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Use of AI in mHealth mobile applications: The influence of virtual therapists' visual characteristics on user perception

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Introduction

The use of medical mobile apps is extensive and varies depending on the field of medicine and its specific requirements. Consequently, the tasks and functions within the app also vary.
Mental health is one of the fields of medicine in which communication and fast and easy contact with medical personnel are crucial. Since the patient's condition cannot be predicted, it is impossible to plan therapeutic sessions that will be carried out at the exact moment of relapse. Therefore, the availability of mobile apps specialised in mental health is a facilitating circumstance that can only benefit the therapeutic process. The application of artificial intelligence (AI) in these apps has extended their importance to a considerably higher level. The most common uses are predicting various factors (stress, mood, risk), supporting conversations, providing diagnostic support in decision-making, personalised notifications, and recommending interventions (Rizzo et al., 2016; Pearce, 2020; Milne-Ives et al., 2022). The literature review reveals that the predominant utilisation of artificial intelligence within mental health apps is through the integration of chatbots. This type of chatbot primarily aims to replicate interactions with a therapist, typically through written exchanges. However, a relevant concern arises regarding the deficiency in emotional intelligence exhibited by these chatbots. Some potential possibilities for implementing artificial intelligence within apps intended for mental health are mood monitoring, personalised recommendations, virtual therapist, recognition of emotions, analysis of feelings, user engagement and gamification, monitoring medication therapy, and early diagnosis and risk assessment. Considering the insights into both present and prospective utilisation of artificial intelligence in mental health applications, the concept of a virtual therapist is particularly interesting.

Methods

The research is based on analysing user responses to virtual characters whose role is to simulate a virtual psychotherapist. A survey served as the fundamental tool for documenting participants' reactions. Models of virtual humans were used as stimuli, presented as six characters - three female and three male characters (Figure 1). The characters were designed for diversity in facial features, skin tones, hair, and eye colors, using MetaHuman Creator software.

Figure 1. *Characters*

Voice recordings (male and female) simulated introductory communication with a virtual therapist, and video stimuli were generated.
In addition to the videos, a seven-section survey was conducted. The first gathered general respondent information, such as gender and familiarity with mental health apps and virtual humans. The remaining six sections assessed each character's likability, naturalness, trustworthiness, enthusiasm, positivity, and desire to continue communication with the virtual therapist.

Results

The study involved 20 (10 male and 10 female) participants aged 25 to 45. All participants were familiar with virtual human technologies; some used mental health apps. They rated six virtual characters (3 male and 3 female) on various criteria, including likability, naturalness, trustworthiness, excitement, positivity, and desire to continue communication.
Key findings:
• **The first male character** received high scores for likability (3.8/5), naturalness (3.95/5), and positivity (6.6/9), and only 15% were hesitant to communicate further.
• **The second male character** had lower scores for likability (2.65/5) and trustworthiness (2.8/5). However, 45% of respondents were still open to further interaction.
• **The third male character** received overall neutral ratings but achieved a positive trustworthiness score (3.55/5). Notably, 70% of respondents were willing to continue communication with him.
• **The first female character** received high ratings for likability (4.15/5) and trustworthiness (3.95/5). 90% of respondents desired further interaction with her.
• **The second female character** had the lowest ratings for likability (2.85/5) and trustworthiness (2.5/5). However, 40% of respondents were still open to communication with her.
• **The third female character** was the most liked (4.2/5) and highly trustworthy (3.85/5); 80% of respondents were willing to continue communication.
• Gender differences were observed, as women generally provided higher ratings than men.

To understand the influence of different parameters on user perception, a statistical analysis using ANOVA, T-tests, and correlation analysis was conducted.
Key findings:
• **Gender impact:** T-tests showed no statistically significant differences between male and female respondents' evaluations of the six characters for all parameters.
• **Character comparison:** ANOVA revealed significant differences across characters regarding likability, naturalness, positivity, and trustworthiness (except for excitement). Post-hoc tests indicated the most significant differences were male character 2 (least liked) and other characters, particularly female characters 1 and 3.
• **Correlation:** A positive and statistically significant correlation was found between likability and trustworthiness (59% of the variance) and between naturalness and trustworthiness (36% of the variance). This suggests that characters perceived as more likable and natural are also viewed as more trustworthy.

Discussion / Conclusion

Based on respondents' subjective assessments, female character 3 received the highest likability rating, while male character 1 was considered the most natural and reliable. Female character 1 produced the greatest excitement and positive feelings among respondents. Conversely, male character 2 received the lowest ratings regarding likability, excitement, and positivity, while female character 2 scored poorly across all parameters. Overall, female character 1 was perceived most positively, while female character 2 garnered the most negative perception. Statistical analyses were conducted to assess variations in respondents' responses for each character individually. The T-test results indicated no statistically significant variations for any parameter across all characters. Additionally, one-factor ANOVA revealed significance only in the excitement parameter. Post hoc tests identified notable differences, particularly between female character 2, the other two female characters, and male character 1. Furthermore, a correlation analysis was conducted to explore the relationship between likability and the naturalness of the character with user trust. Both pairs exhibited a strong positive correlation.
Based on the results, it is concluded that when creating characters representing virtual therapists, it is necessary to take care of their visual characteristics, and adapt them to the user. Interestingly, some respondents perceived character voices as different, even though only one per gender was used. In addition, it was observed that male respondents notice more details when observing male characters and potentially compare themselves to them. In order to carry out the implementation of this type of content within mobile applications for mental health, it would be necessary to expand the base of examined characters with more intense mutual differences and include a more significant number of respondents. It would be interesting to examine the influence of the colour of the voice, the clothing and the environment in which the character is located on the respondents' reactions.

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