Environment and Social Psychology (2025) Volume 10 Issue 5 ISSN: 2424-8975 (O)
doi: 10.59429/esp.v10i5.3742 2424-7979 (P)

RESEARCH ARTICLE

Integrating AI chatbots into mental health strategies: Pre-post intervention study on support for unemployed graduates in China

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ABSTRACT

Artificial intelligence (AI) plays a crucial role in tertiary education; reshaping teaching and learning experiences, streamlining administrative tasks, and driving research innovation. This study aims to assess the effectiveness of AI chatbot interventions on unemployed university graduates in China, in reducing anxiety and enhancing career readiness. A mixed-methods research design was employed, incorporating a quantitative approach using a randomized pretest-posttest control group design and a qualitative approach involving focus group discussion. Sixty unemployed graduates in China were randomly assigned to an experimental group (receiving eight structured AI chatbot counseling via Chat GPT); and control group (receiving human counseling and supplementary activities). Anxiety and career readiness were assessed using the Generalized Anxiety Disorder-7 scale (GAD-7) and Career Adapt-Abilities Scale (CAAS). The findings indicated that, following the intervention, the experimental group demonstrated significant improvements in both anxiety and career readiness, and greater than those measured in the control group. In terms of user experience, AI chatbots in counseling offer several advantages, including enhanced accessibility, constant availability, and anonymity. According to university policymakers, counselors, and technology specialists, AI chatbots can be effectively utilized by a large number of students to address diverse mental health concerns, ensuring cost efficiency compared to human counseling. Therefore, AI chatbot interventions represent as a feasible tool within tertiary education for delivering mental health and career development services under the guidance and oversight of counselors or educational advisors. Successful integration requires preparation in terms of leadership support, institutional policies, resource allocation, and capacity building for both students and staff.

Keywords: artificial intelligence; AI chatbot; career readiness; anxiety; unemployed graduates; Chinese tertiary education

1. Introduction

Graduate unemployment in China presents a growing challenge with wide-reaching implications for both economic development and societal cohesion[1]. The rapid increase in university graduates and intensified labor market competition have led to higher unemployment rates, especially among those lacking essential job readiness skills[2]. As of 2023, youth unemployment in urban areas reached nearly 21%, revealing a growing disconnect between the tertiary education system and the labor market. Unemployment among Chinese university graduates has become a pressing social issue, economic productivity. The persistent job

ARTICLE INFO
Received: 25 April 2025| Accepted: 23 May 2025 | Available online: 18 June 2025

CITATION
Zhang GL, Chansaengsee S, Niramitchainont P. Integrating AI chatbots into mental health strategies: pre-post intervention study on support for unemployed graduates in China. *Environment and Social Psychology* 2025; 10(5): 3742 doi:10.59429/esp.v10i5.3742

search stress among recent graduates is closely linked to heightened anxiety, psychological burdens, reduced motivation, self-efficacy and growing mental health concerns[3]. For many graduates, this situation negatively affects their confidence and ability to engage in career planning and decision-making. Similar concerns were echoed in international data showing increased vulnerability to depressive symptoms and suicidal ideation among this demographic[4,5].

Scholars have examined how the rapid expansion of tertiary education has intensified existing concerns. The increase of university enrollment has not corresponded with a proportionate growth in employment opportunities, resulting in an oversupply of graduates and intensified competition for employment[6]. The further reinforcement these findings by demonstrating that academic pressure, combined with uncertain post-graduation prospects, significantly contributes to psychological distress among Chinese university students[7]. Collectively, these studies highlight a widening gap between institutional resources and the evolving needs of students nearing graduation, subsequently lead to the stress and anxiety among graduates. The unemployment-related anxiety adversely affects graduates' mental health and impedes their job-search effectiveness.

Career Readiness is a key to enhance the employment opportunities. In this context, career readiness—defined as the capacity to anticipate, plan for, and effectively

navigate the transition into employment—becomes increasingly relevant[8]. Despite systemic efforts to improve access to tertiary education, many institutions still lack adequate mechanisms and sufficient resources to provide integrated psychological and career support services, particularly regarding the cultivation of career readiness among final-year students[9]. Moreover, traditional counseling remains underutilized in part due to persisting mental health stigma, compounding the difficulty for students needing timely intervention[10]. Hence, the interventions that simultaneously enhance job readiness and address psychological challenges related to unemployment are urgently needed.

In this context, emerging technologies such as AI-driven chatbots is one of the solutions and present an opportunity to bridge these supporting gaps.AI-based chatbots are effective tool offering potentially accessible, low-cost, scalable, and private platforms capable of delivering structured content rooted in cognitive-behavioral principles, career development theory, and career planning frameworks for university students and graduates. These technologies could not only assist them in managing stress and improving career planning; but the accessibility and perceived neutrality also make them especially suitable for students reluctant to seek help through conventional channels. In practical applications, certain AI chatbots have been integrated into mobile mental health applications, such as Woebot, which provides users with immediate and personalized support. These chatbots employ cognitive-behavioral therapy (CBT) techniques to facilitate therapeutic conversations, thereby contributing to the enhancement ofusers' mental well-being[11,13].

This study aims to assess the effectiveness of AI chatbot interventions on unemployed university graduates in China, in reducing anxiety and enhancing career readiness; and explore the feasibility and guidelines in integrating AI chatbots into Chinese tertiary education; represents a feasible and innovative approach to addressing the complex intersection of mental health and employability among graduates. The findings will not only contribute to the growing body of knowledge on AI interventions in mental health and career counseling but also guide universities, policymakers, and career services in creating more effective support structures for graduates transitioning into the workforce.

2. Literature review : AI chatbot as a mental health intervention

AI chatbots have recently emerged as essential components within digital ecosystems, operating at the intersection of automation, personalization, and accessibility. Their functionality is developed through a

multidisciplinary approach, integrating theories from artificial intelligence, cognitive psychology, human-computer interaction (HCI), and educational technology. These chatbots employ natural language processing (NLP) and deep learning, which are particularly prominent in enabling natural and interactive exchanges with users. By analyzing user input and leveraging embedded knowledge, they support dynamic and diverse interactions. Engineered to accurately interpret user queries, AI chatbots generate contextually relevant responses. Currently, they are considered powerful tools with a broad range of applications across various industries—for example, assisting in coding problem-solving in programming, enhancing learning outcomes in education, maximizing customer satisfaction in the retail sector, and supporting policy formulation and citizen engagement in public administration[14,15].

AI-driven chatbots have been introduced in various fields, including education and healthcare, as tools to provide structured and scalable support. In the context of psychological interventions, research has shown that chatbots can deliver simplified cognitive-behavioral techniques and help users manage mild to moderate anxiety symptoms[16,17]. Their ability to offer on-demand access, maintain user anonymity, and guide users through structured tasks makes them suitable for initial support, especially where professional counseling services are limited. Nevertheless, concerns remain regarding their limitations in handling complex emotional conditions, offering empathy, and ensuring ethical data use[18,19]. The absence of human judgment in nuanced cases highlights the importance of viewing these tools as complementary rather than substitutes for professional counseling.

However, recent advancements in artificial intelligence (AI) offer a promising solution to these challenges. AI-powered chatbots, which have been effectively integrated into mental health interventions in other contexts, provide a scalable, accessible, and cost-effective means of delivering mental health support. In China, where mobile phone penetration is exceptionally high, AI-powered chatbots can be deployed through mobile platforms, making mental health support available 24/7. These chatbots can engage users in conversations and counseling, offer some counseling techniques such as cognitive-behavioral therapy (CBT), and provide immediate feedback, which is critical for reducing symptoms of anxiety and depression [20]. Given their ability to provide personalized and on demand assistance, these chatbots present a powerful tool for improving the mental health of unemployed graduates, offering an innovative, cost-effective approach to tackling a pressing issue.

In the career support domain, AI chatbots have been integrated into systems designed to build user confidence, set career goals, and simulate job-related scenarios. These systems often align with the Career Adapt-Abilities framework, which emphasizes personal agency in managing career development[21]. Evidence suggests that chatbot-guided interventions can help individuals improve their readiness for employment and reduce stress related to job seeking[22,23]. Within the Chinese context, recent studies have noted increasing acceptance of digital tools among students, especially when the tools are designed to be flexible and discreet[24]. However, most existing studies focus on user satisfaction or adoption, with limited empirical work on outcome-based evaluation.

ChatGPT is one of the widely used AI chatbot that has been rapidly and continuously developed to meet global users' needs including China. Therefore, in this study use ChatGPT as intervention tool for experimental group with two main reasons:

1) Language proficiency: ChatGPT, developed by OpenAI, is trained on a diverse dataset that includes multiple languages, enabling it to comprehend and generate text in Chinese. This multilingual training allows ChatGPT to engage in conversations across various topics in Chinese; 2) Specialized Training for CBT: While ChatGPT has a broad understanding of language, delivering effective CBT-based counseling requires

specialized training. Researchers have developed models like CBT-LLM, a Chinese large language model fine-tuned specifically for CBT-based mental health question-answering. This model was trained on a dataset designed for Chinese psychological health Q&A, emphasizing professional and structured responses aligned with CBT principles[25-27].

Although AI chatbots are widely used for providing psychological counseling, they still have certain drawbacks. However, AI researchers have been striving to study and develop solutions to bridge these gaps such as: 1) Limitation in Building Rapport: effective therapy relies heavily on the therapist's ability to build rapport and convey empathy, elements that are inherently human. ChatGPT, as an AI, lacks genuine emotional understanding, which can result in interactions that feel impersonal or fail to provide the emotional support on clients' need. To compensate for the lack of human empathy, AI chatbots have been designed to offer emotional support through guided conversations and provides cognitive support through CBT-based exercises and allows users to express their emotional problems, thereby reducing mental distress. 2) Cultural Sensitivity Challenges: understanding and appropriately responding to cultural nuances is crucial in therapy. ChatGPT may not fully grasp the cultural contexts and stigmas associated with mental health in Chinese society, potentially leading to responses that are culturally insensitive or ineffective. Studies have highlighted the importance of cultural considerations in mental health interventions and the limitations of AI in this regard. To enhance the cultural sensitivity, efforts have been made to improve chatbots' understanding of cultural nuances by incorporating culturally relevant data into their training. This approach helps the chatbot provide responses that are more aligned with the cultural context of Chinese users, thereby increasing the effectiveness of the intervention. By implementing AI chatbots in psychological counseling, researchers aim to overcome the limitations of AI chatbots in delivering CBT-based counseling in the Chinese language, enhancing their effectiveness and safety as mental health intervention tools [28-30].

3. Methods

3.1. Research design

This study employed a mixed-methods approach, integrating both quantitative and qualitative research. The quantitative component utilized a true experimental design randomized pretest – posttest control group design; to evaluate the effectiveness of an AI chatbot in reducing unemployment-related anxiety and enhancing career readiness among unemployed graduates in China. While the qualitative component utilized focus group discussion in exploring the feasibility of implementing AI chatbots to support the mental health and career readiness of unemployed graduates. **Figure 1** presents the research design.

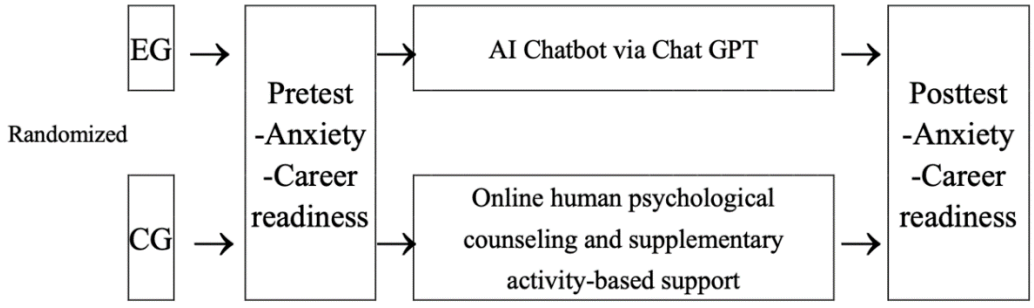

Figure 1. Research design.

3.2. Participants

Participants for evaluating the effectiveness of an AI chatbot in reducing unemployment-related anxiety and enhancing career readiness among unemployed graduates were recruited using multi-stage sampling through online platforms, following an announcement made by the researcher on the BOSS Zhipin website (www.bosszhipin.com); which is China's largest online recruitment platform, connecting job seekers directly with employers through its mobile app. Established in 2014, it introduced a "Direct Recruitment Model" that facilitates instant messaging between candidates and hiring managers, enhancing communication efficiency. The platform leverages artificial intelligence algorithms and big data to provide accurate job and candidate recommendations. Initially, purposive sampling was employed to select 60 unemployed graduates, aged between 22 and 25 years, who had been unemployed for a period of three to six months following university graduation in China and were willing to attend a four-week intervention program. All participants were required to complete the Generalized Anxiety Disorder-7 (GAD-7) Scale and the Career Adapt-Abilities Scale (CAAS), with their scores recorded as baseline assessment results. Subsequently, simple random sampling was used to assign 30 participants to the experimental group, while the remaining 30 were randomly assigned to the control group.

Participants for exploring the feasibility of implementing AI chatbots to support the mental health and career readiness of unemployed graduates were recruited using purposive sampling. Twenty participants from the experimental group who were willing to provide insight feedback of AI Chatbot in counseling were selected. Additionally, ten key stakeholders with more than three years of experience; comprising four university counselors, four university policymakers, and two technology specialists—were included in the study.

3.3. Intervention and its procedure

Intervention program for the experimental group: the AI chatbot intervention, utilizing ChatGPT in Chinese, was implemented for participants in the experimental group. Each participant engaged in sessions lasting 30 minutes, twice a week over a four-week period (March 1–31, 2025), totaling eight sessions and 240 minutes of interaction. Each session included structured interaction practice, feedback, a conclusion, and reinforcement for the participants. The objective of the intervention was to facilitate meaningful engagement with the chatbot, minimizing random or unproductive communication and maintaining a focus on interactions that supported mental health to reduce anxiety and career readiness. The core functions of ChatGPT in this intervention included career guidance, anxiety management, interactive engagement, data collection, and the evaluation of feasibility in the Chinese language context.

Intervention program for the control group: the online human psychological counseling and supplementary activity-based support, was implemented for participants in the control group. Each session lasted 30 minutes and was conducted twice a week over a four-week period (March 1–31, 2025), totaling eight sessions and 240 minutes of engagement. Each week consisted of two sessions: (1) Traditional Psychological Counseling (30 minutes, online), and (2) Supplementary Activity-Based Support such as physical activity, skill development, mindfulness and relaxation and peer sharing (30 minutes, online activities). This intervention aimed to address unemployment-related anxiety and enhance career readiness among participants.

Both the AI chatbot intervention and the control group intervention were facilitated and monitored by a certified psychological counselor in China by the Occupational Skill Testing Authority and the Chinese Association for Mental Health.

3.4. Measurement

This study employed two standardized instruments to evaluate intervention outcomes. The Generalized Anxiety Disorder-7 (GAD-7) scale was employed to assess anxiety. It was developed by Spitzer et al. [31], was utilized. The GAD-7 is a brief self-report tool commonly used in clinical and research settings to measure general anxiety severity over a recent two-week period. Its reliability and sensitivity to intervention effects make it suitable for university populations experiencing stress. The reliability of the instrument, as measured by Cronbach's alpha coefficient, was 0.939.

The Career Adapt-Abilities Scale (CAAS) was employed to assess career readiness. It was developed by Savickas & Porfeli[32], and was used to assess four key dimensions of career adaptability: concern, control, curiosity, and confidence. The CAAS is widely recognized for its cross-cultural applicability and has been validated in both Western and Asian contexts, including among Chinese university students. In this study, it provided a framework to gauge participants' readiness and psychological resources for managing career transitions. The reliability of the instrument, as measured by Cronbach's alpha coefficient, was 0.955.

3.5. Data analysis

A paired t-test was employed to compare pre and post-intervention anxiety and career readiness scores within the experimental group. An independent t-test was used to compare baseline scores between the experimental and control groups. Content analysis was conducted to examine qualitative data and derive guidelines for tertiary institutions to support graduates facing unemployment-related anxiety and employability challenges.

3.6. Ethical considerations

The study received ethical approval from Mahidol University's Institutional Review Board. Informed consent was obtained from all participants, with confidentiality and voluntary withdrawal rights guaranteed. Data were anonymized and securely stored.

4. Findings

A total of 60 unemployed graduates participated in the study, with equal distribution between the experimental and control groups (50% each). The experimental group had an equal gender distribution (50% male, 50% female), with a mean age of 24.5 years and an average unemployment duration of five months. The control group comprised a majority of female participants (57%), with an average age of 24.5 years and an average unemployment duration of 4.5 months. The baseline scores for anxiety and career readiness among unemployed graduates in both the experimental and control groups are presented as shown in **Table 1**.

Table 1. The baseline scores for anxiety and career readiness among unemployed graduates in both the experimental and control groups.

Variables	EG		CG		t	p
	M	SD	M	SD		
Anxiety	12.533	1.279	13.100	1.029	1.890	0.064
Career readiness	32.167	1.555	32.233	1.591	0.164	0.870

The independent samples t-test revealed no statistically significant differences between the experimental and control groups in terms of anxiety (M-EG = 12.533, M-CG = 13.100, t = 1.890, p = 0.064) and career readiness (M-EG = 32.167, M-CG = 32.233, t= 0.164, p = 0.870).

These results confirm that both groups were comparable at baseline, allowing subsequent differences to be attributed to the intervention rather than pre-existing group differences.

Therefore, this study examines the effectiveness and acceptability of AI chatbot interventions in reducing anxiety and increasing career readiness among unemployed graduates in China. The results, as illustrated in the two figures, clearly demonstrate the positive impact of AI chatbot in reducing unemployment-related anxiety (measured by GAD-7) and enhancing career readiness (measured by CAAS) among unemployed graduates in China in the experimental group, compared to those in the control group, over the course of eight intervention sessions as shown in **Figure 2**.

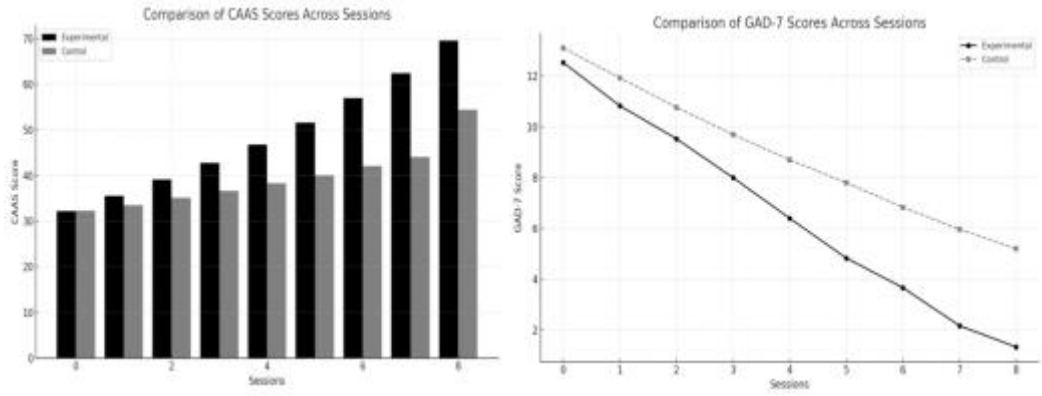

Figure 2. Comparison of career readiness & anxiety across sessions between experimental and control group.

From the above development of experimental and control group, The assumptions for the t-test were tested before analysis, and the results indicated that both the pre-test and post-test scores for career readiness (CAAS) and anxiety (GAD-7) were normal distribution as shown in **Figure 3**.

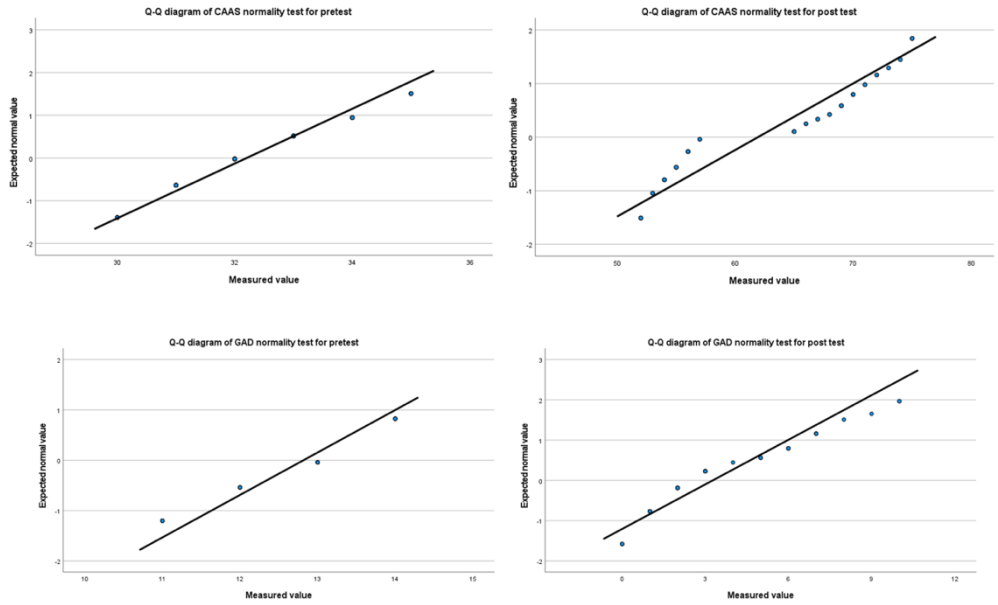

Figure 3. Normal distributions of pre-test and post-test scores for career readiness and anxiety.

After the assumption was tested, the results are structured according to the study's four hypotheses and the corresponding statistical analyses with the additional qualitative data from focus group discussion:

Hypothesis 1: Unemployed graduates in the experimental group demonstrated lower levels of anxiety following the intervention.

Table 2. The comparison of anxiety levels among unemployed graduates in the experimental group before and after the intervention.

Variables	Pre-test		Post-test		t	p
	M	SD	M	SD		
Anxiety	12.53	1.28	1.33	0.92	33.91	0.001**

Table 2. presents the result of the paired samples t-test, which revealed that unemployed graduates in the experimental group demonstrated significantly lower levels of anxiety following the intervention (Pre-M = 12.53, Post-M = 1.33, t= 33.91, p < .01).

Hypothesis 2: Unemployed graduates in the experimental group demonstrated higher levels of career readiness following the intervention.

Table 3. The comparison of career readiness levels among unemployed graduates in the experimental group before and after the intervention.

Variables	Pre-test		Post-test		t	p
	M	SD	M	SD		
Career readiness	32.17	1.56	69.50	3.26	34.26	0.001**

Table 3. presents the result of the paired samples t-test, which revealed that unemployed graduates in the experimental group demonstrated significantly higher levels of career readiness following the intervention (Pre-M = 32.17, Post-M = 69.50, t= 34.26, p < .01).

Hypothesis 3: Unemployed graduates in the experimental group exhibited lower levels of anxiety compared to those in the control group

Table 4. The comparison of career readiness levels among unemployed graduates in the experimental group before and after the intervention.

Variables	Levene's test	p	EG		CG		t	p
			M	SD	M	SD		
Anxiety	1.61	0.225	1.333	0.922	5.200	2.524	7.880	0.000***

Table 4. presents the result of the independent samples t-test, which revealed that unemployed graduates in the experimental group exhibited significantly lower levels of anxiety compared to those in the control group (EG-M = 1.333, CG-M = 5.200, t= 34.26, p < .001).

Hypothesis 4: Unemployed graduates in the experimental group exhibited higher levels of career readiness compared to those in the control group

Table 5. The comparison of career readiness levels among unemployed graduates in the experimental group before and after the intervention.

Variables	Levene's test	p	EG		CG		t	p
			M	SD	M	SD		
Career readiness	6.13	0.026*	69.500	3.256	54.367	1.712	22.532	0.000***

Table 5. presents the result of the independent samples t-test, which revealed that unemployed graduates in the experimental group exhibited significantly higher levels of career readiness compared to those in the control group (EG-M = 69.500, CG-M = 54.367, t= 22.532, p < .001).

Based on the findings from the four hypotheses, additional insights emerged from researchers' observations and participants' reflection notes during the intervention. Although the AI chatbot used was not custom-designed, its adaptation for the intervention added significant value. The sessions were structured using principles from educational management and cognitive-behavioral strategies, enabling participants to manage stress and develop clearer career plans. The design emphasized gradual progress through weekly sessions, integrating theoretical concepts with practical applications. A key contribution of this study lies in the implementation model it presents—leveraging existing AI platforms in ways that align with student needs. The researcher played a central role in planning and integrating the sessions into a culturally relevant and meaningful program, demonstrating how thoughtfully applied existing tools can yield practical and impactful outcomes.

To complement the quantitative findings, a focus group discussion was conducted with ten key stakeholders, including four university counselors, four university policymakers, and two technology specialists. The discussion aimed to gather insights into the practical feasibility and implementation guidelines for integrating AI chatbots into tertiary education systems to support mental health and career development services. Thematic analysis revealed three major themes:

Table 6. Stakeholders' recommendations on the practical feasibility and guidelines for implementing AI chatbots in tertiary education systems to support mental health and career development services.

Theme	Experimental Group	University Policymakers	University Counselors	Technology specialists
Perceived Value	*"It didn't feel like I was being judged, so I could really think about my next step."*	*"AI can help expand services to rural or underfunded regions."*	*"Students are more likely to open up to a bot than a counselor during stressful times."*	*"We see the tech is there, but integration with university systems still needs refinement."*
Challenges & Limitations	*"It sometimes misunderstood what I meant, and that was frustrating."*	*"Without clear policy guidelines, it's risky to rely on AI advice."*	*"We worry about over-dependence— students still need real-life guidance."*	*"Emotion recognition is still basic; tone and context aren't fully captured."*
Recommendations & Enablers	*"I think it's helpful if there's a human to explain or support when needed."*	*"We'd consider supporting this with clear ethical review structures."*	*"Training should be part of counselor development programs."*	*"Building in safety protocols will help acceptance among engineers and IT teams."*

Table 6. present the stakeholders' recommendations which shared insights into the practical feasibility and implementation guidelines for integrating AI chatbots into tertiary education systems to support mental health and career development services, as outlined below

1) Perceived value and effectiveness:

Participants in the experimental group with experience using the AI chatbot widely acknowledged its structured, accessible, and responsive support, particularly beneficial for individuals without immediate access to human counselors. They also appreciated the chatbot's 24/7 availability and nonjudgmental tone, which encouraged self-reflection, as well as the consistency in saving ongoing dialogues and the ability to engage with guided prompts at their own pace.

Similarly, university counselors, university policymakers and technology specialists regarded the AI chatbot as an effective supplement to human counseling services, addressing critical gaps such as the limited availability of psychological counselors, long waiting times in scheduling, ease of use for the digitally savvy generation, and the need for cost-effective and affordable mental health support.

2) Challenges and limitations:

Participants in the experimental group, along with university counselors, university policymakers and technology specialists, expressed concerns regarding the chatbot's emotional intelligence. Users noted its limited capacity to navigate nuanced interpersonal dynamics or convey empathy during emotionally distressing moments.

Additional challenges included low digital literacy among some users, initial uncertainty about how to navigate the AI chatbot, reluctance to trust AI-driven systems, and the lack of institutional infrastructure for proper onboarding and user support. Moreover, participants observed that the paid version of the chatbot demonstrated greater effectiveness compared to the free version, raising concerns about accessibility and equity in implementation.

3) Implementation Enablers:

Participants in the experimental group suggested that a hybrid model—combining sessions with human counselors and the AI chatbot—would be more effective in enhancing emotional and contextual responsiveness. In this model, human counselors would be primarily involved during the initial and concluding sessions, while the AI chatbot would provide ongoing support in between. This approach also facilitates the implementation of escalation mechanisms for high-risk individuals who may require immediate professional intervention. Participants further emphasized the importance of user training programs to help individuals select AI chatbots appropriate for their personal concerns and to utilize these tools effectively, maximizing the potential of the AI technology.

University counselors, University policymakers and technology specialists outlined a phased approach to AI chatbot implementation. This begins with leadership support at the policy level to integrate AI into teaching, learning, mental health, and career development services. This is followed by the allocation of budgets, infrastructure development, and the provision of supporting resources, including access to paid software and necessary devices. Capacity building through user training and digital literacy initiatives was identified as essential—not only for psychological counselors but also for lecturers, academic advisors, and technology staff—so they can effectively use AI in educational contexts and guide students in its appropriate use during periods of anxiety or mental distress. Ethical considerations regarding the use of AI were also highlighted as critical. Finally, the establishment of mentoring and follow-up mechanisms was recommended to monitor usage, redesign support policies, and improve both user capacity and satisfaction over time.

5. Discussion

The findings of the study supported all hypotheses. This reflect the empirical support for the integration of AI chatbot interventions into mental health and career readiness for unemployed graduates in China.

As the unemployed graduates in the experimental group demonstrated significantly lower levels of anxiety following the intervention (Hypothesis 1); and also exhibited significantly lower levels of anxiety compared to those in the control group (Hypothesis 3). These findings align with previous studies demonstrating the effectiveness of digital cognitive-behavioral therapy (CBT) tools[33-35]. These findings demonstrate that structured chatbot interventions can deliver measurable psychological benefits, especially in settings with limited access to professional counseling[36]. The continuity and cumulative engagement in digital interventions will reinforces the achieve behavioral and attitudinal change[37].

The unemployed graduates in the experimental group demonstrated significantly higher levels of career readiness following the intervention (Hypothesis 2); and also exhibited significantly higher levels of career readiness compared to those in the control group (Hypothesis 4). These findings align with prior studies linking adaptability training to enhanced employability outcomes[38]. This suggests that AI-facilitated, structured interactions can foster vocational competencies related to concern, control, curiosity, and confidence, which are key for navigating transitions in a competitive labor market[39].

In addition to its empirical findings, this study highlights stakeholders' recognition of AI chatbots as valuable tools, particularly due to their 24/7 availability and guided support. However, concerns were raised regarding the chatbot's limited emotional intelligence, low digital literacy among users, and equity issues related to the superior functionality of paid versions. A hybrid model integrating AI chatbots with human counseling was recommended, supported by institutional commitment, user training, and ethical oversight to ensure effective implementation. This study contributes a novel application model by structuring an existing hybrid framework that integrates AI chatbots and human counseling into mental health and career development services within tertiary education. Although the chatbot was not custom-developed, the adaptation strategy featured a carefully designed session flow, the integration of career development theory, and alignment with cognitive-behavioral principles. This model offers a balance between scalability and contextual relevance, demonstrating that human-centered design in AI interventions can effectively bridge mental health support gaps in higher education. These findings align with previous research, which noted that anonymity and convenience enhance user engagement with mental health resources[40-42]. This also contributes to policy discussions in Chinese tertiary education regarding the expansion of student support through technology-enhanced services. Integrating chatbot-based interventions into existing institutional frameworks may extend support provision while reducing the burden on human resources, particularly in universities facing high demand for counseling and career guidance[43].

6. Conclusion and implications

This study aims to assess the effectiveness of AI chatbot interventions in reducing anxiety and enhancing career readiness among unemployed university graduates in China, as well as to explore the feasibility and implementation guidelines for integrating AI chatbots into Chinese tertiary education. The findings are based on interventions with 60 unemployed graduates—30 in the experimental group utilizing an AI chatbot (ChatGPT) adapted for Chinese-language use, and 30 in the control group receiving online human psychological counseling and supplementary activity-based support—support the integration of chatbot-assisted tools within mental health services. The unemployed graduates in the experimental group demonstrated significantly lower levels of anxiety and significantly higher levels of career readiness following the intervention, as well as compared to those in the control group. Focus group discussions with university counselors, policymakers, and technology specialists further confirmed that AI chatbots are perceived as structured, accessible, and responsive tools that effectively supplement human counseling, particularly for students who lack immediate access to traditional support services. They valued features such as 24/7 availability, nonjudgmental tone, and guided self-reflection. However, concerns were raised about the chatbot's limited emotional intelligence, inability to handle complex interpersonal dynamics, and challenges like low digital literacy, lack of onboarding infrastructure, and distrust in AI systems. Equity concerns emerged from the greater effectiveness of the paid version over the free one. To address these issues, stakeholders recommended a hybrid model integrating AI chatbots with human counselors—using chatbots for ongoing support and humans for initial and final sessions. They also emphasized the need for

policy-level commitment, resource allocation, staff capacity building, ethical guidelines, and continuous monitoring to ensure effective and inclusive implementation.

The practical implications of this study are as follows:

1) AI chatbots can be utilized to extend mental health and career development services in tertiary education. Universities could enhance support for unemployed graduates through the use of AI chatbot tools. First, integrating structured chatbot interventions into university systems may expand access to career and mental health support, particularly in contexts where professional counselors are limited. Second, AI chatbots can provide ongoing support both before and after graduation, helping to fill service gaps and effectively supplement human counseling. This should be conducted under the guidance and oversight of counselors or educational advisors to ensure responsiveness, ethical integrity, and appropriate monitoring of students in severe conditions.

2) As this study highlights the benefits of AI chatbots in providing cost-effective and affordable mental health support, as well as supporting other educational activities. Universities seeking to adopt such tools should initiate the process with strong leadership commitment and strategic policy support to embed AI within teaching, learning, mental health, and career guidance services. This should be followed by the allocation of financial resources, enhancement of digital infrastructure, and the provision of essential tools, including licensed software and compatible technological devices.

3) Capacity building through user training programs should be provided for both students and staff. For students, training should focus on selecting AI chatbots appropriate to their personal concerns, ethical considerations and using these tools effectively to maximize the potential of the technology. For staff, training should include managing digital programs and recognizing when to refer students to human counseling services. It is also recommended that institutions introduce chatbot support early in the student journey, rather than waiting until after graduation, to help students build emotional awareness and career planning skills in advance.

4) Further research should explore the long-term outcomes of such interventions and examine how this model can be expanded to support teaching, learning, and student affairs services within tertiary education contexts.

5) This study focused on counseling interventions with a limited sample size of 30 participants per group. Future research should include a larger sample size to strengthen and validate the findings. In addition, the inclusion of more independent variables; and analyzed using inferential statistical methods, would provide deeper insights into the effectiveness of AI chatbot implementation in tertiary education. These variables may include internal factors such as users' readiness, attitudes toward AI technology, and self-efficacy in coping with personal issues, as well as external factors such as university policies, learning and equipment support, and the role of counselors. Considering both internal and external factors will be beneficial for tertiary education institutions in formulating concrete and targeted policies to support students effectively in the future.

Conflict of interest

The authors declare no conflict of interest.

References

1. International Labour Organization. (2023). Global employment trends for youth 2023: Technology and the future of jobs. https://www.ilo.org

2. Chen, W., & Zhao, Y. (2020). Graduate unemployment and job readiness: The challenges for Chinese universities. Chinese Education and Society, 53(2), 135–151.
3. Chen, X., Li, H., & Zhang, Y. (2021). The psychological impact of unemployment on recent graduates. Journal of Mental Health Studies, 28(3), 245–261.
4. International Labour Organization. (2023). Global employment trends for youth 2023: Technology and the future of jobs. https://www.ilo.org
5. JAACAP. (2024). The effectiveness of pretest-posttest designs in mental healthresearch. Journal of the American Academy of Child & Adolescent Psychiatry, 63(1), 45–62.
6. Yang, C.C., & Sheng, S.C. (2017). Is higher education expansion related to increasing unemployment rates? A comparative analysis of Japan, South Korea, and Taiwan. International Journal of Chinese Education, 5(2). https://brill.com/view/journals/ijce/5/2/ijce.5.issue-2.xml
7. Liu, J. (2023). Well-being of Chinese students: A review in the context of education.International Journal of Chinese Education, 12(1). https://doi.org/10.1177/2212585X231163388
8. Savickas, M. L., & Porfeli, E. J. (2012). Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. Journal of Vocational Behavior, 80(3), 661–673. https://doi.org/10.1016/j.jvb.2012.01.011
9. Xu, Q., Chen, R., & Zhang, L. (2023). The integration of AI-driven mental health tools into university career services. Journal of Higher Education Policy, 41(3), 321–340.
10. Li, Y., & Zhu, J. (2023). The impact of stigma on help-seeking behavior among young adults in China. Journal of Psychological Well-being, 10(2), 89–104.
11. Fitzpatrick, K. K., Darcy, A., & Vierhile, M. (2017). Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent. JMIR Mental Health, 4(2),19.https://doi.org/10.2196/mental.7785
12. Chew, H. S. J. (2022). The use of artificial intelligence–based conversational agents (Chatbots) for weight loss: scoping review and practical recommendations. JMIR medical informatics, 10(4), e32578.
13. Shankar, S., et al. (2025). Development and feasibility testing of an AI-powered chatbot for early detection of caregiver burden: Protocol for a mixed methods feasibility study. Frontiers in Psychiatry, 16, Article 1553494. https://doi.org/10.3389/fpsyt.2025.1553494.
14. Tlili, A., et.al. (2023). What if the devil is my guardian angel: ChatGPT as a case study of using chatbots in education. Smart learning environments,10(1), 15.
15. Antony, S., & Ramnath, R. (2023). A Phenomenological exploration of students'perceptions of AI chatbots in higher education. IAFOR Journal of Education, 11(2), 7-38.
16. Fitzpatrick, K. K., Darcy, A., & Vierhile, M. (2017). Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent. JMIR Mental Health, 4(2),19.https://doi.org/10.2196/mental.7785
17. Inkster, B., Sarda, S., & Subramanian, V. (2018). An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: Real-world data evaluation mixed-methods study. JMIR mHealth and uHealth, 6(11), e12106.
18. Manole, A., Cârciumaru, R., Brînzaș, R., & Manole, F. (2024). Harnessing AI in anxiety management: A chatbot-based intervention for personalized mental health support. Information, 15(12), 768.
19. Zielinski, C et al. (2023). Chatbots, generative AI, and scholarly manuscripts:
20. WAME recommendations on chatbots and generative artificial intelligence in relation to scholarly publications. Colombia Médica, 54(3).
21. Fitzpatrick, K. K., Darcy, A., & Vierhile, M. (2017). Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent. JMIR Mental Health, 4(2),19.https://doi.org/10.2196/mental.7785
22. Savickas, M. L., & Porfeli, E. J. (2012). Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. Journal of Vocational Behavior, 80(3), 661–673. https://doi.org/10.1016/j.jvb.2012.01.011
23. Almalki, et al. (2022). Career readiness among Saudi pharmacy students: Exploring the need for and the impact of career counseling services. Advances in Medical Education and Practice, 13, 1267–1275.
24. Dawood, E. (2024). Assessing the effectiveness of chatbots in providing personalized academic advising. Studies in Technology Enhanced Learning, 4(1).
25. Xu, Q., Chen, R., & Zhang, L. (2023). The integration of AI-driven mental health tools into university career services. Journal of Higher Education Policy, 41(3), 321–340.
26. Na, H. (2024a). CBT-LLM: A Chinese large language model for cognitive behavioral therapy-based mental health question answering. arXiv preprintarXiv:2403.16008.

27. Na, H. (2024b). CBT-LLM: A Chinese large language model for cognitive behavioral therapy-based mental health question answering. In Proceedings of the 13th Language Resources and Evaluation Conference (pp. 1234–1245). European Language Resources Association.
28. Sabour, S., Zhang, W., Xiao, X., et al. (2022). Chatbots for mental health support: Exploring the impact of Emohaa on reducing mental distress in China. arXiv preprint arXiv:2209.10183.
29. Na, H. (2024a). CBT-LLM: A Chinese large language model for cognitive behavioral therapy-based mental health question answering. arXiv preprintarXiv:2403.16008.
30. Na, H. (2024b). CBT-LLM: A Chinese large language model for cognitive behavioral therapy-based mental health question answering. In Proceedings of the 13th Language Resources and Evaluation Conference (pp. 1234–1245). European Language Resources Association.
31. Sabour, S., Zhang, W., Xiao, X., et al. (2022). Chatbots for mental health support: Exploring the impact of Emohaa on reducing mental distress in China. arXiv preprint arXiv:2209.10183.
32. Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A brief measure for assessing generalized anxiety disorder: The GAD-7. Archives of Internal Medicine, 166(10), 1092–1097. https://doi.org/10.1001/archinte.166.10.1092
33. Savickas, M. L., & Porfeli, E. J. (2012). Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. Journal of Vocational Behavior, 80(3), 661–673. https://doi.org/10.1016/j.jvb.2012.01.011
34. Fitzpatrick, K. K., Darcy, A., & Vierhile, M. (2017). Delivering cognitive behavior therapy to young adults with symptoms of depression and anxiety using a fully automated conversational agent. JMIR Mental Health, 4(2),19.https://doi.org/10.2196/mental.7785
35. Inkster, B., Sarda, S., & Subramanian, V. (2018). An empathy-driven, conversational artificial intelligence agent (Wysa) for digital mental well-being: Real-world data evaluation mixed-methods study. JMIR mHealth and uHealth, 6(11), e12106.
36. Franze, A., Galanis, C. R., & King, D. L. (2023). Social chatbot use (e.g., ChatGPT) among individuals with social deficits: Risks and opportunities. Journal of Behavioral Addictions, 12(4), 871–872.
37. Rajala, R., Hakkarainen, V., Westerlund, M., & Sharma, S. (2023). Digital service innovation with AI: A systematic review and research agenda. Journal of Business Research, 157, 113609.
38. Almalki, et al. (2022). Career readiness among Saudi pharmacy students: Exploring the need for and the impact of career counseling services. Advances in Medical Education and Practice, 13, 1267–1275.
39. Savickas, M. L., & Porfeli, E. J. (2012). Career Adapt-Abilities Scale: Construction, reliability, and measurement equivalence across 13 countries. Journal of Vocational Behavior, 80(3), 661–673. https://doi.org/10.1016/j.jvb.2012.01.011
40. Trappey, A. J., Lin, A. P., Hsu, K. Y., Trappey, C. V., & Tu, K. L. (2022). Development of an empathy-centric counseling chatbot system capable of sentimental dialogue analysis. Processes, 10(5), 930.
41. Chew, H. S. J. (2022). The use of artificial intelligence–based conversational agents (Chatbots) for weight loss: scoping review and practical recommendations. JMIR medical informatics, 10(4), e32578.
42. Zielinski, C et al. (2023). Chatbots, generative AI, and scholarly manuscripts: WAME recommendations on chatbots and generative artificial intelligence in relation to scholarly publications. Colombia Médica, 54(3).
43. Ghosh, S., & Ghosh, S. (2022). AI-based career counseling with chatbots. International Journal of Engineering Applied Sciences and Technology, 7(1), 245–249.
44. Xu, Q., Chen, R., & Zhang, L. (2023). The integration of AI-driven mental health tools into university career services. Journal of Higher Education Policy, 41(3), 321–340.