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The Impact of Mindfulness Yoga on AI Anxiety among College Students: A Chain Mediation Model of Life Meaning and Psychological Resilience Moderated by Perceived Social Support

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Abstract

With the rapid advancement of artificial intelligence (AI), AI anxiety has become an emerging psychological concern among college students. This study examined the effects of mindfulness yoga on AI anxiety and explored the underlying mechanisms involving meaning in life, psychological resilience, and perceived social support. A total of 224 college students participated in a 16-week intervention and were assigned to either a mindfulness yoga group (n = 113) or a conventional physical activity control group (n = 111). A 2 (group: mindfulness yoga vs. control) × 2 (time: pre-test vs. post-test) mixed experimental design was employed. Repeated-measures ANOVA showed that the mindfulness yoga group demonstrated significantly greater improvements in meaning in life and psychological resilience, as well as greater reductions in AI anxiety, compared with the control group (all $p < 0.001$). PROCESS analyses further revealed that meaning in life and psychological resilience independently mediated the relationship between mindfulness yoga and AI anxiety, and also formed a significant chain-mediating pathway. In addition, perceived social support significantly moderated the relationship between meaning in life and psychological resilience, strengthening the indirect effect of mindfulness yoga on AI anxiety under higher levels of social support. These findings suggest that mindfulness yoga is an effective intervention for reducing AI anxiety among college students by enhancing meaning in life and psychological resilience, particularly when supported by strong social support networks.

Keywords

Mindfulness Yoga, AI Anxiety, Life Meaning, Psychological Resilience,

Perceived Social Support

1. Introduction

With the rapid advancement of artificial intelligence (AI) and its widespread adoption in fields such as education, healthcare, and finance, profound transformations are occurring in both societal productivity and individual lifestyles. While AI technology offers significant benefits, growing public concerns about its potential risks—such as job displacement, ethical dilemmas, and loss of control—have brought increasing attention to the phenomenon of AI anxiety, especially among college students.

AI anxiety refers to a specific form of anxiety marked by persistent worries about the uncertainty, perceived threats, or potential displacement associated with the expansion of AI technologies. Studies have consistently identified a significant negative relationship between AI anxiety and mental health. Elevated levels of AI anxiety may undermine students' self-confidence and learning motivation, impairing their academic adjustment and emotional regulation. In some cases, such anxiety has been linked to broader psychological issues, including depression and generalized anxiety disorder. For instance, concerns about AI being integrated into academic assessments have caused psychological distress in some students, ultimately affecting both their academic performance and well-being.

The negative consequences of AI anxiety manifest across multiple dimensions of psychological development. Cognitively, overreliance on AI tools for academic tasks may hinder the cultivation of creativity and critical thinking. In terms of career development, AI anxiety can intensify fears about job insecurity, leading to uncertainty and difficulty in career planning. Given these wide-ranging impacts, identifying effective psychological interventions to mitigate AI anxiety among college students is of both theoretical importance and practical urgency (Wang & Xiao, 2025).

1.1. Mindfulness Yoga, Treatment of Anxiety, and AI Anxiety

The Comprehensive Fear Acquisition Theory posits that AI anxiety can develop through four distinct pathways: (1) direct negative experiences with AI technologies; (2) vicarious learning through observing others' distress related to AI; (3) exposure to negative information about AI's consequences; and (4) anxiety triggered by uncertainty and the unknowns of AI development. This theoretical framework offers a structured lens through which to understand the psychological origins of AI anxiety (Wang & Xiao, 2025).

In parallel, Self-Determination Theory (SDT) emphasizes that psychological well-being and motivational development depend on the satisfaction of three basic psychological needs: autonomy, competence, and relatedness (Ryan et al., 2021). Mindfulness functions as an internal regulatory mechanism that fosters au-

tonomous motivation and promotes self-integration (Falsafi, 2016). By cultivating present-moment awareness and an accepting attitude, mindfulness helps individuals interrupt habitual stress responses and make conscious, value-aligned decisions (Yang et al., 2023).

Mindfulness yoga, which integrates physical postures, breath control, and mindful awareness, enhances individuals' sensitivity to their internal states. This increased awareness supports the identification of authentic needs, reduces the influence of external stressors or evaluative pressures, and strengthens psychological autonomy and emotional stability (Jacoby et al., 2024). These effects are consistent with SDT's principles of internalizing motivation, enabling individuals to better cope with external uncertainty—such as that posed by AI—and thereby mitigate AI-related anxiety (Pranata et al., 2024).

From a mechanistic standpoint, mindfulness yoga may reduce AI anxiety through several pathways (Hunt et al., 2018). It helps individuals redirect attention away from perceived AI threats, reducing emotional responses to negative stimuli and traumatic experiences (Lemay et al., 2019). Mindfulness fosters a non-judgmental attitude, enabling more balanced appraisals of AI's potential impacts on employment and academic outcomes (Bartos et al., 2022). Mindfulness practice strengthens critical thinking and emotional regulation, promoting a rational interpretation of AI-related information and buffering against anxiety triggered by passive exposure to negative news (Kwok et al., 2022). Finally, the core principles of mindfulness—acceptance and present-focused awareness—support psychological adaptability and a sense of control in the face of technological uncertainty (Liu et al., 2025).

Mindfulness yoga, as an integrated practice rooted in Mindfulness-Based Stress Reduction (MBSR) and traditional Hatha yoga, requires sustained present-moment attention and the observation of physical and mental sensations without judgment (Grensman et al., 2018). The practice emphasizes mind-body unity and acceptance, which has been empirically linked to improvements in emotional regulation, resilience, and self-acceptance (Martela & Steger, 2023).

A growing body of empirical research supports the effectiveness of mindfulness yoga in reducing psychological distress (Goodman & Kashdan, 2021). For instance, several studies have found that college students participating in mindfulness yoga programs exhibited significant reductions in depression, anxiety, and stress levels, alongside increased mindfulness (Kelso et al., 2020). Other findings suggest that yoga can interrupt the feedback loop between anxiety and sleep disturbances by calming the nervous system and enhancing sleep quality (Korkmaz & Güloğlu, 2021). In clinical contexts, a 12-week Kundalini yoga intervention significantly alleviated symptoms of generalized anxiety disorder (Ma et al., 2025). Furthermore, research has demonstrated that mindfulness mediates the relationship between yoga practice and reduced anxiety, and that the acceptance-based approach of mindfulness yoga effectively reduces emotional avoidance—one of the core maintenance mechanisms of anxiety (Jing & Ding, 2024). Based on the

above theoretical foundations and empirical evidence, this study proposes the following hypothesis:

H1: A mindfulness yoga intervention will significantly reduce AI anxiety levels among college students.

1.2. Mindfulness Yoga and the Meaning of Life

The meaning of life is a central theme in interdisciplinary research bridging philosophy and psychology (Zika & Chamberlain, 1992). It primarily concerns individuals' understanding of life's purpose, value, and existential significance (King & Hicks, 2021). According to Logotherapy and the Will to Meaning theory, the fundamental driving force of human existence lies in the pursuit of meaning (Frankl, 2014). A lack of life meaning can severely compromise psychological functioning and overall well-being (Halady & Cook-Cottone, 2023). Some scholars conceptualize life meaning as a cognitive network comprising connection, understanding, and interpretation, which involves both constructing future goals and perceiving value in the present (Zhao et al., 2024).

The meaning construction model further distinguishes between global meaning (core beliefs and values) and situational meaning (the interpretation of meaning in specific contexts) (Marco et al., 2021). When these two levels of meaning are misaligned, individuals may experience meaning frustration, which can manifest as anxiety, depression, or emotional distress (Waechter & Wekerle, 2015).

With increasing attention to holistic mental health, mindfulness yoga—a practice combining mindfulness and physical movement—has emerged as a promising approach for enhancing life meaning (Felver et al., 2020). Empirical studies provide robust support for this intervention (Kukihara et al., 2020). For instance, a randomized controlled trial involving anxious elementary school students found that an 8-week mindfulness/yoga program significantly improved emotional regulation and social well-being, fostering conditions for positive meaning-making (Evazei et al., 2019). Similarly, online surveys have revealed that long-term yoga practitioners report higher levels of mindfulness, spiritual well-being, and mental health than non-practitioners, suggesting that yoga facilitates not only emotional relief but also existential insight (Pinellas, 2020).

Research with marginalized populations indicates that mindfulness practices can help individuals contextualize their suffering within a broader human experience, thereby reconstructing life meaning in the face of adversity (Kim et al., 2025). In higher education, semester-long courses integrating secular mindfulness practices have been shown to significantly improve college students' mindfulness and perceived life meaning (Roberts et al., 2021). Notably, the non-judgmental dimension of mindfulness is negatively correlated with meaning-seeking, implying that reduced self-criticism and enhanced present-moment awareness contribute to a deeper cognitive experience of meaning (Beutel et al., 2010).

At the theoretical level, the mindfulness–meaning model suggests that mindfulness enhances both emotional regulation and cognitive reappraisal, allowing

individuals to more effectively process everyday experiences (Connor & Davidson, 2003). This leads to increased life satisfaction and meaning perception, as individuals learn to construct meaning through mindful engagement with daily life, ultimately promoting psychological resilience and personal growth (Bonanno et al., 2012).

1.3. The Mediating Role of Meaning of Life in the Relationship between Mindfulness Yoga and AI Anxiety

In the context of rapid AI-driven societal transformation, AI anxiety has emerged as a critical psychological challenge for college students (Anyan & Hjemdal, 2016). Investigating the role of life meaning in this process has become a key focus at the intersection of psychology and technology ethics (Peterson & Dutton, 2022).

According to logotherapy, the pursuit of life meaning serves as a core psychological resource for coping with existential uncertainty (Ostafin & Proulx, 2020). When confronted with the potential threats posed by AI, individuals with a strong sense of meaning are more likely to interpret AI as a means of fulfilling personal values and contributing to the greater good (Platsidou & Daniilidou, 2021). This positive framing reduces perceived threat and thereby alleviates anxiety (Kleiman & Beaver, 2013).

Empirical support for this mechanism comes from a German study showing that life meaning negatively predicted anxiety levels and moderated emotional distress during public health crises like the COVID-19 pandemic (Zhang et al., 2023).

Further research reveals that career adaptability, a construct closely linked to life meaning, mediates the relationship between proactive personality and AI anxiety (Seon & Smith-Adcock, 2023). This suggests that fostering a sense of purpose may help individuals respond more flexibly and constructively to AI-related changes (Kim et al., 2005). A large-scale survey of nearly 5,000 Chinese adolescents also found that life meaning significantly buffered the effect of anxiety on depression, supporting its protective role in preventing the escalation of psychological distress (Tsibidaki, 2021).

Meaning-centered interventions have also demonstrated effectiveness in reducing psychological distress and enhancing quality of life, especially among vulnerable groups (Lasota & Mróz, 2021). These findings further reinforce the centrality of life meaning in maintaining mental well-being in the face of uncertainty and technological disruption. Taken together, these findings suggest that mindfulness yoga may reduce AI anxiety indirectly by enhancing individuals' sense of life meaning. Accordingly, this study proposes the following hypothesis:

H2: Meaning of life mediates the relationship between mindfulness yoga intervention and reductions in AI anxiety among college students.

1.4. The Promoting Effect of Mindfulness Yoga on Psychological Resilience

As mental health challenges continue to intensify globally, psychological resili-

ence—the capacity to adapt positively to adversity and environmental change—has become a central focus in clinical and health psychology (Zimet et al., 1988). In this context, mindfulness yoga, which integrates mindfulness-based mental training with physical awareness and movement, has received increasing empirical support as an effective intervention to enhance psychological resilience and improve psychological flexibility (Yıldırım & Çelik-Tanrıverdi, 2021).

In adolescent populations, an 8-week mindfulness yoga intervention conducted among South Korean elementary students significantly improved participants' self-esteem, well-being, and resilience, demonstrating its potential to cultivate adaptive coping capacities in response to academic and interpersonal stress (Kalaitzaki et al., 2021). Similarly, among working adults, a study involving university staff in the UK found that a 6-week Dru yoga program significantly improved emotional states and the ability to manage work-related stress, highlighting its benefits for occupational resilience (Öksüz et al., 2019).

In elderly populations, a 12-week randomized controlled trial found that mindfulness yoga significantly enhanced psychological resilience and reduced the risk of mild mental disorders (Felver et al., 2020). Moreover, a systematic review and network meta-analysis of nine empirical studies confirmed the effectiveness of mindfulness yoga and related mind-body practices in promoting resilience among older adults, underscoring their value for mental health maintenance in aging populations (Kukihara et al., 2020).

From a theoretical perspective, the Polyvagal Theory offers a neurophysiological explanation. Yoga practice regulates the autonomic nervous system and activates the ventral vagal complex (VVC), thereby enhancing social engagement, emotional stability, and ultimately psychological resilience (Evazei et al., 2019). Additionally, insights from Self-Determination Theory and Stress Coping Theory suggest that mindfulness yoga enhances emotional regulation and cognitive reappraisal abilities, thereby improving self-regulation (Pinellas, 2020). This enables individuals to respond to stressors in a more flexible, constructive manner and contributes to better psychological functioning and overall well-being (Kim et al., 2025).

1.5. The Mediating Role of Psychological Resilience in Alleviating AI Anxiety

As artificial intelligence (AI) technology rapidly advances and transforms various aspects of modern life, AI anxiety has emerged as a novel psychological challenge (Roberts et al., 2021). This form of anxiety typically involves persistent concerns about issues such as job displacement, privacy breaches, and ethical risks posed by autonomous systems. If left unaddressed, AI anxiety may escalate into more severe mental health problems, including generalized anxiety, depression, or social withdrawal (Beutel et al., 2010).

Existing literature confirms the detrimental effects of AI-related stress on mental health. Similar to social stressors observed during the COVID-19 pandemic, technological change can trigger emotional dysregulation, cognitive disruption,

and heightened anxiety (Connor & Davidson, 2003). Moreover, studies on pandemic-related stress (Bonanno et al., 2012) and broader social or health crises (Anyan & Hjemdal, 2016) highlight how rapid, uncontrollable environmental change undermines psychological stability.

Psychological resilience serves as a key protective factor in this context. Resilient individuals are better equipped to engage in cognitive reappraisal and adopt constructive coping strategies, thereby mitigating negative emotions and preserving psychological balance (Peterson & Dutton, 2022). For example, during the pandemic, individuals with high resilience exhibited significantly lower levels of anxiety and depression (Ostafin & Proulx, 2020) than those with lower resilience. Similar patterns have been observed in studies of chronic illness and maternal health, affirming resilience's broad moderating role in mental health (Platsidou & Daniilidou, 2021).

When facing the career uncertainty, identity conflicts, and value shifts induced by AI-driven societal restructuring, individuals with greater resilience are more likely to employ problem-solving strategies and mobilize social support (Kleiman & Beaver, 2013), thereby buffering the psychological impact of technological anxiety. This perspective aligns with contemporary coping theories that emphasize the importance of internal resources in navigating complex and evolving stressors (Zhang et al., 2023).

In light of this evidence, it is proposed that mindfulness yoga may help alleviate AI anxiety indirectly by enhancing psychological resilience (Seon & Smith-Adcock, 2023). Accordingly, the following research hypothesis is proposed: H3: Psychological resilience mediates the effect of mindfulness yoga intervention on reducing AI anxiety among college students.

1.6. The Chain-Mediating Role of Life Meaning and Psychological Resilience in Reducing AI Anxiety through Mindfulness Yoga

The sense of meaning in life has been increasingly recognized as a core internal psychological resource and a crucial protective factor when individuals face adversity and stress (Kim et al., 2005). In recent years, scholars have paid growing attention to the mechanisms by which a sense of life meaning contributes to psychological resilience, proposing that it not only directly promotes mental well-being but also indirectly fosters resilience by enhancing emotional regulation, cognitive reappraisal, and adaptive coping strategies (Tsibidaki, 2021).

Empirical studies across diverse populations have consistently demonstrated the positive impact of life meaning on psychological resilience (Lasota & Mróz, 2021). For example, research involving individuals at high risk for suicide found that a strong sense of life meaning significantly reduced suicidal ideation and behavior, thereby strengthening psychological resilience in the face of existential threats (Zimet et al., 1988). Among adolescents who experienced school bullying, life meaning was found to buffer trauma symptoms and aid in the recovery of adaptive psychological functions (Yıldırım & Çelik-Tanrıverdi, 2021). Similarly,

studies among children affected by HIV revealed that a higher level of perceived life meaning was associated with increased resilience and reduced symptoms of depression and loneliness (Kalaitzaki et al., 2021).

While some studies—such as those among Latino college students—did not find a significant direct effect of life meaning on resilience, they revealed important indirect pathways (Öksüz et al., 2019). For instance, hope was identified as a mediator linking life meaning and resilience, suggesting that the influence of meaning may be exerted through other positive psychological constructs (Felver et al., 2020). These findings collectively underscore the complex, multilayered relationship between life meaning and psychological resilience (Kukihara et al., 2020).

Special context studies further strengthen this theoretical foundation. During the COVID-19 pandemic, numerous studies confirmed a robust positive correlation between life meaning and resilience (Evazei et al., 2019). One study found that a temporal perspective moderated this relationship, suggesting that individuals with a future-oriented mindset and a strong sense of meaning showed greater adaptability during crisis (Pinellas, 2020). A survey of Greek families with special-needs children reported that the co-enhancement of life meaning and resilience helped alleviate pandemic-related anxiety and family dysfunction (Kim et al., 2025). In Türkiye, large-scale research among the general adult population also found that life meaning was a significant predictor of psychological resilience and played a vital role in mitigating fear and stress related to the pandemic (Roberts et al., 2021). Similarly, research among COVID-19 patients in China found that meaning in life, mediated by perceived social support and coping modes, significantly contributed to psychological resilience (Beutel et al., 2010).

Based on the above evidence, it is plausible to propose that life meaning not only serves as an independent protective factor in reducing AI anxiety but may also contribute indirectly by enhancing psychological resilience. In particular, mindfulness-based interventions—such as mindfulness yoga—have been shown to improve individuals' inner awareness, attentional control, and sense of presence. These changes are conducive to constructing and internalizing life meaning, which in turn strengthens resilience (Connor & Davidson, 2003). Ultimately, this chain of psychological processes may reduce the anxiety triggered by technological uncertainty and perceived existential threats associated with AI. Accordingly, the following research hypothesis is proposed:

H4: Life meaning and psychological resilience play a chain-mediating role in the effect of mindfulness yoga on reducing AI anxiety. That is, mindfulness yoga enhances individuals' sense of life meaning, which subsequently strengthens their psychological resilience, ultimately leading to lower levels of AI anxiety.

1.7. The Moderating Role of Perceived Social Support in the Relationship between Meaning of Life and Psychological Resilience: A Chain-Mediated Pathway to Reducing AI Anxiety

Understanding the interactive mechanisms among individual psychological resources is essential for explaining how individuals maintain mental health under

emerging stressors (Bonanno et al., 2012). Among these resources, perceived social support—defined as the subjective perception of emotional, informational, and instrumental support from one's social network—is widely recognized as a critical external factor influencing individuals' emotional regulation, meaning-making processes, and coping strategies (Anyan & Hjemdal, 2016).

Theoretically, Social Support Theory posits that when individuals perceive greater levels of support from family, friends, and significant others, they are more likely to develop a secure psychological foundation for dealing with adversity (Peterson & Dutton, 2022). Perceived social support not only enhances individuals' confidence and coping capacity but also helps in forming a coherent and positive sense of life meaning, which is closely associated with greater psychological resilience (Ostafin & Proulx, 2020). This buffering effect is particularly relevant in response to novel stressors such as the anxiety elicited by rapid advancements in artificial intelligence (Platsidou & Daniilidou, 2021).

Empirical research lends strong support to this framework. Among university students, studies have consistently found significant positive correlations among perceived social support, life meaning, and psychological resilience (Kleiman & Beaver, 2013). Moreover, social support has been shown to indirectly promote the development of life meaning through its influence on resilience (Zhang et al., 2023), reinforcing the interactive and mutually reinforcing nature of these psychological constructs. For instance, studies on individuals with chronic illnesses, such as breast cancer patients, have revealed that perceived social support fosters family resilience, thereby enhancing patients' sense of life meaning and enabling them to better cope with disease-related stress (Seon & Smith-Adcock, 2023). Similarly, research involving teachers and nurses under occupational stress found that social support significantly reduced psychological distress by enhancing resilience, which in turn alleviated symptoms of anxiety and burnout (Kim et al., 2005).

In light of these findings, perceived social support may act not only as a moderator that strengthens the relationship between life meaning and psychological resilience but also as a boundary condition that amplifies the effectiveness of interventions—such as mindfulness yoga—in reducing AI anxiety. Specifically, when perceived social support is high, individuals may derive more benefit from mindfulness interventions through a strengthened "life meaning → psychological resilience" pathway (Tsibidaki, 2021), thereby experiencing a more substantial reduction in AI-related anxiety. Based on this theoretical and empirical foundation, the following hypotheses are proposed.

H5: Perceived social support moderates the relationship between life meaning and psychological resilience, such that the predictive effect of life meaning on psychological resilience is stronger at higher levels of perceived social support.

H6: Perceived social support moderates the chain-mediating effect of the "life meaning → psychological resilience" pathway, thereby enhancing the impact of mindfulness yoga on reducing AI anxiety. The theoretical model diagram for this paper is shown in **Figure 1**.

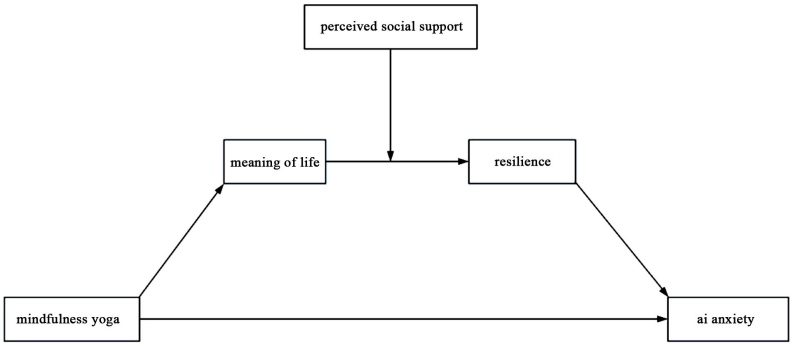

Figure 1. Theoretical model.

2. Methods

2.1. Experimental Design

This study adopted a 2 (group: mindfulness yoga vs. conventional physical education) × 2 (time: pre-test vs. post-test) mixed experimental design. The type of physical activity intervention (mindfulness yoga vs. conventional physical activity) served as the independent variable, while AI anxiety was the dependent variable. Meaning in life and psychological resilience were examined as sequential mediators, and perceived social support was included as a moderating variable. By comparing pre- and post-test outcomes across groups, the study aimed to explore both the direct effects of mindfulness yoga on AI anxiety and the mechanism of influence through internal psychological resources.

2.2. Participants and Sample Size

Using G*Power 3.1.9.7, the minimum required sample size to detect significant group differences with adequate statistical power was calculated to be 110 per group. To account for potential attrition or data loss, the planned recruitment target was 120 participants per group (total N = 240).

Participants were recruited through campus-wide advertisements, classroom announcements, and the university online learning platform. Students who expressed interest were screened according to the inclusion and exclusion criteria. Eligible participants provided written informed consent before enrollment.

After baseline assessment, participants were randomly assigned to either the mindfulness yoga group or the control group using a computer-generated randomization sequence. Random allocation was conducted by a research assistant who was not involved in the intervention delivery or outcome assessment. A total of 240 students were initially enrolled and randomly allocated at a 1:1 ratio to the mindfulness yoga group (n = 120) and the control group (n = 120). Following attrition during the intervention period, the final valid sample consisted of 224 participants (113 in the mindfulness yoga group and 111 in the control group).

2.3. Inclusion Criteria

(1) Aged 18 - 23. (2) Use of AI tools (e.g., ChatGPT, educational AI platforms, AI-

assisted coding) at least three times per 3week, primarily for academic tasks. (3) No prior experience with systematic mindfulness/yoga training or related self-practice in the past year. (4) No severe psychological symptoms based on the Chinese College Students' Mental Health Scale. (5) AI-related psychological states suitable for intervention as assessed by the AI Attitude Scale.

2.4. Exclusion Criteria

(1) Program withdrawal or ≥30% absence (i.e., missing ≥4 sessions). (2) Incomplete or invalid questionnaires (e.g., missing >20% of responses). (3) Diagnosed physical illnesses incompatible with yoga (e.g., cardiovascular disease, joint injuries). (4) Diagnosed psychiatric conditions (e.g., clinical anxiety, depression) or current psychological/medical treatment. (5) The final valid sample consisted of 224 participants: 113 in the mindfulness yoga group and 111 in the control group, yielding an effective response rate of 93%. Demographic details are summarized in Table 1.

Table 1. Demographic characteristics.

Variables	Experimental group		Control group	
Gender	Male (n = 55)	Female (n = 58)	Male (n = 58)	Female (n = 53)
Age	19.25 ± 0.54		19.58 ± 0.62	
Height (cm)	168.13 ± 5.75		169.71 ± 6.67	
Body weight (kg)	59.87 ± 10.31		61.37 ± 12.72	
Mental health level	1.57 ± 0.62		1.63 ± 0.49	
Ai attitude	5.53 ± 2.54		5.8 ± 1.99	

2.5. Ethics Statement

This study was reviewed and approved by the Ethics Committee of the Second Affiliated Hospital of Wenzhou Medical University (Ethics Approval No. KY2024-235). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Because the study was conducted within routine educational activities and involved minimal risk to participants, the ethics committee waived the requirement for written informed consent. Prior to participation, all students were informed about the study objectives, procedures, confidentiality measures, and their right to withdraw at any time without penalty. Participation was voluntary, and all data were collected anonymously and analyzed confidentially.

3. Procedure

3.1. Pre-Test (Week 1)

During the first week of the semester, participants completed baseline assessments via the university's online teaching platform. The questionnaire collected demographic information (e.g., gender, grade level, academic major, frequency of AI

tool usage) and administered standardized scales assessing AI anxiety, life meaning, psychological resilience, and perceived social support.

3.2. Intervention (Weeks 1 - 16)

3.2.1. Experimental Group: Mindfulness Yoga

A structured 16-week mindfulness yoga intervention was implemented, based on principles from Mindfulness-Based Stress Reduction (MBSR) and Mindfulness-Based Cognitive Therapy (MBCT). Each week, participants attended two 90-minute sessions led by certified instructors.

The intervention included: (1) Yoga Poses: Classic Hatha yoga postures (e.g., Tree Pose, Warrior Pose, Triangle Pose) emphasizing bodily awareness, posture alignment, muscle tension release, and breath-movement coordination. (2) Breathing Exercises: Techniques such as diaphragmatic breathing and full yogic breathing, guiding students to focus on breath for present-moment awareness and calmness. (3) Meditation Practice: Seated meditation to cultivate non-judgmental observation of thoughts and emotions, with emphasis on attention redirection. (4) Mindfulness Guidance: Short lectures, case discussions, and activities on mindfulness strategies for managing AI-related stressors.

All instructors underwent pre-intervention training to ensure consistency.

3.2.2. Control Group: Conventional Physical Activity

The control group engaged in traditional physical education courses (e.g., boxing, aerobics, basketball), twice weekly for 90 minutes over 16 weeks. These sessions matched the experimental group in intensity and structure but contained no mindfulness elements.

Participants signed an agreement not to engage in additional yoga or mindfulness-related activities during the intervention to minimize confounding.

3.3. Post-Test (Week 16)

Within one week after the intervention ended, participants were re-assessed using the same instruments to ensure measurement consistency.

4. Research Instruments

4.1. AI Anxiety

AI anxiety was measured using the AI Anxiety Scale developed by Li and Huang (2020). The scale consists of 24 items, rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree). It assesses eight dimensions of AI-related anxiety, each represented by three items: Privacy Violation Anxiety, Bias Behavior Anxiety, Job Replacement Anxiety, Learning Anxiety, Existential Risk Anxiety, Ethics Violation Anxiety, Artificial Consciousness Anxiety, Lack of Transparency Anxiety. This instrument demonstrated excellent psychometric properties in the current study. Cronbach's $\alpha = 0.89$. Confirmatory Factor Analysis (CFA) results: $\chi^2/df = 1.85$, CFI = 0.980, TLI = 0.972, RMSEA = 0.038, SRMR = 0.032.

4.2. Meaning in Life

The Three-Dimensional Meaning in Life Scale (3DM) developed by Martela and Steger (2023) was used to assess participants' sense of life meaning. The scale comprises 11 items, rated on a 7-point Likert scale (1 = not at all true, 7 = very true). It includes three subdimensions: Coherence (understanding one's life and experiences), Purpose (having direction and goals), Significance (feeling that life is valuable and worth living). The scale exhibited good internal consistency and construct validity in this study. Cronbach's α = 0.84. CFA results: $\chi^2/df = 1.60$, CFI = 0.985, TLI = 0.980, RMSEA = 0.030, SRMR = 0.025.

4.3. Psychological Resilience

Resilience was measured using the Connor–Davidson Resilience Scale (CD-RISC) developed by Connor and Davidson (2003). This instrument consists of 25 items, rated on a 5-point scale (0 = not true at all, 4 = true nearly all the time). It assesses five resilience-related factors: 1) Personal competence, high standards, and tenacity; 2) Trust in one's instincts, tolerance of negative affect, and the strengthening effects of stress; 3) Positive acceptance of change and secure relationships; 4) Sense of control; 5) Spiritual influences. The CD-RISC has demonstrated strong reliability and validity across general and clinical populations. In the current study, Cronbach's α = 0.90. CFA results: $\chi^2/df = 1.75$, CFI = 0.980, TLI = 0.975, RMSEA = 0.035, SRMR = 0.030.

4.4. Perceived Social Support

Perceived social support was assessed using the Multidimensional Scale of Perceived Social Support (MSPSS) developed by Zimet et al (1988). This 12-item instrument evaluates perceived support from three sources: Family, Friends, Significant Others. Each subscale contains four items rated on a 7-point Likert scale (1 = very strongly disagree, 7 = very strongly agree). This scale has been widely used and validated across various populations. In this study, it demonstrated good reliability. Cronbach's α = 0.86. CFA results:$\chi^2/df = 2.30$, CFI = 0.955, TLI = 0.945, RMSEA = 0.052, SRMR = 0.045.

4.5. Chain Mediation Analysis

The mediation and moderated mediation analyses were conducted using PROCESS Macro Version 4.2 for SPSS. Post-intervention (post-test) scores of meaning in life, psychological resilience, perceived social support, and AI anxiety were entered into the models.

To account for pre-existing individual differences and strengthen causal inference, baseline scores of the corresponding variables were included as covariates. Specifically, baseline meaning in life, baseline psychological resilience, and baseline AI anxiety were controlled for in all mediation and moderation analyses. Gender, age, and attitude toward AI were also included as control variables.

This approach allowed the estimated indirect effects to reflect intervention-re-

lated differences in post-test outcomes beyond baseline levels.

5. Results

5.1. Homogeneity Test of Population Variables

An independent samples t-test was conducted to examine potential differences between the experimental group (mindfulness yoga intervention) and the control group (conventional physical activity) on key demographic and baseline variables. The results revealed no significant differences in gender distribution ($p = 0.41$), age ($p = 0.35$), height ($p = 0.52$), body weight ($p = 0.24$), AI attitude ($p = 0.61$), or mental health level ($p = 0.22$) (all $p > 0.05$). These findings indicate good homogeneity between the two groups at baseline.

5.2. Normality Test

The Kolmogorov-Smirnov (KS) test was conducted to assess the normality of the variables: meaning in life, psychological resilience, AI anxiety, and perceived social support. The KS test p-values for meaning in life ($p = 0.12$), psychological resilience ($p = 0.09$), AI anxiety ($p = 0.08$), and perceived social support ($p = 0.11$) were all greater than 0.05, indicating no significant deviations from normality. Additionally, Levene's test confirmed homogeneity of variances across groups ($p > 0.05$). Therefore, the assumptions of normal distribution and homogeneity of variances were met, supporting the use of independent samples t-tests for group comparisons.

5.3. Common Method Bias Test

Common method bias was evaluated using Harman's single-factor test and the control of unmeasured latent factors. Harman's test extracted five factors with eigenvalues greater than 1 without rotation; the first factor accounted for 28.6% of the total variance, which is below the 40% threshold. These results suggest that common method bias does not significantly influence the study data, confirming good validity and reliability.

5.4. Homogeneity Test of Variables between Groups before the Experiment

Independent samples t-tests and chi-square tests were performed to examine baseline homogeneity between the experimental and control groups for meaning in life, psychological resilience, AI anxiety, and perceived social support. No significant differences were observed for meaning in life ($t = 0.83$, $p = 0.41$), psychological resilience ($t = 1.21$, $p = 0.23$), AI anxiety ($t = 0.67$, $p = 0.51$), or perceived social support ($t = 0.92$, $p = 0.36$). These findings confirm that the groups were homogeneous before the intervention, ensuring the validity and reliability of subsequent comparisons.

5.5. Descriptive Statistics

Table 2 presents the descriptive statistics for all study variables across groups and

measurement occasions. At baseline, no significant differences were observed between the mindfulness yoga group and the control group in AI anxiety, meaning in life, psychological resilience, or perceived social support, indicating satisfactory group equivalence before the intervention.

Following the 16-week intervention, participants in the mindfulness yoga group demonstrated substantial improvements across all psychological outcomes. Specifically, mean AI anxiety scores decreased from 3.81 (SD = 0.62) to 2.74 (SD = 0.58), whereas the control group showed only a modest reduction from 3.79 (SD = 0.64) to 3.48 (SD = 0.61). Similarly, meaning in life increased from 4.12 (SD = 0.73) to 4.86 (SD = 0.69) in the mindfulness yoga group, compared with a smaller increase in the control group.

Psychological resilience also improved considerably among participants receiving mindfulness yoga, increasing from 3.68 (SD = 0.57) to 4.42 (SD = 0.61), whereas only minor changes were observed in the control group. In addition, perceived social support increased from 4.01 (SD = 0.71) to 4.39 (SD = 0.68) in the mindfulness yoga group, while remaining relatively stable in the control group.

Overall, the descriptive findings suggest that mindfulness yoga was associated with greater improvements in positive psychological resources and a greater reduction in AI anxiety compared with conventional physical activity.

Table 2. Descriptive statistics of study variables by group and time.

Variable	Group	Pre-test M ± SD	Post-test M ± SD
AI Anxiety	Mindfulness Yoga (n = 113)	3.81 ± 0.62	2.74 ± 0.58
	Control (n = 111)	3.79 ± 0.64	3.48 ± 0.61
Meaning in Life	Mindfulness Yoga (n = 113)	4.12 ± 0.73	4.86 ± 0.69
	Control (n = 111)	4.08 ± 0.75	4.26 ± 0.72
Psychological Resilience	Mindfulness Yoga (n = 113)	3.68 ± 0.57	4.42 ± 0.61
	Control (n = 111)	3.71 ± 0.59	3.89 ± 0.60
Perceived Social Support	Mindfulness Yoga (n = 113)	4.01 ± 0.71	4.39 ± 0.68
	Control (n = 111)	3.98±0.69	4.07 ± 0.67

5.6. Effects of Mindfulness Yoga on Meaning of Life, Resilience, and AI Anxiety

Repeated-measures ANOVA revealed significant temporal effects across all psychological constructs. The time factor (pre- to post-intervention) showed substantial influence on meaning of life ($p < 0.001$, $\eta_p^2 = 0.112$), resilience ($p < 0.001$, $\eta_p^2 = 0.127$), and AI anxiety ($p < 0.001$, $\eta_p^2 = 0.153$), indicating significant improvement trajectories over time in both the experimental and control groups.

Between-group analyses demonstrated significant treatment effects, with the

mindfulness yoga group showing superior outcomes compared to the control group on meaning of life ($p < 0.001$, $\eta_p^2 = 0.083$), resilience ($p < 0.001$, $\eta_p^2 = 0.167$), and AI anxiety ($p < 0.001$, $\eta_p^2 = 0.126$), confirming the differential efficacy of the mindfulness yoga intervention.

Significant time × group interactions were observed for all dependent variables: meaning of life ($p < 0.001$, $\eta_p^2 = 0.132$), resilience ($p < 0.001$, $\eta_p^2 = 0.148$), and particularly AI anxiety ($p < 0.001$, $\eta_p^2 = 0.346$). These interactions indicate that the experimental group experienced significantly steeper improvements compared to the control group throughout the intervention period.

Post hoc simple effects analyses confirmed that although both groups showed significant pre-post improvements (all < 0.05), the experimental group exhibited: (a) significantly higher post-intervention scores than the control group across all measures (all < 0.01), and (b) larger effect sizes in change magnitude (Cohen's d range = 0.72 - 1.15). The notably strong interaction effect for AI anxiety ($\eta_p^2 = 0.346$) suggests the mindfulness yoga intervention was particularly effective in reducing technology-related anxiety.

5.7. Correlation Analysis

Correlation analysis was conducted to examine the relationships among four variables: meaning in life, psychological resilience, AI anxiety, and perceived social support. The results indicated that all variables were significantly correlated with each other at the 0.01 level ($p < 0.01$), demonstrating strong interrelations among the constructs (Table 3).

Table 3. Correlation test for each variable.

Variables	1	2	3	4	5
1) Mindfulness yoga	1				
2) Meaning of life	0.52**	1			
3) Resilience	0.38**	0.47**	1		
4) AI anxiety	−0.43**	−0.39**	−0.36**	1	
5) Perceived social support	0.41**	0.49**	0.53**	−0.31**	1

**$p < 0.01$.

5.8. Multicollinearity Test

Variance inflation factor (VIF) was used to assess multicollinearity among the independent variables. The VIF values for life meaning (1.23), psychological resilience (1.41), AI anxiety (1.37), and perceived social support (1.19) were all well below the commonly accepted threshold of 5. This indicates that severe multicollinearity is not present among the variables. Therefore, the data meet the assumptions necessary for subsequent statistical analyses such as regression and structural equation modeling, reducing the risk of biased parameter estimates and ensuring the reliability and robustness of the findings.

5.9. Chain Mediation Model Testing

The chain mediation model was tested using Model 6 of Hayes' PROCESS macro, with mindfulness yoga intervention as the independent variable, AI anxiety as the dependent variable, and meaning of life and psychological resilience as sequential mediators.

As shown in Table 3, after controlling for gender, age, and attitude toward AI, mindfulness yoga intervention significantly positively predicted life meaning (β = 0.47, t = 6.81, $p < 0.001$). Life meaning significantly positively predicted psychological resilience (β = 0.36, t = 6.92, $p < 0.001$), while psychological resilience significantly negatively predicted AI anxiety (β = −0.27, t = −3.80, $p < 0.001$). Life meaning also directly negatively predicted AI anxiety (β = −0.17, t = −2.95, $p < 0.01$), and mindfulness yoga had a significant negative direct effect on AI anxiety (β = −0.24, t = −2.93, $p < 0.01$). The R^2 values for the models predicting life meaning, psychological resilience, and AI anxiety were 0.31, 0.42, and 0.37, respectively, with all F-tests highly significant ($p < 0.001$), demonstrating good explanatory power. These findings support the hypothesized chain mediating role of life meaning and psychological resilience in the effect of mindfulness yoga on AI anxiety. The path model is illustrated in Figure 2.

Using a bias-corrected bootstrap approach with 5,000 resamples, mediation effects were examined. The total effect of mindfulness yoga on AI anxiety was significantly negative (β = −0.41, 95% CI [−0.538, −0.282]), with the direct effect accounting for 59% of this total (β = −0.24, 95% CI [−0.401, −0.079]). All three indirect pathways were significant and negative. Path 1: Mindfulness yoga → Life meaning → AI anxiety (effect = −0.08, 20% of total effect, 95% CI [−0.142, −0.018]). Path 2: Mindfulness yoga → Psychological resilience → AI anxiety (effect = -0.05, 11% of total effect, 95% CI [−0.103, −0.007]). Path 3: Mindfulness yoga → Life meaning → Psychological resilience → AI anxiety (chain mediation effect = -0.04, 10% of total effect, 95% CI [−0.081, −0.009])

The total indirect effect accounted for 41% of the total effect (β = −0.17, 95% CI [−0.274, −0.066]), indicating a significant chained mediating role of life meaning and psychological resilience in the reduction of AI anxiety by mindfulness yoga (Table 4).

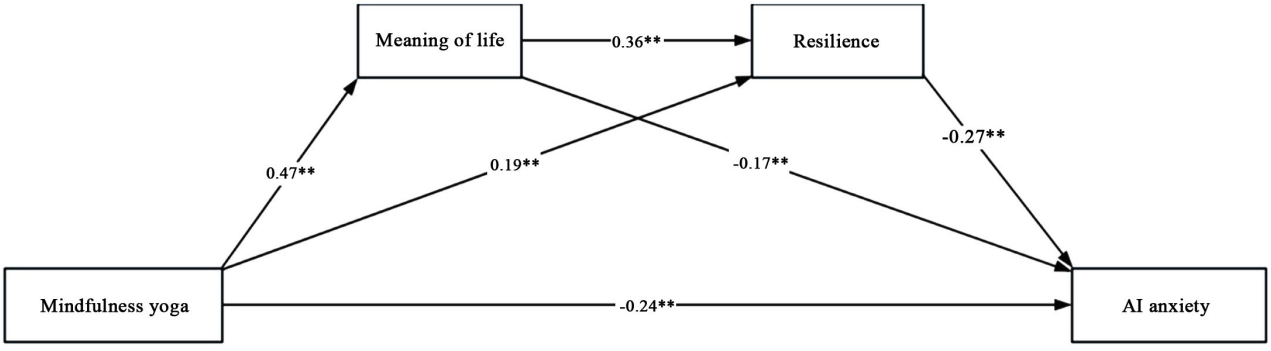

Figure 2. Model path effects.

Table 4. Mediating effects test.

	Model 1 Meaning of life				Model 2 Resilience				Model 3 AI anxiety			
	β	se	t	95% CI	β	se	t	95% CI	β	se	t	95% CI
Control Variables												
Gender	−0.07	0.062	−1.13	[−0.192, 0.052]	−0.04	0.051	−0.78	[−0.141, 0.061]	0.09	0.068	1.32	[−0.046, 0.226]
Age	0.13	0.043	3.02**	[0.045, 0.215]	0.08	0.034	2.35*	[0.013, 0.147]	−0.06	0.042	−1.43	[−0.143, 0.023]
AI attitude	0.16	0.052	3.08**	[0.057, 0.263]	0.11	0.041	2.68*	[0.029, 0.191]	-0.23	0.063	−3.65**	[−0.354, −0.106]
Main Effects												
Mindfulness yoga	0.47	0.069	6.81**	[0.333, 0.607]	0.19	0.057	3.33**	[0.077, 0.303]	−0.24	0.082	−2.93**	[−0.401, −0.079]
Meaning of life					0.36	0.052	6.92**	[0.257, 0.463]	−0.17	0.058	−2.95**	[−0.285, −0.055]
Resilience									−0.27	0.071	−3.80**	[−0.411, −0.129]
R^2			0.31				0.42				0.37	
F			12.74**				18.63**				15.29**	

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

5.10. Testing the Moderating Effect of Perceived Social Support

Perceived social support significantly and positively predicted psychological resilience (β = 0.25, t = 6.41, $p < 0.001$). More importantly, the interaction between meaning in life and perceived social support significantly predicted psychological resilience (β = 0.12, t = 4.29, $p < 0.001$), indicating that perceived social support moderates the relationship between meaning in life and psychological resilience.

To further examine this interaction, simple slope analyses were conducted at low (−1 SD), mean, and high (+1 SD) levels of perceived social support. The results showed that the positive association between meaning in life and psychological resilience was significantly stronger among participants reporting high levels of perceived social support than among those reporting low levels of perceived social support.

These findings suggest that perceived social support enhances the beneficial effect of meaning in life on psychological resilience. In other words, when students perceive greater support from family, peers, and teachers, the positive influence of life meaning on resilience becomes stronger. Therefore, perceived social support strengthens the indirect pathway through which mindfulness yoga reduces AI anxiety by promoting meaning in life and psychological resilience (Figure 3 and Table 5).

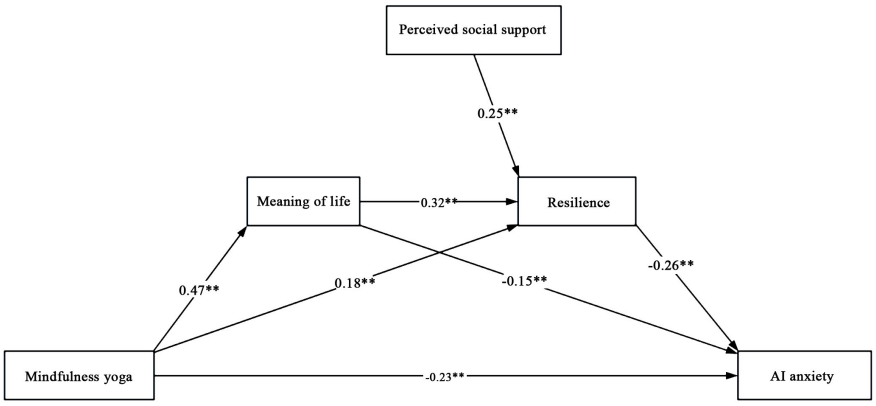

Figure 3. Moderation effect model.

Table 5. Tests for chained mediation effects with moderation.

	Model 1 Meaning of life				Model 2 Resilience				Model 3 AI anxiety			
	β	se	t	95% CI	β	se	t	95% CI	β	se	t	95% CI
Control Variables												
Gender	−0.07	0.062	−1.13	[−0.192, 0.052]	−0.05	0.051	−1.02	[−0.149, 0.049]	0.09	0.067	1.34	[−0.044, 0.224]
Age	0.13	0.043	3.02**	[0.045, 0.215]	0.07	0.033	2.12*	[0.005, 0.135]	−0.06	0.041	−1.46	[−0.141, 0.021]
AI attitude	0.16	0.052	3.08**	[0.057, 0.263]	0.10	0.041	2.50*	[0.021, 0.179]	−0.22	0.062	−3.55**	[−0.342, −0.098]
Main Effects												
Mindfulness yoga	0.47	0.069	6.81**	[0.333, 0.607]	0.18	0.056	3.21**	[0.069, 0.291]	−0.23	0.081	−2.84**	[−0.389, −0.071]
Meaning of life					0.32	0.051	6.27**	[0.220, 0.420]	−0.15	0.057	−2.63**	[−0.263, −0.037]
Resilience									−0.26	0.072	−3.71**	[−0.398, −0.122]
Perceived social support					0.25	0.039	6.41**	[0.173, 0.327]				
Perceived Social Support × Meaning of life					0.12	0.028	4.29**	[0.065, 0.175]				
R^2	0.36				0.50				0.39			
F	14.85**				23.42**				16.03**			

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

6. Discussion

6.1. Mindfulness Yoga and AI Anxiety

The results of this study indicate that college students who participate in mindfulness yoga experience significant reductions in AI anxiety. This effect can be explained from two perspectives: the psychological mechanisms underlying mind-

fulness and the mind-body regulatory functions of yoga.

From the mindfulness perspective, mindfulness training emphasizes awareness and acceptance of present experiences (Wang & Xiao, 2025). This helps students reduce excessive worry and rumination about AI-related uncertainties. Through sustained practice, students enhance their metacognitive abilities, enabling them to objectively examine their anxiety towards AI and avoid falling into the cognitive trap of perceiving AI as a "technological threat." Moreover, the non-judgmental attitude cultivated in mindfulness supports students in developing a more rational cognitive framework toward AI, viewing it as an auxiliary tool rather than a threat, thus reducing fear and unease toward AI technological development (Lasota & Mróz, 2021).

At the mind-body regulation level, yoga postures and breathing exercises activate the parasympathetic nervous system, promote relaxation, and alleviate physiological arousal associated with anxiety, such as increased heart rate and muscle tension. This physiological improvement feeds back to the brain, regulating emotional centers and reducing feelings of anxiety (Zimet et al., 1988). Furthermore, the chain mediating effect found in this study suggests that mindfulness yoga reduces AI anxiety indirectly by enhancing life meaning and psychological resilience. During yoga practice, students re-examine their life values through focused attention and self-awareness, establishing a more stable internal system of meaning and reducing value confusion induced by AI (Yıldırım & Çelik-Tanrıverdi, 2021). Simultaneously, regular practice strengthens psychological resilience, enabling students to respond more calmly to AI-related challenges and effectively buffer anxiety (Kalaitzaki et al., 2021).

6.2. The Mediating Role of Meaning of Life

This study reveals that life meaning plays a key mediating role in reducing AI anxiety through mindfulness yoga. Theoretically, mindfulness yoga encourages individuals to focus on the present and accept themselves, helping college students re-evaluate their life values, construct a clearer meaning system, and alleviate value confusion and existential anxiety caused by rapid AI development (Öksüz et al., 2019). Clarifying life meaning allows individuals to perceive AI as a tool to achieve personal goals rather than a threat, thus diminishing fear of technological uncertainty.

Life meaning also functions as an internal resource that enhances psychological resilience and coping abilities, enabling students to adopt proactive strategies when facing AI challenges (Felver et al., 2020). Hence, life meaning is not only a critical outcome of mindfulness yoga intervention but also a core mediator linking intervention to anxiety reduction, offering a theoretical foundation for understanding the mechanisms by which mindfulness yoga alleviates AI anxiety (Kukihara et al., 2020).

From multiple theoretical lenses, this mediating effect can be further elaborated. Positive psychology posits that mindfulness yoga promotes positive emo-

tions such as calmness and satisfaction, which Fredrickson's broaden-and-build theory identifies as broadening cognitive and behavioral repertoires, enabling students to better identify their values and goals amid AI challenges (Evazei et al., 2019). Cognitive-behavioral theory suggests that mindfulness yoga disrupts automatic negative thoughts about AI (e.g., "AI will replace me"), while life meaning reconfigures individuals' evaluative framework to integrate AI as a means for personal growth rather than a threat (Pinellas, 2020). Socioculturally, amid AI reshaping social roles and values, students with strong life meaning better withstand existential crises from "technological determinism" by connecting AI use to social innovation and personal goals, thus regulating anxiety (Kim et al., 2025).

Neuroscience research supports this by showing that mindfulness enhances cooperation between the default mode network and prefrontal cortex, facilitating self-reflection and meaning construction (Roberts et al., 2021). These multidimensional perspectives deepen understanding of the intervention's mechanisms and support the design of integrated AI anxiety interventions combining mindfulness, meaning exploration, and cognitive restructuring (Beutel et al., 2010).

6.3. The Mediating Role of Resilience

Psychological resilience also mediates the effect of mindfulness yoga on AI anxiety. Mindfulness yoga fosters awareness and acceptance through mind-body exercises, directly enhancing students' resilience (Connor & Davidson, 2003). Increased resilience enables individuals to use positive cognitive reappraisal when confronting AI-related uncertainties, perceiving AI as an opportunity rather than a threat, thereby reducing anxiety (Bonanno et al., 2012).

From a stress management view, resilient students flexibly mobilize internal and external resources, actively learn about AI, and engage in technological practices (Anyan & Hjemdal, 2016). This fosters a positive "challenge-response-growth" cycle, further lowering AI anxiety. Moreover, group mindfulness yoga creates an emotional support environment, indirectly boosting resilience through shared experiences and social support (Peterson & Dutton, 2022). Thus, resilience emerges as a core mediator revealing how mindfulness yoga strengthens psychological resources to alleviate anxiety (Ostafin & Proulx, 2020).

6.4. Meaning of Life and Resilience

The study shows that life meaning significantly influences psychological resilience through cognitive restructuring and resource activation. Cognitively, life meaning offers a value framework for interpreting stressors (Platsidou & Daniilidou, 2021). When students clarify their life meaning, they positively reframe AI challenges as necessary for goal achievement rather than threats, reducing negative emotions and enabling proactive coping, thus enhancing resilience (Kleiman & Beaver, 2013).

Regarding resource activation, life meaning acts as a core psychological resource, increasing self-efficacy and motivation (Zhang et al., 2023). Pursuing life meaning encourages students to mobilize personal abilities and external support, fostering

a virtuous cycle of meaning-driven resource integration and resilience enhancement (Seon & Smith-Adcock, 2023). Research confirms that life meaning underpins psychological adaptation and drives resilience development, elucidating growth mechanisms in complex environments (Kim et al., 2005).

The chain mediation model—mindfulness yoga → life meaning → psychological resilience → AI anxiety—clearly outlines the psychological pathways by which mindfulness yoga reduces AI anxiety (Tsibidaki, 2021). Theoretically and practically, mindfulness yoga's mind-body practices foster present-moment, non-judgmental awareness, guiding students to build a stable meaning system that anchors them internally (Lasota & Mróz, 2021). This enables them to reinterpret AI challenges as growth opportunities, significantly lowering anxiety.

Further, enhanced life meaning fuels resilience development by motivating students to actively address stressors with positive attitudes and problem-solving strategies, rather than avoidance (Zimet et al., 1988). This coping model not only reduces anxiety immediately but also builds resilience through experience accumulation (Yıldırım & Çelik-Tanrıverdi, 2021). Ultimately, high resilience helps students manage AI anxiety flexibly, through adaptive behaviors such as proactive learning, cognitive reframing, and building social networks (Kalaitzaki et al., 2021).

6.5. The Moderating Role of Perceived Social Support

Perceived social support adds an important dimension to this chain mediation model. As students' subjective perception of external support, social support significantly influences life meaning formation by providing emotional, informational, and instrumental resources (Öksüz et al., 2019). When students perceive strong social support from peers, teachers, or family during mindfulness yoga practice, this interpersonal affirmation satisfies belonging needs and encourages exploration of self-worth and goals, strengthening life meaning (Felver et al., 2020). For instance, shared experiences and emotional resonance in group yoga sessions accelerate meaning construction (Kukihara et al., 2020).

The interaction between perceived social support and life meaning further modulates the strength of the mediation pathway. In high-support contexts, the positive impact of life meaning on resilience is amplified (Evazei et al., 2019). Students with both strong life meaning and abundant social support can draw motivation internally and obtain practical and emotional assistance externally, thereby more effectively enhancing resilience (Pinellas, 2020). Conversely, in low-support environments, even high life meaning may struggle to translate into resilience due to insufficient external reinforcement, limiting coping resources for AI anxiety (Kim et al., 2025).

Moreover, this interaction likely influences AI anxiety by shaping cognitive and behavioral strategies (Roberts et al., 2021). High social support combined with strong life meaning fosters proactive reappraisal and problem-solving, viewing AI as a means to realize personal meaning rather than a threat, thus reducing anxiety (Beutel et al., 2010). In contrast, low social support may foster self-doubt and

heighten anxiety despite life meaning (Connor & Davidson, 2003). Therefore, the interplay of social support and life meaning not only influences mediation strength but also shapes coping patterns, ultimately affecting AI anxiety relief (Bonanno et al., 2012).

This finding offers important theoretical insights and practical guidance for optimizing mindfulness yoga interventions and enhancing coping strategies for technology-related anxiety (Anyan & Hjemdal, 2016).

7. Summary

This study employed a chain mediation model to demonstrate that mindfulness yoga significantly reduces AI anxiety among college students, with the pathway "life meaning → psychological resilience" serving as the core mechanism. Mindfulness yoga fosters present-moment awareness and acceptance, aiding students in reconstructing their sense of life meaning. This clarified life meaning enhances psychological resilience, promoting proactive coping strategies in the face of AI-related challenges and thereby alleviating anxiety. Moreover, perceived social support interacts with life meaning to moderate this mediating chain, such that higher social support amplifies the positive impact of life meaning on resilience, underscoring the synergistic role of external and internal resources.

7.1. Theoretical Contributions

This study makes several important theoretical contributions to the literature on psychological interventions for technology-related anxiety. First, it expands the conceptual framework of interventions by integrating life meaning, psychological resilience, and perceived social support into a unified chain mediation and moderation model. This approach bridges individual-level cognitive and emotional mechanisms (mindfulness, meaning-making, resilience) with interpersonal-level factors (social support), offering a more holistic explanation of how mindfulness yoga alleviates AI anxiety. Second, the findings advance the understanding of interactions among key variables. Specifically, the moderating role of perceived social support highlights the importance of contextual and relational factors in strengthening or weakening the pathways from meaning to resilience and anxiety reduction. This enriches interdisciplinary dialogue between social support theory, positive psychology, and meaning-making theory, and provides a nuanced perspective on individual differences in psychological adaptation to technological change. Finally, by empirically demonstrating the unique relevance of mindfulness-based practices in the emerging domain of AI anxiety, this study contributes to the growing body of work exploring how traditional mind–body techniques can address modern psychological challenges posed by rapid technological advancement.

7.2. Practical Contributions

The findings also offer valuable practical implications for designing and implementing effective interventions to reduce AI anxiety. First, the results suggest that

mindfulness yoga programs can be optimized by intentionally fostering group interaction, shared experiences, and emotional resonance, which enhance perceived social support and amplify the benefits of meaning-making and resilience cultivation. Practitioners and educators should therefore consider delivering mindfulness yoga in collaborative formats rather than purely individual settings. Second, the study provides evidence-based guidance for mental health education and employee training in academic and organizational contexts. Specifically, incorporating components that help participants explore personal values, clarify life meaning, and build resilience—while simultaneously cultivating supportive social environments—can increase the efficacy of interventions aimed at managing anxiety about AI and other technological changes. Such integrative approaches can support students and employees alike in developing adaptive coping strategies, maintaining psychological well-being, and engaging constructively with technological innovations. Third, the study highlights the potential for tailoring interventions to account for interpersonal differences in social support and meaning orientation, which could lead to more personalized and effective mental health programs.

7.3. Research Limitations and Future Directions

While this study provides novel insights, several limitations point to directions for future research. First, the sample was drawn from students at a single university, which may limit the generalizability of the findings. Future research should include more diverse populations across different age groups, occupational backgrounds, and cultural contexts to assess the robustness and cross-cultural applicability of the proposed model. Second, the reliance on cross-sectional and short-term data restricts our understanding of the dynamic nature of the intervention effects. Longitudinal studies and experimental designs are recommended to capture the stability, evolution, and potential delayed effects of mindfulness yoga on AI anxiety, as well as to establish stronger causal inferences. Third, although this study focused on perceived social support as a moderator, other individual and contextual factors—such as personality traits, prior technology experience, and organizational climate—may also shape the relationships among mindfulness, life meaning, resilience, and AI anxiety. Future research should therefore explore broader multi-factor models, incorporating additional predictors and moderators to develop more comprehensive and precise interventions. Addressing these limitations can help refine theoretical understanding and improve the design of targeted, evidence-based practices for managing technology-related anxiety in diverse settings.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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