

Original Research

The Effect of Puzzle Game Simulation on Mother Knowledge Improvement about Stunting Prevention and Feeding Pattern in Children Aged 0-24 Months



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Article Info	Abstract
Article history: Received: 6 December 2022 Accepted: 28 January 2023	<i>Introduction:</i> Stunting is a condition in which a child's height is shorter than other children of the same age. Mothers' knowledge about stunting prevention and feeding pattern could be a factor that influences the incidence of stunting. Knowledge is the outcome of comprehension after sensing a particular object. A feeding pattern is defined as the mother's feeding practice to children aged between 0 to 24 months. This study aimed to explore the effect of the puzzle game simulation in increasing mothers' knowledge about stunting prevention and feeding pattern in children aged 0-24 months. <i>Methods:</i> This was a quasi-experimental with a non-equivalent (pretest and posttest) control group design. <i>Results:</i> There was a significant difference in mothers' knowledge about stunting prevention and feed pattern in the puzzle game simulation and booklet group after the intervention, with the value of $p=0.032$ and 0.043 , respectively. <i>Conclusion:</i> Puzzle ame simulation was perceived as a more effective method compared to booklets in improving knowledge and feeding pattern practice for children aged 0-24 months among the mothers. These findings suggested using puzzle game simulation to attract and deliver stunting and feeding pattern information to the mothers.
Keywords: puzzle game simulation, booklet, stunting prevention, feeding pattern	

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INTRODUCTION

Data of stunting prevalence among children under five years old in Southeast Asia countries in 2019 reached a total of 24.7%. This prevalence has secured the seventh rank of highest stunting cases worldwide, after Oceania, East Africa, South Asia, Central Africa, South Africa, and West Africa in the same year [1]. The prevalence rate of stunting in West Nusa Tenggara was 31.4%. This number is considered lower than stunting cases in the previous year, but this number remains above the national stunting cases of 29.6%. East Lombok Regency is the highest contributor of stunting cases in West Nusa Tenggara, with 37.6 percent of stunting cases [2]. In addition, Sikur, Jerowaru, and Sukaraja District were presented as areas with high cases of stunting in East Lombok Regency in 2021 with a total prevalence of 39.4%, 34.2%, and 32.1%, respectively [3].

Stunting is a condition in which a child's height is shorter than other children of the same age. Malnutrition occurs since the baby is in the womb and the early period after birth, but it only appears after the child is two years old [4]. The causes of stunting are classified into direct and indirect causes. Direct causes include low nutritional intake and health status. Meanwhile, indirect causes enclose food security (availability of affordable and access to nutritious food, social environment (norms, infant and child food, hygiene, education, workplace, health environment (access to preventive and curative services), and residential environment (water, sanitation, building conditions) [5]. Factors that can affect the incidence of stunting are

household wealth, the mother's exposure to mass media, the child's age, child size at birth, place of birth, parents' education, resilience status, household food, shelter, and types of toilet facilities [6].

Stunting delivers short-term and long-term effects on children. Short-term impacts include disruption in brain development, reduced intelligence, impaired physical growth, and metabolic disorders. In the longer duration, stunting could decrease cognitive abilities and learning achievement, alter the immune system, and present a higher risk of developing diabetes, obesity, heart disease, and stroke [7]. Stunting also interrupts language and gross motor development [8].

Based on a study conducted by [9], children from mothers with a lower level of knowledge proposed a 10.2 times greater risk of developing stunting than mothers with a sufficient level of knowledge. Knowledge is the outcome of comprehension, the result of "knowing", after sensing a particular object. Sensing occurs through the five human senses: touch, sight, hearing, smell, and taste [10].

The high cases of stunting among children aged between 6 months to 2 years indicates poor feeding practices and insufficient complementary foods in Indonesia. More than 40% of infants were introduced to complementary feeding too early (before the age of six months), 40% of children aged 6-24 months were not exposed to adequate types of food as they should be, and 28% of children did not get food in sufficient frequency, concurrently indicating a low-quality food intake and a lack of essential nutrients [1]. There is an association between

diet and the incidence of stunting. Children with less protein intake develop about 2.5 to 3.1 times higher risk of becoming stunted, in comparison to those who consume high-protein foods [11]. Energy and protein intake are risk factors for stunting. Proper feeding practices for infants and toddlers can help children to grow and develop, achieving their full potential while preventing stunting [12].

In the recent study, we employed Simulation Games (Puzzle) and Booklet to increase mothers' knowledge about stunting prevention. A booklet is a small book used as a medium in health promotion to display various health messages by combining text and images [13][14]. Kamsiah (2020) demonstrated the significant effect of the puzzle in increasing the knowledge level about nutrient intake [15]. Booklets were also effective in increasing mothers' knowledge about stunting prevention [16]. Puzzle media is a learning means manifested in a play of assembling or disassembling boxes or pieces of images to form a complete picture pattern [17]. A puzzle game challenges creativity and memory due to its nature in evoking motivation to solve problems but in a more fun way. This game also elicits an addictive effect to constantly try until it is completed [18].

METHODS

Participant's characteristics and study design

This study used a quasi-experimental approach with a non-equivalent (pretest and posttest) control group design. The health

messages in the intervention and control group was delivered using a puzzle game simulation and a booklet, respectively.

Sampling procedures

This study was conducted in two locations, namely Sikur Village and Jerowaru Village, in August 2022. The study's ethical clearance has been granted by the Health Research Ethics Commission Board of the Faculty of Medicine, University of Mataram.

The study population was mothers with children aged 0-24 months in Sikur Village and Jerowaru Village in 2022. The study participants were selected based on the study inclusion and exclusion criteria. The inclusion criteria included all mothers with children aged 0-24 months in Sikur Village and Jerowaru Village with good literacy skills. Mothers who were not willing to participate were excluded from the study.

Sample size, power, and precision

Random sampling and purposive sampling technique were applied in the study. The random sampling technique used to determine which group was set as the intervention and control group, while the purposive sampling technique enrolled to choose the eligible subjects. The total number of study participants was 100. Participants were then equally distributed into two groups with 50 participants each.

Similar educational material was prepared in the puzzle and booklet. Basically, the materials consisted of information about the definition of stunting, causes of stunting, risk factors for stunting, characteristics of

stunting, adverse effects of stunting, prevention of stunting, stunting management, and feeding patterns for infants and children. This information was derived from several references: the Guidebook for Implementing Integrated Stunting Reduction Interventions in Districts/Cities [5], Book of 100 Priority Districts/Cities for Intervention for Dwarf/Stunting Children [19], Stunting Epidemiology Book [20], Village Pocket Book in Handling Stunting [21], Stunting Communication Book: Strategy and Action [22], and the Infant and Child Feeding book [23].

The research team and some graphic design experts subsequently worked to develop the puzzle game and booklet after gathering the materials for stunting and feeding pattern education. The puzzle game was prepared in a format of a 30x43cm-sized frame, coupled with the appealing combination of colors and images. Similarly, the booklets were also organized in attractive color combinations and images, complemented with simple description and explanation.

A knowledge questionnaire about stunting prevention and feeding pattern was organized to measure the mother's knowledge of stunting prevention and the feeding pattern. This questionnaire was compiled based on several references: the Guidebook for Implementing Integrated Stunting Reduction Interventions in Districts/Cities [5], Book of 100 Priority Districts/Cities for Intervention for Dwarf/Stunting Children [19], Stunting Epidemiology Book [20], Village Pocket Book in Handling Stunting [21], and Stunting

Communication Book: Strategy and Action [22]. The feeding pattern questionnaire was prepared according to the Infant and Child Feeding Book [23].

The validity and reliability statistical test was conducted before the administration of the questionnaire to the real participants. Thirty mothers with infants aged 0-24 months in Sakra Village participated in this test. Sakra Village was selected due to its high number of stunting cases, as it secured fourth place for the highest stunting case in East Lombok.

Statistical analysis with the Pearson Product Moment showed that all items in the knowledge questionnaire about stunting prevention were valid ($r_{count} = 0.368-0.708$ greater than $r_{table} = 0.361$). However, the reliability test using Cronbach's alpha only obtained 15 reliable question items (0.740). The validity test results revealed that all question items on the feeding pattern questionnaire were valid ($r_{count} = 0.435-0.815$ greater than $r_{table} = 0.361$), however only 15 items were confirmed reliable in the reliability test (0.752).

Measures and covariates

Initially, the explanation of study objectives and procedures was conducted to the prospective participants. Mothers who were willing to participate were then asked to sign the informed consent form. The data collection process was separated according to the study groups: intervention and control. The data collection process in the intervention group was conducted in the following sequence: (a) distributing the pretest questionnaires, (b) dividing the

participants into fifteen smaller groups, with a facilitator in each group, (c) directing participants in each group to arrange the puzzle, (d) instructing the participants to comprehend information appeared in the puzzle for 30 minutes, and (e) distributing the posttest questionnaires. The data collection process in the control group was done in the following order: (a) distributing the pretest questionnaires, (b) providing the participants with a booklet as the educational media, (c) instructing the participants to comprehend information in the booklet for 30 minutes, and (e) distributing the posttest questionnaires. Evaluation of the feeding pattern knowledge and practice in both groups was done a week after the intervention.

Data analysis

Univariate analysis

The univariate analysis was conducted to explain and describe the characteristics of each study variable, namely: age, educational background, employment status, children's age, children's gender, knowledge about stunting prevention, and feeding patterns in children aged 0-24 months.

Bivariate analysis

Shapiro-Wilk was applied to know the study data distribution ($p>0.05$). Finally, Paired T-Test and Independent T-Test were applied to analyze the collected data. Paired T-Test was employed to know the differences in knowledge and feeding patterns before and after the intervention in each group. the Independent T-Test was used to spot

statistical comparison of knowledge and feeding patterns between the intervention and control group.

RESULTS

Participant's Characteristic

Table 1 presents the demographic characteristics of the participants and their children. Statistical analysis confirmed no statistical difference between the demographic characteristics in both groups ($p>0.05$). The majority of participants' children were female and aged between 12 to 24 months. Most participants were aged between 25-34 years, graduated from senior high school, and working mothers.

Comparison of Knowledge Level and Feeding Pattern in Children Aged 0-24 Months Before and After the Intervention in the Intervention Group and the Control Group (Within Group Comparison)

Table 2 shows a significant difference in knowledge level before and after the puzzle intervention ($p<0.001$), a significant difference in knowledge level before and after the booklet intervention ($p<0.001$), a significant difference in the feeding pattern before and after the puzzle intervention ($p<0.001$), and a significant difference in the feeding pattern before and after the booklet intervention ($p<0.001$).

Comparison of Knowledge Level and Feeding Pattern in Children Aged 0-24 Months Before and After the

Intervention in the Intervention Group and the Control Group (Between Group Comparison)

knowledge level about stunting prevention and feeding pattern in children aged 0-24 months between groups with the p-value of 0.032 and 0.043, respectively.

Table 3 shows a significant difference in

Table 1
Participant's Characteristics

Characteristic	Intervention Group		Control Group		p-value	
	f	%	f	%		
Mother's Characteristics						
Age	<25	12	24.0	15	30.0	0.254
	25-34	29	58.0	30	60.0	
	>35	9	18.0	5	10.0	
Educational Background	Primary school	10	20.0	13	26.0	0.424
	Junior High School	17	34.0	16	32.0	
	Senior High School	18	36.0	19	38.0	
	University/College	5	10.0	2	4.0	
Employment Status	Employed	37	74.0	35	70.0	0.824
	Unemployed	13	26.0	15	30.0	
Children's Characteristics						
Age	0-6 months	6	12.0	7	14.0	0.538
	7-8 months	1	2.0	1	2.0	
	9-11 months	6	12.0	4	8.0	
	12-24 months	37	74.0	38	76.0	
Gender	Male	26	52.0	23	46.0	0.689
	Female	24	48.0	27	54.0	

Table 2
Comparison of Knowledge Level and Feeding Pattern in Children Aged 0-24 Months Before and After the Intervention in the Intervention Group and the Control Group

Study Variable	Pretest		Posttest		Delta Mean	P value
	n	Mean±SD	n	Mean±SD		
Knowledge						
Intervention Group	50	8.96±2.33	50	11.88±2.41	2.92	<0.001
Control Group	50	9.10±2.22	50	10.92±2.41	1.82	<0.001
Feeding Pattern						
Intervention Group	50	45.26±8.75	50	55.70±4.53	10.44	<0.001
Control Group	50	44.32±8.67	50	51.82±5.14	7.50	<0.001

Table 3

Comparison of Knowledge Level and Feeding Pattern in Children Aged 0-24 Months Before and After the Intervention in the Intervention Group and the Control Group (Between Group Comparison)

Study Variable	n	Mean±SD	p-value
Knowledge			
Intervention Group	50	2.92±2.55	0.032**
Control Group	50	1.82±2,51	
Feeding Pattern			
Intervention Group	50	10.44±7.48	0.043*
Control Group	50	7.50±6.83	

DISCUSSION

Knowledge of Stunting Prevention

A significant increase in knowledge about stunting prevention after the puzzle game simulation and booklet groups was reported in the recent study. There was a significant increase in knowledge after the puzzle game simulation, as yielded by the difference between the mean score in the pretest and posttest, from 8.96 to 11.88, with a p-value of <0.001. A study also found a significant difference between students' knowledge before and after a balanced nutrition puzzle game intervention [24]. Further, a study that used a disaster puzzle educational media also reported an increase in knowledge about volcanic eruption disaster mitigation [25]. Education with game simulation proposed a significant effect on adolescents' knowledge about stunting prevention [26]. A previous study also mentioned a substantial increase in knowledge level about nutrient intake after a puzzle media intervention [15]. A significant increase in the knowledge about diet and nutrition was also demonstrated after using

games-based education media in that study. Most participants stated that games and educational media were relatively fun and increased their internal motivation [27]. The use of games as educational media generally aimed to actively engage its participant in the learning process, generating retention of information. Games also attract more attention due to their fun and appealing nature. Additionally, games are appropriate media to teach other types of skills, such as critical thinking, problem-solving, integrity, interaction, and peer teamwork [28].

There was a significant increase in knowledge about stunting prevention after using the booklet media. This change was confirmed by the difference between the mean score in the pretest and posttest session, from 9.10 to 10.92, with a p-value of <0.001. Booklets could effectively increase maternal knowledge about stunting prevention [16]. Booklet media was confirmed as effective means to significantly increase mothers' knowledge about complementary foods [29]. A study also found that the booklet media could increase knowledge level about complementary foods

among postpartum mothers [30]. A study also found a significant increase in mothers' knowledge about infant and child feeding practices after using a booklet [31]. As a means to convey health messages, a booklet offers advantages for the targeted audience, as it could contain more information and can be studied at a more flexible time [32]. Other benefits of booklets as educational media have been reported elsewhere: constituting beliefs, providing comprehensive messages, offering very detailed information that intrigues the reader's perception, and incorporating appealing pictures [33].

There was a significant difference in knowledge about stunting prevention in the two groups after the intervention. There was a significant difference in knowledge level before and after the simulation games intervention among adolescent girls. Participants who received counseling with game simulation also demonstrated a higher increase in knowledge level than participants who received counseling with the audiovisual method [34]. Games simulation was also confirmed as a more effective media than brains storming technique in improving students' knowledge about breast cancer [35].

Playing is an activity that is surprisingly required by both children and adult population. Play is considered a learning process that involves thoughts, perceptions, and concepts, also social and physical skills. The puzzle game simulation in the recent study requested the participants to remember the objects from the puzzle pieces, sort the puzzle pieces to complete the patterns, and recognize the blank spaces in puzzles [36]. The involvement of more senses to receive

and process information produces better understanding and information retention [32].

Feeding Patterns in Children Aged Between 0 to 24 Months

There was a significant increase in the feeding patterns of children aged 0-24 months after the intervention in both groups. There was a significant increase in the feeding pattern after the puzzle game simulation, as yielded by the difference between the mean score in the pretest and posttest, from 45.26 to 55.70, with a p-value of <0.001. A study also demonstrated the substantial effect of the Rango Card Game on changes in dietary behavior [37]. Rango Card games offered a complete experience, increased motivation, and endowed the feeling of joy during the learning process. The monopoly nutrition game (MOMOGI) and snakes and ladders (UTAGA) also effectively improved the attitudes and practices in meeting balanced nutrition [38].

There was a significant increase in the feeding pattern after using the booklet media. This change was confirmed by the difference between the mean score in the pretest and posttest, from 44.32 to 51.82, with a p-value of <0.001. A previous study demonstrated the effect of toddler nutrition booklet media in modifying the mother's feeding attitude [39]. In addition, a study also confirmed the effect of booklet use in increasing complementary feeding practices among parents with toddlers aged 6-24 months [39].

There was a significant difference in the feeding pattern in both groups after the

intervention. A study was conducted to know the effect of AMZIGG cards and leaflet games on balanced nutrition intake. Significant differences in positive attitudes about balanced nutrition intake were reported in the AMZIGG card and leaflet game group. However, the use of the AMZIGG card game was discovered to be more effective in improving mother's attitudes about a balanced nutritional intake [40]. The puzzle contains pictures, so it doesn't take a long time to see it. The puzzle also can increase concentration, attention, and imagination, which are expected so that someone begins to learn to apply what is known to form good knowledge and attitudes about feeding patterns in toddlers [41].

CONCLUSIONS

According to the findings and discussion, we highlighted several vital discoveries in the recent study: (1) there was a significant increase in mothers' knowledge about stunting prevention after the puzzle game simulation, (2) there was a significant increase in mothers' knowledge about stunting prevention after the booklets intervention, (3) there was a significant increase in feeding patterns in children aged 0-24 months after the puzzle game simulation, (4) there was a significant increase in feeding patterns in children aged 0-24 months after the booklet intervention, (5) there was a significant difference in mothers' knowledge about stunting prevention in the puzzle game simulation and booklet group after education, and (6) there was a significant difference in feeding

patterns in children aged 0-24 months in the puzzle game simulation and booklet group after education.

ACKNOWLEDGMENT

We would like to extend our sincere gratitude to the Hamzar Institute of Health Sciences and the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia for the fund granted in this study.

ETHICAL CONSIDERATIONS

The ethical approval of study has been granted by the Health Research Ethics Commission Board of Faculty of Medicine, University of Mataram, issued on June 23rd, 2022, through the letter Number 135/UN18.F7/ETIK/2022.

FUNDING STATEMENT

This study was funded by the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia through the Decree no. 033/E5/PG.02.00/2022 and agreement/contract no 160/E5/PG.02.00.PT/2022.

CONFLICT OF INTEREST STATEMENT

Authors have no conflicts of interest to disclose.

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