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Validation of Mobile Application Usability Questionnaire for Evaluation of Usability of the Mommy-Be Application in Indonesia

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ABSTRACT

Aims Mobile health (mHealth) applications have emerged as an effective approach to supporting maternal breastfeeding health. However, adopting these applications often faces challenges in terms of usability and user satisfaction. This study aimed to adapt and validate the Malay-language version of the Mobile Application Usability Questionnaire (MAUQ) for the Mommy-Be application in Indonesia.

Instrument & Methods This research uses a descriptive, quantitative design with a Confirmatory Factor Analysis (CFA) to test the instrument's validity. A total of 386 breastfeeding mothers in Makassar City, South Sulawesi, participated in a two-week trial of the application, who were invited via social media applications at each primary health service.

Findings A CFI value of 0.548 and a TLI of 0.477 indicated a less-than-ideal model fit. After removing items with high Modification Indices (MIs), the second model showed a significant improvement, with a CFI of 0.972, a TLI of 0.966, and an RMSEA of 0.062.

Conclusion These results highlight the importance of adapting instruments to the local context and technical conditions of the application. The results of this study are expected to support the development of health applications better aligned with local users' needs.

Keywords mHealth; Mobile Applications; Factor Analysis; Breastfeeding

CITATION LINKS

[1] Theoretical advancements in mHealth ... [2] Understanding the relationships between mHealth ... [3] mHealth apps assessment among ... [4] Interrater reliability of mHealth app rating measures: Analysis of ... [5] Improving mental health in U.S. Veterans ... [6] Social support for breastfeeding in the ... [7] Perinatal support for breastfeeding using mHealth: A mixed methods feasibility study ... [8] The value of mobile health in improving breastfeeding outcomes among perinatal or postpartum women ... [9] Description of an mHealth tool for breastfeeding support: LactApp. Analysis of how lactating mothers seek support ... [10] Usability study of the mommy-be app: Exploring the experience ... [11] Usability challenges for health and wellness mobile apps: Mixed-methods ... [12] Factors influencing the adoption of mHealth services in a ... [13] Enablers and inhibitors: A review of the situation regarding mHealth adoption ... [14] Role of mHealth applications for improving antenatal and postnatal care in low and ... [15] The mHealth app usability ... [16] Malay version of the mHealth app usability questionnaire ... [17] Chinese version of the mobile health app usability ... [18] German version of the mHealth app usability questionnaire in a cohort of patients ... [19] The system usability scale ... [20] Barriers to and facilitators of the use of mobile health apps ... [21] Development and validation of the user version ... [22] Perceived usefulness, perceived ease of use ... [23] Consumer acceptance and use of information technology: Extending the unified ... [24] Investigating acceptance of telemedicine services through ... [25] An extension of technology acceptance ... [26] The adoption of software measures ... [27] Effectiveness of internet-based electronic technology ... [28] Efficacy of e-technologies in improving breastfeeding outcomes ... [29] Mobile phone-based interventions ... [30] Mobile application intervention to improve nutritional literacy of mothers ... [31] The effectiveness of smartphone-based nutrition education intervention in successful ... [32] The KIA book's digitalization as a means to educate breastfeeding and ... [33] The application of digital health as a nursing solution for leprosy patients during ... [34] The effect of foot self care and diabetes self-management mobile application in preventing foot ... [35] Analysis of acceptance of e-health application by users in ... [36] ncreasing self-care of patients with type 2 diabetes through the implementation of a nursing ...

Introduction

Breastfeeding is a key public health priority because it supports optimal infant growth and development, helps protect infants against infection [1-3], and benefits maternal health [4, 5]. Although exclusive breastfeeding for the first six months is strongly recommended, early discontinuation remains common. Mothers often face multiple interacting challenges, including perceived insufficient milk supply, difficulties with latch or milk expression, pain, fatigue, pressure to introduce formula, and return to work [6-9]. The quality and timeliness of breastfeeding counseling and social support can influence how mothers respond to these challenges. Therefore, interventions that provide accessible education and practical problem-solving support remain important.

Mobile health (mHealth) has become an increasingly important channel for delivering health education, self-management support, and behavior change interventions through smartphones and other mobile devices [1-5]. In maternal and child health, mobile applications are widely used to provide pregnancy and postpartum information, reminders, interactive learning materials, and peer support, complementing routine services [6, 7]. For breastfeeding mothers, timely, practical guidance is often needed outside clinic hours, and mHealth can offer low-cost, on-demand access to information and support. When apps are designed to fit mothers' needs and daily routines, they can strengthen confidence, reduce avoidable problems, and improve the continuity of recommended practices [7-9]. One application developed for this purpose is Mommy-Be [10], which aims to support breastfeeding mothers through digital application-based guidance specifically in the middle area of Indonesia.

In Indonesia, the development of maternal health and breastfeeding applications is expanding [10, 11], but usability evaluation is not always conducted using validated instruments. Some studies rely on generic tools such as the System Usability Scale (SUS) or on self-developed questionnaires and ad hoc items. Generic tools can support broad comparisons across software systems, but they may not fully capture usability aspects important to mHealth applications, such as usefulness for health-related tasks, satisfaction with the information layout, and support for behavior change in real-life settings [11]. Self-developed questionnaires can be tailored to a specific app, but without psychometric validation, their results are difficult to interpret and compare across studies.

Given Indonesia's diverse geography and varying access to health services, mobile applications may also help reduce inequities in information delivery. Mothers living in rural or remote areas may have fewer opportunities for in-person lactation counseling, and clinic visits can be limited by travel costs and time. At the same time, variation in smartphone experience and digital literacy means that applications must be intuitive and low-burden. An app that requires complex steps or uses unfamiliar terms may discourage use, especially among mothers who are already managing fatigue, household responsibilities, and infant care. For this reason, usability assessment is a critical step before recommending an app as part of a health promotion strategy.

Previous studies have shown that adopting mHealth applications often faces challenges in terms of usability and user satisfaction with the features offered [11, 12]. Therefore, a comprehensive evaluation is needed to measure the extent to which these applications can meet user needs and function well in certain contexts [13, 14]. To assess the usability of the Mommy-Be application, the Mobile Application Usability Questionnaire (MAUQ) instrument was used, previously developed by Zhou *et al.* [15] and translated into Malay [16] and adapted for use in Indonesia.

The mHealth App Usability Questionnaire (MAUQ) was developed to address the need for a reliable and valid instrument specifically designed for evaluating mHealth applications. The MAUQ provides four versions to match key usage contexts: Interactive versus standalone applications, and patient versus provider users. For the standalone patient version, the MAUQ comprises 18 items grouped into three dimensions: ease of use (5 items), interface and satisfaction (7 items), and usefulness (6 items). Items are rated on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree), where higher scores indicate better perceived usability. Previous validation studies reported good psychometric properties for the MAUQ, including strong internal consistency for the standalone version and evidence of construct and criterion validity.

MAUQ has been translated into other languages, such as Malay [16], which provides useful prior evidence and methodological foundation for adaptation. However, linguistic similarity does not guarantee measurement equivalence, and Indonesian users may interpret some items differently because of differences in expressions, culture, and the local app context. Establishing validity evidence in Indonesia is, therefore, necessary to ensure that the Indonesian MAUQ version measures the intended usability dimensions, supports reliable score interpretation, and enables meaningful comparisons across mHealth applications.

The MAUQ instrument was chosen for adaptation and translation into Indonesian because it offers advantages for measuring various aspects of mHealth application usability, including ease of use, satisfaction with the interface, and overall application usability. This instrument has been validated in several previous studies [15-18], including in the context of mHealth applications in Malaysia,

thus providing a strong theoretical basis for use in a similar context in Indonesia. MAUQ is considered relevant for evaluating the Mommy-Be application because it covers important dimensions of the user experience when interacting with digital health applications. The process of adapting the MAUQ instrument to the Indonesian language was carried out with consideration of language and cultural differences to better describe the perceptions and experiences of Indonesian users. The selection of the MAUQ instrument was also based on its relevance to the experience of mHealth application users in Malaysia, which has cultural similarities with Indonesia, so this instrument is expected to be easier to adapt.

Nevertheless, translation alone is not sufficient when an instrument is applied in a new language and context. Cross-cultural adaptation is needed because literal translation may not preserve the same meaning, and because technology use patterns, digital literacy, and expectations about app features can differ between settings. For example, items referring to internet connectivity, the suitability of app use in social situations, or expectations about app functions may be interpreted differently depending on local infrastructure and the specific scope of the application being evaluated. A culturally adapted instrument can help ensure that usability scores reflect the intended constructs and support valid conclusions for decision-making and future development.

In response to the need for accessible breastfeeding support, we developed Mommy-Be, a mobile app that provides educational content and practical guidance to breastfeeding mothers in Indonesia. The application was designed to provide information and recommendations that mothers can use during everyday breastfeeding situations, including when professional support is not immediately available. Before broader implementation and potential scale-up, it is necessary to evaluate whether mothers can use the application effectively and comfortably, and whether the instrument used to assess usability is valid for this context.

Therefore, this pilot study aimed to adapt and validate the MAUQ for evaluating the usability of the Mommy-Be application among breastfeeding mothers in Indonesia. Specifically, we assessed the construct validity of the adapted MAUQ using Confirmatory Factor Analysis (CFA) and evaluated the adequacy of model fit in the Indonesian context. By providing initial validity evidence for the Indonesian version of the MAUQ, this study was expected to support future usability studies of mHealth applications and to guide the refinement of Mommy-Be to better fit users' needs.

Instrument and Methods

This descriptive instrument-based study was conducted from July to September 2023. Because the main psychometric analysis in this pilot study was a CFA, we followed the commonly used rule of thumb of at least 10 participants per item for factor analysis/validation studies. The standalone patient version of MAUQ contains 18 items; therefore, the minimum target sample was 180 participants (18 items x 10). To increase the stability of parameter estimates and to account for non-response and incomplete questionnaires, we invited 400 mothers. A total of 386 mothers completed the questionnaire and were included in the analysis.

The sample in this study consisted of breastfeeding mothers who used the Mommy-Be application. Participants were recruited from two Community Health Centers (Puskesmas) in Makassar City (Pattingaloang and Tamalate). Eligible participants were breastfeeding mothers with a smartphone who were willing to download and use Mommy-Be. Mothers who reported a prior diagnosis of mental disorders were excluded.

The Mobile Application Usability Questionnaire consists of 18 items to measure three dimensions: Ease of use, interface satisfaction, and application usability [16]. This research was conducted at several primary health centers in Makassar City, South Sulawesi, the location of the Mommy-Be application research project. The selection of this location was based on the potential and need for lactation support for breastfeeding mothers in the area. During the research, breastfeeding mothers in this village were supported in adapting to the Mommy-Be application. The adaptation process and pilot testing of this application lasted for two weeks. During this period, participants were given video tutorials on registering and navigating the application, as well as limited support from research assistants to help them use the application until they could master its features. After two weeks of use, participants were asked to complete a questionnaire to assess their experience with the Mommy-Be application. Mothers who responded to the request were then given a link to download the application along with installation instructions. This study does not set strict qualifications, as it is a pilot study for an application trial. What is certain is that mothers must have babies under two years old and be breastfeeding, be able to use Android-based applications, have an Android cellphone, and have never been recorded or diagnosed with mental disorders before.

The original MAUQ development study reported strong internal consistency for the standalone 18-item version (overall Cronbach alpha=0.914; Ease of use alpha=0.847; Interface and satisfaction alpha=0.908; Usefulness alpha=0.717) and evidence of construct and criterion validity [15]. The Malay validation study also demonstrated good validity evidence (content and face validity indices) and high internal consistency (Cronbach alpha for 18 items=0.946) [16]. In this pilot study, we evaluated the construct validity of the adapted Indonesian MAUQ

using confirmatory factor analysis [17]. Each item was rated on a 7-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). Subscale scores were calculated as the mean of the items within each dimension, and the overall usability score was calculated as the mean of all items. Higher scores indicated better perceived usability of the application.

The instrument used in this study was the mHealth App Usability Questionnaire (MAUQ) for standalone mHealth apps (patient version) [15], which we adapted into Indonesian based on the Malay MAUQ (M-MAUQ) [17] for the Mommy-Be application. The standalone patient MAUQ contains 18 items grouped into three dimensions: Ease of use (5 items), interface and satisfaction (7 items), and usefulness (6 items).

Data analysis

Confirmatory factor analysis (CFA) was conducted to evaluate the construct validity of the adapted MAUQ in the Mommy-Be context. CFA was performed using IBM SPSS AMOS. Model fit was assessed using multiple indices, including chi-square and degrees of freedom, Goodness-of-Fit Index (GFI), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), and the Root Mean Square Error of Approximation (RMSEA). As commonly applied in validation studies, acceptable fit was considered when CFI and TLI approached or exceeded 0.90, GFI approached or exceeded 0.90, and RMSEA was below approximately 0.08. When needed, model modification was guided by standard CFA diagnostics (e.g., modification indices) while maintaining conceptual consistency of the factors.

Findings

The majority of mothers were young to middle-aged and came from middle- to upper-socioeconomic classes, with education mostly at the diploma or bachelor's level. The composition of housewives and working mothers was almost balanced. Most mothers cared for very young babies, especially those aged 0-6 months, and most gave birth spontaneously. These data show a diverse population in terms of age, socio-economic status, education, and method of delivery, providing a good representation to understand the dynamics of breastfeeding mothers in this context (Table 1).

An initial CFA was conducted to test the 18-item, three-factor MAUQ structure for the Mommy-Be application. The initial model fit indices were Chi-Square=407.071, df=132, p<0.001, GFI=0.890, CFI=0.949, TLI=0.941, and RMSEA=0.073 (Figure 1). Based on the results of this model test, several items were found with high Modification Indices (MI), so it was deemed necessary to review the relationship between items and remove items that caused unnecessary error correlations. Given that this is the first model, some items may be less relevant to measuring the desired construct.

Table 1. Participant characteristics (n=386)

Characteristics	N (%)
Age	
18-24	89 (23.0)
25-30	156 (40.4)
31-35	94 (24.4)
36-40	47 (12.2)
Socio-economic	
Lower	49 (12.7)
Middle	170 (44.0)
Upper	167 (43.3)
Occupation	
Housewife	195 (50.5)
Working mother	191 (49.5)
Education	
Basic 12 years	125 (32.4)
Diploma/bachelor	239 (61.9)
Postgraduate	21 (5.4)
Babies' age (months)	
0-6	196 (50.8)
7-12	84 (21.8)
13-24	106 (27.4)
Baby gender	
Male	170 (44.0)
Female	216 (56.0)
Birth method	
Spontaneous	245 (63.5)
Caesarian	141 (36.5)

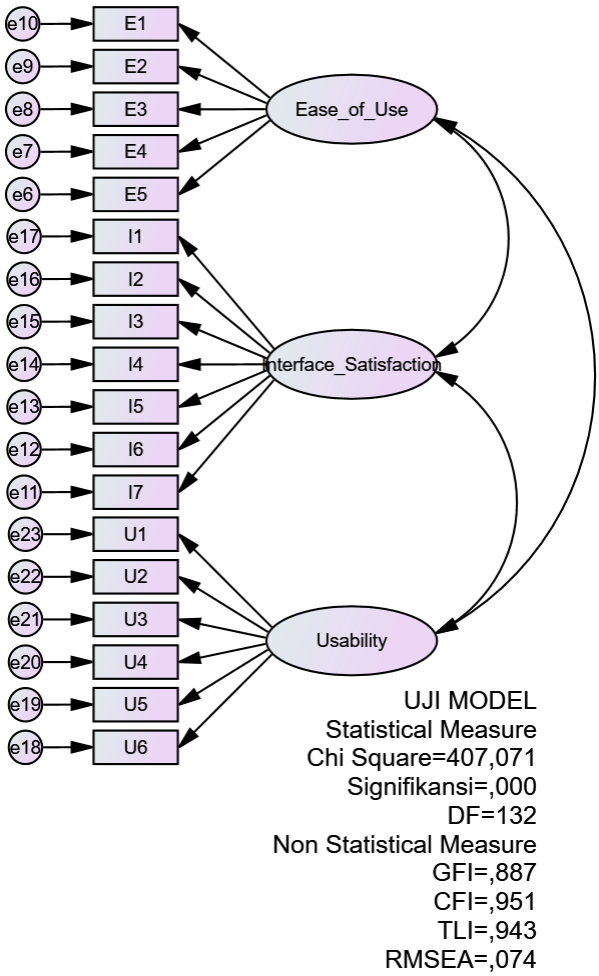

Figure 1. First model result of MAUQ adoption

In the early stages of this study, the first model was compiled using all items adapted from the MAUQ instrument to measure Ease of Use, Interface

Satisfaction, and Usability of the Mommy-Be application. However, the results of the Confirmatory Factor Analysis on the initial model showed several fit indices that did not meet ideal criteria, although several indices were close to a good fit. Based on the MI results, several items were identified as sources of inconsistency in the model. These items had high MI, indicating unexpected error correlations with other items. For example, item E4, which assesses the application interface's ability to support all functions; item I5, which measures the suitability of the time spent using the application; and item U5, which assesses the application's ability to function without an internet connection. After considering the real conditions of the Mommy-Be application, these items were considered less relevant to measure in this context, due to the limitations of the application that cannot function without an internet connection, as well as the usage time, which tends to be longer because the application is still in the early trial stage. Here are some strong reasons why items related to the Mommy-Be application were deleted: Deletion of Item E4: "The app's interface allowed me to use all the functions offered by the app": This item was considered irrelevant in the context of the Mommy-Be application trial because some of the application's functions could not be fully explored by breastfeeding mothers during the short trial period. For example, several baby growth-monitoring menus and periodic postpartum depression screening features in the application have not been fully explored by users in the limited time available. Deleting this item is expected to improve model fit because items that are not fully relevant or that respondents cannot answer well can increase error variability and interfere with the representation of the factors being measured.

Deletion of Item I5: “The amount of time involved in using this app has been fitting for me.” Given that the Mommy-Be app is new, the time it takes breastfeeding mothers to learn and use it may be longer than they expected. Therefore, the question of the appropriateness of the time required to use this app may be less relevant to measure in the early stages of app introduction. Deleting this item is expected to help reduce data noise caused by users’ perceptions of the time required to learn a new app. This, in turn, improves the model fit as only more appropriate and relevant items remain to measure Interface Satisfaction.

Removal of Item U5: "I could use the app even when the Internet connection was poor or unavailable": One of the main limitations of the Mommy-Be app is its reliance on an Internet connection. Given that the app was not designed to function offline, this item is not relevant to the actual user experience. Asking about the app's ability to function without an Internet connection could lead to a mismatch between user perceptions and app performance. Removing this item from the Usability factors is expected to help align the measurements with the app's actual technical capabilities, thereby reducing model mismatch. This allows the model to focus more on usability aspects relevant to the app's context of use. These items were removed because they did not reflect the actual conditions and user experiences during the application trial. This is important to ensure that the remaining items truly reflect the user's perception of the application's usability, not external factors such as technical limitations or limited time. Removing irrelevant items is expected to reduce variability caused by inaccurate perceptions, thereby allowing the model to better measure the constructs of Ease of Use, Interface Satisfaction, and Usability. Thus, the model fit value increases because the model is a better representative of the existing data.

After model diagnostics, two items (I5 and U5) were removed, and the CFA was re-estimated. The modified 16-item model retained three factors (Ease of Use: 4 items; Interface and Satisfaction: 6 items; Usefulness: 5 items) and showed improved fit: Chi-square=255.712, df=101, p<0.001, GFI=0.925, CFI=0.972, TLI=0.966, and RMSEA=0.062 (Figure 2).

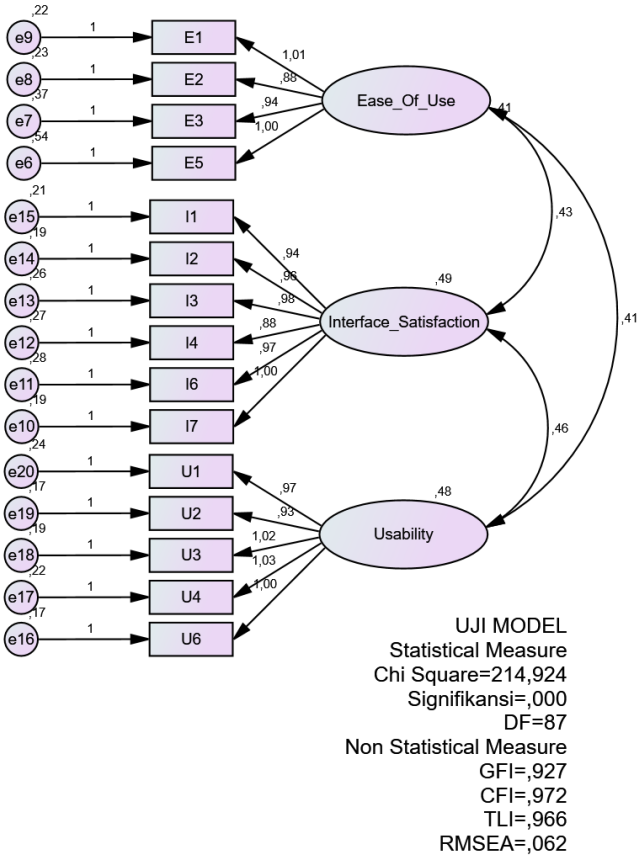

Figure 2. Results of the second modified model test (item deletion)

Based on Figure 2, the Model Fit Index includes the chi-square test, GFI, CFI, TLI, and RMSEA values. The Chi-Square test shows significant results (p<0.05), which usually indicates a mismatch between the model and the data. However, the Chi-Square test is

sensitive to sample size, and with large samples, significant results are common even though the model fit is acceptable. A GFI value above 0.90 indicates a good fit of the model with the observed data. A GFI value of 0.927 indicates that this model fits the data well. A CFI value above 0.95 indicates a very good fit. A value of 0.972 indicates that the revised model has a very good fit, meaning that the hypothesized model accounts for the observed covariance structure. Like the CFI, a TLI value above 0.95 indicates a very good fit. A value of 0.966 indicates that this model is well-defined and provides a good representation of the data structure. RMSEA values below 0.06 indicate a good fit, while values between 0.06 and 0.08 indicate a fair fit. The RMSEA of 0.062 is within the acceptable range, indicating adequate fit for the population data.

For the model structure that includes loading factors, it shows that most of the loading factors (e.g., E1, E2, I1, I2, U1, U2, etc.) appear strong (above 0.80), indicating that the observed variables are well represented by their respective latent constructs (Ease of Use, Interface Satisfaction, and Usability). Loading factors approaching 1.00 (e.g., E3=1.00, U3=1.02) indicate that the items have a very strong correlation with the factors they represent. The inter-factor correlation, namely the correlation among the latent factors (Ease of Use, Interface Satisfaction, and Usability), is moderate to high (e.g., around 0.41-0.49). This indicates that although the constructs are interrelated, they measure somewhat different aspects of application usability. Measurement Error Terms: This model includes several error terms (e.g., e9, e8, e7) that capture measurement errors for each indicator. This error-covariance adjustment likely contributed to the improvement in the fit indices, as suggested in the previous recommendations.

Thus, it can be concluded that the revised model provides a good fit to the data, with most fit indices indicating that the model is appropriate and well-defined. The significant Chi-Square value is most likely due to sample size rather than model inadequacy, as CFI, TLI, and GFI show a good fit. Strong factor loadings indicate that the selected indicators are appropriate and valid in measuring the latent construct. Moderate correlations between factors indicate that each construct measures distinct aspects of usability and satisfaction with the application, which is useful for understanding how users perceive the application's different dimensions (Appendix 1).

Discussion

The results of this study indicate that adapting the Mobile Application Usability Questionnaire (MAUQ) instrument from Malay to Indonesian can measure user perceptions of the Mommy-Be application across three main dimensions: ease of use, interface satisfaction, and application usability. In the first model, several fit indices, such as CFI and TLI, indicate that the model is not fully supported by the data, suggesting a mismatch between the hypothesized factor structure and the empirical data. This finding aligns with a study by Lewis [19], which emphasized the importance of instrument validation using Confirmatory Factor Analysis to ensure that the items used truly reflect the constructs being measured.

Based on the Modification Indices analysis, several items showed unexpected error correlations with other items, which affected the model fit. Therefore, items such as E4, I5, and U5 were removed. This decision is consistent with the approach proposed by Zhou *et al.* [20], which emphasizes that removing items that are irrelevant or difficult for users to understand can improve model fit in evaluating mHealth applications. For example, item U5, which assesses the application's ability to function without an internet connection, was removed because the Mommy-Be application does require an internet connection to work. This is also in line with the research of Stoyanov *et al.* [21], which shows the importance of adjusting the instrument to the technological context and technical capabilities of the application being tested.

After modification, the second model showed significant improvements in fit indices, including CFI and TLI, which increased to 0.972 and 0.966, respectively. The RMSEA value of 0.062 also indicates that the model's error in estimating the data structure remains within an acceptable range. This increase indicates that the second model is more representative of user perceptions and better aligned with the Mommy-Be application trial conditions. Eliminating irrelevant items reduces data noise and yields a simpler yet robust model for measuring the application's usability dimensions. This finding supports the principle proposed by Davis [22]. The Technology Acceptance Model (TAM) states that perceived ease of use and usefulness are key factors in user acceptance of technology, also supported by other scholars in similar studies [23-26].

In addition, these results are relevant to studies conducted in several regions [27, 28], which highlighted that adapting instruments to local contexts can improve data quality and ensure that interventions are acceptable to users. Thus, this study not only successfully adapted the MAUQ instrument to the Indonesian context but also contributed to other researchers seeking to test new health applications in Indonesia. This study shows that thorough adaptation and validation of instruments are important steps to ensure that mHealth applications can be measured accurately within specific cultures and user needs.

The findings of this study can also be a reference for future research, especially in the context of developing mHealth applications in Indonesia. In future studies, researchers are encouraged to

consider external factors, such as family support and health workers, which can influence perceptions and adoption of mHealth applications, as suggested by studies on specific health problems [29]. This approach is expected to enrich understanding of the factors influencing the successful implementation of health applications in Indonesia, as well as to provide insight into how applications can be designed to better meet the needs of local users.

The rapid proliferation of mobile technology presents a unique opportunity to overcome barriers in health management [30]. Information technology innovations are increasingly used to deliver health services and promote health, with mobile applications as one example [31]. The development of this concept involves many levels of intervention: a) at the policy level, b) at the organizational level, c) at the local level, d) by integrating familyresponsibilities on an interpersonal level, and e) at the individual level [32]. The use of digital technology is an innovative and comprehensive development [33]. The utilization technology in health interventions can help overcome disincentive factors and encourage individuals to manage their health [34]. The use of information technology in the health sector can help people access health services faster and more practically [35]. The application was found to be effective in increasing self-care ability in several health problems experienced [36].

Some limitations in conducting this test include limited trial time, geographical constraints, and reliance on an internet connection. This study involved only a two-week trial of the application, which may not be enough to fully understand how breastfeeding mothers interact with its features in the long term. This study was conducted only in Makassar City, South Sulawesi, so the results may not be generalizable to other areas with different user characteristics, such as rural residents. As an application that relies on internet connectivity, some respondents may face obstacles to accessing and using it optimally, which may affect their perception of its usefulness. For further research, it is expected to extend the trial period to several months to obtain a more comprehensive picture of the application's long-term use. Conducting research across multiple locations, both urban and rural, can yield more representative results on the adoption of the Mommy-Be application across different social and economic contexts. Given that the Mommy-Be application requires an internet connection, further research can explore the development of features that can be used offline. This is expected to increase the application's accessibility, especially in areas with limited internet access. Finally, it is recommended to examine external factors, such as family support and the role of health workers, to enrich understanding of the factors that influence the successful implementation of mHealth applications.

Conclusion

This study successfully adapted the Malay MAUQ instrument for Indonesia and evaluated the Mommy-Be application. Confirmatory Factor Analysis shows that the second modified model fits better than the first. The model's fit improved after removing irrelevant items, such as E4, I5, and U5, based on Modification Indices. Thus, the final model better described the Mommy-Be app user experience in the trial context.

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Ethical Permissions: The study was reviewed and approved by the Ethics Committee, with the opinion and authorization referenced under Identification Number 192/STIKE-NH/KEPK/VII/2023.

Conflicts of Interests: No conflict of interest to declare.

Authors' Contribution: Syam A (First Author), Introduction Writer/Methodologist/Statistical Analyst (60%); Fadli F (Second Author), Main Researcher/Statistical Analyst (10%); Syam A (Third Author), Assistant Researcher/Statistical Analyst (10%); Amelia AR (Fourth Author), Introduction Writer (10%); Toaha A (Fifth Author), Assistant Researcher (10%)

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References

1- Chib A, Lin SH. Theoretical advancements in mHealth: A systematic review of mobile apps. J Health Commun. 2018;23(10-11):909-55.

2- Lin TT, Bautista JR. Understanding the relationships between mHealth apps' characteristics, trialability, and mHealth literacy. J Health Commun. 2017;22(4):346-54.

3- Bt Wan Mohamed Radzi CWJ, Salarzadeh Jenatabadi H, Samsudin N. mHealth apps assessment among postpartum women with obesity and depression. Healthcare. 2020;8(2):72.

4- Powell AC, Torous J, Chan S, Raynor GS, Shwarts E, Shanahan M, et al. Interrater reliability of mHealth app rating measures: Analysis of top depression and smoking cessation apps. JMIR Mhealth Uhealth. 2016;4(1):e15.

5- Latour C, O'Byrne L, McCarthy M, Chacko R, Russell E, Price RK. Improving mental health in U.S. Veterans using mHealth tools: A pilot study. Health Informatics J. 2020;26(4):3201-14.

6- Schindler-Ruwisch JM, Roess A, Robert RC, Napolitano MA, Chiang S. Social support for breastfeeding in the era of mHealth: A content analysis. J Hum Lact. 2018;34(3):543-55.

7- Laws RA, Cheng H, Rossiter C, Kuswara K, Markides BR, Size D, et al. Perinatal support for breastfeeding using mHealth: A mixed methods feasibility study of the My Baby Now app. Matern Child Nutr. 2023;19(2):e13482.

8- Qian J, Wu T, Lv M, Fang Z, Chen M, Zeng Z, et al. The value of mobile health in improving breastfeeding outcomes among perinatal or postpartum women: Systematic review and meta-analysis of randomized controlled trials. JMIR Mhealth Uhealth. 2021;9(7):e26098.

9- Padró-Arocas A, Quifer-Rada P, Aguilar-Camprubí L, Mena-Tudela D. Description of an mHealth tool for breastfeeding support: LactApp. Analysis of how lactating mothers seek support at critical breastfeeding points and according to their infant's age. Res Nurs Health. 2021;44(1):173-86.
10- Syam A, Dewi I, Firawati F. Usability study of the mommy-be app: Exploring the experience of breastfeeding mothers in eastern Indonesia. REVISTA DE GESTÃO SOCIAL E AMBIENTAL. 2024;18(3):e05253.
11- Liew MS, Zhang J, See J, Ong YL. Usability challenges for health and wellness mobile apps: Mixed-methods study among mHealth experts and consumers. JMIR Mhealth Uhealth. 2019;7(1):e12160.
12- Alam MZ, Hoque MdR, Hu W, Barua Z. Factors influencing the adoption of mHealth services in a developing country: A patient-centric study. Int J Inf Manag. 2020;50:128-43.
13- Aamir J, Ali SM, Kamel Boulos MN, Anjum N, Ishaq M. Enablers and inhibitors: A review of the situation regarding mHealth adoption in low- and middle-income countries. Health Policy Technol. 2018;7(1):88-97.
14- Feroz A, Perveen S, Aftab W. Role of mHealth applications for improving antenatal and postnatal care in low and middle income countries: A systematic review. BMC Health Serv Res. 2017;17(1):704.
15- Zhou L, Bao J, Setiawan IMA, Saptono A, Parmanto B. The mHealth app usability questionnaire (MAUQ): Development and validation study. JMIR Mhealth Uhealth. 2019;7(4):e11500.
16- Mustafa N, Safii NS, Jaffar A, Sani NS, Mohamad MI, Abd Rahman AH, et al. Malay version of the mHealth app usability questionnaire (M-MAUQ): Translation, adaptation, and validation study. JMIR Mhealth Uhealth. 2021;9(2):e24457.
17- Shan Y, Ji M, Xie W, Li R, Qian X, Zhang X, et al. Chinese version of the mobile health app usability questionnaire: Translation, adaptation, and validation study. JMIR Form Res. 2022;6(7):e37933.
18- Moorthy P, Weinert L, Harms BC, Anders C, Siegel F. German version of the mHealth app usability questionnaire in a cohort of patients with cancer: Translation and validation study. JMIR Hum Factors. 2023;10:e51090.
19- Lewis JR. The system usability scale: Past, present, and future. Int J Hum Comput Interact. 2018;34(7):577-90.
20- Zhou L, Bao J, Watzlaf V, Parmanto B. Barriers to and facilitators of the use of mobile health apps from a security perspective: Mixed-methods study. JMIR Mhealth Uhealth. 2019;7(4):e11223.
21- Stoyanov SR, Hides L, Kavanagh DJ, Wilson H. Development and validation of the user version of the mobile application rating scale (uMARS). JMIR Mhealth Uhealth. 2016;4(2).
22- Davis FD. Perceived usefulness, perceived ease of use, and user acceptance of information technology. MIS Q. 1989;13(3):319-40.
23- Venkatesh V, Thong JYL, Xu X. Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. MIS Q. 2012;36(1):157-78.
24- Kamal SA, Shafiq M, Kakria P. Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM). Technol Soc. 2020;60:101212.
25- Rajak M, Shaw K. An extension of technology acceptance model for mHealth user adoption. Technol Soc. 2021;67:101800.
26- Wallace LG, Sheetz SD. The adoption of software measures: A technology acceptance model (TAM) perspective. Inf Manag. 2014;51(2):249-59.
27- Almohanna AA, Win KT, Meedya S. Effectiveness of internet-based electronic technology interventions on breastfeeding outcomes: Systematic review. J Med Internet Res. 2020;22(5):e17361.
28- Lau Y, Htun TP, Tam WSW, Klainin-Yobas P. Efficacy of e-technologies in improving breastfeeding outcomes among perinatal women: A meta-analysis. Matern Child Nutr. 2016;12(3):381-401.
29- Whittaker R, McRobbie H, Bullen C, Rodgers A, Gu Y. Mobile phone-based interventions for smoking cessation. Cochrane Database Syst Rev. 2016;4(4):CD006611.
30- Hasan DS, Arief YS, Krisnana I. Mobile application intervention to improve nutritional literacy of mothers with stunting children: A systematic review. Pediomatern Nurs J. 2024;10(2):70-5.
31- Pratiwi R, Atmaka DR, Sutoyo DAR, Mahmudiono T. The effectiveness of smartphone-based nutrition education intervention in successful practice of exclusively breastfeeding: A meta-analysis. AMERTA Nut. 2023;7(4):615-25.
32- Amalia R, Indriani D, Laili U, Windarti Y, Nisa F. The KIA book's digitalization as a means to educate breastfeeding and postpartum moms on their children's health. South East Eur J Public Health. 2024;23(3):487-91.
33- Dahoklory DF, Haryanto J, Indarwati R. The application of digital health as a nursing solution for leprosy patients during the COVID-19 pandemic: A systematic review. J Pak Med Assoc. 2023;73(Suppl 2):S170-4.
34- Pratiwi LD, Haryanto J, Wahyudi AS. The effect of foot self care and diabetes self-management mobile application in preventing foot ulcer recurrence: A systematic review study. Malays J Med Health Sci. 2023;19:109-16.
35- Astani NMMW, Ati NLPAP, Ernawaty. Analysis of acceptance of e-health application by users in primary healthcare center in Surabaya city. Indones J Public Health. 2021;16(1):66-78.
36- Purwanto CR, Sukartini T, Bakar A, Devy SR. Increasing self-care of patients with type 2 diabetes through the implementation of a nursing agency based on the health promotion model. J Pak Med Assoc. 2023;73(Suppl 2):S13004.

Appendix 1.

MAUQ English version

Code	Items	Construct
E1	The app was easy to use	Ease of Use
E2	It was easy for me to learn to use the app	
E3	The navigation was consistent when moving between screens	
E4	The app's interface allowed me to use all the functions offered by the app	
E5	Whenever I made a mistake using the app, I could quickly recover	
I1	I like the interface of the app	Interface and Satisfaction
I2	The information in the app was well organized, so I could easily find the information I needed	
I3	The app adequately acknowledged and provided information to let me know the progress of my action	
I4	I feel comfortable using this app in social settings	
I5	The amount of time involved in using this app has been fitting for me	
I6	I would use this app again	
I7	Overall, I am satisfied with this app	
U1	The app would be useful for my health and well-being	Usability
U2	The app improved my access to healthcare services	
U3	The app helped me manage my health effectively	
U4	This app has all the functions and capabilities I expected it to have	
U5	I could use the app even when the Internet connection was poor or unavailable	
U6	This mHealth app provided an acceptable way to receive health care services, such as accessing educational materials, tracking my own activities, and performing self-assessments	

MAUQ Indonesian version

Kode	Pernyataan	Konstruk
E1	Aplikasi ini mudah digunakan.	Kemudahan Penggunaan
E2	Saya mudah mempelajari cara menggunakan aplikasi ini.	
E3	Navigasinya konsisten saat berpindah antar layar.	
E4	Tampilan aplikasi memudahkan saya menggunakan semua fitur yang tersedia.	
E5	Saat saya melakukan kesalahan, saya bisa cepat memperbaiki dan melanjutkan penggunaan aplikasi.	
I1	Saya menyukai tampilan (*interface*) aplikasi ini.	Kepuasan Tampilan Aplikasi
I2	Informasi di aplikasi tersusun rapi, sehingga saya mudah menemukan informasi yang saya butuhkan.	
I3	Aplikasi ini memberikan informasi yang cukup untuk menunjukkan perkembangan/proses dari tindakan yang saya lakukan.	
I4	Saya merasa nyaman menggunakan aplikasi ini saat berada di lingkungan sosial (misalnya di depan orang lain).	
I5	Waktu yang dibutuhkan untuk menggunakan aplikasi ini sesuai bagi saya.	
I6	Saya bersedia menggunakan aplikasi ini lagi.	
I7	Secara keseluruhan, saya puas dengan aplikasi ini.	
U1	Aplikasi ini bermanfaat untuk kesehatan dan kesejahteraan saya.	Kegunaan
U2	Aplikasi ini meningkatkan kemudahan akses saya ke layanan kesehatan.	
U3	Aplikasi ini membantu saya mengelola kesehatan dengan lebih efektif.	
U4	Aplikasi ini memiliki semua fitur dan kemampuan yang saya harapkan.	
U5	Saya tetap bisa menggunakan aplikasi ini meskipun koneksi internet buruk atau tidak tersedia.	
U6	Aplikasi mHealth ini menjadi cara yang dapat diterima untuk mendapatkan layanan kesehatan, misalnya mengakses materi edukasi, mencatat/memantau aktivitas saya, dan melakukan penilaian mandiri.	