

Validation of the pSUAPP Questionnaire and User Experience Evaluation of the Satu Sehat Health Application in Indonesia

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ABSTRACT

The increasing use of digital health applications in Indonesia requires valid and reliable instruments to evaluate usability and user experience. This study aims to adapt and validate the pSUAPP questionnaire in the Indonesian context and to assess the usability of the Satu Sehat application. A cross-sectional validation study was conducted from May to June 2025 involving 102 active users of the Satu Sehat application, with 90 respondents included in the final psychometric analysis. The adapted pSUAPP questionnaire consists of 27 items covering four domains: first contact, registration, features, and overall user experience. Reliability and validity were assessed using Cronbach's alpha, correlation analysis with SUS, and exploratory factor analysis (EFA). The results showed that the mean pSUAPP score was 67.76 (SD = 18.39), indicating moderate usability. The registration domain obtained the highest score (mean = 87.50; SD = 12.50), while the feature (mean = 70.36) and experience (mean = 69.62) domains showed relatively lower scores. The questionnaire demonstrated high internal consistency, with strong correlations across domains and with SUS. EFA identified four factors explaining 76.7% of the total variance. No significant differences were observed across sociodemographic characteristics. In conclusion, the Indonesian version of the pSUAPP questionnaire is a valid and reliable instrument for evaluating digital health applications. While the Satu Sehat application performs well in registration, improvements are needed in monitoring features and user experience to support long-term engagement.

1. Introduction

Digital-based health technology, especially mobile health applications accessible via smartphones, has become an essential component of healthcare systems worldwide [1]. These applications help patients manage their health and improve the efficiency of healthcare services by providing faster access to medical information and communication with healthcare professionals [2]. These applications aim to facilitate patients in managing their health while improving the efficiency of healthcare services by providing faster access to medical information and communication with health professionals [3].

In Indonesia, the large population, unequal distribution of healthcare facilities, and increasing prevalence of

chronic diseases such as diabetes and hypertension make digital health technology increasingly important to support more effective healthcare delivery [4].

To support digital health transformation, the Indonesian Ministry of Health developed the Satu Sehat application as part of the national health data integration program. The application allows users to access electronic medical records, monitor health conditions, receive reminders for medication and medical appointments, and communicate with healthcare providers [4].

To support national digital health transformation, the Indonesian Ministry of Health developed the SatuSehat platform as an integrated health information system. This application enables users to access electronic

medical records, monitor health conditions, receive reminders, and communicate with healthcare providers [5]. The implementation of the SATUSEHAT platform continues to expand as part of Indonesia's health transformation program in 2024–2025, aiming to integrate healthcare data nationally and improve service quality [6].

Previous studies evaluating the SatuSehat application show that usability and user experience still need improvement to support optimal utilization [7]. Although the Satu Sehat application is starting to be widely used, there have not been many studies that have explored whether this application is easy to use and provides a satisfactory experience for its users, especially in the context of the needs of the Indonesian people [8]. Ease of use, which refers to how effectively, efficiently, and conveniently an application can be used, is very important because it affects whether users will continue using it long term [5]. Therefore, evaluating user experience is essential to ensure that the application can be used effectively and continuously by the public.

Usability and user experience are important factors influencing the acceptance of mobile health applications. According to ISO 9241-11, usability is defined as the extent to which a system can be used by specific users to achieve specified goals with effectiveness, efficiency, and satisfaction in a specified context of use [9]. A good user experience can increase user engagement, especially in applications used for long-term health management [10]. Several instruments have been developed to evaluate usability in mobile health applications, such as the Health-ITUES, MAUQ, and MARS, which have been validated in various international studies [11], [12], [13]. However, these instruments may not fully capture the specific characteristics of applications designed for chronic disease management or may require adaptation for different cultural and language contexts [14], [15], [16].

To overcome these limitations, the pSUAPP questionnaire was developed and validated to assess usability and user experience in mobile health applications, especially those used for chronic disease management [3]. This instrument provides a more comprehensive evaluation, including first-time use, registration process, feature usability, and overall user satisfaction. However, the pSUAPP questionnaire has not yet been adapted and validated for use in the Indonesian language, particularly for evaluating national health applications such as SatuSehat.

Therefore, there is still a research gap regarding the availability of a validated usability instrument suitable for evaluating mobile health applications in Indonesia. This study aims to adapt and validate the Indonesian version of the pSUAPP questionnaire and to evaluate the user experience of the SatuSehat application among

users in Indonesia. The results are expected to provide a valid measurement tool and useful recommendations for improving digital health services.

2. Research Method

The study uses a cross-sectional approach, which means that data is collected at a specific time to provide a direct picture of what is being studied. The research was carried out from May to June 2025 in Jakarta, Indonesia, involving active users of the Satu Sehat application from the general public. One hundred two people participated in filling out the PSUAPP questionnaire, which had been adapted into Indonesian. Of these, 90 people provided complete data and qualified for further analysis. The entire research process follows the ethical guidelines set out in the Helsinki Declaration to protect the rights and welfare of participants.

The research procedure consisted of several stages, including questionnaire translation, cultural adaptation, data collection, data screening, and statistical analysis. The overall research process is illustrated in Figure 1.

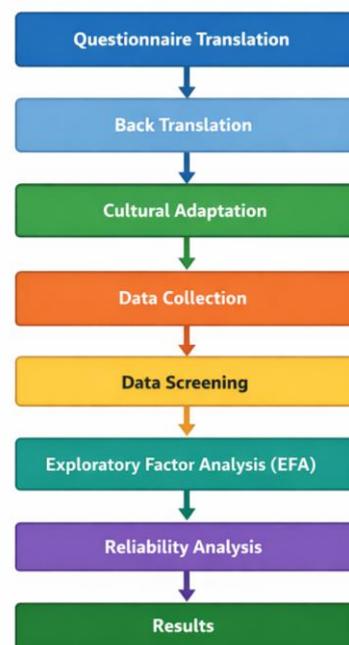


Figure 1. Research Process Flowchart

2.1. Research Design

This cross-sectional validation study was conducted from May to June 2025 and involved members of the general public who used the SatuSehat application in Jakarta, Indonesia. The study aimed to evaluate the usability and user experience of the SatuSehat application and to examine the psychometric characteristics of the pSUAPP questionnaire adapted for use in the Indonesian context.

All research procedures were carried out in accordance with the principles of the Helsinki Declaration.

2.2. Questionnaire

The pSUAPP questionnaire was initially designed to assess smartphone-based health applications supporting chronic disease management [3]. In this study, the questionnaire was adjusted into Indonesian through several stages. First, two independent translators who were proficient in computer science translated the questionnaire into Indonesian from the original language. Then, a reverse translation is carried out into the original language to ensure the original meaning does not change. After that, the research team reviewed the results to ensure the questionnaire was easy to understand and appropriate for Indonesia's cultural and linguistic context.

The adapted questionnaire consisted of 27 items using a 5-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (5). The questions are divided into four main groups. First Contact with 6 questions about the user's initial experience when opening the app, Registration contains 8 questions about the registration process and account setup, Features with 6 questions about the app's features, functionality, and ease of use and Experience contains 7 questions about users' general app impressions. In addition, one open-ended question allows users to provide feedback or suggestions freely. In addition, one open-ended question was included to allow users to provide suggestions or feedback freely.

2.3. Participants

Participants were recruited from the general public who actively used the SatuSehat application in Jakarta, Indonesia. The inclusion criteria were age ≥ 18 years, active use of the application for at least one month, and the ability to complete the questionnaire independently. Participants included both healthy individuals and individuals with certain health conditions.

A total of 120 users were invited to participate, and 102 completed the questionnaire. After data validation, 90 responses met the completeness criteria and were included in the sociodemographic and psychometric analysis.

The mean age of participants was 36.7 years (SD = 10.2), with the majority aged 18–44 years (75.6%). The gender distribution was relatively balanced (male 53.3%, female 46.7%), and most participants had higher education levels (72.2%). Written informed consent was obtained from all participants before participation.

2.4. Variable

The primary variable is the pSUAPP score calculated from 90 valid respondents, a composite measure with a range of 0-100 that represents the perception of the usability and user experience of the Satu Sehat application. The score is calculated by converting a 5

point Likert scale response to a scale of 0-4 (for positive items: score = response 1; for negative items: score = 5 response), adding up all the converted scores, and then multiplying them by a factor of 2.5 [17]. A higher score indicates a more positive user perception of the app's usability and experience. Secondary variables included the sociodemographic characteristics of the participants (age, gender, and education level) as well as the System Usability Scale (SUS) score used to evaluate the convergent validity [17].

2.5. Statistical Analysis

Statistical analysis was conducted to evaluate the psychometric properties of the Indonesian version of the pSUAPP questionnaire. Descriptive statistics were used to summarize the sociodemographic characteristics of the participants and the distribution of pSUAPP scores, including mean, standard deviation, median, and range values.

Construct validity was examined using Exploratory Factor Analysis (EFA) to identify the dimensional structure of the questionnaire and to evaluate factor loadings for each item. Correlation analysis between questionnaire domains and total scores was also performed to assess the relationship between dimensions and to examine the overall dimensionality of the instrument.

Internal consistency reliability was evaluated using Cronbach's alpha coefficient, with a value ≥ 0.70 considered acceptable. In addition, McDonald's Omega total (Omega t) and Omega hierarchical (Omega h) were calculated to provide a more robust estimate of reliability for multidimensional instruments.

Additional graphical analyses, including histograms, scatter plots, correlation matrices, and heatmaps of factor loadings, were used to visualize the distribution of scores, relationships between domains, and the structure of the extracted factors.

All analyses were performed on valid responses only after data completeness screening.

3. Result and Discussion

3.1. Respondent Characteristics

This validation study involved 102 respondents who completed the pSUAPP questionnaire. All respondents were active users of the SatuSehat application developed by the Ministry of Health of the Republic of Indonesia. Of the 102 initial respondents, 90 (88.2%) met the data completeness requirements and were included in the final analysis. The sociodemographic characteristics of the respondents are presented in Table 1.

Table 1. Study Population Characteristics

Features	Participants (n=90)	n Valid
Age (years), Average	36.7 (10.2)	90
Age (years), median (min,max)	31.0 (31.0, 54.5)	90
Gender, n (%)		
Man	48.0 (53.3%)	90
Woman	42.0 (46.7%)	90
Education, n (%)		
Higer Education	65.0 (72.2%)	90
High School	25.0 (27.8%)	90
Primary School		

The average age was 36.7 years (SD=10.2) and the median was 31 years. Based on age group, most of the respondents were in the age range of 18 to 44 years old at 75.6% followed by respondents in the age range of 45 to 64 years old at 24.4%.

Based on education, most respondents have higher education (Diploma 3, Strata 1, Strata 2 and Strata 3), as many as 65 people or 72.2% of the population and the rest, 27.8% have secondary education. The number of male respondents was 53.3% or a total of 48 people, and female respondents were 46.7% or a total of 42 people.

The Satu Sehat application used in this study is a national health application developed by the Ministry of Health of the Republic of Indonesia to integrate patients' electronic medical records, facilitate communication between patients and health care facilities, and enable independent monitoring of health conditions by patients.

Features used in the application include reporting daily health conditions, filling out self-questionnaires related to physical symptoms and activities, reminders of control and medication schedules, and lifestyle monitoring such as diet and physical activity. The app also allows patients to access their medical record history independently and assists healthcare workers in remote monitoring to support faster and more informed clinical decision-making.

3.2. Psychometric Evaluation of pSUAPP

The following analysis uses 90 respondents with complete data. The overall average pSUAPP score was 67.76 (SD = 18.39). Based on the results of descriptive analysis on the pSUAPP score and subdomains in this study, the overall mean of the pSUAPP score was 67.76 with a standard deviation (SD) of 18.39, a median of 70.37, and a value range from 0 to 99.07. There was no missing data when filling out the pSUAPP item.

In the pSUAPP Reduced version, an average score of 70.43 (SD = 16.80), a median of 70.83, with a range of values of 0-100. There was missing data in 8 respondents (7.84%), which generally occurred due to incompleteness in filling in the items included in the reduced version. The complete descriptive statistics for

the overall scores and each subdomain are presented in Table 2.

Figure 2–Figure 5 show the distribution of pSUAPP scores across the four subdomains, namely First Contact, Registration, Feature, and Experience. The graph indicates that respondents generally reported high acceptance and positive experience when using the application, especially in health recording functions and communication features with health workers.

The results of the analysis per First Contact subdomain had an average score of 69.79 (SD = 17.16), median 70.83, range 0-100, with missing data in 6 respondents (5.88%), Subdomain Registration showed the highest average score among subdomains, namely 87.50 (SD = 12.50), median 87.50, range 75-100, with seven respondents (6.86%) missing data. This shows that the respondents consider the registration aspect very good. While the Feature subdomain had an average of 70.36 (SD = 17.25), a median of 75, with a value range of 0-100, and data was lost in 6 respondents (5.88%) and Experience had an average of 69.62 (SD = 12.91), a median of 70.83, with a value range of 33.33-95.83, and data lost in 9 respondents (8.82%). The full statistical results for all variables and subdomains are presented in Table 2.

Table 2. Overall and Median pSUAPP Average and Median Scores per Dimension

Variabel	Mean	Std. Deviation (SD)	Median (Min,Max)	Lost (n,%)
pSUAPP	67.76	18.39	70.37 (0.00,99.07)	0, 0.00 %
pSUAPP Reduced	70.43	16.80	70.83 (0.00,100.00)	8, 7.84%
Sub Domain First Contact	69.79	17.16	70.83 (0.00,100.00)	6, 5.88%
Registration	87.50	12.50	87.50 (75.00,100.00)	7, 6.86%
Feature	70.36	17.25	75.00 (0.00,100.00)	6, 5.88%
Experience	69.62	12.91	70.83 (33.33, 95.83)	9, 8.82%

The distribution of pSUAPP scores across the four subdomains is illustrated in Figure 2–Figure 5. As shown in Figure 2, the First Contact dimension demonstrates a relatively balanced distribution of responses, although some variability is still observed.

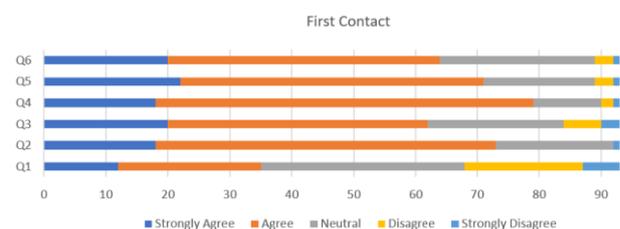


Figure 2. Stacked bar chart of pSUAPP scores on the first contact dimension.

Figure 3 highlights that the Registration dimension has consistently high scores, reflecting strong user agreement regarding ease of registration.



Figure 3. Stacked bar chart of pSUAPP scores on the registration dimension.

Meanwhile, Figure 4 shows that the Feature dimension has a wider spread of responses, indicating varying user perceptions of the available features. In Figure 5, the Experience dimension reflects generally positive responses, although not as strong as the Registration dimension.

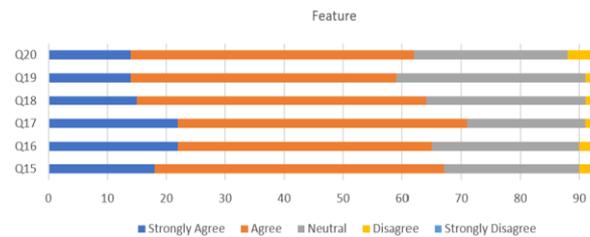


Figure 4. Stacked bar chart of pSUAPP scores on the feature dimension.

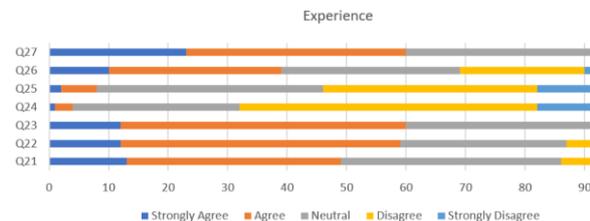


Figure 5. Stacked bar chart of pSUAPP scores on the experience dimension.

Based on Figure 2–Figure 5, it can be concluded that respondents' acceptance and positive experience of the tested application are relatively high, especially regarding health recording functions and supporting features of communication with health workers. These findings support the usefulness of the Satu Sehat application for users, but further evaluation is still needed to integrate the application into daily routines and manage notifications to increase user engagement on an ongoing basis.

3.3. Reliability

Based on the results of the reliability analysis of the pSUAPP questionnaire using Cronbach's Alpha, Omega Total (Omega t), and Omega Hierarchical (Omega h) on the entire scale, reduced version, and

each domain, the results were obtained that the Alpha value showed very high internal consistency on the overall scale (0.97), pSUAPP *reduced* (0.93), and the *Registration* subdomain (0.96) and *Features* (0.95). The Alpha value in the *Experience* domain (0.77) is slightly lower but still in the good category. Overall, these results show that the items in each domain strongly correlate in measuring the same aspects of the app's usability and user experience. The Omega t value on the overall scale was 0.62, and the reduced pSUAPP version was 0.74, indicating a good level of total reliability. In the Experience and First Contact domains, Omega t was 0.69 each, while the Registration (0.68) and Features (0.65) domains showed adequate total consistency. This value is consistent with Alpha, reinforcing that the instrument has stable reliability in the measurement of various aspects of application usage. Lower Omega h values compared to Alpha and Omega t (e.g. on the overall scale: 0.49; pSUAPP reduced: 0.41; Registration: 0.40) indicate that the proportion of variance produced by common factors is on a relatively moderate scale, while domain-specific factors explain other variances. This is common in multidimensional instruments like pSUAPP because each domain measures specific aspects of usability and user experience. The pSUAPP questionnaire has excellent internal consistency in measuring digital health apps' usability and user experience. A high alpha value indicates a close relationship between items, while an omega value supports the overall reliability of the instrument. The moderate Omega h value confirms that this instrument is appropriate for use in Satu Sehat *usability research* that requires multidimensional measurement, considering each domain's contribution in providing a comprehensive picture of the user experience. These results support using pSUAPP as a usability evaluation tool for the Satu Sehat application and the basis for further application development to improve user engagement and experience. Full results can be seen in Table 3.

Table 3. Reliability Measure

Variabel	Alpha	Omega t	Omega h	n
pSUAPP	0.97	0.62	0.49	87
pSUAPP Reduced	0.93	0.74	0.41	90
Sub Domain				
First Contact	0.96	0.68	0.40	87
Registration	0.95	0.65	0.28	88
Feature	0.77	0.69	0.41	90
Experience	0.97	0.62	0.49	87

3.4. Dimensionalities

Correlation analysis between the individual domains of the questionnaire and the overall pSUAPP score showed a pattern of relationship between the overall pSUAPP score, pSUAPP *reduced*, and four domains (*First Contact*, *Registration*, *Features*, and *Experience*), with very high correlation values (0.79-

0.97). The correlation between pSUAPP and pSUAPP reduced (0.97), Registration (0.95), and Features (0.96) shows that all domains are closely related in measuring the usability and user experience of digital health apps consistently. The histogram on the diagonal also shows a relatively normal distribution of values. However, there is a *tendency to skew to the right*, reflecting the generally positive user assessment of the tested application. Strong linear relationships are evident in scatter plots, with tight data spreads along linear regression lines, reinforcing the assumption of linear relationships between dimensions. These results indicate good construct consistency between domains, supporting the multidimensional structure of the pSUAPP questionnaire.

Overall, these findings show that the pSUAPP instrument has good dimensionality with integrated multidimensional characters, allowing each domain to capture specific aspects of the application user's usability and user experience while contributing to the comprehensive measurement of the overall construct. The high correlation supports the application of pSUAPP as a reliable health application usability evaluation tool in Satu Sehat application research. It can be the basis for further analysis using second-order confirmatory factor analysis (CFA) to validate the usability construct as a latent factor measured by well-defined domains.

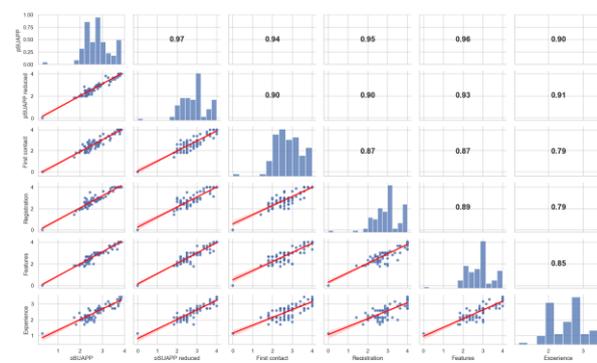


Figure 6. Correlation Analysis Between Domains.

The results of the Exploratory Factor Analysis (EFA) showed that most items had a high load on MR1, with values ranging from 0.58 to 0.85 (e.g. K2 = 0.85, K11 = 0.79, K12 = 0.80), suggesting that the first factor had the most significant contribution in explaining the variance of the instrument, which was likely related to the central aspect of usability or user satisfaction. The second factor (MR2) also shows significant loading on certain items, such as K14 (0.75) and K13 (0.66), indicating a second dimension that is separate but still relevant to usability, such as application features or technical support. The third factor (MR3) appears to contain items such as K23 (0.56), K20 (0.48), and K19

(0.41), which indicate a grouping of dimensions related to user experience or application personalization. Meanwhile, MR4 predominantly showed only significant loading on K24 with a value of -0.91 and K26 with 0.67, suggesting that the fourth factor is likely to measure specific aspects that are unique or different (negative) from other factors, such as the perception of task load or intrusive notifications on the application.

Overall, the results of this EFA indicate that the pSUAPP questionnaire has a stable factor structure with four main factors that complement each other in explaining the usability construct and user experience of digital health applications. The dominance of MR1 shows a significant contribution of the main factors to the total variance, while other factors help separate specific dimensions such as technical features and user experience. This supports the use of pSUAPP as a valid usability evaluation tool, with a multidimensional structure that can be used for further CFA (Confirmatory Factor Analysis) analysis in digital health application usability research to ensure model suitability in the context of Indonesian users.

Figure 7 illustrates the heatmap of factor loadings obtained from the EFA, showing that most items load strongly on their corresponding factors, confirming the stability of the four-factor structure.

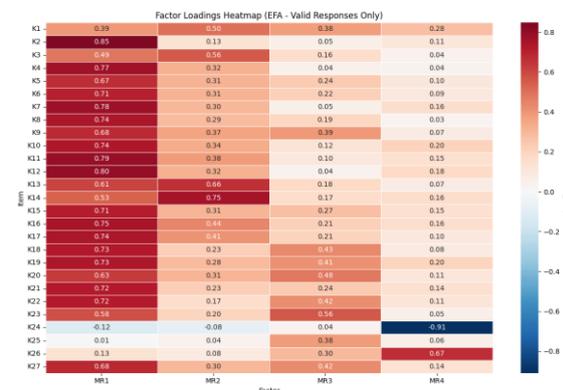


Figure 7. Factor Loadings Heatmap

3.5. Discussion

The growing use of the Satu Sehat application requires a reliable tool to assess its usability and user experience in clinical practice [4]. This assessment is crucial because high user engagement is often associated with increased efficacy of health interventions [5]. The pSUAPP questionnaire was developed in response to this specific need; a multidimensional tool designed for the comprehensive assessment of the Satu Sehat application, specifically for the integrated follow-up of patients with chronic diseases [3].

This study confirms that the Satu Sehat application has a moderate usability level (mean pSUAPP = 67.76)

with high acceptance in the registration aspect (mean = 87.5), showing the ease of the registration process that has been well optimized in the application. However, scores in other domains, such as feature (mean = 70.36) and experience (mean = 69.62), show room for improvement to improve user comfort and engagement in chronic health monitoring. These findings align with a similar study on the Satu Sehat app, which showed that registration tends to score highly, while self-monitoring and notification features often challenge maintaining ongoing user engagement. This indicates that while the app has helped users with the administrative aspects and early access to healthcare, the supporting elements of self-monitoring and notifications need to be optimized for the app to support long-term health management fully.

The reliability analysis showed very high values of Cronbach's alpha (0.97 overall), total omega (0.62-0.74), and hierarchical omega (0.28-0.49), indicating that the pSUAPP instrument has excellent internal consistency in measuring the usability and user experience of the Satu Sehat application. The hierarchical omega values that are lower than alpha and total omega indicate that while there are common factors underlying the overall usability of the application, there are specific variances in each domain that capture aspects of the user experience in more detail, supporting a multi-dimensional understanding in the evaluation of the usability of the Satu Sehat application. The dimensionality of the instrument was also strengthened by a very high interdomain correlation value (0.79-0.97), showing the close relationship between the First Contact, Registration, Feature, and Experience domains in shaping the overall application user experience. However, this high correlation also indicates the possibility of redundancy of certain items, so a review for simplifying the instrument in practical use may be a consideration to reduce the burden on respondents.

The results of the Exploratory Factor Analysis (EFA) show that a stable four-factor structure is formed, with MR1 loading the most items with high loads (0.58-0.85), illustrating the main factors related to the perception of usability and user satisfaction of the application. The second factor (MR2) contains items about the app's features, while the third factor (MR3) contains aspects of personalization and the experience of using the app regularly. The fourth factor (MR4) includes items related to negative user perceptions, such as app usage load or annoying notifications, that app developers need to pay attention to to avoid becoming a barrier to long-term use. These findings support the results of previous pSUAPP validation, which found a similar factor structure, showing that pSUAPP has the potential to be a consistent and comprehensive instrument in evaluating the Satu Sehat application in the context of Indonesian users [17]. This analysis also opens up opportunities to conduct

Confirmatory Factor Analysis (CFA) in the subsequent research to validate the structural usability model of the Satu Sehat application in more depth.

The absence of significant score differences based on sociodemographic characteristics such as age, gender, and education supports that the pSUAPP questionnaire can be widely used in diverse populations [17]. However, the age distribution of respondents tending to the younger group (median 31 years) suggests the need for further research on the elderly population, especially considering that the Satu Sehat application is also intended for patients with chronic diseases that are prevalent in the elderly age group [5].

Overall, this study shows that the Satu Sehat application has the potential as a means of chronic health monitoring that supports patient involvement in their health management, with usability aspects that have been good in the registration area, but still need to be improved in the self-monitoring feature and overall user experience. The pSUAPP questionnaire is proven to be a valid, reliable, and multidimensional usability measurement tool, providing a solid foundation for app developers to design features that better suit user needs and ensure long-term user engagement in using the Satu Sehat app in Indonesia. Future research is recommended to test this instrument on other Satu Sehat applications and populations with a wider diversity, to strengthen the generalization of findings and validate the utility of pSUAPP on an ongoing basis as a tool for evaluating the usability of digital health applications.

4. Conclusion

This study concludes that the Indonesian version of the pSUAPP questionnaire is a valid, reliable, and multidimensional instrument for evaluating the usability and user experience of the Satu Sehat application. The psychometric evaluation demonstrated high internal consistency, strong inter-domain correlations, and a stable four-factor structure based on Exploratory Factor Analysis, confirming the suitability of the instrument for usability assessment in digital health applications. The results indicate that the Satu Sehat application has moderate usability, with the highest scores observed in the registration domain, while the feature and experience domains still require improvement to enhance long-term user engagement. These findings provide practical contributions for digital health application developers and health policymakers by identifying specific usability aspects that need improvement to optimize user interaction, system performance, and user satisfaction in real-world implementation. Future development of the Satu Sehat application is recommended to focus on improving self-monitoring features, notification management, and user interface simplicity to reduce perceived workload and increase user comfort, so that sustained user engagement can be achieved. Further research is also

recommended to test the pSUAPP instrument in broader populations and different digital health application settings to confirm its generalizability and support long-term usability evaluation in the context of health services in Indonesia.

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