

## The role of digital health interventions in reducing obesity among primary school children: A behavioural insights perspective

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### Abstract

This study investigates the effectiveness of a web application called "Jejak BMI 1.0" aimed at reducing obesity among primary school students by promoting healthier behaviours in children and their parents. The research objectives were to assess the usability and user experience of the application, and to evaluate its impact on children's Body Mass Index (BMI) and parental behaviours. Using a mixed-methods approach, including pre- and post-test surveys, statistical analysis, and thematic analysis, the study found significant improvements in parental behaviours and children's BMI scores. The app was well-received by participants, with high usability and functionality ratings. Despite the positive outcomes, limitations such as the short study duration and potential biases were noted. The findings underscore the potential of digital tools in public health interventions and the importance of parental involvement in addressing childhood obesity.

**Keywords:** Childhood obesity; Digital technology; Behavioural insights; BMI; Public health intervention; Parental involvement

### 1. Introduction

Childhood obesity has emerged as a critical public health concern, with its prevalence continuing to rise globally. It is associated with numerous adverse health outcomes, including type 2 diabetes, cardiovascular diseases, and psychological issues, which can persist into adulthood [1],[2]. Addressing this issue early is vital, as childhood obesity can negatively impact quality of life and lead to long-term health complications. This study explores the potential of digital technology in reducing obesity among primary school students, with a particular focus on engaging both children and their parents through the use of a web application, "Jejak BMI 1.0."

The increasing rates of childhood obesity have garnered widespread attention from health professionals, researchers, and policymakers. In many countries, the rising incidence of obesity among children has been attributed to a combination of factors, including poor dietary habits, sedentary lifestyles, and limited awareness of healthy behaviours [1],[2],[3]. Traditional interventions, such as school-based programs and community campaigns, have shown varying degrees of success [2],[3]. However, these initiatives often struggle to engage parents effectively, despite their critical role in shaping children's health behaviours. Digital technology has gained traction as an innovative tool in public health interventions [4].

The rapid advancement of mobile applications and online platforms has opened new avenues for delivering health education, tracking progress, and promoting behaviour change. Given the accessibility and scalability of digital

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interventions, this study examines the effectiveness of the "Jejak BMI 1.0" web application as a means to reduce obesity by encouraging healthier behaviours among children and their parents.

### 1.1. Problem Statement and Rationale

While numerous interventions have targeted childhood obesity, many have struggled to fully engage parents, who play a crucial role in fostering healthier behaviours at home, revealing a clear gap in leveraging digital platforms to promote sustained behaviour change [2]. This study aims to address that gap by utilizing the "Jejak BMI 1.0" web-based application to enhance parental engagement and encourage healthier lifestyles among primary school students. The rationale for developing "Jejak BMI 1.0" lies in the ability of digital tools to offer personalized, user-friendly experiences that are accessible anytime, incorporating features like BMI tracking, goal setting, and educational content to promote long-term healthier habits. To evaluate its effectiveness, the study explores three main research questions:

- How usable and effective is "Jejak BMI 1.0" in engaging parents to foster healthier behaviours in their children
- What impact does parental engagement with the app have on children's BMI scores and
- How do parents perceive the app's utility and user experience.

The study's general objective is to assess the usability and effectiveness of "Jejak BMI 1.0" in reducing childhood obesity by encouraging healthier behaviours through parental engagement, while the specific objectives are to evaluate the user experience of both parents and children, compare children's BMI scores before and after the intervention, and assess parental perceptions of the app's utility in promoting healthier lifestyles.

### 1.2. Significance of the Study

This study contributes to the growing body of public health research focused on digital health interventions, specifically in the context of childhood obesity. By evaluating the "Jejak BMI 1.0" web application, the study provides valuable insights into the role that digital tools can play in engaging parents and children in health-promoting behaviours. The findings will inform future public health strategies and policies aimed at reducing childhood obesity, while also highlighting the importance of integrating technology into intervention efforts.

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## 2. Materials and Methods

This study employed a mixed-methods approach, integrating both quantitative and qualitative data collection techniques. The quantitative component included pre- and post-test surveys to measure changes in children's BMI and parental behaviours, while the qualitative component involved analysing open-ended responses through thematic analysis. Participants consisted of primary school students and their parents, recruited through schools in Petaling Jaya, which only one school was selected as the preliminary data Sekolah Kebangsaan Seksyen 7, Kota Damansara, Kuala Lumpur, with 41 respondents from 50 parents were enrolled and 82% completing both the pre- and post-test surveys. The intervention involved the "Jejak BMI 1.0" web application, which offers tools for BMI tracking, health goal setting, and educational content on nutrition and physical activity, along with interactive features to engage both parents and children. Data were collected at two points—baseline (pre-test) and 10 weeks post-intervention (post-test)—with BMI calculated using standard methods and parental behaviours assessed via validated questionnaires. Usability and user experience were evaluated using a Likert scale, and additional qualitative feedback was gathered through open-ended questions. Quantitative data were analysed using paired t-tests to compare pre- and post-intervention BMI and parental behaviour scores, meanwhile and open-ended question where analyse to identify recurring themes that were appeared, providing further insights into user experiences and perceptions.

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## 3. Results and Discussion

The result below shows demographic of parents who are applied in the study based on their gender, race, age, education and household income.

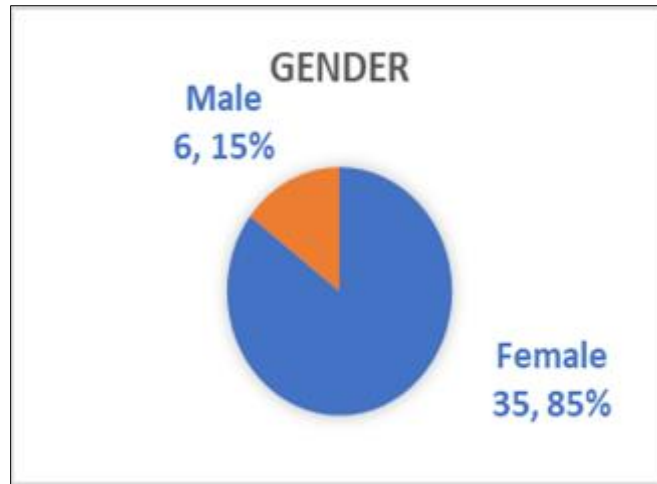


Figure 1 Gender of respondents

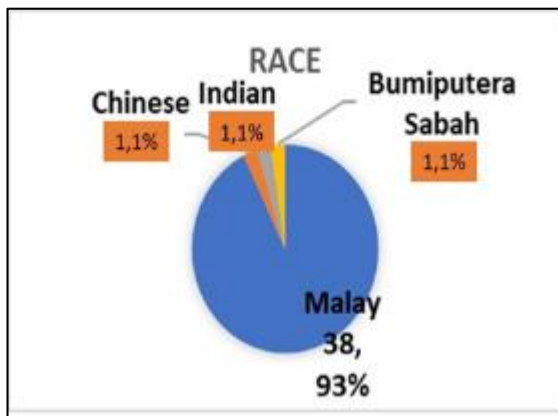


Figure 2 Race of respondents

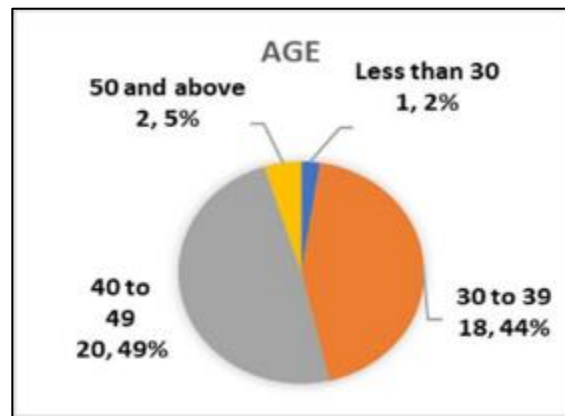


Figure 3 Age of respondents

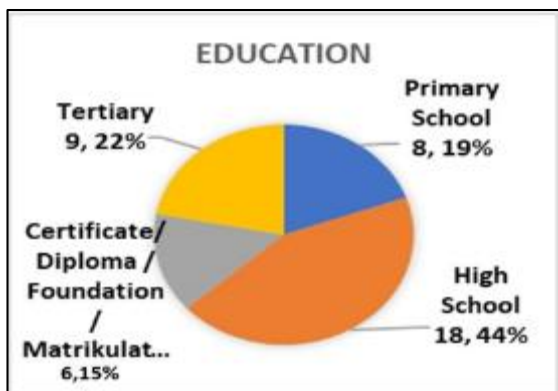


Figure 4 Education of respondents

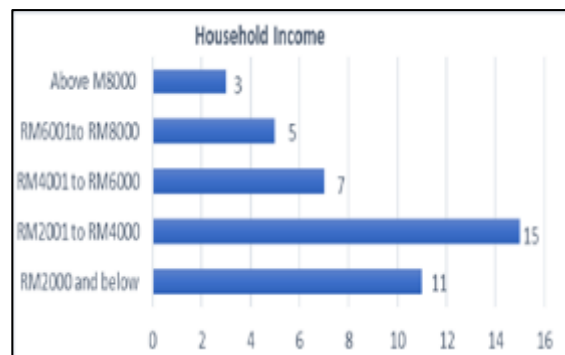


Figure 5 Household income of respondent

It shows that the majority of the parents who participate in this study are women, Malays, their age is between 40 to 49 years old, education wise are high school and their household income is within RM2000 to RM4000. Although the average BMI didn't show a significant change, but there was a marked increase in health-promoting behaviours among parents. The app was positively received, with 92.7% of participants finding it easy to navigate and 95.1% rating it visually appealing. The open-ended feedback highlighted the app's role in enhancing parental engagement and awareness, with many parents noting that the app made it easier to track and manage their children's health. However, some participants mentioned the need for additional features and longer-term support to sustain behaviour change.

**Table 1** Mann-Whitney test results of Groups A and B Healthy Behaviour

| Behaviours  | Group A<br>Mean<br>rank | Group B<br>Mean<br>rank | Asymp.Sig.<br>(2-tailed) |
|---|-------------------------|-------------------------|--------------------------|
| 1. I'll make sure my child's food intake is based on the Healthy Plate "Quarter-Quarter Half" concept | 21.41                   | 20.71                   | .845                     |
| 2. I'll make sure my child eats vegetables and fruits   | 14.82                   | 25.38                   | .003***                  |
| 3. I'll make sure my child does physical activities   | 18.15                   | 23.02                   | .166                     |
| 4. I'll make sure my child sleeps 9-12 hours a day  | 20.21                   | 21.56                   | .695                     |
| 5. I'll make sure my child drinks a lot of plain water rather than sweet beverages                    | 17.94                   | 23.17                   | .134                     |

Although the Jejak BMI app was given to monitored the parents' usage in helping their children to engage a healthy behaviour, a comparison shows that by using the app it shows a small minimal difference in enhance their behaviour, this can be indicate by only one behaviour shows significant. This can be due to the duration of the study which only takes about 10 weeks and it would be appropriate to see a long duration study as it engages with an application. The result also has a similar view in the BMI change of the students who were chosen in the study as the pre and post-test shows there are no significant changes in their weight change. Anyhow, from the result using the apps, the behaviour changes in vegetables intake does show a positive respond and this can show that the parents are engage with the prompt notes given in monitoring their kids in eating healthy with a p value of 0.003.

Despite these mix outcomes which is positive and negative, the study acknowledges several limitations. The short duration of the intervention may limit the generalizability of the findings, and the reliance on self-reported data introduces potential biases. Future research should address these limitations by extending the study period, increasing the sample size, and incorporating objective measures of health outcomes.

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#### 4. Conclusion

Parents' perceptions of the "Jejak BMI 1.0" web application provided valuable insights into its effectiveness and usefulness in supporting their efforts to reduce child obesity. Overall, parents expressed positive feedback, recognizing the app as a valuable tool in managing their children's BMI. Many appreciated the app's features, such as BMI tracking, goal setting, and nutritional information, which helped them monitor and improve their children's health behaviours. The educational content was found to be user-friendly, empowering parents with practical knowledge to implement behaviour changes [4],[5],[6]. The satisfaction with the app's content suggests that it was relevant, credible, and actionable, making it easier for parents to translate information into healthier lifestyle practices. This positive feedback highlights the importance of tailoring digital health interventions to meet users' needs and preferences. Moreover, parents' favourable perceptions of the app indicate its potential to be an effective tool for public health interventions targeting childhood obesity [6],[7]. Future improvements could further refine the app's features based on parental feedback, ensuring continued user engagement and effectiveness in supporting long-term health outcomes for children.

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#### Compliance with ethical standards

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##### *Disclosure of conflict of interest*

We declare no conflict of interest.

### *Statement of ethical approval*

Ethical approval for this study will be obtained from the Medical Review & Ethics Committee (MREC). Before completing the survey, all participants will be informed about the purpose of the study including the potential risks and benefits.

### *Statement of informed consent*

Those who agreed to involve in this study will answer the question on consent and they will also be free to withdraw from the study at any time during their involvement. Information sheet and consent form will be made available for every respondent during the scouting process and verbal consent will be obtained when approaching them during the phone calls.

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