

Conference Paper

Arbi Care: An Educational Game Innovation To Increase Healthy Behavior Among Preschoolers

Arbianingsih¹, YeniRustina¹, Tri Krianto², and Dian Ayubi²¹Postgraduate Program, Faculty of Nursing, Universitas Indonesia, Depok, Indonesia¹Department of Pediatric Nursing, Faculty of Nursing, Universitas Indonesia, Depok, Indonesia²Faculty of Public Health, Universitas Indonesia, Depok, Indonesia

Abstract

To prevent diarrhea in children, an innovative approach is needed to promote healthy behavior. Games are widely recommended as a means of educating children in this regard. This paper describes the process of developing an educational game to increase healthy behavior for diarrhea prevention among preschool children. The reported study employed a research and development design involving four stages: define, design, develop, and disseminate. The process of developing the game involved (1) exploring the characteristics of games favored by the children; (2) designing an intervention based on those preferences; (3) validating the game prototype with experts and testing the game with preschool children to assess its applicability; and (4) revising the game for application as an intervention. Observation sheets were used to assess the game's applicability. The results showed that 92% of the 10 preschool children were able to play the game (which we called arbi care) and to understand its message. The results indicate that the arbi care game can be used as a learning device to increase healthy behavior related to diarrhea prevention among preschool children.

Keywords: diarrhea; educational game; healthy behavior; preschoolers

1. INTRODUCTION

Diarrhea is the second most prevalent cause of child mortality in developing countries such as Indonesia. According to the Indonesian Basic Health Survey (IBHS), the incidence of diarrhea in children has risen continuously from 11% in 2002 to 13.7% in 2007 to 14% in 2012 [4]. Among these, preschoolers represent the second largest group [4]. In treating diarrhea, one nursing intervention is to provide preventive health education to prevent recurrence of the problem. However, as nurses are commonly overburdened by their routine workload, the time available for health education provision is limited.

Corresponding Author:

Dian Ayubi

dian_ayb@ui.ac.id

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Preschool involves a transition from parental control to self-control. During this phase, children learn independently from play activities [7]. With developments in digital technology, children enjoy playing computer-based or electronic games. Games allow players to experiment with decision-making and problem solving in a risk-free conditions and an active learning environment [1]. Educational games convey information in an entertaining way [5], helping to develop children's language and thinking skills and interaction with their environment [8]. Video games have also been found effective in changing children's behavior [2].

Numerous studies have identified poor community hygiene and health practices as contribute as causes of diarrhea (Santos et al. 2012; [3, 9]), making it necessary to teach children healthy behavior for prevention. The use of video games to change children's behavior is based on social cognitive theory and the elaboration likelihood model, which comprises four stages: attention, retention, production, and motivation [2]. The successful use of video games to change children's health behavior depends in the first place on their interest in the game itself that is, the children should be interested enough to want to play the game repeatedly. In developing an educational game for preschoolers, the first step is to understand the game characteristics favored by the children themselves. This article describes the process of developing an educational game to prevent diarrhea by increasing healthy behavior among preschoolers.

2. METHODS

The study participants were preschoolers aged 3–6 years. As adopted here, the 4D approach to developing and designing an educational game [14] involves four stages: define, design, develop and disseminate. In the define stage, the researchers conducted a qualitative descriptive study to model the game characteristics favored by preschoolers. In the design stage, the game's story was devised, using content related to the prevention of diarrhea among preschoolers. This stage also involved cooperation with game developers to create the prototype. During the develop stage, the researchers sought validation of the product by consulting pediatric nursing media experts, health communication specialists, and specialists in health promotion media for children.

Based on inputs from these experts, the game prototype was revised and then tested on 10 preschool children aged 3–6 years. Product evaluation used observation sheets with indicators of the children's ability to understand the game, their interest in the game, and their ability to learn from the game. Finally, in the disseminate phase,

the results were presented in articles or at conference. The qualitative data were analyzed by means of abstraction and interpretation; quantitative data were analyzed by frequency distribution. The study was approved by the Ethics Committee of the Faculty of Nursing, University of Indonesia.

3. RESULTS

3.1. Define Stage

To create an interesting educational game for preschoolers, the first step is to initiate brainstorming and discussion with the children themselves. This process identified three game characteristics that the children found pleasing. 1) The children loved the movable main characters, which were in the form of human or animal cartoons, with distinctive accessories or style and involving elements of fantasy and attractiveness. 2) The game model included varied activities, adrenaline rush, reward, and educational content. The preferred gameplay activities included nurturing or caring for the main character, object or color matching, coloring, shooting, drawing, and taking order. 3) The children liked bright colors (red, yellow, blue) and combinations of those three colors (green, orange, purple, pink). Pink and purple were favored mostly by girls while red, yellow, blue, and green were liked by both boys and girls.

3.2. Design Stage

This involved drafting the educational game, with the goal of preventing diarrhea by increasing healthy behavior among preschoolers.

1. Based on information from the qualitative study, the main characters (a girl and a boy) were designed to be representative of the player, so enhancing the children's engagement in the game. The aim was to make the characters' impact (both positive and negative) easily accepted by the children's five senses [1]. The characters were depicted as follows.

Boy character: black hair, black eyes, wearing a red shirt, blue pants, and yellow sandals; observed distinctive style typical of most of the boys, conveyed by hands clenched and saying "yes."

Girl character: black eyes, wearing a pink shirt and purple skirt, with accessories (two hair ties) and pink sandals; observed distinctive style of lifting a hand as a sign of "peace."

Learning Objective	Game Model
Emphasize the importance of hand washing with soap at two critical points: <ul style="list-style-type: none"> • Before eating • After toilet 	When a child says "I'm hungry", the player must click on the dining table. However, this cannot be done if the child has not first clicked on the sink to wash their hands. The same applies in the case of toilet elimination; players cannot leave the toilet until they click on a sink to wash their hands after toileting. On clicking the sink to wash their hands, the player is asked to rank the steps in terms of proper hand washing.
Demonstrate the practice of clean eating: <ul style="list-style-type: none"> • Wash fallen cutlery before reuse • Choose healthy foods and beverages 	When a child eats, the spoon suddenly falls, and the video shows the proper behavior in this situation. There is also a mini game in which the player is asked to choose the healthy food and beverage. On choosing a healthy food, the player gets a star score.
Teach how to choose a diet that provides balanced nutrition	When the player clicks on the dining table, they are asked to select menu. Their menu selection must include the four components of balanced nutrition: carbohydrates, proteins, fruits and vegetables.

2. With regard to healthy behavior for prevention of diarrhea, the design refers to the Ministry of Health (2012). Behaviors were selected on the basis that they could be applied by preschoolers, including hand washing with soap and clean eating practices for balanced nutrition. The game scenario requires the players to meet nutritional needs, elimination needs, and the need for balanced play, rest, and sleep. The table presents an overview of the game.

In addition to the above core learning objectives for diarrhea prevention, other relevant mini games include organic and inorganic waste sorting and physical activities such as cycling. This variation was introduced to prevent boredom while playing the game, as preschoolers are known to like diverse forms of activity and music in games [6].

The Android-based ArbiCare application was developed in collaboration with game developers. During the making of this game, weekly meetings and intense ongoing communication with the game developer helped to ensure that the product conformed to the prepared script. Making the first prototype of the game took about 3 months. On completion, the next step was validation by the experts, and seminars were conducted to acquire inputs that would improve the game prototype.

3.3. Develop Stage

For product validation, the researchers consulted pediatric nursing media experts, health communication specialists, and specialists in health promotion media for children. During this stage, the product was presented and its use was simulated, enabling the experts to assess the feasibility of the product prototype and suggest improvements. The results indicated that the experts considered Arbi Care to be feasible but in need of some revision. Limited testing of the revised prototype with 10 children of preschool age was then undertaken to evaluate the game's applicability. The evaluation used observation sheets with indicators related to the children's ability to understand the game, their interest in the game, and their ability to learn from the game. The mean score from these user evaluation groups indicated that 92% of respondents were able to play the game and understand its message. These results confirmed that the ArbiCare game could be used to promote healthy behavior in preventing diarrhea.

4. Discussion

The study results indicate that children are interested in playing the Arbi Care game, that they are capable of playing the game, and that they are able to understand the message of the game. Baranowski et al. (2008) suggested that an educational game's effectiveness in changing children's health behaviors is determined by the children's level of interest in the game and how long they persist in playing it; the longer children play a game, the more educational information they are exposed to.

In accordance with the game models favored by the children in the previous study, the game is characterized by activity, adrenaline, a prize (reward), varied gaming, and educational elements. Children's preferred activities in electronic games include caring or nurturing, color matching, shooting, design, and taking order game. Games involving obstacles and racing to stimulate adrenaline are also favored. When playing a game, children expect to get a prize, which can be a trophy, something new in the game, or higher scores. The game models favored by preschoolers include varied gaming and educational elements.

Nisa and Indrayana (2012) argued that a number of psychographic characteristics are relevant when designing a board game for children aged 5–6 years. (1) Children like to ask questions and are interested in things they do not know. (2) They like active movement. (3) They exhibit a strong sense of curiosity. (4) They are imaginative. (5)

They always want to be involved in something. (6) They love to interact with peers. (7) They are interested in new things. (8) They are highly creative.

On that basis, we explored the needs of users of educational media in early childhood. The five criteria for children's interest in multimedia application included the following observations. (1) Boys and girls interact with multimedia applications differently; while girls are interested in the visual display, boys are more interested in control, speed and navigation. (2) The children found funny and cheerful characters attractive. (3) They liked flashy colors. (4) The game's challenge is very important in arousing children's curiosity and interest in the game. (5) Words of appreciation and motivation are very important in encouraging children. (6) Game activities should be varied to avoid boredom. (7) Most children liked the music and sounds in the game [6].

Game display can be of interest to a player if the game incorporates their favored characteristics. Preschoolers (aged 3-5 years) favor content that supports imaginative play, fantasy, and informal gaming [7]. Imaginative play enables players to experiment with decision-making, solving problems under risk-free conditions [1]. This creates pleasant learning conditions for children and stimulates emotional development.

As in the present case, educational games serve a specific purpose, as well as providing entertainment, interactive learning supports, and an opportunity to build knowledge and understanding independently [5]. There are two general categories of game: mini-games and complex games. Mini-games are generally played for less than an hour. Focusing on a specific content area, they can be developed by a group or small team of two to three people. In contrast, developing complex games requires a larger team of designers, programmers, and artists [12]. The game developed in the present study also included digital mini-game.

Educational games for the preschool age group have great potential for these children's growth and development. Most preschool children already have control over their bodily functions and are able to interact and cooperate with others, using language and their increasing attention span and memory. In this period, a sense of initiative is important for psychosocial development, and preschool children are very keen to learn new things, playing and learning to gain success and satisfaction. This is a golden period for instilling a sense of positive and healthy behavior, as cultivation of such ideas at this time will shape behavior in later life [7].

5. Conclusions

Arbi Care, the educational game described here, can help to promote diarrhea prevention in preschool children. In addition, the game can be used as a nursing intervention to educate children admitted with diarrhea. Building on these results, further research will continue to improve the effectiveness of Arbi Care in preventing diarrhea and increasing healthy behavior among preschoolers.

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