

Evidence for Digital Mental Health Assessment Tools: Protocol for a Systematic Review on Diagnostic Accuracy Across All Age Groups

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Abstract

Background: Digital assessments in health care are increasingly used to aid clinicians in diagnosing mental health conditions. Particularly since the quarantine and isolation guidelines of the COVID-19 pandemic moved much of health care online, there has been an accelerated adoption of digital tools for assessment. The diagnostic accuracy of digital mental health assessments for a range of psychiatric conditions has yet to be fully explored, especially for their use in populations of older adults and children.

Objective: This systematic review aims to evaluate the current landscape of evidence for the diagnostic accuracy of digital self-report question- and answer-based assessments for use in all ages for various psychiatric conditions.

Methods: The Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) guided the development of this protocol. The protocol has been registered with the International Prospective Register of Systematic Reviews (PROSPERO). The searches were guided by the PICO framework (population, intervention, comparator, and outcome). A systematic search was conducted of the following databases of literature published since 2021: MEDLINE, Embase, Cochrane Library, Applied Social Sciences Index and Abstracts (ASSIA), Web of Science Core Collection, Cumulative Index to Nursing and Allied Health Literature (CINAHL), and PsychINFO. Searches of clinical trial databases and hand searching of reference lists will be completed. Two authors will independently screen titles and abstracts of identified articles and select studies according to eligibility criteria, resolving inconsistencies through discussion. Full texts will then be screened following the same process. The two authors will extract data using the Covidence data extraction tool. Two authors will use the Quality Assessment of Diagnostic Accuracy Studies-2 (QUADAS-2) tool to assess risk of bias for each full text inclusion. A descriptive summary of the findings will be presented along with tables.

Results: Scoping for this review began in December 2024. Searches of databases were completed in January 2025. Full identification of relevant gray literature is aimed to be completed by April 2025, and the final review is expected to be completed by June 2025.

Conclusions: The current review aims to evaluate the landscape of the diagnostic accuracy of digital mental health assessments across different ages (including children and the elderly), particularly following the COVID-19 pandemic due to the exponential increase in development and use of such tools. This review will provide evidence for wider deployment of digital mental health assessment tools across a wide age range. There will also be discussion about future research for digital tools and avenues for policy around digital mental health assessments. Clinical Trial: International Prospective Register of Systematic Reviews (PROSPERO) CRD420250654734; <https://www.crd.york.ac.uk/PROSPERO/view/CRD420250654734>

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Trial registration: International Prospective Register of Systematic Reviews (PROSPERO) CRD420250654734; <https://www.crd.york.ac.uk/PROSPERO/view/CRD420250654734>

Introduction

The implementation of digital technologies in health care has rapidly increased since the COVID-19 pandemic as health care services were forced to operate in the unprecedented circumstances of quarantine. This posed great challenges as global health care systems had to adapt quickly to continue to serve patients, but there was also a unique opportunity for growth and improvements when systems were challenged to transition to online platforms [1, 2]. Simultaneously, the surge in the global burden of mental health symptoms since the pandemic [3] resulted in an increased demand for evidence based interventions that are accessible and can reduce the strain of mental health symptoms and conditions on the wider health care system. Currently, mental health care systems both in the United Kingdom (UK) and globally are struggling to address the clinical needs of patients, leaving help-seeking individuals on long waiting lists that span months and even years for certain diagnoses and presentations [4, 5, 6].

Digital mental health interventions pose a scalable solution to various system level problems that may contribute to poor mental health care outcomes [7,8]. By their nature, digital tools are accessible and cost effective, allowing anyone with access to a device and an internet connection to retrieve resources [9,10]. Individuals unable or less willing to seek in-person care now have the option to be seen online, potentially reducing stress associated with visits and cost of travel [11]. Additionally, digital interventions can be easily deployed by health care professionals with adequate training [12], while also allowing for the results of the intervention to be accessed anywhere. One specific type of digital mental health interventions are assessments, which can range from computerized versions of traditional pen and paper assessments to sophisticated algorithms that incorporate artificial intelligence and machine learning to assess patients. Digital assessments vary greatly in their processes and may be used outside or alongside clinical care. Their outcomes vary as well, from providing diagnostic aid to serving as symptom severity checkers and risk assessments.

Digital assessment tools are part of an ever-changing landscape of health technologies, and while the evidence for the accuracy of digital assessment tools for mental health care has become more robust [13], continued updated research about the safety and validity of digital assessments is needed due to the potential for rapid development and deployment which may result in the availability of low quality tools [14]. It is also important to investigate the utility and accuracy of digital assessment tools in the wider population, especially for younger and older people.

The current study is intended to summarize recently published literature on digital tools for mental health assessment, with a particular focus on the years following the initial outbreak of the COVID-19 virus which shifted many aspects of health care online. A previous systematic review from 2021 focused on digital mental health provides a basis to establish the quality of these assessments [13]. However, as outlined above, there is an opportunity for a more comprehensive evaluation in ages outside the range of 18-65 years which was the population of interest in the previous review. As digital interventions become more widespread and more people rely on digital assessment tools, including young people [15] and older adults [16], it is important to understand the evidence for the validity of such tools for a wider age range, especially given the specific needs of these populations. Additionally, as this recent review ended in 2021, there is a need to examine literature in the years following the first wave of the pandemic and to analyze the current state of digital tools for mental health assessment which are more widely implemented now than prior to the pandemic. Evaluating the accuracy of these assessments in diverse age populations is imperative due to the exponential increase in their development and deployment since 2021 [17].

Therefore, the following research question is left unanswered in the current literature: what is the evidence on the validity (ie, accuracy) of digital assessment tools for mental health in children and young people (ie, under the age of 18), working-age adults (ie, between the ages of 18 and 65), and older adults (ie, above the age of 65) since the increased digitization of health care following the COVID-19 pandemic? Therefore, this systematic review will aim to establish the current state of evidence for digital assessments of mental health conditions. Specifically, literature published since 2021 that reports on the validity of these assessments is the target of the review. By collecting key evidence related to the diagnostic accuracy of digital psychiatric assessment tools (ie, area under the curve (AUC), specificity, sensitivity, positive predictive value (PPV), and negative predictive value (NPV)), this review will inform our understanding of the quality and safety of currently available tools, as well as potentially support the wider acceptance and uptake of such tools.

Methods

Overview

We have used the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) [18] guidelines for development of this protocol. The protocol for this systematic review is registered with the International Prospective Register of Systematic Reviews (PROSPERO;

CRD420250654734). The searches will be guided by the PICO framework (population, intervention, comparator, and outcome). For the full report, the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) [19] will be used as a guide. All documentation will be submitted of our adherence to all the above guidelines in the final report, and any changes to the protocol will be noted.

Inclusion criteria

To assess the current evidence for the validity of digital tools for mental health assessment, the following inclusion and exclusion criteria were developed according to the PICO framework (Table 1). There is an increasingly vast number of digital assessment tools and substantial improvements of these digital technologies [20]. As these digital technologies in health care have been widely implemented particularly since the pandemic [17], this review will focus on studies published since 2021 to capture the current evidence base of the accuracy of these assessments across different age groups and to contribute to existing evidence for digital tools for mental health assessment. Studies will be included regardless of study design.

Population

All study locations, mental health condition severity, and populations will be included regardless of gender or ethnicity. While the previously referenced systematic review included working age adults (18-65) [13], the population of interest for this review will expand to include individuals of any age. The inclusion of a wider age range will provide more evidence for the validity of digital assessments in both children and older adults.

Intervention

Research that includes a digital question- and answer-based mental health assessment tool intended for assessment of any of the mental health conditions of interest specified in the population will be included (Table 1). The intervention required for inclusion for this review is digital question- and answer-based mental health tools for assessment that are completed by a patient/user. Because this review will include children and older adults, studies with tools aimed to investigate this population that require additional input from a parent or caregiver will be included when applicable.

Comparator

To be included, studies must have a “gold standard” comparator (ie, a clinician assessment, a structured clinical interview, a clinical diagnosis). Identification of this comparator will be done via

screening of the title, abstract, or full-text, rather than defined through searches.

Outcome

The primary outcome measures of the study will be metrics of validity and accuracy for question- and answer-based digital assessments. This will include metrics such as area under the curve (AUC), specificity, sensitivity, positive predictive value (PPV), and negative predictive value (NPV).

Exclusion criteria

Exclusion criteria were developed to ensure the inclusion of most relevant studies. To prevent including articles multiple times in the analysis, previous systematic reviews will be excluded, although their reference lists will be hand searched for relevant articles for inclusion. While excluded, systematic reviews of similar topics will be saved in order to compare the results of the current review with previous results.

Other exclusion criteria will be literature published before 2021, articles with less than 500 words, ongoing clinical trials without results, articles published in non-English languages, editorials, opinion pieces, newspaper articles, and other various forms of popular media.

Population

Articles that specifically focus on military personnel and veterans, incarcerated or imprisoned individuals, detained individuals, or pregnant people will be excluded. The only exception are articles which provide evidence for an assessment tool of for post-traumatic stress disorder (PTSD), where the experiences of these populations (eg war, detention, traumatic birth) may be relevant due to the diagnostic criteria. Studies that evaluate assessment tools designed for use in currently psychotic individuals, for assessment within the context of mental health crises or emergency mental health presentations within emergency department settings (eg, Accident and emergency or A&E, Emergency room or ER), or use in groups solely due to a diagnosis of a physical illnesses (eg, cancer patients) will also be excluded. Articles that consist of nonhuman studies will also be excluded.

Intervention

Studies with interventions that are designed to predict future mental illnesses and high-risk behaviors (eg, suicidality, suicide attempts, suicidal acts, self-harm) will be excluded. Interventions that are non-digital (ie, pen and paper) question- and answer-based tools will be excluded. Studies that evaluate digital tools that use other assessment methods outside of a question- and answer-based

methods such as blood tests, imaging, genome analyses, wearables, speech biomarkers, and other digital biomarkers will be excluded.

Comparator

Literature that does not address the current outlined research question or include the specified reference standards will also be excluded.

Outcomes

Studies that do not include one of the primary outcome measures of validity and accuracy for question- and answer-based digital assessments will also be excluded.

Table 1. PICO Framework (for full search strategies, see Multimedia Appendix 1)

Population	Intervention	Comparator	Outcome
Individuals assessed for symptoms of major depressive disorder, bipolar disorder, generalized anxiety disorder, panic disorder, social anxiety disorder, attention deficit hyperactivity disorder, autism spectrum disorders, insomnia, anorexia nervosa, bulimia nervosa, obsessive compulsive disorder, psychosis, alcohol use disorder, substance use disorder, post-traumatic stress disorder, acute stress disorder, adjustment disorder, borderline personality disorder, emotionally unstable personality disorder, self-harm, and suicidality	Patient-completed digital question-and-answer-based mental health tools for assessment or similar assessments completed by a caregiver in the case of children or the elderly	Reference standard including assessment by a clinician (eg, clinician interview), clinical diagnosis, or standardized structured or semi-structured interview based on the DSM-5-TR ^a and ICD-11 ^b criteria (or DSM-5 ^c and ICD-10 ^d for older publications)	Validity (eg, accuracy, AUC ^e , sensitivity, specificity, PPV ^f , NPV ^g)

^aDSM-5-TR: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision

^bICD-11: International Classification of Diseases, 11th Revision

^cDSM-5: Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition

^dICD-10: International Classification of Diseases, 10th Revision

^eAUC: Area under the curve

^fPPV: Positive predictive value

^gNPV: Negative predictive value

Search strategies

A medical librarian completed the formal searches on January 14th 2025 of the following databases: MEDLINE (via Ovid), Embase (via Ovid), Cochrane Library, ASSIA (via ProQuest), Web of Science (Core Collection), CINAHL (via EBSCOhost) and PsycINFO (via EBSCOhost). Searches of the clinical trial databases, Clinicaltrials.gov [21] and the WHO clinical trial database [22], were also completed on January 28th 2025 and February 10th 2025, respectively. To build on the existing literature [13] and to evaluate digital tools for mental health assessment after the COVID-19 pandemic, searches were done for literature published in and after 2021. Gray literature searches through Google were also completed February 10th 2025 by authors KB and EF in collaboration with the medical librarian.

While previous systematic reviews without meta-analyses will be excluded from the present analysis, hand-searches will be performed of the reference lists of relevant systematic review captured by database searches in order to identify studies that will then be screened against the eligibility criteria. These searches are expected to be completed by April 30th, 2025.

The included search terms were adapted from the previous similar systematic review [13] which demonstrated an effective search strategy for identifying relevant studies. The full search strategy can be found here (Multimedia Appendix 1).

Screening and article selection

Following the formal searches done by the medical librarian and grey literature searches, all of the identified literature has been stored in Covidence, a systematic review software. The literature was screened to remove duplicates before it was uploaded to Covidence. Any additional duplicates identified by the systematic review software will be reported in the PRISMA flow chart in the final report.

Two independent reviewers (KB, EF) are working in Covidence to screen titles and abstracts against predetermined eligibility and exclusion criteria. Articles will be flagged by the authors to include or exclude or to label if they are unsure. Any disagreements about whether to include or exclude articles will be resolved by discussion. Following the initial screening, both reviewers will screen the full texts of all included articles to determine their final eligibility based on the predetermined inclusion and exclusion criteria. Any disagreements will be discussed and when unable to come to a

conclusion, a third reviewer (SB) will be consulted.

Reasoning for exclusion at the full-text screening stage will be recorded. The authors will document the number of articles included and excluded in every stage of review in the PRISMA 2020 flow diagram.

Data extraction

Data will be extracted via the standardized Covidence data extraction form. Two reviewers (KB, EF) will complete each form for every full text. The following data will be extracted: general publication information (author, date, title, location of study), study design, sample characteristics (size, mean age/age range, gender and ethnicity breakdowns), mental health condition(s) addressed by the study, assessment type (including the available reference standard used), and specific aspect of the outcome measures addressed by the study (positive predictor value (PPV), negative predictor value (NPV), area under the curve (AUC), etc.).

The reviewers will compare data extraction forms for each study and resolve any discrepancies. Anything that remains unresolved will be decided by a third reviewer (SB).

Quality appraisal

To evaluate the quality of the selected studies, the Revised Tool for the Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) will be used [23]. Two independent reviewers (KB, EF) will complete this assessment for all included studies. The QUADAS-2 is intended to evaluate possible biases and applicability of the study in relation to the research question for the review. The assessment consists of four domains which each address different aspects of the study. The domains are patient selection, index tests, reference standard, and flow and timing. Each domain consists of a subdomain about risk of bias and three have a subdomain about applicability. The subdomains consist of questions which the rater evaluates as either “low”, “unclear”, or “high.” The subdomains are then evaluated together for the larger domain to reach a final decision about the risk of bias and concern about applicability. This method will be completed for all included studies. The results of the two reviewers will be compared. There will be discussion about reaching a consensus when the reviewers have reached different conclusions, and a third reviewer will be consulted as needed (SB). A table will be created with results.

Data synthesis

Due to the anticipated heterogeneity of study designs and findings, a descriptive approach will be employed for results synthesis. Tables will also be used to present findings. Results will be summarized based on the mental health condition and population (ie, children and young people, working-age adults, and older adults).

Results

Scoping of the current review began in December 2024. All database searches were completed on February 10th 2025. Manual searching of reference lists is expected to be completed by April 2025, and the complete review with analysis is expected to be completed by June 2025.

Discussion

The current review aims to expand on previous literature reviews regarding the evaluation of digital mental health assessment tools, particularly in light of the increase in deployment of digital technologies in health care following the COVID-19 pandemic. By doing this, the current landscape of digital mental health assessments in adult populations will be re-evaluated while also expanding this evaluation to include children and young people as well as older people to address this gap in the literature. This review will potentially provide evidence for the safe and effective deployment of digital assessment tools in a wider patient population and explore the potential opportunities for digital assessments to support health care delivery. There will also be discussion about the implications and potential avenues for policy changes and future research directions.

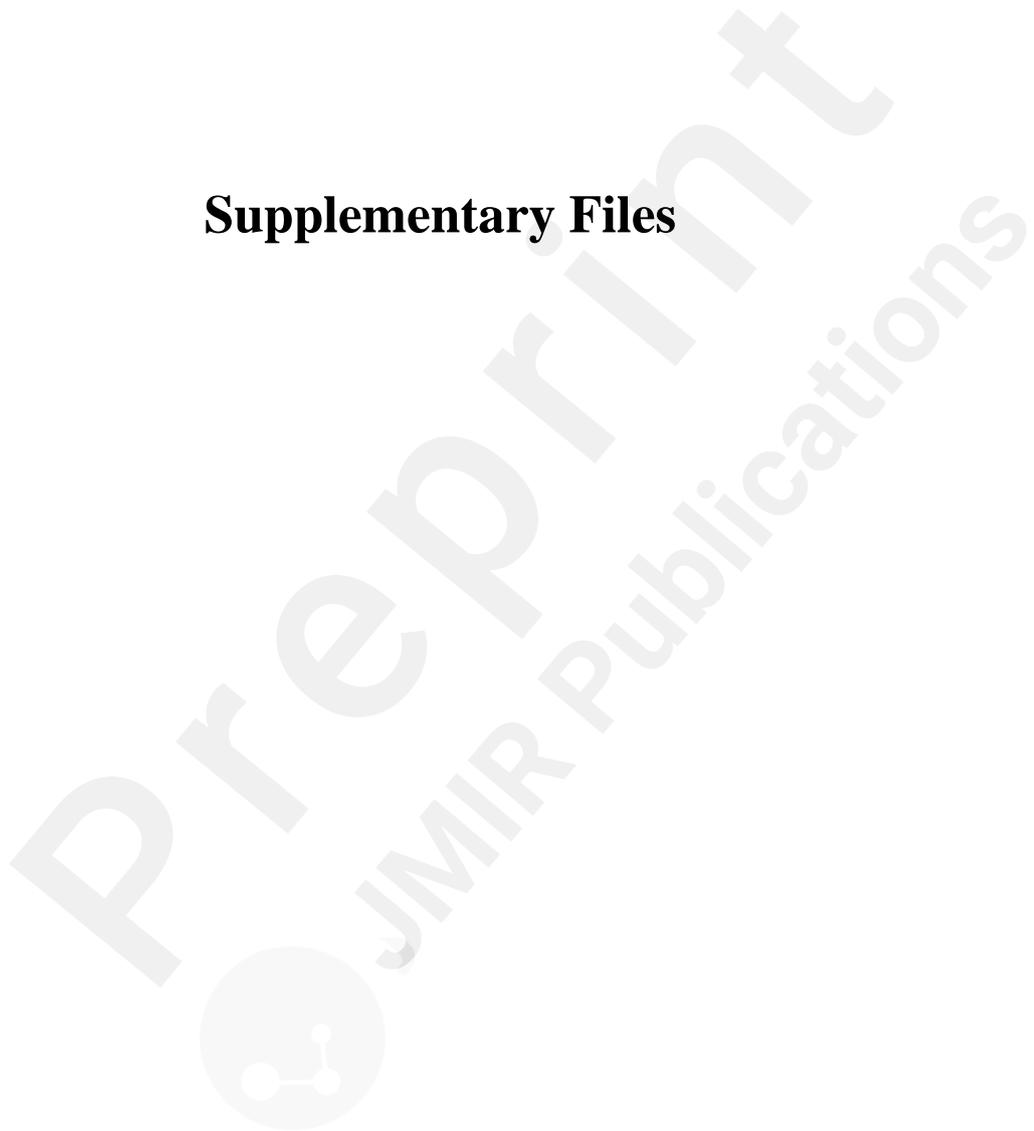
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Supplementary Files

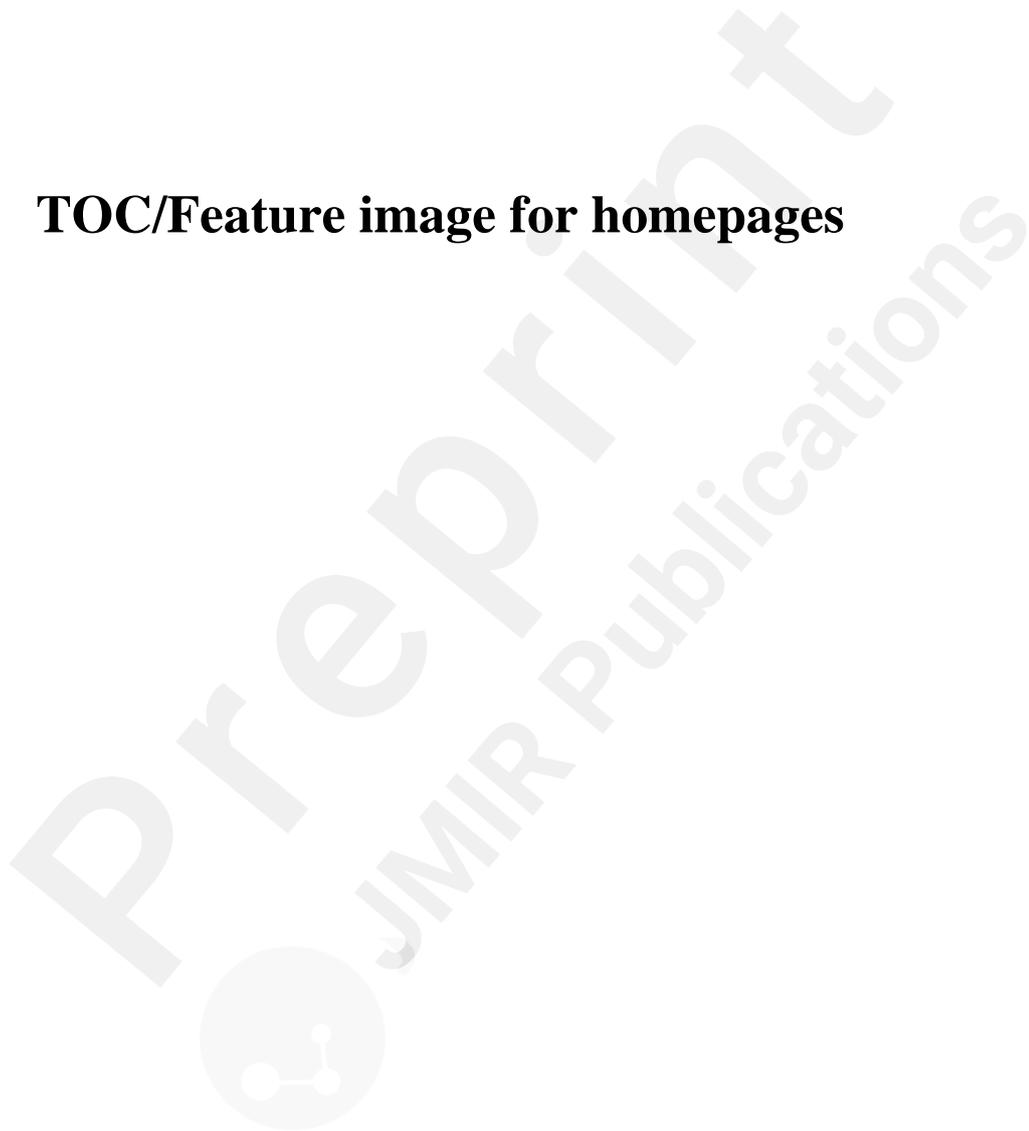


Multimedia Appendixes

Search strategies.

URL: <http://asset.jmir.pub/assets/954b43c30cc8f783c018bae3a80e240b.docx>

TOC/Feature image for homepages



TOC image.

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