IAES International Journal of Artificial Intelligence (IJ-AI)
Vol. 13, No. 3, September 2024, pp. 2635~2644
ISSN: 2252-8938, DOI: 10.11591/ijai.v13.i3.pp2635-2644

Chatbot with ChatGPT technology for mental wellbeing and emotional management

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Article Info

Article history:

Received Dec 1, 2023
Revised Jan 24, 2024
Accepted Feb 10, 2024

Keywords:

Chatbot
ChatGPT
Emotional disorder
Health
Mental health

ABSTRACT

There is a growing concern among the world's population about mental health in work, academics, and other contexts where stress, anxiety, and depression are common problems that negatively impact mental health. This study evaluates a chatbot powered by ChatGPT, offering a novel perspective on emotional intervention and mental well-being. It highlights the urgency of this approach in a context where mental health is critical, providing value by combining advanced technologies with emotional management. A multi-faceted approach was implemented to evaluate both usability and technical performance. The usability of the chatbot was evaluated by users using the system usability scale (SUS), while the technical performance was evaluated by experts. The active participation of 15 users provided a detailed perspective, resulting in an average usability of 83, reflecting a positive experience in interacting with the system. At the same time, five experts, through technical metrics, assigned an average technical performance of 4.28, indicating solid operational effectiveness. In conclusion, although more research is needed to customize and optimize chatbots over the long term, this approach holds promise for addressing mental health issues in a variety of settings and represents the integration of artificial intelligence to the benefit of those seeking help managing emotional disorders.

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1. INTRODUCTION

Mental health has become a pressing public health issue in light of the growing global concern about the incidence of mental disorders, which affect both the quality of life of individuals and the economies of societies [1], [2]. The demand for mental health services is increasing significantly, and it is imperative to find solutions that are accessible, effective, and economically viable [3]. Furthermore, this challenge is compounded by the inequality in mental healthcare, as many individuals in need of assistance do not receive it due to the negative stigma associated with mental healthcare, the scarcity of specialized professionals, and limitations in terms of physical accessibility [4]. All of this underscores the need for more inclusive and accessible approaches to mental health.

In this sense, the adoption of conversational agent solutions, such as chatbots and robots, in the field of mental healthcare is experiencing rapid growth and gaining increased popularity among the population [5], [6]. Furthermore, chatbots can address the limitations that exist in the availability of traditional healthcare professionals. In this sense, they could play a crucial role in reducing the worrying rates of mental health

disorders [7]. Given their affordability and cost-effectiveness, these automated chat applications show encouraging potential in the field of mental health treatment [8].

Proper management of mental well-being is essential to maintaining a healthy balance in daily life, and although there are various sources of information on the subject, it is not always accessible or personalized. Many people do not have the support or time to seek out resources and advice to effectively manage stress, anxiety, and other emotional and mental issues. To address this challenge, this study proposes an interactive and personalized chatbot integrated with ChatGPT to provide advice, tips, guidelines, and recommendations on how to manage stress, anxiety, and other factors that influence people's mental well-being, especially for people who work and/or study, who are much more likely to experience problems with their mental well-being due to the increasing pressures of their professional and academic lives. Furthermore, the application is based on Python technology and is implemented as a mobile-responsive web application, allowing easy and convenient access for users anytime, anywhere.

The importance of this solution is that it provides a quick and effective means of improving people's mental well-being, helping them to face everyday challenges and develop mental self-care skills through the chatbot. Currently, chatbots are presented as a tool with great potential to support public health initiatives [9]. In addition, the use of mobile solutions in mental health is becoming more common, as they can expand the availability of treatment and reduce associated costs [10]. In parallel, the use of artificial intelligence in health is increasing [11], [12]. In this sense, the conversational agent in this study incorporates ChatGPT, a recently developed large language model (LLM) trained on a large textual dataset, to engage in conversations with users [13]. This LLM is a milestone in artificial intelligence and has made significant advances in natural language processing that have been widely recognized. It can comprehend and generate human language, and its use extends across multiple domains, including automated customer support and chatbot design, among other areas [14].

By using ChatGPT's AI, the chatbot will be able to provide contextualized and personalized responses, adapting to the individual needs of each user. This holds immense significance because personalizing mental health advice is a critical factor in meeting the diverse needs and preferences of individuals seeking support for mental health challenges [15]. In addition, its implementation in a web application that can be adapted to mobile devices ensures accessibility and convenience for users with busy schedules.

2. METHOD

2.1. Development

The chatbot development process included four basic phases, as shown in Figure 1. These stages form a comprehensive strategy for the effective creation of the proposed conversational system, ensuring its coherence, relevance, and optimal performance in interacting with users. In the first stage, goal setting and scoping, specific goals were set for the chatbot, such as providing emotional support, offering advice, and providing emotional management techniques. In addition, the scope of the chatbot was clearly outlined, addressing key questions about the emotions to be considered, the types of advice to be offered, and the situations to be addressed. The next phase, interaction design and user interface, involved creating a detailed interaction flow that specifies how the chatbot will respond to various user inputs. This ensures that the chatbot adapts to the emotions expressed by users and limits its reach. At the same time, the user interface was developed, which defines the appearance of the web application, including visual elements such as submit buttons, text boxes, icons, and color selection for messages and user responses. The third stage, "Chatbot implementation," involved building the user interface and implementing the conversation flow according to the pre-established design. The connection to the ChatGPT model was made using the application programming interface (API) to generate consistent and relevant responses. The topic or context of the conversation was defined, ensuring that messages were related to the topic and applying constraints so that the system focused its responses on the topic being discussed. The final "test and evaluation" phase involved extensive testing and evaluation to identify potential problems and areas for improvement. The primary objective was to ensure that the system worked properly and was able to provide useful and consistent responses.

2.2. Evaluation

2.2.1. Chatbot usability

The usability of the application is evaluated using the system usability scale (SUS), a tool that has proven to be reliable and economical. This scale is used to perform comprehensive evaluations of the usability of systems, as indicated in [16]. The SUS consists of a standard 10-item questionnaire designed to measure users' perceptions of the ease of use and efficiency of the system. This structured and focused approach provides valuable insight into the user experience, allowing for a detailed and meaningful evaluation of the usability of the application in question.

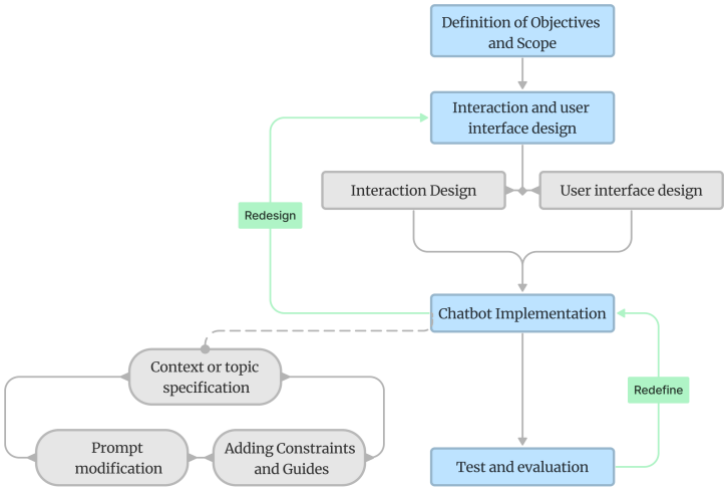


Figure 1. Development phases of the proposed chatbot

2.2.2. Expert validation

The experts carried out the validation of the chatbot's performance through an exhaustive evaluation of its technical aspects, addressing its operation from the perspective of both technical metrics and functionality. This process involved the application of a questionnaire composed of 10 specific technical aspects, detailed in Table 1, ranging from response times to understanding of questions, among other relevant technical parameters. This comprehensive approach allowed for an in-depth and accurate evaluation of the chatbot's performance, providing valuable insights into its effectiveness and efficiency from a technical perspective.

Table 1. Technical aspect

Id	Technical aspect	Id	Technical aspect
1	Ease of use	6	Adaptability to emotions
2	Response time	7	Information accuracy
3	Comprehension of questions	8	Functionality
4	Variety of responses	9	Scalability
5	Response coherence	10	Conversational context analysis

2.3. Development tools

2.3.1. ChatGPT integration tool

To integrate the application with the ChatGPT model API, Python was used, a high-level programming language widely used in programming, web development, data analysis, artificial intelligence, and many other fields. The structure of the language and its object-oriented approach make it easy for developers to create logical and understandable code for projects of different sizes, whether small or large [17]. This popularity has made it the most widely used programming language [18]. Furthermore, Flask, a web framework developed in Python [19], [20], was used to build the web application. A micro-framework that has few tools and libraries makes it highly portable and low-resource [21].

2.3.2. User interface development tool

For the creation of the user interface, the hyperText markup language (HTML) was used, which is used to structure elements such as text, images, etc. Furthermore, to give style and design to these components, regulating aspects such as colors, fonts, and layout on the page, Bootstrap was chosen, a framework that combines HTML, cascading style sheets (CSS), and JavaScript. This framework was designed to adapt the viewing of websites, both on computers and on the different screen resolutions present on mobile devices [22]. In addition, JavaScript has been implemented to add dynamism to the web application, taking advantage of its wide adoption in the web environment [23]. This choice is supported by the importance of programming web interfaces using HTML, CSS, and JavaScript in web application systems, allowing the inclusion of dynamic interactions in websites [24].

3. CHATBOT DEVELOPMENT

This section provides a detailed overview of some of the key stages of the chatbot development process, providing a detailed insight into how this innovative tool was conceived and built. By exploring these

stages, we aim to provide a more complete and accurate understanding of the fundamental elements that underpin the creation of this chatbot, whose purpose is to support mental well-being and facilitate emotional management. From the definition of objectives and scope to the implementation of the chatbot to the testing and evaluation phases, each step contributes to the coherent and effective design of this conversational tool, highlighting its comprehensive approach to providing valuable support in the area of emotional well-being.

3.1. Objectives and scope of the chatbot

In the context of managing emotional disorders and promoting mental wellness, Table 2 details the primary goals and essential scope of the chatbot. This clear and concise visualization of the system's fundamental objectives demonstrates its commitment to providing resources and guidance that actively support users in their pursuit of optimal emotional health. The close interrelationship between these goals and scope underscores their critical role, which serves as a key determinant of the chatbot's overall effectiveness and usefulness in the context of mental health.

Table 2. Objectives and scope of the chatbot

Objective	Scope
Objective 1: facilitate the learning and effective use of stress, depression, and anxiety management techniques.	Scope 1: the chatbot will provide detailed resources, such as interactive and practical exercises based on cognitive behavioral therapy (CBT) techniques, mindfulness, and other recognized methodologies, to help users apply these techniques in their daily lives and reduce symptoms of stress, depression, anxiety, and other mental health concerns.
Objective 2: provide specific advice for managing stress, depression, and anxiety in work, academic, and other settings.	Scope 2: the chatbot will offer highly specific recommendations to address situations of stress or other emotional disturbances related to work, studies, or other, adapting to the individual circumstances of users.
Objective 3: provide easy and convenient access to emotional support.	Scope 3: the chatbot will be available 24/7 to provide immediate emotional support to users, providing timely answers and relevant resources when needed.

3.2. Interaction and user interface design

3.2.1. Interaction flow

Figure 2 shows the essential interaction flowchart that the chatbot must follow. This process includes several crucial aspects, including the initial greeting of the user, the analysis of the user's emotional expression, the provision of support techniques and strategies, the ability to answer questions related to mental health, and others. Every one of these stages is crucial for establishing a comprehensive and efficient experience that benefits the user in their quest to improve their mental well-being.

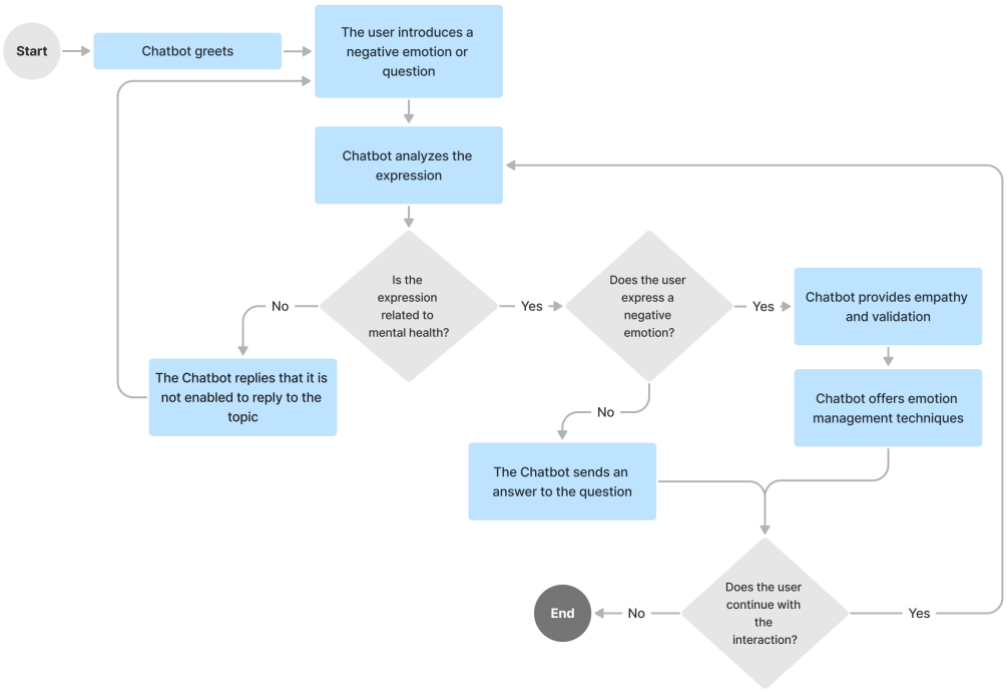


Figure 2. Interaction flow

3.2.2. User interface

Figure 3 shows the user interface of the mobile version, highlighting several key options, including home, chat, and information. The getting started section introduces the user to the conversational agent and the specific approach it is designed for, providing a clear initial overview. The chat section provides access to the conversational interface, where users can engage in meaningful and effective dialogues that contribute to their mental well-being. Finally, the information section gives users access to important details such as the scope and limitations of the chatbot, concrete interaction examples, detailed information on the use of artificial intelligence, and other aspects relevant to an informed and enriching experience.

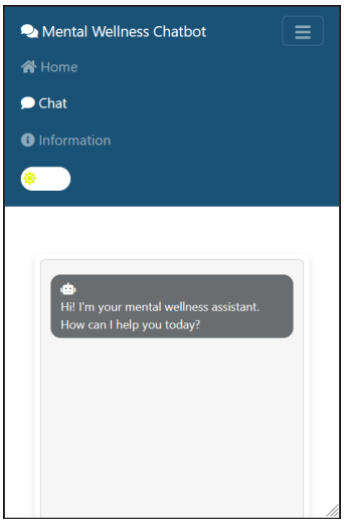


Figure 3. User interface

3.3. Limit of conversational context

After establishing the flow of exchanging requests and responses with the ChatGPT model through the API, we proceed to implement and customize additional functionality as well as specific constraints. In this process, Figure 4 shows two crucial aspects: the definition of the conversational context and the verification of the generated response. These elements play a fundamental role in improving and adapting the performance of the chatbot, ensuring consistency and relevance in the interaction with users.

```
# List of keywords related to mental well-being
wellness_keywords = ['well-being', 'emotional', 'relaxation', 'stress', 'anxiety', 'happiness', 'mental',
'motivation', 'depression', 'mental health', 'mental well-being', 'emotional management']

# Check if the answer contains keywords related to mental well-being
if any(keyword in chatbot_response.lower() for keyword in wellness_keywords):
    # Add the Chatbot response to the chat log
    chat_log.append(f'Chatbot: {response["choices"][0]["text"]}')
else:
    # If the answer is not relevant to mental well-being, generate an alternative answer
    alternative_response = "Sorry, I can't answer that. Please ask me something related to mental well-being."
    chat_log.append(f'Chatbot: {alternative_response}')
    chatbot_response = alternative_response
```

Figure 4. Setting the conversational context

3.3.1. Conversational context

A list is used to define the context or topic to which the chatbot should respond. This list establishes a specific focus on the area of mental health. The information related to this approach is stored in a variable that contains a set of specific keywords related to the topic at hand. These keywords serve as a means to facilitate effective communication with the model.

3.3.2. Generated response verification

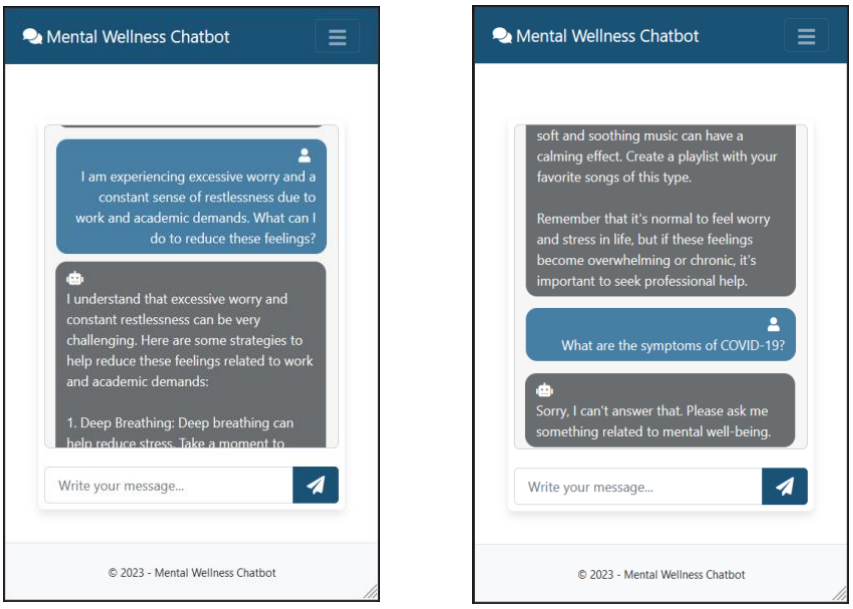
When a user asks questions or expressions related to mental health, the model performs a conditional check (using 'if' and 'else' statements) to determine if the generated response matches the defined keywords. If the answer does not meet these criteria, the model replaces it with a predefined alternative answer. In this way, the user can interact with the chatbot in a precise and targeted manner regarding mental health.

4. RESULTS

4.1. User interaction

Figure 5(a) shows the interaction between the user and the conversational agent. As can be seen in the figure, when the user shares their emotions or describes the situation they are experiencing, the chatbot responds in an empathetic and constructive manner, offering strategies and techniques to help the user reduce their emotional stress levels and improve their mental well-being. This interaction aims to provide valuable and personalized support to users in moments of emotional distress.

Figure 5(b) shows the scenario where the chatbot responds to user queries that are not related to mental health issues. In this context, the chatbot informs the user that it is not able to provide answers in areas that are not related to mental health. This response is implemented to maintain clarity about the application's limitations and ensure that users understand that the focus of the tool is to improve mental health. This will ensure a consistent experience and focus on the main purpose of the application.



(a) (b)

Figure 5. Chatbot: (a) user interaction in the chat and (b) response to queries on topics not related to mental health

4.2. Chatbot evaluation

4.2.1. Usability evaluation

Table 3 shows the results of the usability evaluation of the chatbot using the SUS. 15 users actively participated in this evaluation, giving individual scores for each item on a scale of 1 to 5, where 1 is strongly disagree and 5 is strongly agree. The majority of scores exceeded the 80 thresholds, with the minority of scores ranging between 70 and 78. In addition, the average score was 83, indicating a high degree of usability. This result is particularly noteworthy given that the average acceptable score is generally around 68 out of 100. Overall, the rating reflects a positive and efficient experience for users, supporting the effectiveness of the chatbot in terms of usability.

4.2.2. Evaluation of technical aspects

Five experts assessed the technical elements of the chatbot, assigning ratings on a scale ranging from 1 (indicating poor) to 5 (indicating excellent). This evaluation was carried out through an online

questionnaire with 10 technical aspects previously defined in Table 2. The results were then analyzed by calculating the mean and standard deviation of the scores.

Figure 6 shows a bar graph illustrating the average scores for each technical aspect evaluated. As can be seen, the grade averages are equal to or greater than 4. Additionally, the error bars, which indicate the standard deviation of responses, reflect the variance of the scores. Likewise, the chatbot received an overall average score of 4.28 from the experts, reflecting positive perceptions in areas including interaction, functionality, understanding, and relevant responses, among others. Although the total standard deviation of 0.543 indicates some variation in experts' responses, the majority of evaluations are positive.

Table 3. Usability evaluation result

Id	Technical aspect	User sample														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	I think that I would like to use this system frequently.	4	4	3	4	3	4	4	3	4	4	3	4	4	4	3
2	I found the system unnecessarily complex.	2	2	2	1	2	2	2	2	2	2	3	2	1	1	1
3	I thought the system was easy to use.	4	5	4	5	5	5	4	4	5	4	5	5	4	5	5
4	I think that I would need the support of a technical person to be able to use this system.	2	1	1	1	1	2	1	1	2	5	1	2	1	1	1
5	I found the various functions in this system were well integrated.	4	4	4	5	4	4	5	5	4	4	5	4	4	4	5
6	I thought there was too much inconsistency in this system.	2	1	2	2	2	2	2	2	1	2	2	2	2	2	2
7	I would imagine that most people would learn to use this system very quickly.	4	5	4	4	5	5	4	4	5	4	5	4	5	5	5
8	I found the system very cumbersome to use.	1	1	1	1	2	2	1	2	1	2	1	1	1	1	1
9	I felt very confident using the system.	4	4	4	3	4	4	3	3	4	4	3	4	4	4	3
10	I needed to learn a lot of things before I could get going with this system.	1	2	1	2	1	2	2	1	1	1	2	1	1	1	1
	Total score	80	88	80	85	83	80	80	78	88	70	80	83	88	90	88

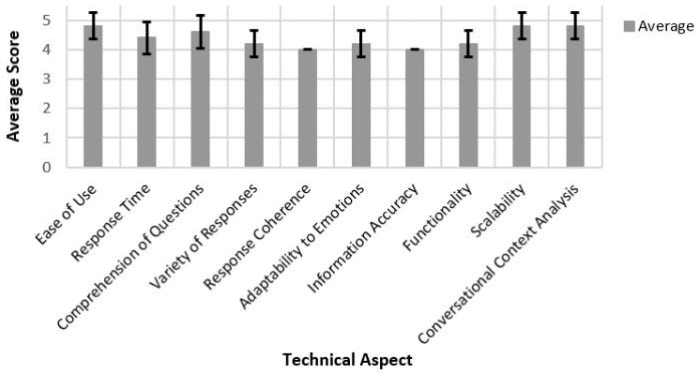


Figure 6. Mean and standard deviation of the rating of technical aspects of the chatbot

5. DISCUSSION

The results obtained demonstrate the high usability of the chatbot integrated with ChatGPT to support the emotional management and mental well-being of people who work and/or study. In addition, the experts evaluated the technical aspects of the chatbot, which also yielded positive results. Unlike previous research in the field of chatbots and mental health, this study makes significant distinctions and specific contributions.

5.1. Advances in the integration of artificial intelligence in mental health

The integration of artificial intelligence in the field of mental health, particularly through chatbots, has seen remarkable growth in recent years. The current study, utilizing a ChatGPT-powered chatbot, aligns

with the emerging trend in this field. In this sense, this approach is supported by prior research, specifically in studies [25]-[27], which have likewise highlighted the chatbots' potential in delivering personalized and ongoing assistance to individuals confronting emotional difficulties.

The inclusion of ChatGPT in this study represents an important step forward in improving the quality of interactions with users. It allows for more natural and effective conversations. However, despite these promising advances, it is important to recognize that challenges and limitations to the integration of chatbots in mental health remain, as noted in [28]. These challenges underscore the need to continue to improve technology and advocate for the implementation of hybrid approaches that combine artificial intelligence with the expertise of mental health professionals.

5.2. Technical aspects of the chatbot

In this study, a group of experts evaluated and rated the technical aspects of the chatbot, which are essential to determining its effectiveness and the user experience in mental health. The results, which earned a mean score of 4.28, provided a reliable and consistent measure of the chatbot's technical performance. Furthermore, by comparing the results of the evaluation of the technical aspects of the chatbot with previous research that analyzed the technical quality of similar chatbots in the field of mental health, this study shows a positive evaluation of the usability of the chatbot, suggesting that users can interact effectively with this tool. This finding is similar to research conducted in [25], who also highlighted the importance of usability in their behavioral therapy chatbot.

In addition, the chatbot in this study received positive ratings in other key areas. First, its ability to adapt to users' emotions was highlighted, suggesting that it can respond appropriately to emotional expressions. This finding is similar to the direction of the study [26], which focuses on Emohaa, a chatbot designed to provide both cognitive and emotional support. Second, it highlighted its ability to provide timely responses, reflecting an efficient response time. This aspect is consistent with the results of the study [20], which assessed a chatbot's efficacy in identifying depression at an early stage and stressed the significance of prompt responses. Likewise, in terms of information accuracy and question understanding, this ChatGPT-powered chatbot also received satisfactory scores. These technical aspects are essential for building trust and empathy with users, and the results are consistent with the concerns expressed in [28] about the depth of answers provided by chatbots.

5.3. The novelty of the study compared to previous research

This study presents several novel features compared to previous research on chatbots for mental health. These developments underscore the uniqueness and value of the current research. Highlighted features include innovative approaches to user interface design, the integration of advanced natural language processing technologies, and the implementation of specific strategies to address the diversity of user needs in the mental health domain.

5.3.1. ChatGPT integration

One of the main innovations is the integration of ChatGPT into the chatbot. While previous studies have focused on chatbots powered by different therapeutic approaches, such as CBT [29] or behavioral activation therapy (BA) [25], the integration of ChatGPT represents an approach based on models of generative language. This allows for a more natural and conversational interaction with users, which is especially valuable in the mental health field, where empathy and understanding are essential.

5.3.2. Contribution to Innovation in the field of mental health

On a general level, this study represents a highly important contribution to the ever-evolving landscape of artificial intelligence integration in mental health. While previous research has explored the effectiveness of chatbots, the uniqueness of this study lies in the inclusion of ChatGPT, an advanced model that expands the possibilities of interaction. In addition, the comprehensive evaluation of technical aspects, from setting up the conversation flow to implementing specific constraints, provides a comprehensive and valuable perspective on this ever-evolving field. This combination of technical innovation and a comprehensive approach highlights the relevance and potential positive impact of this study in the development of conversational tools for emotional support and mental health management.

5.4. Limitation of the study and future work

A major limitation of this research is that the evaluation focused exclusively on the usability of the chatbot and its technical performance without fully exploring its impact on emotional management and mental well-being. The research focuses on the chat interface but does not comprehensively address the emotional and psychological elements that could influence the user experience. This lack of detailed

evaluation in the emotional domain limits the comprehensive understanding of chatbot effectiveness in the context of emotional management and mental well-being.

To extend the research, it is suggested as future work to conduct a larger study that includes a control group, which will allow for a solid comparison between users who use the chatbot and those who do not, thus providing a deeper understanding of the impact of the intervention. In addition, it is important to diversify the user population by including individuals of different ages, cultural backgrounds, and professions, which would help identify possible variations in the perception and usefulness of the chatbot. It is also suggested that a long-term evaluation be conducted to provide a more complete view of the sustainability of the positive effects. Likewise, prioritize research on privacy and security, given the sensitivity of emotional conversations and the protection of personal data. Furthermore, research on how the chatbot can adapt to different cultural norms and values would be crucial to ensuring its effectiveness and sensitivity in cross-cultural interactions.

6. CONCLUSION

In conclusion, the successful development of an innovative chatbot powered by ChatGPT aimed to enhance emotional management and promote mental well-being in various scenarios, including work and academic settings. Evaluations conducted by experts and users have yielded extremely encouraging results, underscoring the effectiveness of this initiative. The evaluation comprehensively addressed both overall performance and usability, revealing key findings that provide a comprehensive view of performance and operational effectiveness. In terms of performance, the overall average of 4.28 highlights consistency and strength in the various areas evaluated, underscoring successful practices and operational strengths that contribute to overall success. This quantitative indicator provides a robust and quantified assessment of efficiency and effectiveness in the area assessed. At the same time, the usability score yielded an overall average of 83, highlighting the efficiency and satisfaction of users interacting with the application. This score reflects a positive user experience, supported by the application's effectiveness in meeting user needs and expectations. These results are extremely important because they provide a complete understanding of performance and the user experience. The above-average performance score indicates areas of strength and successful practices, while the usability score highlights efficiency and user satisfaction. For future research, it is recommended to conduct a larger study with a control group, to diversify the user population, and to evaluate the long-term sustainability of the positive effects. The importance of investigating privacy and security, as well as the adaptability of the chatbot to different cultural norms, is also highlighted.

ACKNOWLEDGEMENTS

Thank the University of Sciences and Humanities for the financial support.

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