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REVIEW

Mental Health and Well-Being of Doctoral Students: A Systematic Review

Yuxin Guo[1,2] and Xinqiao Liu[3,*]

[1]School of Economics and Management, Dalian University of Technology, Dalian, 116024, China
[2]Graduate School of Education, Dalian University of Technology, Dalian, 116024, China
[3]School of Education, Tianjin University, Tianjin, 300354, China
*Corresponding Author: Xinqiao Liu. Email: xinqiaoliu@pku.edu.cn

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ABSTRACT: Background: Mental health concerns among doctoral students have become increasingly prominent, with consistently low levels of well-being making this issue a critical focus in higher education research. This study aims to synthesize existing evidence on the mental health and well-being of doctoral students and to identify key factors and intervention strategies reported in the literature. **Methods:** A systematic review was conducted to examine the determinants and interventions related to doctoral students' mental health and well-being. Relevant studies were comprehensively searched in Web of Science, PubMed, Scopus, and EBSCO, with the final search conducted on September 19, 2025. Records were screened according to predefined criteria: empirical studies on doctoral students' mental health or well-being published in English were included, while non-empirical, non-English, and non-doctoral-student-focused studies were excluded. A total of 56 studies were included after rigorous screening. **Results:** Doctoral students' mental health and well-being are shaped by multiple interacting factors across individual, academic, interpersonal, organizational, and environmental levels. Moreover, variations in gender, identity, discipline, study stage, and institutional context may further exacerbate or mitigate psychological distress. Existing intervention studies primarily focus on three approaches: psychologically oriented training, practice-based behavioral and learning programs, and relationship- or support network-based initiatives. **Conclusion:** This review offers integrated evidence on doctoral students' mental health and well-being and highlights the need for universities to assume greater responsibility in developing systematic and responsive support mechanisms. Current research remains limited by insufficient cross-cultural comparison, a lack of intersectional perspectives, and a scarcity of large-scale, long-term evaluations of intervention effectiveness. Future studies should give greater attention to institutional contexts and vulnerable groups while expanding the scope and rigor of intervention research.

KEYWORDS: Doctoral students; mental health; well-being; interventions; depression; anxiety

1 Introduction

Doctoral students occupy a distinctive position within higher education. As the most highly trained group in their disciplines, they represent both an essential national intellectual resource and a key driving force in knowledge production [1]. Compared with undergraduates and master's students, doctoral candidates encounter more complex and multifaceted pressures, including sustained academic demands, financial burdens, and uncertainties about future career prospects [2,3]. Consequently, their overall levels of mental health and well-being tend to be lower [4,5], with higher prevalence rates of depression and anxiety than in the general population [6]. Studies have shown that doctoral students report more frequent physical symptoms, anxiety,

sleep disturbances, behavioral issues, and depressive symptoms than graduates who did not pursue further study [7–10].

Mental health challenges among doctoral students not only undermine their quality of life but may also exert long-term effects on their academic career trajectories, ultimately influencing the broader functioning of higher education systems. On one hand, psychological distress can lead to academic stagnation, dropout, and research burnout, directly weakening the effectiveness of doctoral training [11]. On the other hand, the resulting loss of talent and psychological imbalance may jeopardize research productivity and the sustainable development of academic human capital, thereby threatening the stability of the knowledge innovation system and the overall quality of higher education [12,13].

The World Health Organization defines mental health as "a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community. It is an integral component of health and well-being" [14]. Well-being, in contrast, reflects individuals' overall evaluations of their lives [15]. Although conceptually distinct, mental health and well-being are closely intertwined and are often examined within a unified analytical framework. To provide a comprehensive synthesis of doctoral students' psychological status, the present review includes studies addressing both mental health and well-being without making a strict conceptual distinction.

Existing research has primarily focused on two major domains: influencing factors and intervention strategies. Regarding influencing factors, economic strain, limited resources, academic workload, and career uncertainty have been consistently linked to deteriorations in mental health [1,11,16], whereas institutional support, high-quality supervision, and intrinsic motivation act as protective factors [5]. Meanwhile, well-being—an increasingly prominent topic—has been explored from multiple perspectives, including individual, interpersonal, and institutional contexts, emphasizing doctoral students' overall life experiences and subjective satisfaction [12,15,17]. In terms of interventions, although empirical evidence remains limited, pilot programs have begun testing various approaches to enhance doctoral students' mental health and well-being, such as psychological counseling and training, peer-support initiatives, improved supervisor–student interactions, and policy-level reforms [18].

Notably, recent studies have begun incorporating the Job Demands–Resources (JD-R) model to enhance explanatory power in examining doctoral students' mental health and well-being. Originally developed to explain stress and performance outcomes in occupational settings, the JD-R model links work-related resources to positive well-being and productivity outcomes. In this context, the doctoral training environment can be conceptualized as a distinct form of "workplace", where resources such as supervisory support and opportunities for skill development function as critical job resources. These resources can foster doctoral performance through enhanced well-being [19,20].

While the JD-R model offers a promising and integrative perspective, there remains a lack of systematic reviews applying this framework to doctoral student populations, and existing literature is still fragmented in its coverage. Some existing reviews focus primarily on the prevalence of specific psychological disorders, overlooking the underlying stress mechanisms, moderating factors, and multilevel influences; others pay limited attention to subjective well-being and positive psychological resources. Therefore, a comprehensive synthesis of current evidence is needed to identify key determinants and intervention approaches, thereby constructing a more integrated framework for understanding doctoral students' mental health and well-being. Therefore, this review aims to address three key questions: (1) What factors influence doctoral students' mental health and well-being? (2) What interventions have been proposed, and what are their effects? (3) How can future research further advance this field?

2 Methods

2.1 Search Strategy

To comprehensively capture studies on doctoral students' mental health and subjective well-being, we conducted systematic searches in four databases: Web of Science, PubMed, Scopus, and EBSCO (including PsycINFO, PsycARTICLES, the Psychology and Behavioral Science Collection). The search period was restricted from 01 January 2010, to 19 September 2025. The search strategy was structured around three key dimensions: the study population (doctoral students), the study topic (mental health), and the outcome constructs (subjective well-being and quality of life). These dimensions were operationalized using relevant keywords and combined with Boolean operators (AND, OR) to ensure both comprehensiveness and precision. Full search terms, database-specific strategies, and inclusion/exclusion criteria are provided in Supplementary Material 1. Also, this study follows the PRISMA 2020 checklist (see Supplementary Material 2).

2.2 Screening Process and Results

The screening process included three stages: de-duplication in Zotero, title/abstract screening, and full-text review using Rayyan (version 1.6.3). Two researchers independently screened all studies, with disagreements resolved through discussion or consultation with a third reviewer. A PRISMA 2020 flow diagram was used to illustrate the study selection process (Fig. 1). The database search identified a total of 431 records. After removing duplicates, 247 articles remained. Title and abstract screening excluded 103 records, leaving 144 articles for full-text review. Following rigorous screening and evaluation, 56 studies met all eligibility criteria and were included in this systematic review.

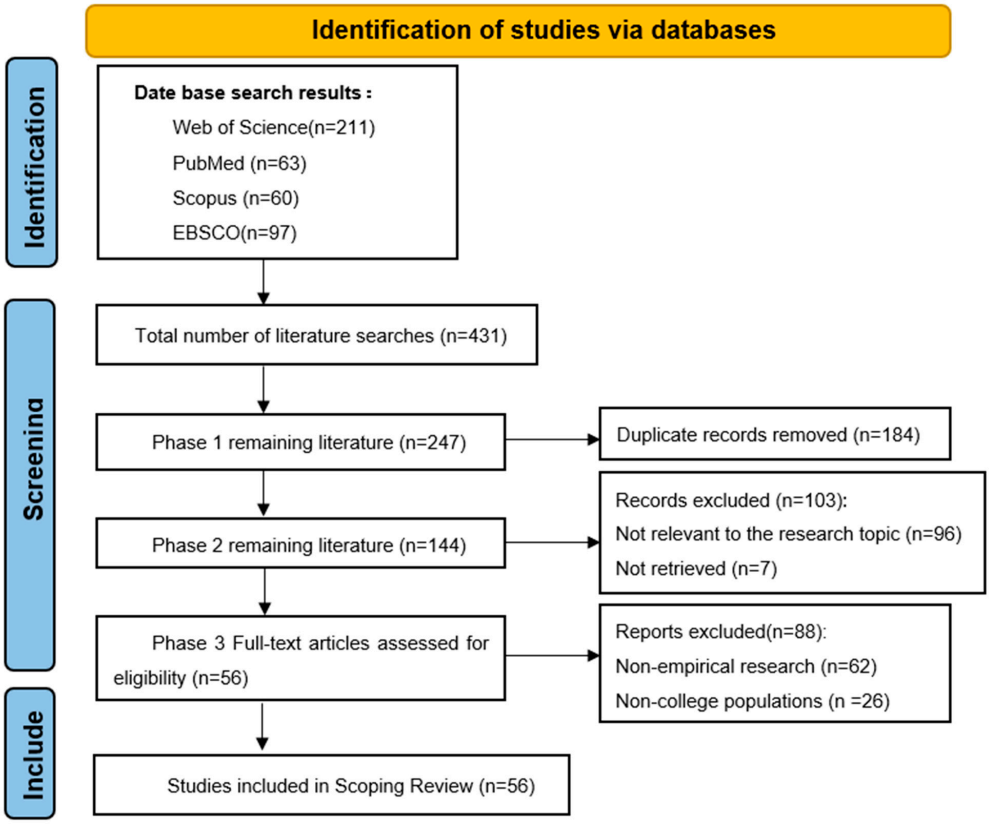

Figure 1: Flowchart of included articles.

3 Results

3.1 Factors Influencing Doctoral Students' Mental Health and Well-Being

Based on the inclusion and exclusion criteria, a total of 45 studies were identified for analysis. In terms of geographical distribution, the literature spans Europe, North America, Asia, and the Nordic countries. Among them, the United States accounts for the largest share with 11 studies, followed by the United Kingdom (n = 5), China (n = 3), Spain (n = 2), Italy (n = 2), Germany (n = 2), and India (n = 2), and Canada (n = 1), France (n = 1), and Norway (n = 1). This distribution highlights the cross-cultural relevance of doctoral students' mental health and well-being as a global issue. Regarding methodological approaches, quantitative studies dominate the field (n = 26), while qualitative designs (n = 14) and mixed-methods studies (n = 5) are less common. In terms of measurement dimensions, research on mental health has primarily focused on anxiety, depression, stress, and burnout, whereas studies on well-being have examined life satisfaction, supervision quality satisfaction, sense of belonging, and loneliness. Overall, the literature remains weighted toward psychological distress, with relatively limited empirical evidence on well-being (see Table 1).

Table 1: Factors influencing doctoral students' mental health and well-being.

Authors and Year	Method	Sample Size	Age (Mean)	Dimensions Involved	Factors	Country
Stubb et al (2011) [21]	Mixed methods	Total: 669 Male: 168 Female: 496 Other: 5	39	socio-psychological well-being, stress, exhaustion, anxiety, and study engagement	Academic community experience (divided into empowering experience and burden experience)	Finland
Moate et al. (2019) [22]	Quantitative research	Total: 528 Male: 167 Female: 358 Other: 3	30.5	stress, life satisfaction, positive emotions, and negative emotions	Perfectionism types (divided into adaptive perfectionists, non-perfectionists, and maladaptive perfectionists)	United States
Sverdlik et al. (2023) [23]	Quantitative research	Total: 708 Male: 151 Female: 529	31.11	Anxiety, depression, stress, satisfaction, and academic emotions (such as anxiety, irritability, enthusiasm, etc.)	COVID-19 pandemic (such as challenges and coping strategies like inability to meet family and friends, staying at home, blurred work-family time, etc.), gender	Multiple countries
Espiritu et al. (2021) [24]	Qualitative research	Total: 1 Female: 1	32	Health, wellness, well-being	Active choices, support network, self-cognition, desire to fulfill roles, time management strategies	United States
Krieger et al. (2025) [25]	Quantitative research	Total: 1265 Male: 414 Female: 739 Other: 112	32.36	Anxiety, depression, life satisfaction, and perception of supervision	Gender, doctoral discipline field, anxiety and depression symptoms, and supervision quality	Spain
Martínez et al. (2025) [26]	Qualitative research	Total: 10 Male: 2 Female: 8	/	Stress, well-being	overwhelming responsibility, lack of self-confidence, uncertainty about various aspects of the doctoral process, and challenges related to family obligations and maternity, support of Supervisors and research groups	Norway
Feizi et al. (2024) [27]	Quantitative research	Total: 2486 Male: 899 Female: 1512 Other: 64	31	Perceived stress, emotional, social, and psychological well-being, as well as program satisfaction and intention to quit	Perceived stress, academic factors (dissertation requirements, program structure), personal factors (workload, time pressure), demographic variables (gender, international student status)	Canada

Table 1: *Cont.*

Authors and Year	Method	Sample Size	Age (Mean)	Dimensions Involved	Factors	Country
Tiet et al. (2025) [28]	Quantitative research	Total: 889 Male: 140 Female: 710 Other: 37	27.63	Depression symptoms, anxiety symptoms, quality of life, physical pain, coping strategies, resilient coping, and social support.	COVID-19 stress, protective factors (problem-focused engagement coping, resilient coping, social support, aerobic/strength/flexibility activities), demographic variables (gender, race/ethnicity, sexual orientation, relationship status)	United States
Geary et al. (2023) [29]	Quantitative research	Total: 113 Male: 15 Female: 96	27	Self-care frequency, self-compassion, satisfaction with life, perceived stress, positive/negative affect	COVID-19 pandemic context, demographic variables (race/ethnicity: Black/African American students reported higher stress), social desirability	United States
Syropoulos et al. (2021) [30]	Mixed methods	Total: 916 Male: 193 Female: 701 Other: 13	27.73	Social belonging, threat, challenge, depression, stress, satisfaction with life, subjective happiness, optimism	COVID-19 pandemic, demographic variables (race: White students higher belonging; sexual orientation: heterosexual lower threat; gender: women/trans/non-binary higher threat/lower challenge)	United States
Satici et al. (2025) [31]	Quantitative research	Total: 405 Male: 146 Female: 259	30.39	Resilience, intolerance of uncertainty, future anxiety, mental well-being	Resilience (direct and indirect effect), intolerance of uncertainty (mediator), future anxiety (mediator), demographic variables (socio-economic status, PhD stage, role, field of study, marital status, number of children, psychological help/receipt of diagnosis)	Türkiye
Paucsik et al. (2022) [32]	Quantitative research	Total: 134 Male: 41 Female: 93 Other: 0	27.8	Depression, anxiety, stress, well-being, doctoral engagement, self-compassion, savouring	COVID-19 pandemic (lockdowns), self-compassion (protective factor), savouring (protective factor, including anticipatory/reminiscent/present-oriented subtypes), age (moderator for well-being)	France
Zhang et al. (2022) [33]	Mixed methods	Total: 206 Male: 82 Female: 123 Other: 1	/	Mental well-being (purposeful life, supportive social relationships, daily engagement, contribution to others' well-being, competence, moral self-perception, optimism, respect), research self-efficacy, research skills	Socialization variables (Year 2: satisfaction with advisor; Year 3: certainty of choice; Year 4: academic development, sense of belonging to lab), academic outcomes (number of publications, research skills), demographic variables (gender, first-generation status, racially minoritized status, international status)	United States
Kismihók et al. (2022) [34]	Qualitative research	Total: 250	/	Well-being, mental health, career sustainability, stigma, work engagement	Systemic (policy, funding, legal frameworks), institutional (research culture, working conditions, evaluation systems), individual (peer relationships, supervision quality, self-care, career planning), transversal skills (time/project management, communication, mental health literacy)	Germany, Ireland, The Netherlands

Table 1: *Cont.*

Authors and Year	Method	Sample Size	Age (Mean)	Dimensions Involved	Factors	Country
Hazell et al. (2025) [35]	Qualitative research	Total: 1783 Male: 550 Female: 1207 Other: 26	31.21	Mental health (depression, anxiety, suicidality), well-being, self-worth, professional identity, supervisory relationship quality	Supervision as a "conduit" (shapes PhD/academia belonging, self-actualization, autonomy development), supervision as a "mirror" (reflects self-worth, role violations cause distress), mental health status (impacts supervision engagement), supervisor's understanding of mental distress (validation, signposting)	United Kingdom
Prendergast et al. (2023) [36]	Qualitative	Total: 10	/	Well-being (mental well-being, including feeling good and functioning well), stress, guilt, anxiety, and imposter syndrome	Doctoral study-related (e.g., workload, responsibilities, pandemic-related delays), family roles, social life, financial difficulties, relationships with supervisors and peers	Ireland
Zeeman et al. (2025) [37]	Qualitative research	Total: 6	/	Well-being, burnout	Curriculum and research (e.g., program design, milestones, cumulative exams), relationships (peer, supervisor, dissertation committee), financial burden, work-life balance	United States
McCray et al. (2021) [38]	Quantitative research	Total: 63 Male: 29 Female: 34	/	Mental well-being, positive and negative mental well-being factors	Personal factors (e.g., self-doubt, isolation), interpersonal factors (e.g., relationships with supervisor, family), business school environment (e.g., competition, individualism), support from different sources	United Kingdom
Corvino et al. (2022) [39]	Quantitative research	Total: 121 Male: 51 Female: 70	30.5	Organizational well-being, discrimination, fairness, sense of belonging, goal sharing	Gender, university location, perception of workplace health and safety, career development opportunities, job autonomy, discrimination, and fairness	Italy
Tikkanen et al. (2024) [40]	Quantitative research	Total: 768 Male: 234 Female:502	30–34	Burnout (exhaustion, cynicism), work engagement	Supervisory experience, frequency of supervision, perceptions of supervisory support and interaction, length of supervisory experience, supervisory workload	Finland
Vilser et al. (2024) [41]	Quantitative research	Total: 1275	30.44	Well-being (measured through perceived stress and work engagement), overcommitment, and resilience	Effort-reward imbalance (effort, reward, ERI ratio), overcommitment, resilience, gender, age, type of promotion, impact, and fear of COVID-19	Germany
Kunz-Skrede et al. (2025) [42]	Qualitative research	Total: 10 Male: 6 Female: 4	/	Well-being, social belonging, social support	Social activities (cooking and social eating, self-care workshops), social capital (social belonging, social support), relationships (with peers, supervisors)	Norway
Tikkanen et al. (2021) [43]	Quantitative research	Total: 692 Male: 253 Female: 424	35	Well-being (study engagement, burnout), drop-out intentions	Gender, country of origin, study status (full-time or part-time), research group status, working in a clinical unit or hospital	Sweden

Table 1: *Cont.*

Authors and Year	Method	Sample Size	Age (Mean)	Dimensions Involved	Factors	Country
Xu et al. (2024) [44]	Qualitative research	Total: 18 Male: 6 Female: 12	28.9	Well-being (emotional well-being, social well-being, psychological well-being)	Individual factors (gender, age, personality, coping strategies, motivation, self-beliefs), microsystem (relationships with family, peers, supervisors), mesosystem (interrelations between different microsystems), exosystem (university hard and soft infrastructure), macrosystem (COVID-19, living and cultural environment), chronosystem	China
Gonzalez et al. (2021) [45]	Quantitative research	Total: 479	27.06	Well-being (physical health, mental health), disciplinary identity, stress, and psychological needs satisfaction	Stress, psychological needs satisfaction (autonomy, relatedness, competence), socio-demographics (gender, age, URM, SES), anticipatory socialization experiences, prior academic credentials (GRE scores, undergraduate GPA, undergraduate institution ranking)	United States
Dutta et al. (2022) [46]	Quantitative research	Total: 778	/	Mental well-being (measured by WEMWBS score), loneliness, anxiety, and distress	Social connection, loneliness, anxiety, student status, impact of lockdown on social contact, change in relationship with university, impact on finances, caregiving responsibilities, impact of caregiving on work, impact on work, impact on research tools, university support, supervisor support, everyday stressors	United Kingdom
Pyhältö et al. (2023) [47]	Quantitative research	Total: 884 Male: 345 Female: 539	37	Study engagement, study burnout, and satisfaction with study	Country of origin, gender, dissertation format, research group status, study status, drop-out intentions, time-to-candidacy	Finland, South Africa
Zhang et al. (2024) [48]	Quantitative research	Total: 643	29.18	Academic stress, academic motivation, emotional intelligence, mindfulness	Academic motivation, emotional intelligence, mindfulness, age, and gender	Pakistan
Friedrich et al. (2023) [49]	Mixed-methods	Total: 589	28.8	General health (depression, anxiety), job satisfaction, life satisfaction, job insecurity, perceived stress	Workload, self-perception, job insecurity, social integration, supervision quality, COVID-19 impact	Germany
Acharya et al. (2024) [50]	Quantitative research	Total: 391 Male: 185 Female: 206	/	Psychological well-being, job strain, and intrinsic motivation	Doctoral program demands, job strain, intrinsic motivation, and gender	India
Devonport et al. (2014) [51]	Qualitative research	Total: 4 Male: 2 Female: 2	26–27	Stress, well-being, and coping effectiveness	Doctoral stressors (time pressure, financial stress, uncertainty, conceptual confusion, competing commitments), dyadic coping (emotional support, practical support, collaboration), individual coping (planning), relationship stress, and career ambiguity	United Kingdom

Table 1: *Cont.*

Authors and Year	Method	Sample Size	Age (Mean)	Dimensions Involved	Factors	Country
Tommasi et al., (2022) [52]	Quantitative research	Total: 204 Male: 76 Female: 128	29	Meaningful work, meaningless work, anxiety, depression, intention to quit	Neoliberal academic environment (individualism, instrumentality, competition), PhD support (financial, social), features of meaningful work (coherence, significance, purpose, belonging), managerial practices	Italy
Almasri et al. (2022) [53]	Quantitative research	Total: 308 Male: 166 Female: 139	/	Mental well-being, depression, anxiety, guilt, loneliness, and physical health	Conflicting cultural values (traditional gender roles, child-rearing expectations), lack of familial support, time pressure, missing professional/personal opportunities, limited childcare, healthcare access barriers, marital conflict, social isolation, immigration policies	United States
Estupiñá et al. (2024) [54]	Quantitative research	Total: 1018 Male: 365 Female: 645 Other: 8	31.7	Psychological distress, depression, anxiety, suicidal ideation, life satisfaction, emotion regulation difficulties, work-family conflict	Gender (being female), years in doctoral program, life satisfaction, emotion regulation, fear of losing tuition rights, social support, work-to-personal-life conflict, regret about doctoral studies, desire to change supervisor	Spain
Koo et al. (2022) [55]	Qualitative research	Total: 7 Female: 7	28–41	Mental well-being, depression, anxiety, guilt, loneliness, and physical health	Ongoing battles to manage both academic progress and mothering, constant conflict with their spouses, feelings of guilt, thoughts of dropping out, and concerns about their children.	United States
Cornwall et al. (2019) [56]	Qualitative research	Total: 152	/	Stress, sense of belonging, social isolation, and well-being	Time pressure, uncertainty (doctoral processes, future workload), financial pressure, social isolation, sense of belonging, supervision issues (supervisor departure, availability, conflict)	New Zealand
Cardilini et al. (2022) [57]	Quantitative research	Total: 114 Male: 46 Female: 65 Other: 1	/	Mental well-being, academic performance, supervision quality satisfaction	Supervisory expectations mismatch, academic anxiety, personal expectations, research progress, supervisor support, student engagement	Australia
Yan et al. (2024) [58]	Quantitative research	Total: 213 Male: 84 Female: 129	/	academic performance, academic anxiety, well-being, self-efficacy	Teacher support, parental support, time management skills, facilitating conditions, student engagement, self-efficacy (task confidence), and academic anxiety	China
Hoque et al. (2024) [59]	Quantitative research	Total: 42	/	Psychological well-being (positive emotion), autonomy, competence, relatedness	Autonomy (task control), competence (study demand management), relatedness (social connection with peers/family), and remote learning challenges during COVID-19	South Africa

Table 1: *Cont.*

Authors and Year	Method	Sample Size	Age (Mean)	Dimensions Involved	Factors	Country
Mavrogalou-Foti et al. (2024) [60]	Quantitative research	Total: 141 Male: 39 Female: 97 Other: 5	/	Depression, anxiety, stress, and supervisory relationship satisfaction	Supervisory styles, discrepancy between actual and preferred supervision, post-COVID-19 mental health exacerbation, research group participation, and funding status	United Kingdom
Wang et al. (2019) [61]	Qualitative research	Total: 10 Male: 5 Female: 5	/	Stress, anxiety, academic frustration, and relationship tension	Graduation pressure, job prospects, relationship issues (supervisor abuse of power, family/marriage concerns, roommate conflicts), financial hardship (limited funding vs. peer wealth), personal factors (perfectionism, career regret)	China
Parveen et al. (2025) [62]	Qualitative research	Total: 40 Male: 28 Female: 12	/	Mental health (stress, anxiety, burnout), research engagement, and well-being	Supervisory factors (inadequate mentorship, unprofessional behavior, exploitation as unpaid labor). Institutional factors (prolonged evaluations, inefficient resource access, rigid policies), social factors (limited peer collaboration, competitive dynamics), financial instability, and health impacts	India
Kusurkar et al. (2022) [63]	Qualitative research	Total:386	/	Stress, energization, burnout, well-being, autonomy, competence, relatedness	Research challenges (excessive paperwork, high publication pressure, complicated lab work vs. engaging topics/analysis), resources, recognition (positive feedback, publications vs. lack of acknowledgment)	The Netherlands
Deroncele-Acosta et al. (2025) [64]	Mixed-methods	Total: 108 Female: 108	/	Mental health (hope, optimism, resilience, self-efficacy), academic motivation (intrinsic/extrinsic), university academic performance, and well-being	Psychological capital (self-efficacy as a protective factor), academic motivation, study cycle, social support (family/friends/peers), hidden factors (family roles, marriage, employment, cultural norms)	Peru
Evans et al. (2021) [65]	Quantitative research	Total: 297 Male: 46 Female: 238 Other: 13	/	Work-related burnout, anxiety, depression, emotional connection, childcare access (for parents), dropout ideation	Protective Factors, Emotional connection to loved ones, Parenthood, Racial minority status (Black/Asian students), Risk Factors, Sexual minority (SM) status, Reduced childcare access (for parents)	United States

The determinants of doctoral students' mental health and well-being span multiple levels, including individual psychological traits and behavioral choices, academic processes and supervisory relationships, interpersonal support systems, organizational and institutional contexts, and group-based differences. These factors intersect to shape doctoral students' psychological experiences and overall quality of life. Synthesizing this evidence not only clarifies the mechanisms underlying doctoral students' psychological risks but also informs the development of multi-level support and intervention strategies. The following sections summarize the literature across four major domains.

3.1.1 Individual-Level Factors

Doctoral students' individual psychological characteristics are a key source of variation in their mental health and well-being. Research has shown that traits such as perfectionism, resilience, future anxiety, and intolerance of uncertainty significantly influence their adaptive capacity. Adaptive perfectionism and higher levels of resilience help alleviate stress and enhance life satisfaction, whereas maladaptive perfectionism and heightened future anxiety are associated with increased psychological distress [22,31]. In addition, positive psychological resources—such as psychological capital (hope, optimism, self-efficacy, and resilience), emotional intelligence, and mindfulness—have been shown to reduce academic stress and enhance psychological adaptability [48,54,64].

Beyond psychological traits, everyday behavioral practices also play a crucial role in shaping doctoral students' mental health. Practices such as self-care, self-compassion, regular physical exercise, and healthy lifestyle habits have been linked to improved quality of life and reduced symptoms of anxiety and depression [29,31]. During the COVID-19 pandemic, these positive behaviors were especially emphasized as key resources for mitigating burnout and feelings of isolation [28]. Moreover, in the context of multiple roles and responsibilities, effective time management and structured daily routines have been shown to help students cope with stress and maintain a sense of well-being [36].

3.1.2 Academic-Level Factors

Supervisors are among the most critical sources of psychological and academic support for doctoral students. The supervisory relationship is widely regarded as one of the most decisive elements in doctoral education [3], and its effectiveness largely depends on the clarity of guidance and the quality of communication between the student and the supervisor. When supervision is unclear or when there are mismatched expectations regarding role division, research goals, or publication outcomes, doctoral students are more likely to experience elevated levels of depression, anxiety, and stress [40,57,61]. In contrast, high-quality and supportive supervision has been associated with greater life satisfaction and reduced psychological distress [24,58]. Moreover, a supervisor's communication style and availability not only influence academic progress but also shape how students understand and manage their own psychological states [35].

Doctoral students are typically subject to intense academic demands, contributing to persistently high stress levels. While academic environments can promote meaningful engagement, they are also frequent sources of anxiety and exhaustion [66]. Key stressors include working conditions, job insecurity, and the pressures and uncertainties associated with dissertation writing, all of which have been linked to psychological distress [26]. Structural factors—such as heavy coursework, bureaucratic procedures, limited resources, and unpaid labor—further increase the risk of burnout [31,56,62]. A lack of control over academic progress has been found to correlate with reduced pro-gram satisfaction and increased dropout intentions [29,33]. The effort–reward imbalance (ERI) model helps explain these outcomes: high personal investment coupled with limited recognition or compensation significantly amplifies psychological stress among doctoral students [41].

3.1.3 Interpersonal-Level Factors

Support and a sense of belonging within the academic community are widely recognized as core contributors to doctoral students' mental health and well-being. A strong sense of social belonging is associated with lower threat perception, better psychological functioning, and greater optimism about the future [29]. Conversely, a lack of belonging can lead to feelings of isolation and detachment, significantly

increasing the risk of anxiety, depression, and dropout intentions [45]. Peer relation-ships play a critical role in this context. Collaborative and supportive peer environments can help reduce stress levels and enhance academic engagement, whereas competitive or exclusionary peer dynamics are closely linked to heightened psychological distress [47,62]. Furthermore, participation in academic social activities—such as seminars, writing groups, and informal gatherings—can strengthen social capital, alleviate loneliness, and foster opportunities for communication and collaboration, thereby indirectly promoting well-being and academic productivity [42].

Outside of academic settings, doctoral students also rely on broader social support networks, including family and partners, for emotional stability. Research has shown that dyadic coping strategies involving a partner can effectively alleviate academic stress, reduce negative emotional responses, and enhance psychological resilience [51]. For specific groups such as international doctoral mothers, partner and family support is especially vital in balancing academic responsibilities with caregiving demands. In the absence of such support, these students are more likely to experience emotional distress, guilt, and even consider program withdrawal [55]. Broader social networks have consistently been identified as protective factors. Students with higher levels of perceived social support report better quality of life and fewer symptoms of anxiety and depression [26]. During times of crisis, such as the COVID-19 pandemic, the combination of social support, resilience, and adaptive coping strategies has been shown to significantly improve doctoral students' psychological functioning by mitigating stress, reducing emotional suffering, and enhancing life satisfaction [28].

3.1.4 Organizational and Environmental-Level Factors

Organizational support plays a critical role in doctoral students' psychological well-being. When students perceive a lack of meaning in their research or insufficient institutional support, they are more likely to experience anxiety, depression, and intentions to withdraw from their programs [52]. Instrumental management styles may undermine students' autonomy and academic identity, con-tributing to psychological distress and uncertainty about the future. Research also indicates that in some disciplines, the institutional environment is psychologically inadequate—over-relying on the supervisor as a single point of support while lacking diversified and formalized support systems—leaving students more vulnerable to mental health risks [38]. Additionally, gender equality studies have revealed systemic disparities: female doctoral students report significantly lower scores in career development, autonomy, and perceived safety compared to their male counterparts. These gaps not only reflect unequal resource distribution but also indicate that institutional and cultural biases may impose additional psychological burdens [39].

Resources and policy conditions. Financial stress and the instability of funding policies are significant determinants of doctoral students' mental health. Insufficient economic support has been shown to intensify symptoms of anxiety and depression, reduce life satisfaction, and increase the likelihood of program attrition [54,56,62]. These issues are particularly pronounced during the early stages of doctoral training and among socioeconomically disadvantaged groups, who are more reliant on scholarships or external funding. In such cases, resource uncertainty places an even heavier psychological toll. The structure and reliability of funding systems at the policy level directly influence students' ability to balance academic demands with financial and personal well-being.

External environmental disruptions. Doctoral students' mental health is also shaped by broader sociopolitical contexts. During the COVID-19 pandemic, numerous studies documented significant increases in anxiety, depression, stress, feelings of isolation, and uncertainty among this population [3,23,46]. The pandemic disrupted access to laboratories and campus facilities and blurred the boundaries between work

and personal life, compounding psychological distress [59]. Similarly, sociopolitical unrest and macro-level instability can heighten mental health risks by restricting aca-demic activities, altering social atmospheres, and undermining career outlooks.

3.2 Group Differences in Doctoral Students' Mental Health and Well-Being

3.2.1 Gender and Identity Differences

Gender is among the most prominent factors underlying disparities in doctoral students' mental health. Numerous studies have shown that female doctoral candidates face higher risks of anxiety and depression, and report disadvantages in organizational well-being indicators such as career development, autonomy, and perceived safety [25,39]. In addition, minority and LGBTQ+ doctoral students are more likely to report negative psychological experiences, suggesting that discrimination or lack of inclusivity in academic environments may constitute additional stressors [30]. For doctoral students who simultaneously bear maternal and international identities, conflicts between academic and family responsibilities are particularly pronounced, often accompanied by guilt, emotional distress, and heightened dropout intentions [54]. Collectively, these findings demonstrate that the psychological vulnerabilities of marginalized groups stem not only from academic pressures but also from their social identities and cultural contexts.

3.2.2 Disciplinary and Study-Stage Differences

Doctoral students' mental health also varies significantly across disciplines. Students in the humanities and arts report higher levels of anxiety and depression compared with those in other fields, whereas medical and STEM doctoral students more frequently exhibit differing patterns of burnout and academic engagement [25,41]. These disciplinary variations may reflect differences in the nature of research work, clarity of career pathways, and availability of academic resources.

Study stage likewise shapes trajectories of mental health. Longitudinal research indicates that doctoral students' psychological health tends to decline overall during the first years of enrollment, though individual trajectories differ markedly: some students maintain stability or even show improvement, while others experience persistent deterioration [45]. Stress levels and the extent to which basic psychological needs are met have been identified as critical predictors distinguishing these trajectories. This suggests that doctoral students' mental health does not follow a linear course, but rather is co-determined by academic progress, need satisfaction, and resource availability.

3.2.3 Institutional Differences

Cross-national comparative studies emphasize that national and institutional contexts substantially alter the risk and protective mechanisms shaping doctoral mental health. In countries with more comprehensive funding systems and social security, doctoral students generally report lower levels of psychological distress; by contrast, in environments where funding is insufficient or institutional support is weak, stress and dropout intentions are far more prevalent [38,44,47]. Moreover, academic cultural differences also shape psychological experiences. For instance, institutional contexts that rely excessively on supervisors while lacking institutionalized mental health support channels render doctoral students more vulnerable to the adverse effects of poor supervisory relationships [38]. These cross-cultural findings underscore that doctoral students' mental health cannot be addressed solely through individual- or interpersonal-level interventions; rather, institutional and policy design must account for cultural and contextual variations.

3.3 Interventions for Doctoral Students' Mental Health and Well-Being

With the growing recognition of mental health concerns among doctoral students, both academia and practice have increasingly explored diverse intervention strategies aimed at alleviating elevated levels of stress, anxiety, and depression, while enhancing overall well-being. This review identified and analyzed 11 empirical studies focusing on interventions targeting doctoral students' mental health and well-being. Geographically, most studies were conducted in the United States (n = 3), followed by the United Kingdom (n = 2), with the Netherlands, Spain, Canada, and France each contributing one study. Methodologically, the body of literature is diverse, encompassing randomized controlled trials (RCTs), mixed-methods research, qualitative interviews, and experimental designs. However, most interventions were tested in small-scale, short-duration studies. Despite these limitations, existing research suggests that interventions can be broadly categorized into three groups: psychology-based training (e.g., mindfulness, positive psychology, and self-compassion), practice-oriented behavioral and learning interventions (e.g., behavioral activation, structured writing retreats, and progress-oriented workshops), and relationship- and support-based approaches (e.g., peer support, reflective practice, and online group learning). These initiatives have enriched the repertoire of doctoral student support strategies and offer valuable insights for institutional policies and practices (see Table 2).

Table 2: Interventions for doctoral students' mental health and well-being.

Authors, Year, and Country	Method	Sample Size	Dimensions Involved	Interventions	Key Outcomes
Newlands et al. (2025) [66], United Kingdom	Qualitative (semi-structured interviews, thematic analysis)	Total:19 Male:6 Female:13	Resilience, social connection, isolation, help-seeking barriers	Peer support (informal experience sharing, key-stage guidance, mixed-format interactions)	Peer support can serve as an effective complement to existing mental health services.
Fang et al. (2021) [67], United States	Quantitative (RCT, pre-test/post-test, 1-week follow-up)	Total:66	Burnout, well-being	Two brief phone-based behavioral interventions: 1) "Reward" (increase pleasant behaviors); 2) "Approach" (tackle avoided goals); 3) Control (monitoring only)	"Approach" group had significantly lower burnout and higher well-being vs. control (immediately post-intervention and follow-up).
Barry et al. (2019) [68], United States	Quantitative (single-blinded RCT, intention-to-treat analysis)	Total: 72 (34 intervention; 38 control)	Psychological distress and psychological capital (hope, optimism, resilience, and efficacy)	Daily guided mindfulness practice (audio CD, self-administered)	Intervention group showed significant reduction in depression and increases in self-efficacy, hope, and resilience vs. control.
Marais et al. (2018) [69], French	Mixed quantitative design:1) Cross-sectional survey2) Quasi-experimental pre–post intervention study (with a control group)	Study 1: N = 136 Study 2: Small intervention and control groups	Psychological distress: stress, depression, anxiety, subjective mental well-being	CARE positive psychology intervention (Positive Psychology Intervention):– Group-based intervention for PhD students– Aimed at strengthening psychological resources, emotion regulation, and well-being– Control group received no intervention	Study 1 (Survey): High levels of stress, depression, and anxiety; overall well-being was below benchmark levels; career uncertainty and work–life balance were major drivers of well-being. Study 2 (Intervention): Anxiety decreased significantly after the intervention; other outcomes improved slightly but were not statistically significant.

Table 2: *Cont.*

Authors, Year, and Country	Method	Sample Size	Dimensions Involved	Interventions	Key Outcomes
Vincent et al. (2023) [70], Canada	Explanatory sequential mixed method with experimental design	Total: 100 Male: 24 Female: 75 Non-binary: 1	Psychological distress, psychological well-being, emotional well-being, social well-being	3-day retreat with lodging, structured activities, and meals; included workshops, writing sessions, recharging activities, and socializing; guided by two facilitators who taught time management and goal-setting techniques	Writing retreats reduced doctoral researchers' psychological distress and improved their psychological, emotional, and social well-being.
Jiménez et al. (2024) [71], Spain	Non-randomized controlled study with repeated measures pre-post design	Total: 97 Male: 34 Female: 60 Other: 3	Well-being (satisfaction with life, positive and negative affect), psychological distress (anxiety, depression, emotional profiles)	The Third Half program: six 3-h sessions held bi-weekly. Each session had two blocks—one with gamified outdoor activities based on positive psychology and the other for peer support through social interactions.	The program was effective in improving some well-being indicators and reducing distress.
Tullet et al. (2024) [72], United Kingdom	Pilot study with pre- and post-online surveys, analysis of transcribed recordings, and reflective notes	Total: 8 Male: 4 Female: 4	Stress & pressure; imposter syndrome; student-supervisor relationship; trust & transparency; and reflexivity	6-month online Reflexivity in Research program for second-year PhD students. It encouraged reflection on professional identity and interpersonal relationships through creative and reflective approaches.	Program helped students gain perspective, become more resilient, and better manage emotions. Positive feedback from students, supervisors, and management board members supported the program's success.
Solms et al. (2025) [73], The Netherlands	Quantitative (RCT); pre-test, post-test, 3-month follow-up)	Total: 115	Psychological capital (PsyCap: hope, self-efficacy, resilience, optimism), self-compassion, positive affect, work pressure, support seeking	1. Self-compassion-based PsyCap intervention: 5-week online program—integrates self-compassion training with PsyCap exercises. 2. PsyCap-only intervention: Focused solely on PsyCap (HERO components) without self-compassion. 3. Wait-list control group	The findings suggest that although fostering PsyCap together with self-compassion may take a longer time, it yields greater improvements in PhD students' well-being compared with developing PsyCap alone.
Gao et al. (2025) [74], United States	Mixed-methods: Qualitative + Quantitative	Total: 4 Female: 4	Awareness and attention, emotional intelligence and regulation, stress and anxiety levels, compassion levels	8-week mindfulness program via *Healthy Minds Program* app: 10–15 min of daily audio-guided mindfulness lessons and meditations	Mindfulness practice serves as a valuable tool for doctoral students to manage project challenges and support their emotional well-being.

Table 2: *Cont.*

Authors, Year, and Country	Method	Sample Size	Dimensions Involved	Interventions	Key Outcomes
Prieto et al. (2022) [75], Spain; Estonia	Design-based research (4 iterations; mixed data)	Total: 82	Psychological capital (PsyCap: hope, self-efficacy, resilience, optimism), burnout, perceived progress, dropout ideation	Progress-oriented workshops (iterative formats): Iter. 1: 2 h F2F—Goal setting, peer feedback; Iter. 2: 6 h F2F—Added mental health & journaling; Iter. 3: 6 h Online—Added thesis mapping, self-tracking (LAPills); Iter. 4: 8 h Online—Extended discussion, data visualization	The seminar has a positive impact on doctoral students' positive psychological capital.
Areskoug (2024) [76], Sweden; Norway	Mixed-methods (Plan-Do-Study-Act (PDSA) cycles; data; thematic analysis)	Total: 28	Academic skills, stress, self-efficacy, supervisor dependency, social connection, well-being, project progress	1. Online monthly meetings: 8–9 a.m., 1-h sessions. 2. Online writing retreats: (20 total)	Doctoral students acquired higher academic and leadership skills, experienced reduced stress, enhanced self-efficacy, and decreased dependence on their advisors.

3.3.1 Psychology-Based Training

This category of interventions draws directly on established psychological approaches to enhance doctoral students' mental health and well-being. Mindfulness interventions are among the most commonly applied, with studies demonstrating that daily mindfulness meditation and attention-focused practices effectively reduce symptoms of depression and anxiety while significantly improving psychological capital, including hope, resilience, and self-efficacy, thereby enhancing overall well-being [68,74]. The advantages of mindfulness lie in its high feasibility, low cost, and adaptability for online delivery. Positive psychology interventions have also shown promising outcomes. For example, the French CARE program reduced anxiety and improved well-being among doctoral students, while a Dutch self-compassion–based PsyCap intervention emphasized cultivating self-compassion to lower stress, enhance positive emotions, and sustain improvements in well-being over time [69,73]. In addition, multi-component psychoeducational programs, such as "The Third Half," integrate stress management, emotion regulation, and health-promoting skills to provide doctoral students with a toolbox for self-care and coping. These programs have been found to significantly reduce negative emotions and psychological distress and demonstrate strong feasibility and scalability in practice [77]. Collectively, these interventions highlight the importance of strengthening psychological resources and equipping doctoral students with systematic frameworks for cognitive and emotional coping in high-pressure academic contexts.

3.3.2 Practice-Oriented Behavioral and Learning Interventions

A second category of interventions focuses on optimizing doctoral students' daily study habits and behavioral routines to improve mental health and well-being. For instance, brief behavioral activation delivered via phone encouraged doctoral students to approach avoided but important goals and engage in rewarding activities, which significantly reduced burnout and enhanced well-being [67]. This flexible, remotely deliverable format makes it particularly suitable for institutions with limited resources. Structured writing retreats, including residential or online formats, have also proven effective in alleviating stress and

improving psychological, emotional, and social well-being. Mechanisms underlying these effects include perceived gains in productivity and opportunities for socialization and networking, which emerged as key predictors of improved well-being [70]. Similarly, progress-oriented workshops that combine educational components, peer sharing, and self-monitoring of progress were shown to enhance students' perceptions of academic advancement, reduce burnout and dropout intentions, and strengthen positive psychological capital and satisfaction with their programs [75]. Overall, such interventions work indirectly by improving doctoral students' academic engagement and sense of progress, thereby mitigating psychological distress.

3.3.3 Relationship- and Support-Based Interventions

The third category emphasizes the role of social relationships and support networks in fostering doctoral students' mental health. Evidence suggests that peer support is highly valued, providing flexible and informal spaces where students can alleviate loneliness, anxiety, and depression while exchanging experiences and practical advice [77]. These interventions are especially effective when peer groups are diverse and inclusive, accommodating the needs of students from different backgrounds. Reflective practice programs offer doctoral students structured opportunities to discuss challenges in supervisory relationships, academic pressures, and work–life balance in a safe environment, thereby strengthening self-awareness, coping strategies, and resilience [78]. Additionally, online group-based learning activities that gained prominence during the pandemic—such as virtual monthly meetings and writing retreats—were found to reduce isolation, enhance academic and leadership skills, alleviate stress, and improve self-efficacy, while reducing overreliance on supervisors [76]. By fostering greater connectivity and mutual support among doctoral students, these relationship-based interventions contribute to building more inclusive, secure, and supportive academic communities.

4 Discussion

This review systematically synthesizes the complex and multilayered factors influencing doctoral students' mental health and well-being across four key domains: individual, academic, interpersonal, and organizational–environmental levels. It also categorizes the major intervention strategies targeted at improving psychological outcomes in this population. Building on these findings, it is necessary to more clearly highlight gaps in the existing literature to inform future research directions and propose specific, actionable recommendations for universities.

In terms of influencing factors, two critical gaps remain underexplored: cross-cultural comparisons and intersectional analyses of vulnerable subgroups. First, although existing studies have documented differences in doctoral students' mental health and well-being based on demographic variables, academic disciplines, stages of study, and institutional settings, cross-cultural and policy-oriented comparative research remains limited. Most empirical studies have been conducted in Western contexts, while only a small number have focused on countries such as China or India. These studies tend to rely on single-nation or region-specific samples, with few adopting comparative perspectives. However, substantial variation exists in doctoral training models, academic cultures, funding structures, and mental health support systems across countries and institutional contexts. These systemic and cultural differences may exert heterogeneous effects on student psychological outcomes [38,44,47]. Future research should therefore undertake in-depth cross-cultural and cross-system comparative studies to examine how structural variations shape doctoral students' mental health and well-being. Second, the differentiated psychological experiences of vulnerable populations within the doctoral student body require closer attention. Existing evidence indicates that female doctoral students are more prone to anxiety and depression, and students from ethnic minorities and LGBTQ+

groups frequently report negative psychological outcomes [33,60]. Moreover, intersecting identities—such as motherhood and international student status—introduce additional stressors and responsibilities that may heighten vulnerability to psychological distress. Future research should incorporate intersectional frameworks to examine how gender, ethnicity, caregiving roles, and institutional settings interact, identify which groups face the highest risks at specific academic stages, and propose tailored support mechanisms. Such analyses would not only advance understanding of risk stratification but also inform inclusive and equity-oriented policy development in higher education.

With regard to intervention strategies, although current research has demonstrated the effectiveness of approaches such as mindfulness training, writing retreats, and peer support in improving doctoral students' mental health and well-being, there remains a lack of large-scale and longitudinal empirical validation [6,78–80]. Most existing interventions are characterized by short durations, small sample sizes, and voluntary participation, which limits their generalizability and scalability. Future studies should implement RCTs with larger, more diverse samples and incorporate extended follow-up periods to evaluate the comparative effectiveness and underlying mechanisms of different interventions across contexts [68]. In parallel, universities must take a more proactive role in promoting the psychological well-being of doctoral students. First, doctoral training programs should place greater emphasis on practical courses rooted in positive psychology. Integrating modules on emotion regulation, self-compassion, and mindfulness meditation into the formal curriculum may enhance students' psychological resilience and their ability to cope with stress. Second, institutions should leverage artificial intelligence and big data technologies [81] to identify high-risk subpopulations and develop targeted, behavior- and learning-based interventions (e.g., structured writing retreats, time management coaching). Third, given that doctoral supervisors serve as critical sources of both academic and emotional support, universities should establish systematic mechanisms for assessing and improving supervision quality. This may include regular feedback sessions to explore supervisory style and communication patterns, evaluations of supervisor–student relationships, and early conflict resolution procedures to prevent the escalation of tensions.

Nevertheless, certain limitations remain. Despite following rigorous systematic review protocols, the number of included studies is constrained, especially with regard to intervention research, where existing evidence is largely limited to small-scale, short-term trials, lacking large-sample RCTs and long-term follow-up. Methodologically, many studies rely on cross-sectional data, limiting causal inference, while longitudinal and mechanism-focused analyses are relatively scarce. Additionally, heterogeneity across studies—in measurement tools, conceptual definitions, and analytical frameworks—complicates integration and comparison. Finally, this review excluded gray literature and unpublished studies, which may introduce publication bias.

5 Conclusions

Doctoral students' mental health and well-being are not only central to their academic development and quality of life but also directly shape research productivity and the sustainability of higher education systems. This study is among the few systematic reviews to comprehensively synthesize research on doctoral students' mental health and well-being, addressing both influencing factors and intervention strategies. It adopts a broad scope, including large-scale quantitative studies as well as qualitative and mixed-method research, and incorporates literature from diverse regions, including Europe, North America, and Asia, thereby reflecting both the universality and specificity of doctoral students' psychological challenges in cross-cultural contexts. Moreover, this review systematically categorizes influencing factors across four dimensions: individual psychological traits and behaviors, academic processes and supervisory

relationships, interpersonal support systems, and organizational and environmental conditions. It further highlights group-level differences related to gender, identity, discipline, stage of study, and institutional settings. In terms of interventions, it synthesizes three primary approaches: psychology-based training, practice-oriented behavioral interventions, and relationship- and support-based strategies. This multi-level, multidimensional integration enriches theoretical understanding and offers valuable insights for developing targeted support and intervention programs in practice.

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