Exploring Mobile and Wearable Technology for Early Depression Detection and Monitoring

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Figure 1. Literature Review Process for Mobile and Wearable Data in Depression Research. *This figure summarizes the methodological workflow, including: (1) database searches (e.g., Google Scholar) using terms such as "depression," "transference," and "digital health"; (2) filtering criteria to select articles with demographic data and monitoring device reporting; (3) data extraction focusing on psychometric tools, geographic distribution, and demographic variables; and (4) systematic identification of digital devices (e.g., wearables, smartphones) used for depression tracking.*

01. Introduction

The escalating rates of depression in both adults and children over the last five to six years, coinciding with the proliferation of digital health tools in smartphones, present a unique opportunity for innovative monitoring approaches (1, 2). This study sought to investigate the current landscape of digital depression monitoring via smartphones through a systematic literature review. The objective was to provide a comprehensive overview of existing research, focusing on study characteristics, monitoring methodologies, and the extent to which demographic factors are considered.

02. Objective

Over the past five to six years, the prevalence of depression among adults and children has significantly increased, alongside other chronic diseases. With the expansion of digital health features in smartphones, this study aimed to evaluate their use in the digital monitoring of depression to provide a comprehensive overview.

References

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2. Goodwin, R. D., Dierker, L. C., Wu, M., Galea, S., Hoven, C. W., & Weinberger, A. H. (2022). Trends in US depression prevalence from 2015 to 2020: the widening treatment gap. American Journal of Preventive Medicine, 63(5), 726-733.

03. Methods

A literature search was conducted on Google Scholar using the keywords "depression," "smartphone," and "digital health". Variables examined included the location and size of study populations, demographic data (gender, age, ethnicity, education, and marital status), type of monitoring device, digital monitoring methods (sleep tracking, heart rate variability, movement, mood tracking, and word tracking), and clinical reporting (Figure 1).

04. Results

Out of the 140 articles that were scanned, a total of 22 met the predefined inclusion criteria. The majority of these studies were published in the year 2024, with the US and Pakistan emerging as the most frequent countries of publication. On average, the studies involved a population size of 465 patients. Among the included articles, 20 reported details on gender and age, while only 9 provided information on ethnicity. Additionally, education and marital status were documented in just 4 studies (Figure 3). Smartphones were the most commonly used monitoring devices, appearing in 20 studies. Digital monitoring methods included mood tracking (20 studies), movement tracking (10), heart rate variability (HRV) tracking (5), word tracking (4), and sleep tracking (2) (Figure 2). Clinical reporting primarily relied on questionnaires, with the Patient Health Questionnaire-9 being the most frequently used (6 studies), followed closely by the Generalized Anxiety Disorder 7 (7 studies).

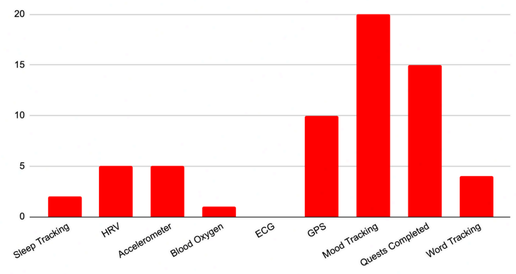

Figure 2. Frequency of digital health features utilized in smartphone-based depression monitoring studies. *The figure illustrates the number of studies that incorporated each specific feature, including sleep tracking, heart rate variability (HRV), accelerometer data (movement), blood oxygen saturation, electrocardiogram (ECG), global positioning system (GPS), mood tracking, completed questionnaires, and word tracking.*

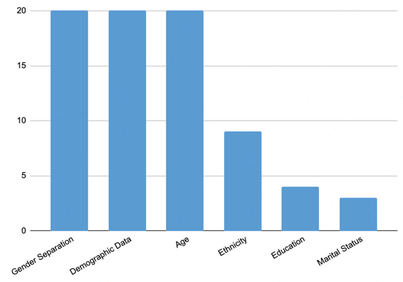

Figure 3. Reporting frequency of demographic variables in studies on smartphone-based depression monitoring. *The bar graph displays the number of included studies that reported on each demographic characteristic: gender separation, any demographic data, age, ethnicity, education, and marital status.*

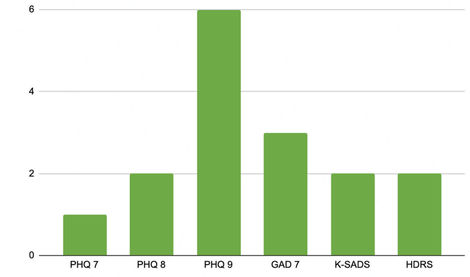

Figure 4. Frequency of clinical tests used for depression evaluation in smartphone-based monitoring studies. *The bar graph shows the number of studies that employed each specific clinical assessment tool, including the Patient Health Questionnaire (PHQ), PHQ-7, PHQ-8, PHQ-9, Generalized Anxiety Disorder 7-item scale (GAD-7), Kiddie-Schedule for Affective Disorders and Schizophrenia (K-SADS), and Hamilton Depression Rating Scale (HDRS).*

05. Conclusion

This study provided a comprehensive overview of the digital monitoring of depression using mobile devices, highlighting a significant gap in the inclusion of demographic data, such as education and marital status, which are crucial factors influencing mental health. Further research is necessary to evaluate the impact of this gap across a broader range of studies.

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