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Usability and engagement of web application on parental behaviors for child obesity intervention

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Abstract

Background: Childhood obesity is a growing global health issue, with increasing prevalence in Asian countries, including Malaysia. Web applications such as JEJAK BMI offer an alternative intervention to address this concern by targeting parental behaviors that could influence their children's weight. The usability and engagement of the app used are important elements that could influence the intervention outcome.

Objective: To assess the engagement and usability of JEJAK BMI apps that could affect parental use of apps in child obesity interventions.

Methods: To evaluate the app's usability, three criteria were evaluated which were ease of use, visual appeal and functionality, post-intervention questionnaires were completed by the parents.

Results: The study found that most parents considered the app practical, easy to use, visually engaging and functional. However, the impact on children's BMI over the short term was inconclusive.

Conclusion: The JEJAK BMI web application demonstrated strong usability and positive effects on parental behaviors. Nonetheless, significant changes in children's BMI may require longer-term interventions and additional strategies.

Keywords: Child obesity; App usability; Engagement; Parental behavior; E- Health

1. Introduction

Child obesity is a pressing global health concern that has rapidly increased in recent years. According to World Health Organisation (WHO), over 390 million children and adolescents aged 5–19 years were overweight in 2022. From 1990 to 2022, the percentage of children and adolescents aged 5–19 years living with obesity increased from 8% to 20% globally [19]. Similar trend can be seen worldwide, including in Asian countries. In Malaysia, the National Health Morbidity Survey (NHMS) found that in 2022, the Malaysian prevalence of overweight among teenagers aged 13 to 17 was 16.2% and obesity was 14.3% [10].

Digital technology in healthcare and digital health have seen significant advancements during and particularly after the advent of COVID-19 pandemic [6,16]. EHealth platforms have since become increasingly popular for delivering health interventions that include child obesity interventions. Digital health is often termed "ehealth" and is defined by the

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World Health Organisation as "the cost-effective and secure use of information and communications technologies in support of health and health-related field, including health care services, health surveillance, health literature, and health education, knowledge and research" [16]. Despite the acknowledgement that technology could enhance care, it must be used with caution to ensure it does not exclude those with poor internet access, low digital literacy or physical or intellectual impairment [19].

Many eHealth apps targeting children exist [17] but the evidence supporting the methods for assessing technical usability, user engagement and user satisfaction of such apps with target end-users or among clinical populations is unclear. The effectiveness of these technologies has been subject to many studies [1,18,20] and require further analysis to see how the approaches can be used to make a lasting impact on positive lifestyle change [7]. Studies also found that the effects of the eHealth interventions fade after more than 6 months which are common to other obesity and overweight control/prevention interventions [20]. Similarly, Gemesi et al. (2023) found that app user adherence, measured as minutes spent on the app per week decreased over time [8]. However, one important factor that could influence the effectiveness of a child obesity eHealth intervention is parental involvement as indicated in several studies [2,15]. Studies have also shown that behavioural variables, such as self-monitoring and appropriate feedback, are the key components of weight management interventions and their optimization can lead to more efficient weight management in children and adults [13]. Woźniak et al. showed that providing appropriate education on nutrition to parents can be effective in improving the nutritional status of children at the social level [20].

However, there is still ambiguity in the literature around definitions of usability and user experiences in digital health studies, and these can differ between fields of study and researchers [3]. The complex nature of obesity further complicates the designing and testing of mHealth interventions.

2. Usability and engagement

An app is only useful if they are used by the intended users. This refers to the real-world applicability and impact of these apps in the proposed intervention. In child obesity intervention, factors such as how well these apps perform in terms of usability, accessibility and engagement, as well as its impact on parents' decision-making should be crucial. Currently, there are various web-based and smartphone apps available with the basic functions of monitoring food intake and physical activities as well as giving notifications in the form of health messages. However, a narrative review by Arthurs et al. (2022) found that literature describing appropriate methods of testing usability and user engagement with young people with overweight/obesity is limited [3].

User engagement involves the quality of the user experience, outlooks and expressions of their interactions, and their want or need to use the app for longer amounts of time or continually [14]. Usability is the degree to which a product can achieve specific tasks efficiently, effectively and satisfactorily by identified users and in an established setting [11].

A systematic review by Wang C. (2021) on the factors influencing users´ acceptance and use of apps shows that a lack of fundamental motivation to alter the current situation can limit the efficacy and acceptance of even the most-well-designed app [18]. Ghelani et al. (2020) revealed that time-consuming and relatively difficult input of dietary data on smartphone applications received less response from participants [9].

Zare et al. (2023) concluded that a smartphone-based app is good when the overall performance of the app, screen capabilities, terms and information of the program, learnability, and general features scored higher than 7.5 out of 9 [21]. However, the high degree of user acceptability in the study could be attributed to the involvement of parents and specialists throughout the various stages of software development [13]. Another study by Alexandrou et al. (2021) found that app features such as comprehensive content, interactive functions and tailored support would be important to support parents with healthy lifestyle behaviours [2].

3. Reducing obesity among primary school students

3.1. The malaysian experience

JEJAK BMI was a study commissioned by Malaysia Productivity Corporation (MPC), a Malaysian government agency established to govern all aspects related to the nation's productivity and international community. One of the study objectives were to investigate the usability and effectiveness of digital technology in nudging parents towards adopting healthier behaviours to reduce child obesity [15]. Participating parents were 85% females with a mean age of 40 years. The majority were Malays (93%), with mixed educational background. Most participants were low-income earners.

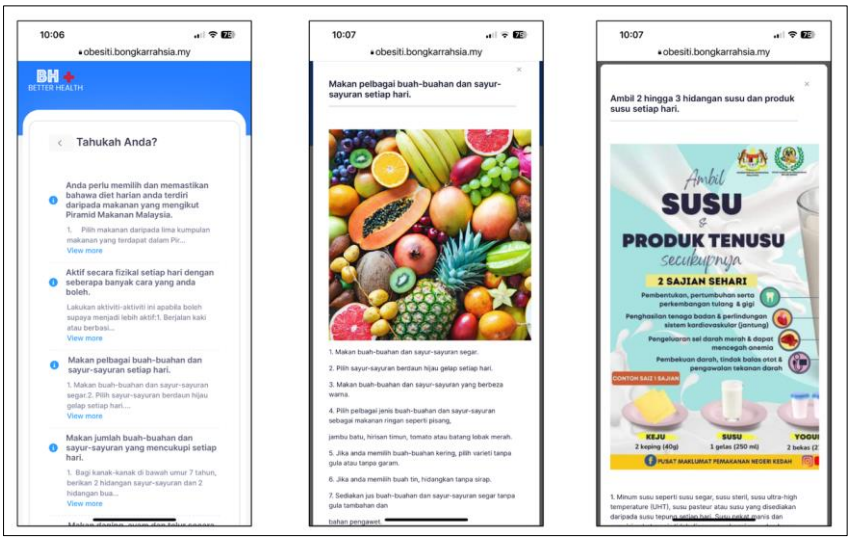

Figure 1 Screen display of *JEJAK BMI*

The app features health metrics such as students' weight, height, waist circumference, food diary, tips on healthy diet and physical activity. During the 10-week intervention, parents were provided with the *JEJAK BMI* app as BMI tracker and access to nutrition and physical activity educational content. Post-intervention results indicated a notable improvement in parents' engagement with their children's dietary habits illustrating the app's success in enhancing parental awareness and activity regarding their children's nutrition [15]. While positive behavioural shifts were observed, these did not significantly translate into changes in the children's BMI within the study period, suggesting the necessity for longer-term interventions to see substantive health outcomes [15]. Results from the study found that most parents reported the app was easy to use (92.7%), visually engaging (95.1%), and functioning well (92.7%). Most parents (87.8%) agree or strongly agree that they will use the web application to monitor or manage their children's BMI. With more than 90% parents agreeing that the app was easy to use, it can be concluded that the app was effective in terms of usability. The app's visual engagement was also rated highly which could contribute to the continued use of the app throughout the 10-week intervention period [15].

The *JEJAK BMI* web application attempted to intervene childhood obesity by encouraging healthier parental behaviours [15]. Among the factors evaluated were the navigation, functionality, user interface design as well as satisfaction to determine the overall user experience for parents.

4. Discussion

The *JEJAK BMI* app highlighted how digital technology could be used to influence parental behaviour and positively affect children's health habits and body mass index (BMI). Parents' perceptions of the application were positive, indicating high satisfaction with its features and content. The majority felt that the application helped track their child's BMI and provided valuable resources for managing diet and health behaviours. By tracking their child's dietary intake, physical activity, and progress towards set goals, parents gain insights into areas for improvement and are motivated to adopt healthier behaviours.

Table 1 Participants' Feedback on App Usability

Number of participants, n=41 Questions	**Strongly Agree n (%)**	**Agree n (%)**	**Unsure n (%)**	**Disagree n (%)**	**Strongly Disagree n (%)**
Jejak BMI 1.0 is easy to use	10(24)	28(68)	3(7)	0(0)	0(0)
Jejak BMI 1.0 is visually engaging	9(22)	30(73)	2(5)	0(0)	0(0)
Jejak BMI 1.0 is functioning well	12(29)	26(63)	3(7)	0(0)	0(0)

Table 2 Summary of Participants' Agreement on Usability Aspects

Usability Aspect	Agreement Percentage (%)
Easy to Use	92.68%
Functioning Well	92.68%
Visually Engaging	95.12%

The high user ratings for usability, ease of navigation, and visual appeal suggest that the JEJAK BMI application is effective in engaging parents. The study also concluded that a visually appealing design can simplify complex information making it more digestible for users and enhancing the learning experience thus reinforce the desired behaviour change. The app's features such as progress tracking, nutritional information and goal-setting tools are other elements that contribute to the parents' app engagement.

Although data indicated that the app was well-received, but the impact on children's BMI over the 10-weeks intervention was not significant. This finding is similar to a study by Bonvicini that concluded apps for preventing and treating childhood and adolescent obesity showed small or no effectiveness [4]. Despite these positive findings, the short-term impact on children's BMI was inconclusive, suggesting the need for longer-term interventions and additional strategies.

The *JEJAK BMI* study corroborates the possibility of web applications to be a tool for modifying parental behaviour in child obesity intervention. The study also confirmed the role of parents as agents of change in their children's health and the effectiveness of digital interventions in supporting them. Additionally, it highlights the need for digital interventions to be user-friendly and visually engaging to ensure sustained engagement and efficacy.

5. Conclusion

The *JEJAK BMI* web application is a promising tool for obesity intervention, demonstrating strong usability and positive effects on parental behaviours. However, further research is needed to assess its long-term impact on children's BMI and explore additional strategies for more comprehensive interventions. Apps that feature easy navigation and appealing visuals could play significant roles in the acceptability and engagement of web-based obesity programmes. It is recommended that similar obesity interventional health apps should be developed according to scientific evidence and on theoretical constructs to ensure the success of the program. In conclusion, digital technology could present an option for childhood obesity. While it is still difficult to ascertain the direct effect of eHealth technologies on child obesity interventions, this potential of these interventions would require more studies from other researchers.

Limitations

The study's limitation includes a small sample size and potential selection bias. The focus on parents with digital access and literacy may not represent the broader population. Furthermore, the study did not account for other possible variables influencing childhood obesity such as socioeconomic factors, parental education levels and literacy.

Compliance with ethical standards

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Disclosure of conflict of interest

We declare no conflict of interest.

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