Wearables and smartphones for tracking modifiable risk factors in metabolic health: a scoping review

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Metabolic diseases, such as cardiovascular diseases and diabetes, are leading causes of death worldwide. Wearable devices and smartphones are increasingly used to monitor modifiable risk factors, including lifestyle behaviors such as nutrition, physical activity, stress, sleep, and substance use, as well as physiological markers, which can improve the management of metabolic diseases. This review will systematically scope the current literature to identify which modifiable (lifestyle and physiological) risk factors are most frequently studied in wearable and smartphone-based metabolic health research and to what extent measures of these risk factors are consistent across studies, particularly regarding measurement methods. A scoping review will be conducted to overview how wearable and smartphone-based studies measure modifiable risk factors related to metabolic diseases. Five databases (Scopus, Web of Science, PubMed, Cochrane Central Register of Controlled Trials, and SPORTDiscus) from 2019 to 2024, with search terms related to wearables, smartphones, and modifiable risk factors associated with metabolic diseases. Eligible studies will use smartphones and/or wearables (worn on the wrist, finger, arm, hip, and chest) to track physiological and/or lifestyle factors related to metabolic diseases. The review will follow reporting standards from PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) and JBI guidance on scoping review methodology. Two reviewers will independently screen articles for inclusion and extract data using a standardized form. Data collection is expected to begin in November; data analysis in the first quarter of 2025, and submission to a peer-reviewed journal by the second quarter in 2025. We expect to identify the degree to which wearable and smartphone-based studies track modifiable risk factors collectively (versus in isolation). Additionally, we will scope the consistency and variation in how modifiable risk factors are measured across existing studies. Results are expected to inform standardized guidelines on wearable and smartphone-based measurements, with the goal to aid cross-study comparison. The final report is planned for submission to a peer-reviewed journal. This review is among the first to systematically overview how wearables and smartphones measure modifiable risk factors associated with metabolic diseases and gaps in the measurement of these factors in digital metabolic health research.