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DEVELOPING AN ANDROID-BASED APPLICATION FOR EARLY DETECTION AND INTERVENTION OF DEVELOPMENTAL PROBLEMS

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ABSTRACT
Telenursing SDIDTK (Stimulation, Detection, Early Intervention of Growth and Development) aims to assist nurses and nursing students in assessing children's growth and development. Objective: This study develops and evaluates the SDIDTK telenursing application. Method: Using a Research and Development (R&D) method, an Android-based mobile application was created, the features include: early detection of growth disorders, developmental deviations, hearing and vision tests, and behavioral and emotional issues, including autism and ADHD. The application was evaluated through expert judgement by pediatric nursing experts and a user acceptance test using the Technology Acceptance Model (TAM) with 104 nursing students. Results: Expert evaluations confirmed the content's appropriateness. User acceptance showed high behavioral intention to use the app (mean score = 21.14, SD±3.095). Ease of use was rated highly (mean score = 26.39, SD±2.977), and the app's usefulness received a mean score of 27.07 (SD±2.585). Significant correlations were found between convenience, usefulness, and behavioral intention to use, with Spearman's rho values of 0.641 and 0.858, respectively. Positive attitudes towards app use correlated with a Spearman's rho value of 0.648 ($P < 0.000$). Conclusions: The SDIDTK telenursing application help students in enhancing clinical learning experiences.

Keywords: developmental delays; early detection; mobile application; telenursing; nursing

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INTRODUCTION

Child growth and development is a critical phase in human life, where growth is measured by weight and height gain, while development is observed through the maturation of organ function (Afzal et al., 2021). Developmental delays are common in childhood, occurring around 10-15% among preschoolers (Choo et al., 2019). Although common, early identification of developmental delays should be followed by appropriate interventions to promote better outcomes for the child. One of the national initiatives related to child development, monitoring and stimulation, and early detection and intervention, called the SDIDTK programme, has been set up for more than a decade in Indonesia. Early developmental screening offers many benefits to the child, family, and health system. However, a lack of skills and knowledge among healthcare providers hinders the implementation of the programme (Gellasch, 2019; Mardiyanti et al., 2020). Improving nursing education is essential to help nursing students acquire the necessary skills and knowledge for early detection and intervention of developmental delays.

Recent studies highlight the effectiveness of mobile applications in enhancing nursing education, specifically in pediatric settings. A mobile app designed to improve clinical learning for nursing students during pediatric practice demonstrated high satisfaction and perceived achievement of learning outcomes. Participants reported that the app facilitated real-time interactions, active learning, and critical thinking, with an overall achievement score of 4.1 out of 5 (Lee et al., 2023). Another study focused on reducing therapeutic turnaround time and improving communication in pediatric emergency departments found that the use of a mobile app significantly reduced the time to consider laboratory results and locate colleagues, demonstrating the app's potential in emergency care settings (Ehrler et al., 2022). Furthermore, the use of a smartphone messenger app for nursing students improved their knowledge and performance in preventing medication errors in pediatric units (Pourteimour et al., 2019). Qualitative insights reveal that mobile applications in nursing education increase self-confidence, reduce stress, and are deemed necessary by all students involved (Ayse Kacaroglu & Media Subasi, 2019).

Despite the promising findings, there are notable research gaps concerning the long-term efficacy and user acceptance of mobile health applications in nursing education. Studies such as those by Lai & Yen, (2018) and Wambui et al., (2023) emphasize the benefits of mobile technology in bridging the gap between theoretical knowledge and practical skills, yet there is limited research on the sustained use and effectiveness of these tools in specific contexts like early child development monitoring. Mobile technology has revolutionized healthcare education and practice, particularly in child development monitoring. Hussain et al., (2021) noted that mobile educational apps enhance self-efficacy among students, suggesting that similar tools can empower nursing students in their clinical practice. Hsu et al., (2019) reported positive experiences among nursing students using mobile apps for physical assessment courses, highlighting the potential for broader application in child development monitoring.

The current study addresses these gaps by developing and evaluating the Telenursing SDIDTK application, developed by UIN Syarif Hidayatullah Jakarta, which has been downloaded by over 1,000 users. This application is designed to assist nursing students and healthcare professionals acquire the necessary skills and knowledge for child's growth and developmental assessment and intervention, yet its acceptance and effectiveness in an educational setting remain underexplored. This study aims to evaluate the effectiveness of the Telenursing SDIDTK application through nursing students' acceptance and behavioral intention to use based on the Technology Acceptance Model (TAM). TAM is a widely recognized theory that explains users acceptance of new technology based on perceived ease of use and perceived usefulness (Davis, 1989; Menant et al., 2021; Zaineldeen et al., 2020). By assessing students' perceived usefulness and ease of use, this study seeks to provide empirical evidence on the application's impact on learning outcomes and practical skills development. The findings will inform future improvements and optimizations of the application, ensuring it meets the educational needs of nursing students and supports effective child development monitoring and intervention. Therefore, this study aims to develops and evaluates the SDIDTK telenursing application.

METHOD

This study employed Research and Development (R & D) method. According to Sugiono, (2015), R&D is a method that can be used to develop and evaluate a new product that aims to

help people work easily and effectively. In this study, an android-based application namely telenursing SDIDTK, has been developed by the researchers. The application is built with the JavaScript programming language with the React Native framework. The researchers made this application with a careful logic function so that the results will be as accurate as possible. Reference from the Ministry of Health regarding SDIDTK guideline 2019 and The Ministry Health law number 2 in 2020 regarding anthropometry standards has been used. This apps has been revised from 1.0.14 version (released on 19 Nov 2021) to 1.0.16 (released on 22 April 2024) based on the expert judgement. Meanwhile, the Technology Acceptance Model (TAM) was used to evaluate the application. TAM was chosen to evaluate nursing students' acceptance and behavioral intention to use the Telenursing SDIDTK application. The evaluation of the app was conducted from March to April 2024, at a higher education institution in Jakarta, Indonesia. A total sampling strategy was employed to recruit nursing students enrolled in pediatric nursing courses. Inclusion criteria included nursing students who had completed at least one clinical experience in pediatric nursing and had access to a smartphone capable of running the Telenursing SDIDTK application. Exclusion criteria were students who were on leave or not currently enrolled in the semester during which the study was conducted. A total of 111 students were given questionnaire and around 104 were returned to the researchers. Ethical approval for this study was obtained from the Health Research Ethics Committee of UIN Syarif Hidayatullah Jakarta (Un.01/F.10/KP.01.1/KE.SP/10.08.020/2021). Informed consent was obtained from all participants prior to their participation in the study. Participants were assured of the confidentiality and anonymity of their responses, and their participation was voluntary, with the option to withdraw at any time without penalty.

RESULTS

The application has been launched in Google Play and can be downloaded in android mobile phone. The feature of the application can be seen from the picture below.

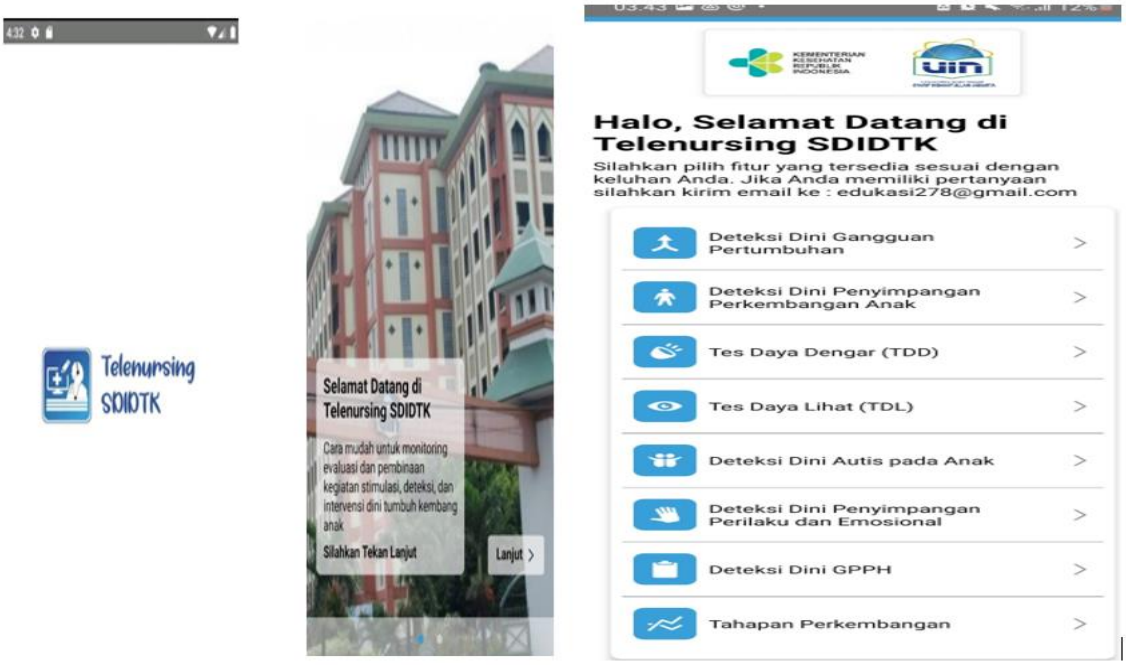

Figure 1. Home view of Telenursing SDIDTK and its features

This study analyzes the relationships between perceived ease of use, perceived usefulness, and attitude toward using with behavioral intention to use the SDIDTK telenursing application. Data was collected from 104 respondents, consisting of 7 males and 97 females.

The findings show that all independent variables have average scores close to the maximum value, indicating positive perception among students towards the application. The relatively small standard deviation indicates consistency in respondents' perceptions.

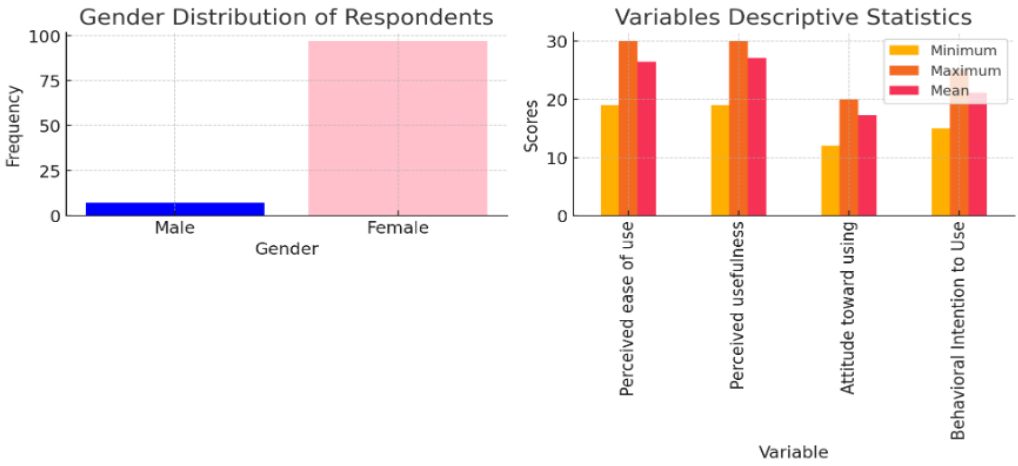

Figure 2. characteristic of respondents and variable's description

Figure 2 shows the results of univariate tests on the independent variable, namely perceived ease of use, with an average score of 26.39, a standard deviation (SD) is 2.977 and the min-max score is 19-30. This illustrates that the average perceived ease of use of the SDIDTK telenursing application according to students is good. The figure also shows variable perceived usefulness, with an average score of 27.07; SD is 2.585 and the min-max score is 19-30. This illustrates that the average perceived usefulness of the SDIDTK telenursing application is good. Furthermore, the variable attitude toward using has an average score of 17.21 (SD is 1.974 with min-max 12-20). Finally, the behavioral intention to use has an average score of 21.14 with SD is 3.095; and a min-max 15-25.

Tabel 1.
Users acceptance and their behavioural to use the app (N=104)

Variabel	Mean	P- Value & r (Correlation Coefficient)
Gender	53,29 (male) 52,44 (female)	P= 0,942
Perceived Ease Of Use	26,39	P= <0,000 (r= 0,641)
Perceived usefulness	27,07	P= <0,000 (r= 0,858)
Attitude toward using	17,21	P= <0,000 (r= 0,648)

Table 1 displays the results of the analysis regarding the relationship between gender and behavioural intention to use the application tested using the Mann-Whitney test. The results of the analysis show that the p-value obtained is 0.942, which is greater than 0.05. Thus, it can be concluded that there is no significant relationship between gender and behavioural intention to use the SDIDTK telenursing application. The table also displays the results of the analysis regarding the relationship between perceived ease of use, perceived usefulness, and attitude toward using with behavioural intention to use, which was tested using the Spearman's rho test. The analysis results show that the p-value obtained is 0.000, which is smaller than 0.05. Therefore, it can be concluded that there is a significant relationship between all these three variables and behavioural intention to use the SDIDTK telenursing application. The Spearman correlation value obtained of 0.641 (strong), 0.858 (very strong), and 0.648 (strong) respectively, and indicates a positive correlation. This indicates that the higher the perceived ease of use, usefulness and intention toward using, the higher the behavioural intention to use the SDIDTK telenursing application.

DISCUSSION

According to the Technology Acceptance Model (TAM) developed by Davis, (1989), Perceived Ease of Use (PEOU) is the degree to which a person believes that using a particular technology will be free of effort. Although PEOU does not always directly relate to behavioral intention to use (BIU), it significantly influences Perceived Usefulness (PU) and Attitude Towards Using (ATU). This study found a significant relationship between PEOU and BIU. This finding aligns with TAM, where PEOU is a key predictor of technology adoption intentions. Similar results were found in studies by Abdul Aziz et al., (2020), Yildirim & Surer, (2021), and Aini et al., (2023), which reported significant effects of ease of use on usage intentions in healthcare learning technologies.The Telenursing SDIDTK application's design prioritizes ease of use, featuring user-friendly interfaces and functionalities that support early detection of growth and development disorders in children. The application's Android-based platform enhances accessibility and usability across multiple devices, including smartphones, computers, tablets, and laptops, providing convenience for users anywhere and anytime. Feature processes on the Google Play Store® further enhance security (Lee, 2012; Irsan, 2015; Madda et al., 2019; Ramadhan et al., 2023). These design aspects ensure that the application meets users' needs efficiently, promoting sustained use among nursing students.

The finding also consistent with Marwasariaty et al., (2019) and Windiyani et al., (2023), which highlight the effectiveness of using SDIDTK application to support users' knowledge on developmental assessment. However, this study chose nursing students as the respondents while the other used mothers of under five children and cadres. Students of nursing have knowledge of SDIDTK better than mothers and cadres due to extensive material of SDIDTK have been taught and part of nursing competence in their learning outcome (AINEC/AIPNI, 2021). Therefore, evaluation from the nursing students regarding the SDIDTK application were superior than those two other respondents. Moreover, screening for mental behavioral disorders is the responsibility of nurses to be implemented in the community. The Telenursing SDIDTK application is designed to comply with the guidelines of the early detection and intervention of child development (SDIDTK) and adheres to the Indonesian Ministry of Health regarding SDIDTK (Kemenkes RI, 2019) and Regulation No. 20 of 2020 regarding child anthropometry standards (Kementrian Kesehatan Republik Indonesia., 2020). The application facilitates healthcare professionals in performing efficient early detection and intervention, providing accurate tools for monitoring child development and timely intervention, thereby reducing the risk of delayed treatment. For nursing students, the application serves as a valuable learning tool, enabling them to practice early detection techniques and simulate real-life scenarios, and develop practical skills in term of developmental stimulation and intervention of developmental delays (ŞENDİR & DOĞAN, 2015).

According to Davis (1989), attitude towards using technology is formed based on the user's experiences and perceptions of the technology's usefulness and ease of use. A positive attitude towards technology can significantly enhance the intention to adopt it (Davis, 1993; Madda et al., 2019). Descriptive analysis showed a high mean score for behavioral intention to use the Telenursing SDIDTK application (21.14) and a positive mean score for attitude towards using (17.21). This positive attitude indicates that students find the application beneficial, easy to use, and effective in early detection of child development issues. The Spearman's rho test indicated a significant relationship between attitude and BIU, with a p-value of 0.000 and a strong positive correlation coefficient of 0.648. These results support

TAM's proposition that a positive attitude towards technology, influenced by perceived usefulness and ease of use, enhances the intention to use the technology. Studies by (Samadbeik et al., (2023) and Sumaryono & Ismiyati, (2023) further corroborate this finding, showing that attitude significantly affects usage intentions in healthcare applications.

The adoption and sustained use of the Telenursing SDIDTK application in nursing education can be enhanced by fostering positive attitudes among students and ensuring that their perceptions of the application's usefulness and ease of use are aligned with their practical needs. By focusing on these factors, developers and educators can promote broader acceptance and effective utilization of the application in nursing education. Evaluation of the SDIDTK telenursing application was only carried out on nursing students at the same institution as the researcher. This could pose an ethical dilemma, but the researcher tried to avoid it by making the questionnaire anonymous and using research assistants who were not part of the core researchers. There are still many external factors that can be included in the TAM theory that have not been discussed in this study such as social support, self-efficacy and clinical competency. Therefore, it is recommended for further research by testing those external factors and in different populations such as nurses in hospitals, community health centres and mothers with toddlers.

CONCLUSION

The study highlights the necessity for nursing students to incorporate the SDIDTK telenursing application into their daily practice to enhance early detection skills. Educational institutions are encouraged to integrate this tool into their curricula, particularly in pediatric health programs. Application developers should continue to refine and expand the application's features based on user feedback to enhance its accessibility and functionality. Future research should investigate the long-term effectiveness of the SDIDTK telenursing application across diverse contexts and populations, comparing its impact with traditional methods, and exploring its effects on child health outcomes and family satisfaction. These advancements could significantly contribute to child health care and nursing education, warranting further exploration and implementation in practice.

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