability and their ability to thrive in diverse educational settings (Yang et al., 2025).

The combined effect of grit and employability further elucidates the pathway from emotional resilience to life satisfaction. Emotional resilience enhances grit, which subsequently improves employability by fostering a commitment to long-term professional development and goal attainment. This chain mediation effect highlights how emotional resilience indirectly contributes to life satisfaction through a sequential improvement in both grit and employability. Teachers who are resilient are likely to persist through challenges (grit), enhance their career-related skills and opportunities (employability), and thereby achieve higher levels of life satisfaction (Shao, 2023).

Gender stereotypes significantly influence the moderation of these indirect effects. Males often benefit from societal perceptions that align with traits such as perseverance and goal-oriented behavior,

which are associated with grit. The magnetic male stereotype suggests that men who demonstrate context-specific goal-setting mindsets are viewed positively, enhancing their professional and personal outcomes. This societal bias can amplify the positive effects of grit on employability and life satisfaction for male teachers (Polat and İskender, 2018).

Conversely, females may face negative stereotypes that undermine their perseverance and goal-oriented efforts (Xu et al., 2023). Gender biases can result in women being perceived less favorably when exhibiting the same traits, thereby diminishing the positive impact of their grit on employability and life satisfaction. Despite possessing high levels of emotional resilience and grit, female teachers might not receive the same recognition and opportunities as their male counterparts, leading to a moderated effect where the benefits of resilience on life satisfaction through grit and employability are less pronounced for women (Brouskeli et al., 2018).

Based on the above revised literature, the following hypotheses are proposed:

Direct effects:

> *H1*: Emotional Resilience (X) has a direct positive effect on Life Satisfaction (Y).

Indirect effects:

> *H2*: Emotional Resilience (X) has an indirect effect on Life Satisfaction (Y) through Grit (M1).
>
> *H3*: Emotional Resilience (X) has an indirect effect on Life Satisfaction (Y) through Employability (M2).
>
> *H4*: Emotional Resilience (X) has an indirect effect on Life Satisfaction (Y) through the chain mediation of Grit (M1) and Employability (M2).

Moderated mediation effects:

> *H5*: Gender (W) moderates the indirect effect of Emotional Resilience (X) on Life Satisfaction (Y) through Grit (M1).
>
> *H6*: Gender (W) moderates the indirect effect of Emotional Resilience (X) on Life Satisfaction (Y) through Employability (M2).
>
> *H7*: Gender (W) moderates the indirect effect of Emotional Resilience (X) on Life Satisfaction (Y) through the chain mediation of Grit (M1) and Employability (M2).

These hypotheses will guide the analysis to explore the complex relationships among Emotional Resilience, Grit, Employability, Gender, and Life Satisfaction as Figure 1 depicts through the PROCESS Model 88 framework.

Methods

Participants

The study comprised a total of 1,003 participants who are teachers of Chinese as a Foreign Language (CFL). The age of the participants ranged from 18 to 69 years, with a mean age of 37.18 years (SD = 11.47). Regarding gender, 56.4% were males. The participants had varying years of work experience with a mean of 8.63 years (SD = 9.45). The educational qualifications of the participants were bachelor's degree (49.4%, $n = 495$), doctoral (Ph.D.) programs (20.3%, $n = 204$), and postgraduate (30.3%, $n = 304$). The participants were involved in different categories of professional education, including secondary education (6.3%, $n = 63$), courses of proficiency tests (19.3%, $n = 194$), higher education (24.9%, $n = 250$), adult education (40.8%, $n = 409$), and online education (8.7%, $n = 87$). The majority of participants were employed by private organizations (77.5%, $n = 777$), with the remaining participants working for public organizations (22.5%, $n = 226$). The distribution of participants based on the size of their organizations was as follows: organizations with 0–9 professors (21.2%, $n = 213$), organizations with 10–49 professors

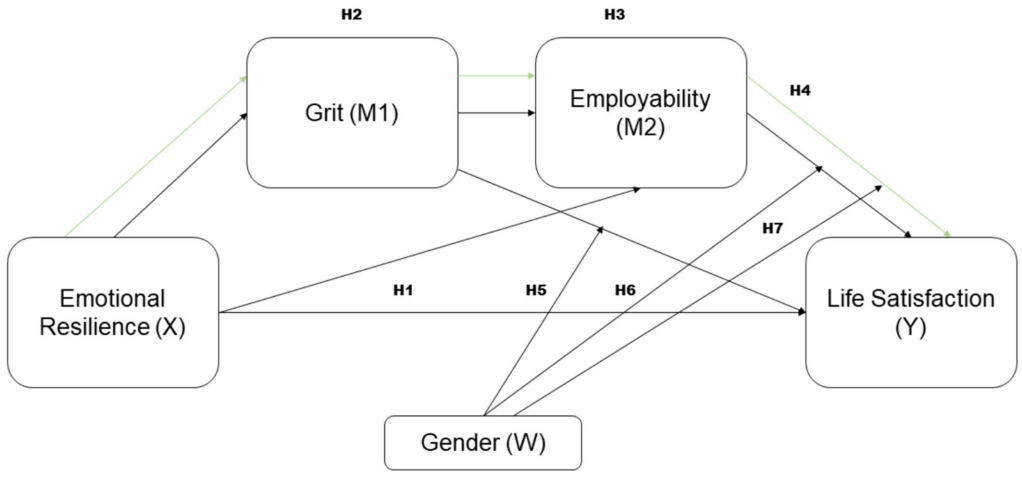

FIGURE 1
Process model 88 framework.

(20.6%, $n = 207$), organizations with 50–199 professors (10.8%, $n = 108$), and organizations with more than 200 professors (47.4%, $n = 475$).

Procedure

This study was conducted in accordance with an approved protocol by the International Students Center, of the Beijing Youth Political College. Research was conducted following with the Declaration of Helsinki [18th World Medical Association (WMA) General Assembly, Helsinki, Finland, June 1964] and the latest amended (October 2013) in Fortaleza, Brazil, and in accordance with the local legislation about Research Involving Human Being [National Health Commission, No. 4 (2023) article 32]. The research protocol included several key steps to ensure the ethical and effective collection of data from participants. Prior to participation, all potential participants were provided with detailed information about the study's objectives, procedures, potential risks, and benefits. They were informed that their participation was voluntary and that they could withdraw from the study at any time without any negative consequences. Participants gave their informed consent electronically before proceeding with the survey. To reach a broad and diverse group of CFL teachers, the survey was disseminated through various social networks. The primary platforms used for dissemination included WeChat, LinkedIn, and specialized forums such as the Chinese Language Teachers Association (CLTA) online community and relevant groups on Facebook. These channels were chosen for their popularity and relevance among CFL educators, ensuring a wide distribution of the survey and helping to gather data from a diverse sample of participants. Data were collected through a web-based survey named "CFL Teacher Professional Profile Survey," during April–May 2024. *A priori* power analysis was conducted to determine the minimum sample size required for detecting statistically significant indirect and moderated effects within the model. Given the number of predictors, mediators, and interaction terms, a sample size exceeding 500 participants was deemed necessary to achieve sufficient statistical power. The chosen sample of 1,003 teachers exceeds this requirement, allowing for reliable estimates of both direct and indirect effects. This survey was designed to capture comprehensive information about the participants' demographics, educational backgrounds, professional categories, type of firm, and organization size. The survey was structured to be user-friendly and accessible, allowing participants to complete it at their convenience. It included a mix of multiple-choice questions and open-ended questions to gather both quantitative and qualitative data.

Instruments

Emotional resiliency was assessed using the Connor–Davidson Resilience Scale (CD-RISC-10), which is recognized for its strong psychometric properties. This scale evaluates an individual's ability to overcome adversity and to recover from challenging situations.

The CD-RISC-10 consists of 10 items, each rated on a unidimensional 5-point Likert scale ranging from 0 ("Not true at all") to 4 ("True nearly all the time"). This scale captures the frequency and intensity of resilience-related behaviors and attitudes. The overall score for each participant can range from 0 to 40, with higher scores indicating greater resilience. This scale is widely used in resilience research due to its reliability and validity in various Chinese subpopulations (Chen et al., 2022; Tu et al., 2023; Wang Y. et al., 2023; Wojujutari et al., 2024; Zhang et al., 2021). In the present study, the scale showed a Cronbach's alpha of 0.789, indicating good internal consistency.

Grit was assessed using the Simple Chinese Version of the Grit Scale (GS-SC), which consists of 11 items. This scale evaluates two key components of grit: Consistency of Interest and Perseverance of Effort. Example items include "I often set a goal but later choose to pursue a different one" for Consistency of Interest and "I finish whatever I begin" for Perseverance of Effort. Participants responded to each item using a 5-point Likert scale, ranging from 1 ("Not like me at all") to 5 ("Very much like me"). The reliability of the GS-SC was confirmed with a Cronbach's alpha coefficient of 0.84 for the Consistency of Interest subscale and 0.72 for the Perseverance of Effort subscale. The overall scale demonstrated a Cronbach's alpha of 0.79, indicating good internal consistency. Evidence for the construct validity of the GS-SC was provided by Ismail et al. (2023).

Employability was measured using the Self-Perceived Employability Scale, which consists of 11 items designed to assess perceived employability as a unitary construct. This scale, originally developed by Rothwell and Arnold (2007), was streamlined from a 16-item version to an 11-item version to enhance its practicality while maintaining its effectiveness (Rothwell et al., 2009). Participants responded to each item on a 5-point Likert scale, ranging from 1 ("Strongly disagree") to 5 ("Strongly agree"). The Self-Perceived Employability Scale captures an individual's perceptions of their employability, reflecting their confidence in their ability to secure and maintain employment. In the present study, the Self-Perceived Employability Scale underwent a back-translation procedure to ensure the accuracy and cultural equivalence of the translated items. A structured process was followed to maintain the integrity of the original scale while adapting it for the target population. Initially, the scale was translated from English to Chinese by a professional translator familiar with both languages and the subject matter. Next, a second independent translator, who was blinded to the original version, translated the Chinese version back into English. The back-translated version was then compared to the original English scale to identify any discrepancies in meaning or terminology. Minor adjustments were made to the Chinese version to resolve inconsistencies and ensure that the translated items retained the intended meanings of the original scale. This rigorous back-translation process helped enhance the linguistic and conceptual accuracy of the scale, ensuring that it was suitable for the study's context and participants. In the present study, the scale showed a Cronbach's alpha of 0.77.

Life satisfaction was assessed using the Satisfaction with Life Scale (SWLS) developed by Diener et al. (1985). This scale provides a global measure of life satisfaction and subjective wellbeing (SWB). It consists of five items, with responses measured on a 7-point Likert scale ranging from 1 ("Totally disagree") to 7 ("Totally agree"). Higher scores indicate greater perceived life satisfaction. The Chinese version of the SWLS, which was utilized in this study, has demonstrated good validity and high internal consistency reliability, with a Cronbach's alpha coefficient of 0.84. This makes it a reliable and valid tool for assessing life satisfaction among Chinese-speaking populations.

Data analyses

Data analyses were conducted using IBM SPSS Statistics version 29.01.0 and the PROCESS macro developed by Andrew F. Hayes, specifically employing Model 88. First, descriptive statistics were computed for all variables to provide an overview of the sample characteristics. The internal consistency of the scales used (e.g., CD-RISC-10, GS-SC, Self-Perceived Employability Scale, SWLS) was assessed using Cronbach's alpha coefficients. Pearson correlation coefficients were calculated to examine the relationships between key variables, such as emotional resiliency, grit, employability, and life satisfaction. To enhance the robustness of the mediation and moderation analyses, bootstrapping procedures were employed. A total of 5,000 bootstrap samples were generated to estimate the indirect effects and their confidence intervals. The bias-corrected bootstrap confidence intervals were used to determine the significance of the indirect effects. The lower level confidence interval (LLCI) and upper level confidence interval (ULCI) were reported for each analysis. An effect was considered significant if the 95% confidence interval did not include zero.

Results

Descriptive and correlational statistics

Table 1 presents the means, standard deviations, and Pearson correlation coefficients for the key variables in the study. These correlations suggest that higher levels of emotional resilience are associated with higher levels of grit, employability, and life satisfaction. Additionally, higher levels of grit are associated with higher levels of employability and life satisfaction. The strong correlation between employability and life satisfaction underscores the importance of employability as a predictor of overall life satisfaction.

Direct and mediating effects

The results of the regression analysis examining the relationship between Emotional Resilience (X) and Grit (M1) are summarized in Table 2. The model demonstrates a statistically significant relationship, with an F-statistic of 116.05 ($p < 0.001$). The R-squared value of 0.104 indicates that approximately 10.4% of the variance in Grit is explained by Emotional Resilience. The regression coefficients indicate that emotional resilience (X) has a positive and statistically significant effect on grit. The 95% confidence interval for the emotional resilience coefficient ranges from 0.203 to 0.294, suggesting that the true population parameter lies within this interval.

The second part of the model, focusing on Employability (M2) as the outcome variable, showed that the model demonstrates a strong and statistically significant relationship between the predictors (emotional resilience and grit) and employability, with an F-statistic of 525.37 ($p < 0.001$). The R-squared value of 0.512 indicates that approximately 51.2% of the variance in employability is explained by emotional resilience and grit.

The regression coefficients indicate that both emotional resilience (X) and Grit (M1) have significant positive effects on employability. Specifically, emotional resilience has a coefficient of 0.146, and grit has a coefficient of 0.543.

Finally, the results of the mediation analysis examined the impact of emotional resilience on life satisfaction (Y) through both mediators, grit (M1) and employability (M2). The model demonstrates a statistically significant relationship between the predictors and life satisfaction. The R-squared value of 0.437 indicates that approximately 43.7% of the variance in life satisfaction is explained by the model.

The direct effect of emotional resilience on life satisfaction is positive but not statistically significant, with a 95% confidence interval ranging from −0.017 to 0.085. This suggests that, while emotional resilience tends to increase life satisfaction, the effect is not strong enough to be statistically significant on its own.

Grit has a positive and statistically significant direct effect on life satisfaction, with a 95% confidence interval ranging from 0.071 to 0.574. This indicates that individuals with higher levels of grit tend to report higher life satisfaction.

Employability also shows a positive and statistically significant direct effect on life satisfaction, with a 95% confidence interval ranging from 0.248 to 0.822. This suggests that individuals with higher employability tend to have higher life satisfaction.

The results indicate that both grit and employability mediate the relationship between emotional resilience and life satisfaction. Although the direct effect of emotional resilience on life satisfaction is not statistically significant, its impact is channeled through grit and employability, which both show significant positive effects on life satisfaction.

These findings underscore the importance of grit and employability as mediators. Emotional resilience contributes to higher grit and employability, which in turn lead to greater life satisfaction. This highlights the complex pathways through which emotional resilience influences overall wellbeing.

TABLE 1 Descriptive statistics and Pearson correlations among study variables.

Variable	Mean	SD	1	2	3	4
1. Emotional resilience (X)	4.05	0.86	–			
2. Grit (M1)	3.98	0.66	0.322**	–		
3. Employability (M2)	4.08	0.58	0.414**	0.686**	–	
4. Life satisfaction (Y)	3.54	0.85	0.302**	0.477**	0.656**	–

**$p < 0.01$.

Moderation of gender

As Table 2 showed, the regression analyses supported that, despite that Gender does not significantly predict Life Satisfaction, both interactions (Grit × Gender, and Employability × Gender) were significant. As Figures 2, 3 shown, Gender significantly moderates the direct relationships between Grit and Life satisfaction, on one hand, and Employability and Life Satisfaction, on the other hand.

The analysis for Hypothesis 5 examined whether gender moderates the indirect effect of emotional resilience on life satisfaction through grit. The interaction term between grit and gender was statistically significant, indicating that the relationship between grit

TABLE 2 Coefficients for emotional resilience predicting grit (M1) and employability (M2).

Outcome variables	Coeff	SE	t-value	p-value	LLCI	ULCI
Grit (M1)						
Constant	2.983	0.096	31.25	0.000	2.796	3.171
Emotional resilience (X)	0.248	0.023	10.77	0.000	0.203	0.294
Employability (M2)						
Constant	1.325	0.087	15.21	0.000	1.154	1.496
Emotional resilience (X)	0.146	0.016	9.22	0.000	0.115	0.177
Grit (M1)	0.543	0.021	26.44	0.000	0.503	0.583
Life satisfaction (Y)						
Constant	−0.009	0.449	−0.019	0.985	−0.889	0.872
Emotional resilience (X)	0.034	0.026	1.316	0.189	−0.017	0.085
Grit (M1)	0.323	0.128	2.514	0.012	0.071	0.574
Employability (M2)	0.535	0.146	3.663	0.0003	0.248	0.822
Gender	−0.323	0.298	−1.083	0.279	−0.907	0.262
Grit M1 × Gender	−0.182	0.085	−2.144	0.032	−0.349	−0.016
Employability M2 × Gender	0.248	0.097	2.565	0.011	0.058	0.437

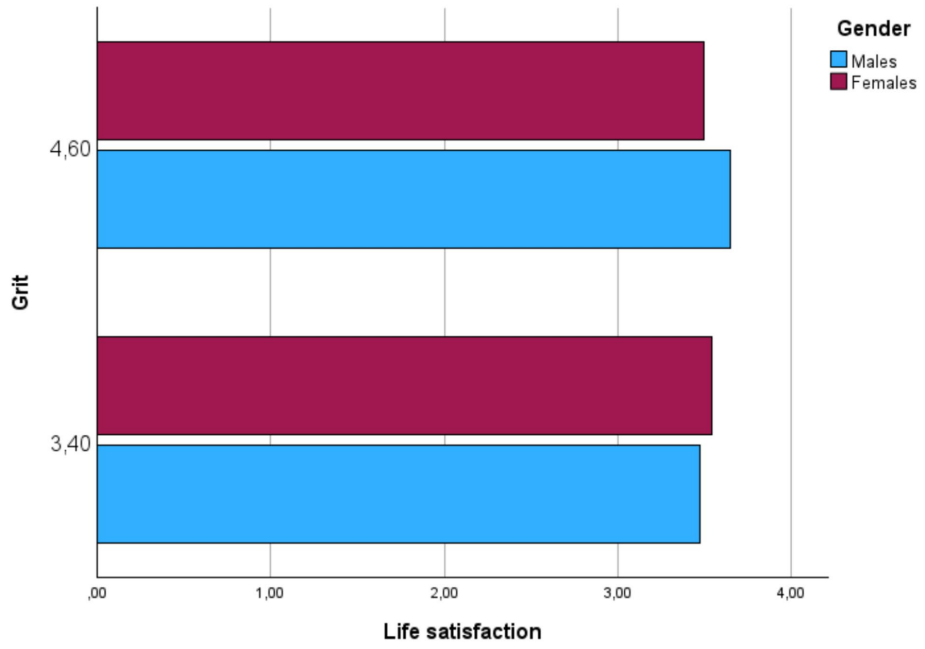

FIGURE 2
Scatterplot for the conditional effects of grit on life satisfaction.

and life satisfaction varies by gender. The conditional effects show that for males (Gender = 1), the indirect effect of emotional resilience on life satisfaction through grit is significant. However, for females (Gender = 2), this indirect effect is not significant. The index of moderated mediation is −0.0452, confirming that the indirect effect of emotional resilience on life satisfaction through grit is significantly moderated by gender.

For Hypothesis 6, the analysis investigated whether gender moderates the indirect effect of emotional resilience on life satisfaction through employability. The interaction term between employability and gender was statistically significant, indicating a gender difference in how employability affects life satisfaction. The conditional effects show that for males, the indirect effect of emotional resilience on life satisfaction through employability is significant. For females, this indirect effect is also significant but stronger. The index of moderated mediation is 0.0361, confirming that the indirect effect of emotional resilience on life satisfaction through employability is moderated by gender.

Hypothesis 7 examined whether gender moderates the chain mediation effect of emotional resilience on life satisfaction through both grit and employability. The conditional indirect effects show that

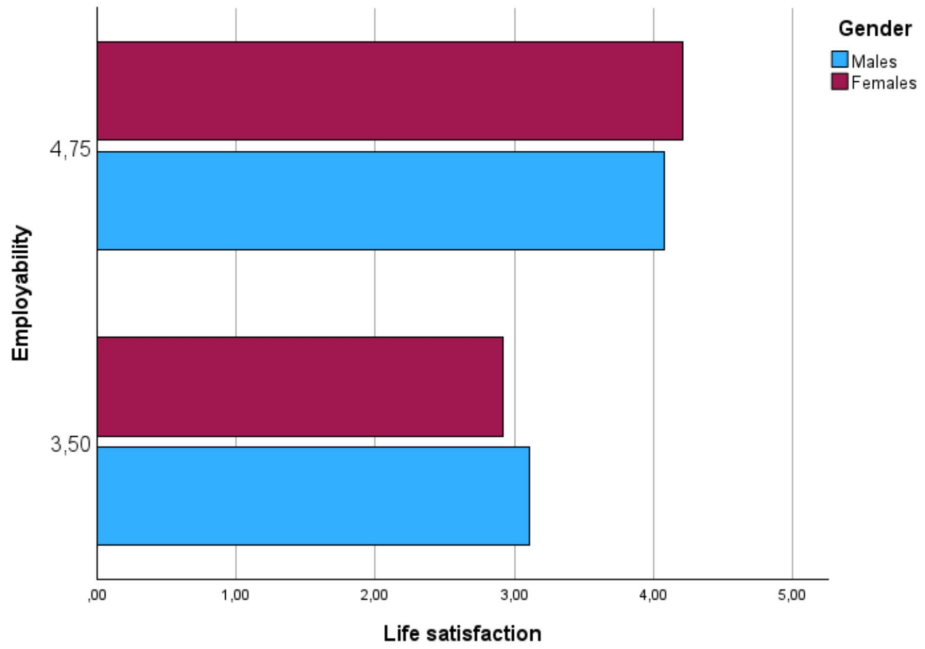

FIGURE 3
Scatterplot for the conditional effects of employability on life satisfaction.

for males, the indirect effect through the chain mediation of grit and employability is significant. For females, this indirect effect is also significant and stronger. The index of moderated mediation is 0.0334, indicating that the chain mediation effect of emotional resilience on life satisfaction through grit and employability is significantly moderated by gender.

These results suggest that gender plays a significant moderating role in the indirect effects of emotional resilience on life satisfaction through both grit and employability, as well as through the combined pathway of grit and employability.

These tables illustrate the moderated mediation effects, with gender significantly influencing the indirect pathways from emotional resilience to life satisfaction through both grit and employability, as well as through the combined mediation pathway of grit and employability. Specifically, the indirect effect of emotional resilience on life satisfaction through grit is significant for males but not for females. In contrast, the indirect effects through employability and through the chain mediation of grit and employability are significant for both genders, with stronger effects observed for females (Table 3).

TABLE 3 Conditional indirect effects of emotional resilience (X) on life satisfaction (Y).

	Effect	BootSE	BootLLCI	BootULCI
Outcome variable: life satisfaction (Y) through grit (M1)				
Males	0.035	0.014	0.007	0.064
Females	−0.010	0.018	−0.046	0.026
Outcome variable: life satisfaction (Y) through employability (M2)				
Males	0.114	0.016	0.084	0.146
Females	0.150	0.020	0.113	0.190
Outcome variable: life satisfaction (Y) through the chain mediation of grit (M1) and employability (M2)				
Males	0.106	0.016	0.075	0.139
Females	0.139	0.019	0.103	0.179

Discussion

The findings of this study provide insight into the complex interplay between emotional resilience, grit, employability, and life satisfaction. Starting with the direct effects, Hypothesis 1 (H1) posited that emotional resilience (X) would have a direct positive effect on life satisfaction (Y). The results, however, indicate that while emotional resilience does have a positive coefficient, this effect is not statistically significant. This suggests that emotional resilience alone may not be a strong enough predictor of life satisfaction for CFL teachers, possibly due to the complex challenges they face in balancing teaching effectiveness with cultural promotion. The 95% confidence interval ranging from −0.017 to 0.085 supports this interpretation, indicating that the true effect could be negligible or slightly positive. Therefore, H1 is not supported by the data, highlighting the necessity of exploring other pathways through which emotional resilience might impact life satisfaction.

These findings partially align with the broader literature on resilience and wellbeing. Studies such as Liu et al. (2024), which emphasize how CFL teachers' identity development in intercultural settings affects wellbeing, suggest that resilience may work indirectly rather than through a direct influence. Similarly, while Luthans et al. (2007) emphasized the strong direct effect of psychological capital (which includes resilience) on wellbeing and job performance, the non-significant direct effect in our study may be explained by differences in study populations or teaching contexts, particularly

among CFL teachers. Nie (2023), who highlights technological and structural challenges faced by CFL teachers, suggests that resilience in this specific group may be insufficient by itself without additional mediators such as grit or employability.

Conversely, studies like Cohn et al. (2009) found a significant direct relationship between emotional resilience and life satisfaction. Their findings suggest that resilience can directly enhance life satisfaction, contrasting with our results. The differences may be attributed to the unique challenges CFL teachers face in managing diverse student populations and cross-cultural responsibilities, which could dilute the direct effect.

Hypothesis 2 (H2) proposed that emotional resilience would influence life satisfaction indirectly through grit (M1). The significant positive effect of emotional resilience on grit demonstrates that emotionally resilient individuals tend to have higher levels of grit. Furthermore, grit itself has a significant positive effect on life satisfaction, indicating that emotional resilience enhances life satisfaction indirectly by fostering greater grit, thus supporting H2. The R-squared value of 0.104 for the model predicting grit suggests that while emotional resilience is a significant predictor, other factors also contribute to grit. Studies like Fu (2025) confirm that grit plays a mediating role in various educational contexts by linking motivation, perseverance, and satisfaction. The role of grit in fostering long-term goals and emotional stability is also emphasized by Duckworth et al. (2007) and Eskreis-Winkler et al. (2014), aligning with our findings that grit is a crucial pathway connecting emotional resilience to life satisfaction. Hypothesis 3 (H3) suggested that employability (M2) would be another pathway through which emotional resilience affects life satisfaction. The data supports this hypothesis, as emotional resilience significantly predicts employability, which in turn positively influences life satisfaction. The model predicting employability has an R-squared value of 0.512, indicating that emotional resilience and grit explain a substantial portion of the variance in employability. This finding aligns with Huang (2024), who explored how foreign language teachers' information literacy and professional adaptability contribute to their employability and overall satisfaction. Fugate et al. (2004) and Berntson et al. (2006) also found that employability enhances life satisfaction by providing individuals with a sense of security and fulfillment, supporting H3. In the context of CFL teachers, Liang and Apedoe (2025) highlight that employability factors, such as adapting to curriculum changes and language fluency development, are critical for success and wellbeing.

Hypothesis 4 (H4) posited a chain mediation effect involving both grit and employability. The results show that emotional resilience positively affects grit, which then enhances employability, and both grit and employability significantly improve life satisfaction. The chain mediation highlights how psychological traits and professional development work together to enhance wellbeing. This comprehensive pathway supports the idea that resilience must foster specific traits and professional competencies to influence life satisfaction, as suggested by studies like Xu et al. (2024), who examined teachers' immediacy and clarity as mediators for reducing emotional stress in foreign language classrooms.Gender differences emerged as a significant factor in these pathways, as indicated in Hypotheses 5, 6, and 7. Hypothesis 5 proposed that gender moderates the indirect effect of emotional resilience on life satisfaction through grit. The results confirm that this pathway is significant for males but not for females, implying that grit plays a more critical role for males in achieving life satisfaction. This finding partially aligns with Diseth et al. (2014), who observed that grit had a stronger impact on academic success in males. Conversely, Clark and Malecki (2019) suggested that grit is equally important for both genders, contrasting with our results. The discrepancy might be explained by cultural expectations, as Yang et al. (2025) suggest that cultural and psychological capital can shape gender-specific outcomes in foreign language teaching.

Hypothesis 6 found that gender moderates the pathway from emotional resilience to life satisfaction through employability, with the effect being stronger for females. Employability's significant impact on females' life satisfaction may be due to its role in providing a sense of purpose and professional security (McQuaid and Lindsay, 2013; Wang H. et al., 2023). This finding also aligns with the work of Sun and Luo (2024), who emphasize the role of career stability in enhancing wellbeing, particularly among female educators.

Hypothesis 7 posited that gender moderates the chain mediation effect of emotional resilience on life satisfaction through both grit and employability. The results confirm that the combined effect of grit and employability is more pronounced for females, suggesting that interventions aimed at improving life satisfaction should be tailored differently for each gender. This gender-specific approach is supported by Tomkova et al. (2022), who emphasize the importance of gender-based differences in resilience outcomes. Conversely, studies like Karatepe and Olugbade (2009) found no significant gender differences, highlighting the need for further investigation into how cultural or contextual factors influence these outcomes.

Overall, the findings emphasize that emotional resilience exerts its influence on life satisfaction primarily through grit and employability, with gender-specific pathways adding complexity. For males, enhancing grit through resilience is key to improving life satisfaction, whereas for females, employability plays a more significant role. As Jiang (2025) and Li and Liu (2025) highlight, addressing contextual and gender-related factors in professional development programs is essential for promoting teacher wellbeing. Future research should further explore these gender-specific pathways in diverse teaching populations to provide comprehensive and tailored interventions.

Limitations of the present study and suggestions for future research

While the study offers valuable insights into the professional profiles and psychological traits of teachers of CFL, several limitations must be acknowledged.

One significant limitation pertains to the sample representativeness. The study primarily reached participants through platforms such as WeChat, LinkedIn, and specific forums. These platforms may not be equally accessible or popular across all regions and cultural contexts, potentially introducing a bias in the sample. The reliance on these platforms might have excluded CFL teachers who are less engaged in digital or social media. Additionally, a significant majority of participants were employed by private organizations (77.5%). This overrepresentation may skew the findings, limiting the generalizability to public sector CFL teachers whose experiences and challenges might differ.

Another limitation relates to the nature of the survey. The study relied on self-reported data, which can be susceptible to social

desirability bias and inaccurate self-assessment. Participants might have overestimated or underestimated their resilience, grit, employability, and life satisfaction due to personal biases or misunderstandings of the survey items. Furthermore, as a cross-sectional study, the research captures data at a single point in time. This design limits the ability to infer causality or understand changes in participants' professional and psychological traits over time.

The measurement tools used in the study also present limitations. While the scales used (e.g., CD-RISC-10, GS-SC, Self-Perceived Employability Scale, SWLS) have demonstrated good reliability and validity in previous research, their application in this specific population may still have limitations. Cultural nuances and contextual factors unique to CFL teachers might not be fully captured by these scales. Moreover, although validated Chinese versions of the scales were used, subtle differences in language and cultural interpretation could affect the accuracy and consistency of responses.

To address these limitations and build on the findings of this study, future research should consider several recommendations. First, enhancing sample representativeness is crucial. Researchers should employ a more diverse range of recruitment methods to include CFL teachers who may not be active on social media platforms. Expanding the geographic and cultural scope of the sample will also help to provide a more comprehensive understanding of CFL teachers' experiences across different contexts or educational institutions (Li and Yu, 2024), as well as the applicability of the current findings to other cultural groups or professional fields (Farinha et al., 2019; Kumar, 2024). Additionally, balancing the representation of private and public sector teachers will ensure the findings are more generalizable, given that public employees exhibit different working conditions in several areas (Lin et al., 2024).

Second, to mitigate the limitations of self-reported data, future studies could incorporate a mixed-methods approach, combining quantitative surveys with qualitative interviews. This would allow for a deeper exploration of participants' experiences and reduce the potential biases associated with self-report measures. Longitudinal designs should also be considered to track changes in professional and psychological traits over time, providing insights into causality and developmental trends.

Third, refining the measurement tools to better capture the specific context of CFL teachers is essential, as the specificity of some features of Chinese (Yuen-han et al., 2024). Developing or adapting scales that consider cultural nuances and contextual factors unique to this population will improve the accuracy and relevance of the findings. Ensuring that these tools are thoroughly validated for use with CFL teachers will also enhance the reliability of the results.

Practical implications for interventions

These results have practical implications for interventions aimed at improving the wellbeing of teachers of CFL. Given that emotional resilience does not have a direct significant effect on life satisfaction but exerts its influence through grit and employability, interventions should focus on these mediating factors. Specifically, programs designed to enhance grit and employability could be particularly effective in improving life satisfaction among CFL teachers.

To enhance grit, training programs that focus on developing perseverance and consistency of interest should be implemented. These could include workshops on goal setting, maintaining focus on long-term objectives, and strategies to overcome setbacks (Santos et al., 2022). Additionally, establishing mentorship programs where experienced teachers can guide less experienced colleagues in developing resilience and grit could foster a community of mutual support and shared learning (Mann et al., 2023).

Improving employability requires offering continuous professional development opportunities that enhance teachers' skills and knowledge. This could include advanced teaching methodologies, language proficiency courses, and certifications that improve job prospects. Providing career counseling services can help teachers identify their strengths, explore career opportunities, and develop strategies to enhance their employability. Career counseling can also address job market trends and how to navigate them effectively. Facilitating networking events and platforms where teachers can connect with potential employers, colleagues, and professional organizations is another key strategy. Building a robust professional network can significantly enhance employability and career advancement.

Gender-specific interventions should be considered, as the study indicates different mediating factors for males and females. Interventions for male teachers should particularly emphasize the development of grit. Since grit is a more crucial mediator for males, programs that build perseverance and dedication to long-term goals will likely have a significant impact on their life satisfaction. For female teachers, interventions should focus more on employability. Given that employability has a stronger impact on life satisfaction for females, providing resources and support to enhance their career prospects will be particularly beneficial. This might include targeted professional development, leadership training, and opportunities to assume higher responsibilities within their institutions.

Developing comprehensive support programs that address both grit and employability simultaneously is essential. By fostering emotional resilience (Lee, 2023), enhancing perseverance, and improving career prospects, these programs can create a more holistic approach to boosting life satisfaction among CFL teachers. Longitudinal support systems that accompany teachers throughout different stages of their careers should also be considered. This could involve periodic training sessions, continuous mentorship, and regular career assessments to ensure sustained development and wellbeing (Zhang et al., 2024).

Context-specific strategies must be tailored to account for cultural and contextual differences among CFL teachers. Programs should be adaptable to various educational environments and responsive to the specific needs and challenges faced by teachers in different regions and institutional settings.

In summary, the study highlights the importance of focusing on grit and employability to enhance life satisfaction among CFL teachers. By implementing targeted interventions that address these mediating factors, educators can be better supported in their professional and personal development. Future research should continue to explore these pathways and develop tailored strategies that consider gender differences and cultural contexts, ultimately contributing to more effective and sustainable interventions for improving teachers' wellbeing.

Conclusion

To sum up, this study highlights the indirect pathways through which emotional resilience affects life satisfaction among CFL teachers, offering a more nuanced understanding of the underlying mechanisms. While the direct effect of emotional resilience on life satisfaction is not statistically significant, its influence is transmitted through its positive impact on grit and employability. These mediating factors are crucial in promoting long-term wellbeing, particularly in the context of CFL teachers who face complex professional and cultural challenges.

The novelty of this study lies in its emphasis on gender-specific differences in these pathways, an aspect that has received limited attention in prior research. The findings reveal that grit plays a more significant role for males, while employability has a stronger effect for females, suggesting that tailored interventions are needed to support both groups. This gender-based approach adds to the growing body of literature that calls for context-specific and targeted strategies in promoting teacher wellbeing.

In terms of contributions to current knowledge, this study extends existing research on resilience by demonstrating the importance of psychological traits and professional competencies as mediators. Unlike previous studies that have largely focused on the direct effects of resilience, this research emphasizes the complex interplay between resilience, grit, and employability, highlighting the importance of indirect pathways. The study also contributes to the broader understanding of CFL teachers' wellbeing by addressing specific factors related to their unique teaching context, such as intercultural challenges and gender dynamics.

From a practical perspective, the findings suggest that interventions aimed at improving life satisfaction among CFL teachers should not only focus on building emotional resilience but also prioritize the development of grit and employability. For male teachers, programs designed to foster perseverance and long-term goal-setting (grit) may be particularly beneficial. For female teachers, initiatives that enhance employability through professional development and career advancement opportunities may have a stronger impact.

Future research should build on these findings by exploring additional mediating factors, such as job satisfaction and self-efficacy, and by examining how cultural and contextual differences influence the observed pathways. By doing so, a more comprehensive understanding of teacher wellbeing can be developed, ultimately contributing to improved support mechanisms for teachers in diverse educational contexts.

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 IRB of the International Students Center of the Beijing Youth Political College. 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

YJ: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Resources, Software, Supervision, Validation, Visualization, Writing – original draft.

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Conflict of interest

The author declares 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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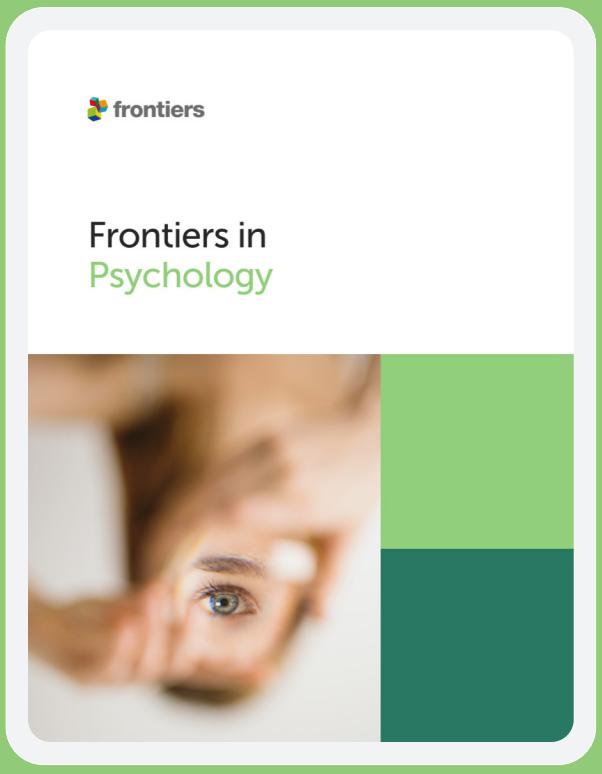

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