Supplementary file

Database / Search engine	# of papers
Pubmed	892
Medline	114
CINAHIL	1,100
EmBase	981
Google Scholar	2,316
Springer Link	168
Saudi digital library (SDL)	1,310
Association of computing machinery (ACM) digital library	6
IEEE Xplore databases	62

Quality Assessment Tools and Methodological Details

This document provides a detailed overview of the quality assessment tools and methodological rigor used to evaluate the studies included in the systematic review and meta-analysis titled: Assessment of Quality Attributes Impacting End-Users' Experience with Mobile Health Applications in Saudi Arabia: A Systematic Review and Meta-Analysis.

1. Quality Assessment Framework

The quality of the included studies was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Tools. These tools evaluate the methodological robustness of studies, focusing on the following aspects:

- Appropriateness of the study design to address the research question.
- Recruitment methods ensuring representative sampling.
- Measurement validity of the tools or scales used.
- Control for confounding variables to ensure unbiased results.

2. Quality Assessment Tools by Study

The table below outlines the quality assessment tools or methods employed across the studies to evaluate specific usability attributes of mHealth applications:

Study	Attributes Assessed	Measurement Tools	Comments/Findings
Almufarij and Alharbi[4]	Satisfaction, Awareness	Surveys (Likert Scale)	High satisfaction with Tawakkalna app
Alanzi, et al.[8]	Satisfaction, Ease of Use	Likert Scales, SUS	MAWID app rated easy to use
AlAli, et al.[12]	Ease of Use	Custom Usability Questionnaire	Ease of use widely appreciated
Alharbi[13]	Usefulness, Awareness	Perceived Usefulness Scale	Awareness linked to app adoption
Alanzi[14]	Satisfaction	Likert Scales	High satisfaction post-COVID
Al-Kahtani, et al.[9]	Satisfaction, Reliability	Error Logs, Surveys	Reliability noted as critical factor
Al Ansari, et al.[15]	Satisfaction, Learnability	Task Completion Rates	Learnability emphasized for fitness apps
Alsaad, et al.[16]	Acceptability	Qualitative Interviews	Self-medication app showed acceptability
Aldhahir, et al.[17]	Satisfaction, Ease of Use	Surveys, SUS	SEHA app highlighted satisfaction levels
BITAR, et al.[18]	Satisfaction, Learnability	User Task Analysis	Ana Alsukary app proved useful for children
Dawood and Alkadi[19]	Satisfaction, Efficiency	Performance Metrics	Efficiency and satisfaction well-rated
Alharbi, et al.[20]	Satisfaction, Reliability	System Logs, Surveys	Seha app improved accessibility
Aljohani and Chandran[21]	Awareness, Acceptability	Behavioral Intention Scales	Healthcare enforcement drives acceptance
Allam, et al.[22]	Awareness	Awareness Surveys	COVID-19 apps increased awareness
Alsaleh, et al.[23]	Satisfaction, Learnability	User Feedback, Task Completion	Learnability critical for older users
Alharbi, et al.[24]	Awareness	Knowledge Assessments	Awareness gaps for MOH apps
Alessa, et al.[25]	Acceptability	Qualitative Feedback	Acceptability good for chronic care
Alsahali[26]	Efficiency, Errors	Performance Metrics, Incident Reports	Efficiency noted; errors reported
Alshathri, et al.[27]	Satisfaction, Usability	MARS Scale, Task Feedback	Weight apps scored average usability
Rafiullah and	Satisfaction, Learnability	Surveys, Training Assessments	Training needs identified for apps

David[28]			
Atallah, et al.[29]	Satisfaction, Usability	Mobile Monitoring Logs	High satisfaction with mental health monitoring

3. Study Characteristics and Table Reference

This supplementary file complements Table 2 in the manuscript, which provides an overview of the key usability attributes evaluated across the 21 included studies. These studies assessed a total of 15,727 participants and covered a variety of mHealth applications commonly used in Saudi Arabia. The details in this file provide additional transparency regarding the tools and methods used for each attribute.

4. Privacy and Security Assessment Gap

Despite the critical role of privacy and security in healthcare technologies, these attributes were notably underreported in the included studies. This gap highlights the need for future research to incorporate explicit evaluations of privacy and security features to ensure user trust and engagement with mHealth applications.

5. Ensuring Methodological Rigor

1. **Study Selection:** Independent screening and data extraction were performed by two reviewers, with a third reviewer resolving any discrepancies.
2. **Assessment Validity:** All studies used validated tools where applicable (e.g., SUS for usability, Likert scales for satisfaction).
3. **Addressing Bias:** Studies were reviewed for potential biases using the JBI checklist. High-risk studies were excluded from the meta-analysis.

6. Key Findings on Methodological Rigidity

- **Consistency in Tools:** Studies assessing satisfaction primarily used validated scales, ensuring comparability.
- **Variability in Measurement:** Awareness and reliability were often evaluated using customized, non-standardized tools, indicating a gap in uniformity.
- **Privacy Gap:** As highlighted, privacy and security remain critical areas for future evaluation to strengthen the trustworthiness of mHealth applications.