



## Arbi Care application increases preschool children's hand-washing self-efficacy among preschool children

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### KEYWORDS

Educational;  
Game;  
Self-efficacy;  
Hand-washing;  
Preschool;  
Diarrhea

### Abstract

**Objective:** This research aimed to examine the effectiveness of an Android mobile game application called Arbi Care as a means to prevent diarrhea and build self-efficacy in hand washing among preschool children.

**Method:** This research used a pre- and post-test control group and time series design approach. Respondents were chosen randomly from a group of four to six years children. The intervention group (n = 60) received Arbi Care intervention for 25 minutes, twice a week, for five weeks while the control group (n = 60) received standard education. Self-efficacy was measured by using questionnaire and observation. Measurement was carried out three times in the sixth, eighth, and tenth week post-intervention. The data was analyzed using the GLMRM test.

**Results:** There was a significant increase in the average score of self-efficacy in hand washing for the intervention group versus the control group. Moreover, there were significant differences in the results of average scores in which the intervention group showed much better self-efficacy improvement over the control group during the first, second, and final post-test after the intervention was given (p < 0.001).

**Conclusions:** An Android-based educational game can be an effective medium to improve hand washing self-efficacy among preschool children, thus helping to prevent diarrhea.

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## Introduction

Diarrhea is an infectious disease that is a common cause of death among children under five years. According to the United Nations Inter-agency Group for Child Mortality Estimation, the estimated number of children's deaths in 2015 was 5.9 million and diarrhea was the second deadliest disease after pneumonia<sup>1</sup>. Diarrhea is generally caused by children's behavior, poor sanitation, and unhealthy lifestyles<sup>2</sup>. Some factors that may affect children's lifestyle in school

are education, awareness, skills, hygiene and sanitation training, joining a club related to hygiene and sanitation, visiting model schools, and the status of their parents' health<sup>3</sup>. Good sanitation and intervention in forming children's behavior to adopt a healthy lifestyle can reduce the risk of diarrhea by 36%-48%<sup>4</sup>. Hand hygiene is one of the most important elements of a healthy lifestyle. The World Health Organization states that washing hands with soap can reduce the risk of diarrhea up to 50%<sup>5</sup>. However, hand hygiene practice among children remains low, due to lack of

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education and the willingness to practice good hand hygiene<sup>3</sup>. Therefore, it is important to increase children's willingness to wash their hands through education to the children.

Based on Nola J. Pender's theory, to encourage healthy lifestyles, an intervention must occur to motivate people to improve their knowledge, self-efficacy and behavior<sup>6</sup>. Self-efficacy is an assessment of an individual's ability in to take action to gain something as it is expected like healthy lifestyle<sup>7</sup>. Self-efficacy, in terms of a healthy lifestyle among children, can also promote healthy behavior in the future. According to Erickson, preschool children's psychosocial development involves creating a sense of initiative. In addition, preschool children are likely to be enthusiastic about learning something new. Children often play and learn as they struggle to accomplish something, and they derive satisfaction from doing their regular activities<sup>8</sup>. At this point, it is recommended to educate children about good behavior through educational video games.

Arbi Care is a game based android for 25 minutes long developed by researcher and game developer. It can play by mobile phone, and helpful preschool children learn about how to prevent diarrhea. Video game is one form of educational media that can be used to change children's behavior and broaden their knowledge by stimulating their imagination and creativity<sup>9</sup>. Moreover, children love to play video games. Thus, video games can be a potentially amusing medium to educate children about healthy behavior. This study was conducted to identify the effectiveness of educational video games to improve children's self-efficacy in hand-washing.

## Method

This research used a pre- and post-test control group with a time series design approach. One hundred and twenty children were involved in the pre-test. All of the participants were then divided randomly using random table into an intervention group of 60 children, with 60 children in the control group. Some respondents who did not attend the second or third measurement were eliminated. Therefore, the researcher processed 57 respondents from the intervention group and 59 respondents from the control group. The intervention group received healthy lifestyle education via the Arbi Care game while the other group only received standard health behavior education at school. The intervention of Arbi Care was given for 25 minutes, twice a week for five weeks. Post-test observation was conducted to measure self-efficacy in the two groups of children, and it was carried out three times: during the sixth, eighth, and tenth weeks following the intervention.

The research was conducted from January to April 2016 in three different kindergartens in Manggala District, Makassar, and South Sulawesi, Indonesia. The location was selected due to the fact that it has the main landfill, which has higher risk of diarrhea. South Sulawesi province, where Makassar is located, is also has the second highest prevalence of diarrhea in Indonesia.

The sample size was determined with sample size formula to compare two independent means. The inclusion criteria for this research were children aged four to six

years, able to play mobile games, willing to be respondents, and having permission from their parents to participate. Children lacking attention and/or with misbehavior problems were excluded from the study. This research was conducted with ethical clearance from the Nursing Faculty of Universitas Indonesia. Informed consent was obtained from the parents, while the children also received a brief explanation of the research.

The independent variable of this study was the Arbi Care application, which is an Android-based game to introduce healthy habits, particularly relating to hand hygiene to prevent diarrhea. The game features a main character of a child-like figure that needs to go to the toilet. However, he should wash his hand before he left the toilet. A similar series events occurs when he is ready to eat food. In order to perform hand-washing, the player must follow the five steps of hand-washing, which are recommended by the nation's health department. The steps of hand-washing are suitable for the short attention spans of preschool children.

The dependent variable used in this study was the self-efficacy of the children, which measured the relevance between their statements and their ability to do standard hand-washing. The measurement tool used in this research was a questionnaire that includes two major topics about self-efficacy, as well as observation of the five steps of hand-washing practice with soap. The observation consist of soaking hands with running water, applying soap to the palms, back of the hands, and fingers, cleansing the fingernails, rinsing the hands, and drying the hands. The questionnaire was developed by the researchers, and its validity and reliability were tested beforehand ( $r = 0.833$ ). The scoring of self-efficacy was measured with a score ranging from 0 to 10.

The intervention procedure began with conducting a meeting with headmasters and teachers of the kindergartens to explain the research. Then, the research assistant gave training on using the measurement tools as well as the procedure of demonstrating the educational game. Children and their parents received informed consent to do the pre-test in both the intervention and control groups. Intervention was carried out by showing educational video game about diarrhea prevention to the intervention group only, for five weeks. Subsequently, the post-test was conducted in the sixth, eighth, and tenth weeks in both group. In order to ensure quality of the intervention, the researcher conducted weekly meetings with the research assistants. Research assistants were fresh graduate from bachelor of nursing who passed the training and have a good score in inter-rater reliability.

The data was analyzed using statistical software. Univariate analysis was applied to obtain the self-efficacy score on each item before and after giving the intervention in both groups. In addition, the bivariate analysis was also applied to detect the differences between the time of measurement of intervention the intervention and control groups by using the General Linear Model Repeated Measure test.

## Results

The results showed an improvement in hand hygiene self-efficacy after the intervention was given. The average score

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