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Alternative Media to Increase Knowledge About COVID-19 Vaccination in Children

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ABSTRACT

***Background**: Several vaccination programs for children have not been maximized. The phenomenon of low vaccination coverage in children can be attributed, in part, to the role played by information distribution. Public service advertisements have been widely studied for their effectiveness but are limited to social media. Public service advertisements can be combined with a game. Games are used for health promotion media with various themes and are considered effective. Print media such as posters and combinations with games are media that need to be studied in this digital era. **Objective**: This study aims to develop public service advertising media to invite COVID-19 vaccinations. **Method**: This research uses research and development (R&D) with ADDIE stages. The intervention study was conducted in Makassar, South Sulawesi, and involved 40 grade 4 and 6 elementary school students and 65 parents. The intervention was carried out at school by combining posters and pinball games. Measurements are managed with a validated questionnaire to assess knowledge and perceptions. Data were analyzed using the Wilcoxon test. **Results: 1)** The quality of the media combination of posters and pinball games obtained a score of 3.023 which was included in the qualification of "good" with the recommendation "need some revision" 2) the application of a combination of posters and pinball games affected the knowledge of children; parents' knowledge is fair and good, and parents' perceptions are positive. **In conclusion,** the poster combination game is an alternative media to promote the uptake of COVID-19 vaccination among elementary school students and their parents.*

***Keywords**: Children, knowledge, pinball game, posters, COVID-19 Vaccination*

INTRODUCTION

In mid-December 2019, an infectious disease was caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). This disease started in Wuhan, China, and has spread throughout the country and many countries worldwide (Yezli & Khan, 2020). COVID-19 raises many other problems, such as regarding the economy, education, tourism, and social, and even has implications for forest degradation in Indonesia ; (Delgado-Gallegos et al., 2022; She et al., 2020). Efforts to prevent disease in children during a pandemic are significant because COVID-19 can affect all ages, including children. The number of children with coronavirus disease-2019 (COVID-19) has also increased significantly (7.4 million) (She et al., 2020).

Various efforts have been made, such as implementing health protocols, but other interventions are needed that are more effective. (Kemenkes RI Dirjen P2P, 2020) Another intervention step is the COVID-19 vaccination policy complementing prevention. Therefore, various countries are trying to develop an ideal vaccine for SARS-Cov-2, especially when there are many new variants. (Delgado-Gallegos et al., 2022) Vaccination is an intervention that can more effectively break the chain of transmission of COVID-19(Cerda & García, 2021). The vaccine program was eventually resumed for the pediatric population (Delgado-Gallegos et al., 2022). In Indonesia, COVID-19 vaccination can be given to children aged six to eleven years. Vaccination is essential for public health, but people's willingness to receive vaccinations has decreased in

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2019. Several vaccination programs for children have not been maximized (Maryam et al., 2019). The role of information dissemination is one of the factors causing low immunization coverage in children.

Dissemination of information about the importance of vaccination for children needs to be encouraged, and one way is through public service advertising. One of the studies from Mexico states that a strategy that can be promoted is by providing information regarding the advantages of vaccines and others (Delgado-Gallegos et al., 2022). Public service advertising must be able to attract the attention of the target audience and create interest to be able to move people's desire to change behavior. Public service advertisements have been widely used and tested for their effectiveness on health behavior (Ananda Pratiwi & Hidayat, 2020; Barik et al., 2019; Putri Kusanti & Leliana, 2018). Public service advertisements are in the form of mass media and print. Print media such as posters are still widely used in this digital era. Health media in the form of posters with a combination of games shows more effectiveness than single media (Barik et al., 2019). However, research on public service advertisements for the COVID-19 vaccination in the form of poster print media combining games for children and parents has not yet been found. The urgency of this research is the importance of giving vaccinations amid the rise of hoax information related to COVID-19 vaccination in various countries, which results in low vaccine coverage for children.

Posters are a form of traditional print media. Even though we are currently in the digital era, posters remain the choice of media for health promotion education in various countries and show higher effectiveness when combined with other media such as games, videos, and others. Posters as print media contain information that is easy to find and use in public places. Posters play a role in conveying ideas to audiences quickly and can be used as learning media (Jatmika et al., 2019). Posters as health media effectively influence health behavior because they have a display in the form of pictures, colors, and valuable message content (Jatmika et al., 2019). Print media must be adjusted to the target audience and community literacy (Al-tammemi & Tarhini, 2021). Things that must be considered in making digital media for health information are psychological barriers, the fear of hoaxes and semantic obstacles in the form of unfamiliar scientific or medical language (Prasanti, 2017). Print media in the form of posters may also have obstacles in its delivery, but not much research has been done. Media posters as public service advertisements regarding child vaccination have also not been widely carried out. Other public service advertisements can be combined with a game. Games are used for health promotion media with various themes and are considered effective (Barik et al., 2019). The game method is not only used for health promotion but is also widely used for learning at multiple levels of education with various purposes. Games are not only popular with children but also among adults (Yunanto & Rochimah, 2017). Pinball has been used as a medium for learning accounting and Arabic, which shows changes after its use (Ksatriani, 2018; Rosikin, 2017).

Pinball is a game that aims to prevent the ball from falling into the hole at the bottom of the game layout while pursuing the highest score by hitting the ball with various objects in the game. Pinball is included in the type of arcade game because it is designed to have a box/machine and also a ball shooting tool to play. The pinball game as a medium in public service advertisements in combination with posters as an invitation to vaccinate against COVID-19 has not caught the attention of many researchers. The purpose of this research is to develop public service advertisements as a medium for promoting COVID-19 vaccination invitations through a combination of posters and pinball games for elementary school-age children and parents and then to see the implications for health behavior, knowledge of children and parents and parents' perceptions.

METHODS

This study uses the research development type or Research and Development (R&D). The research stages include ADDIE (analysis, design, development, implementation, and

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evaluation) (Almomen et al., 2016; Kardosod et al., 2023; Lu & Sides, 2022; Nurbaeti et al., 2021; Sahaat et al., 2020). In the analysis stage, it is carried out by identifying the lack of interest in the child age group in the COVID-19 vaccination. This stage is carried out by observing the health center and vaccination coverage through the website. This stage produces data in numbers and poster material content. The material has been adapted to the main poster from the Ministry of Health of the Republic of Indonesia. The design stage is designing a poster design and a pinball game design. The combination media such as posters and pinball games have the potential to be effective media for health education, targeting school-age children (Barik et al., 2019). The graphic design and physical appearance of the poster can determine its success in promoting knowledge transfer (Ilic & Rowe, 2013). The distribution of health-educational posters is recommended in situations where it is necessary to reach a wide audience over a long period of time (Hasanica et al., 2020). Pinball serves to attract children's interest. The development stage carried out was the product validation process by experts. Then, pinball games and posters were assessed for their feasibility by one material expert (public health lecturer), one media expert (design expert), and one health practitioner (health promotion expert, Ministry of Health of the Republic of Indonesia). The validation results from the experts became the basis for developing posters and pinball games. After that, implementation or field tests were conducted at elementary schools at SDN 01 Sudirman in Makassar City, South Sulawesi. The field test used a quasi-experimental method without a control group. A combination of posters and pinball games was posted on the school wall for one unit.

This research was conducted in June-August 2022 at SDN 01 Sudirman, South Sulawesi. The population in this study were all students in grades 4 and 6, both boys and girls. The sample in this study was 40 children and 65 parents. AAs 25 children did not complete the questionnaire, so there were differences in the number of samples of children and parents. The sampling technique in this study was total sampling in grades 4 and 6 at SDN 01 Sudirman. At the evaluation stage, questionnaires were given before and after to test the effectiveness of the implementation of posters and pinball games in schools for children and parents. The evaluation included the target knowledge and perception. Primary data were collected twice, before and after the two-week intervention. The choice of two weeks of intervention was based on the research objectives to see an increase in children's knowledge regarding COVID-19 vaccination based on the media that had been used. This is in accordance with research showing an increase in knowledge for two weeks using media such as WhatsApp, digital story and posters (Ariestantia & Utami, 2020; Wyatt & Hauenstein, 2008; Young et al., 2013). were collected through interviews and questionnaires, which had been tested for validity and reliability. Data processing includes verification, coding, entry, cleaning, and analysis. Data were processed and analyzed descriptively and inferentially using SPSS 22.0. Variable levels of knowledge for children and parents and parental attitudes are processed by adding up the score of each question based on the appropriate answer divided by the total score multiplied by one hundred. The knowledge category uses high (score> 80%), fair (60-80%), and less (score <60%) categories of the total score. Questionnaires about parental perceptions have been tested for validity and reliability with a Cronbach's alpha of 0.835. The statistical test used was the Wilcoxon test because the data distribution was not normal for children's knowledge before and after. The knowledge and perceptions of parents are only seen after the intervention, which was analyzed using chi-square.

RESULTS AND DISCUSSION

The results are adjusted to research and development through the ADDIE stages (needs analysis, making a poster and pinball game designs, product development involving media and health promotion and media experts, and implementation and evaluation).

Analysis Stage

At the needs analysis stage, the researchers conducted observations at target schools and local health centers.

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Based on the results of initial observations, it was found that less than 50% of elementary school students had not carried out the COVID-19 vaccination, and there was no public service advertising media such as posters in schools. The following observation is to identify service advertisements in the community related to COVID-19 vaccination for elementary school children. Based on search results through the Ministry of Health website, posters are one of the media for public service advertisements to invite COVID-19 vaccinations, both for children and even older people. There has not been found any posters aimed at ages 6-11 years. Based on further observations, not many posters have been combined with other methods, such as games. The results of a systematic review show that combining posters with other media, such as games, videos, and e-mail, leads to higher application (56.3%) compared to only posters (18.7%) (Barik et al., 2019). Types of games in health education have different levels of effectiveness, and some researchers consider that games can give players a sense of enjoyment (Nakao, 2019). Thus, the combination with the game has the potential to be effective and provide a sense of enjoyment.

Design Stage

This stage is an advanced stage of the gap in the analysis stage. In this stage, we designed public-service advertising media such as posters. Then it was combined with a pinball game. The pinball game has an ergonomic shape, is flexible, is easy for children to play, is matched in size, and has an attractive color combination. The game adds fun for children and is made into a printed poster (Muslimin, 2015). The Educational Game Tools provide these criteria for the target age of 10 years but need further SNI testing. Pinball game is one of the methods used in learning, which is considered effective in improving and motivating students. The results of research conducted by Ksatriani (2018) showed that the pinball game could increase motivation by 10.8% from 75.11% to 85.19%, with a gain score reaching 0.4%, which is in the medium category (Ksatriani, 2018). Learning math counting skills using pinball games is proven to improve math skills by more than 80% (Sari, 2022). Therefore, in this study, we developed posters combined with pinball games to invite COVID-19 vaccinations for elementary school children and their parents. The contents of the combination pinball game poster consist of information regarding the purpose of the vaccine, vaccine location, and vaccine dosage and are equipped with pinball games for children. The pinball game contains material related to COVID-19 prevention such as the use of masks, hand sanitizers, hand washing, and checking temperatures. The poster describes vaccine knowledge, while the pinball game is used as an attraction so the target can have a memorable experience reading the persuasive poster. The pinball game combination poster intended for elementary school-age children at an early stage is shown in Figure 1 part A.

Figure 1. Posters and pinball game

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Development Stage

The development stages are the stages in the development of poster products and pinball games. This stage involved several experts, such as media experts, health promotion experts, and academics. At this stage, it produces some input from several experts as expert judgment prior to dissemination or field testing on a large scale. Poster and pinball game validation tests include aspects of format, content, language, and effectiveness. The following is a resume validation results through expert judgment.

Table 1. Resumes of Several Experts Validation Results

No	Validator	validator score				mean	qualification	Recommendation
		format	content	language	effectivity			
1	Media expert	2	3	2	3	2.5	Not good	Major revision
2	Health promotion expert	4	3.25	3	3	3.3	Very good	No revision
3	Academic (lecturer)	3	3.5	3	3,6	3.27	Good	Minor revision
mean						3.023	Good	Minor revision

The table shows that the average validation value reaches 3.023 with a good category and minor revision. Some of the inputs that have been generated are the compatibility of the poster and layout, as well as the entire poster and the use of language that is adapted to the target in elementary school children and parents. In use of solicitation words in posters, the poster form is adapted to the theme of the poster, namely the COVID-19 vaccination, so that it can be in the form of a COVID-19 vaccine bottle. Children prefer to choose the bright color in the poster because their eyes have not fully developed yet and the bright color is more stimulating and interesting (Saudin & Zainal, 2018). Bright colors for children are pink, red, yellow, green, purple and blue. These color preferences have the emotional aspect such as happy, strength, and excitement (Boyatzis, 1993). In the literature, it has been stated that young children prefer bright colors, but in primary education, they prefer pastel colors and tones (Kurnaz et al., 2022). The color of the poster is suggested to be pink and Tosca. Layout is suggested to be one groove when viewed so that the reader can only see vertically from top to bottom. One of the layout principles is sequence. Some sequences that are often encountered use letters such as Z, C, L, T, and I. This is to make it easier to read the information on the poster (Landa, 2011). The initial position of the pinball game is on the side. At the development stage, the pinball game is placed in a lower position. This study did not pre-test media with children directly due to research limitations. This research focuses on testing media based on experts and scientific references. This can be input for further research so that media can be pre-tested for children. Overall changes the posters and pinball games can be seen in Figure 1, part B.

Implementation Stage

At this stage, the product that has been designed was tested on a small scale, in an elementary school with research subjects in grades 4 and 6 of elementary school The number of students involved in this study, according to the completeness of the questionnaire, was 40 for children and 65 for parents. At the preparatory stage, the researcher prepared a questionnaire before the intervention was carried out aimed at children and parents. The research team also provided socialization or information related to posters and pinball games to grade 4 and 6 students in the class. As for parents, information was provided through social media by providing videos related to the poster and how to play the pinball game on the poster. The research team put up posters at school on the walls, which were intended to provide various information to students so that

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students would not be unfamiliar with the addition of posters at school. A poster was posted at one point in the school. The poster was placed in an open place so that parents would be exposed to the information.

Evaluation Stage

The evaluation stage is the last stage of a series of development research activities. This stage tests the effectiveness of promotional media calling for COVID-19 vaccination on the knowledge of children, parents, and parent's perceptions of COVID-19 vaccination. Questionnaires at this evaluation stage were given to children and parents after two weeks of implementation/intervention.

Effect of Posters on COVID-19 Vaccination Knowledge

Knowledge about public service advertisements and COVID-19 vaccination in children before being given the pinball game combination poster obtained the results of knowledge with a fair level of 28 children (70%) with a score of 60-80 with an average score of 62. Meanwhile, after the intervention, there was an increase in the level of knowledge, and the average score was 83, which can be seen in Table 2.

Table 2. Knowledge Level of Children Before and After Intervention (n=40)

Knowledge	Category	Children n (%)
Pre test	Less	12 (30)
	fair	28 (70)
	good	0
	score average	62
Post test	Less	1 (2.5)
	Fair	27 (67.5)
	good	12 (30)
	score average	83

As for the results of the comparison of knowledge before and after giving posters and games, 26 children experienced an increase, and 14 children did not experience a gain after being given the intervention. The Wilcoxon test results showed (p=0.0001). Statistically, it shows that p <0.005, so there is a significant difference in knowledge between before and after giving the game combination poster. In line with research conducted on nutrition awareness interventions through poster media, it shows effectiveness in early childhood (Winingsih et al., 2020).

One of the determining factors for the success of learning is the media. The media has the function of clarifying a message. The pinball game poster media combination in this study uses visualization that is in line with the target, elementary school-age children, cheerful colors, legible writing, and the form of a poster in the condition of a COVID-19 vaccination bottle. The child will be interested in the colors and images on the poster. Research conducted on nutritional disc media is increasingly being accepted by the target because it pays attention to the color and image aspects that are tailored to the target (Mahmudah & Sari, 2021). Visualization on posters is considered to be able to increase the effectiveness of information media by 40% in increasing one's knowledge (Okinarum et al., 2017) The visualization depicted through the poster is expected to be accepted so that it is captured by the five senses. The more the five senses are involved, the clearer the knowledge obtained will be. This is the principle of educational media (Mahmudah & Sari, 2021).

The combination of posters with pinball games is a strategy to get children interested in seeing posters repeatedly. A number of researchers have also provided posters placed in schools which have shown effectiveness but other strategies are needed so that children often witness the posters (Caesar, 2020; Winingsih et al., 2020),). Playing pinball games can be an alternative to increase the frequency of exposure to COVID-19 vaccination posters. Pinball games are often used in the learning process. The pinball game is considered a cooperative learning model that is easy to apply to various age groups, involves the role of students as peer tutors, and contains elements of play and reinforcement (Kurniawan, 2019). Increased knowledge is expected to be capital in taking action. The action aimed in this poster call is the COVID-19 vaccination for elementary school-age children. A person's actions are influenced by the knowledge or cognition that has been obtained (Sidabutar & Sumantrie, 2021). COVID-19 vaccination measures for children are still accompanied by their

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parents. The development of posters in this study involved children as well as parents.

Parental knowledge after giving the pinball game combination poster is described in Table 3. The level of parental knowledge was not tested based on before and after the intervention. This is because the data before the intervention did not meet the number of samples. Based on Table 3, it was found that knowledge of the fair and good categories was higher in the female sex with statistically significant results. The other variables (occupation, income, education, child exposure, and age) are not statistically significant.

Table 3. Parental Knowledge of Public Service Advertisements and Vaccinations (n=65)

Variable	Group	N (%)		P-value
		Good and fair	less	
Gender	men	28 (46.7)	0	0.043
	women	32 (53.3)	5 (100)	
Working experience	work	37 (61.7)	2 (40)	0.342
	Does not work	23 (38.3)	3 (60)	
Income	< 2 million	42 (70)	3 (60)	0.639
	>2 million	18 (30)	2 (40)	
Education	low	14 (23.1)	1 (20)	0.971
	Middle	21 (35.0)	2 (40)	
	high	25 (41.7)	2 (40)	
Child exposure	+	9 (15)	0	0.351
	-	51 (85)	5(100)	
Age	<35	22 (36.7)	1 (20)	0.454
	>35	38 (63.3)	4 (80)	

chi-square trend

In general, the level of parental knowledge regarding COVID-19 vaccination is in the fair-good range. Parents' knowledge of COVID-19 vaccination is expected to be a domain factor so that they can vaccinate their children with against COVID-19 in elementary schools. Based on the results of initial observations that, less than 50% of elementary school-aged children in the target areas had not received the COVID-19 vaccination. Good knowledge of vaccinations is a factor for someone to take or receive a COVID-19 vaccination. This study shows that parents have good knowledge of vaccinations, so they play a significant role in carrying out COVID-19 vaccinations for their children in elementary schools (Bakrie et al., 2022). The attitude of acceptance of people in making decisions for the COVID-19 vaccination varies, some refuse and are enthusiastic (Bakrie et al., 2022).

Perceptions based on the TPB (theory of planned behavior) theory of parents toward COVID-19 vaccination after being given an intervention can be seen in Table 4. The perceptions used in this study were positive attitudes and subjective norms of parents towards co-19 vaccination. Based on Table 4, it can be seen that parents have a positive attitude towards the perception of COVID-19 vaccination. Parents agree that primary school-aged children are given the COVID-19 vaccination, and there is an attitude toward the importance of giving the vaccine, the function of the vaccine, and its effectiveness. In addition, the family also plays a role in administering the COVID-19 vaccination.

Table 4. Parental Perceptions of COVID-19 Vaccination Based on TPB Theory (n=65)

Perception	Strongly disagree	Disagree	Agree	Strongly agree
Positive Attitude of Parents on COVID-19 Vaccination				
Parents need to consider supporting the COVID-19 vaccine for their children	1 (1.4)	14 (20.3)	35 (50.7)	15 (21.7)
The COVID-19 vaccine is essential for elementary school-age children.	-	18 (26.1)	31 (44.9)	16 (23.2)

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The COVID-19 vaccine is effective in protecting elementary school-age children.	-	17 (24.6)	34 (49.3)	14 (20.3)
The COVID-19 vaccine can contribute to controlling the spread of transmission in Indonesia	3 (4,3)	10 (14.5)	36 (52.2)	16 (2.2)
Subjective norm				
The family plays a supportive role in administering vaccines to children	3 (4.3)	14 (20.)	34 (49.3)	14 (20.3)

This study discusses parents' perceptions of COVID-19 vaccination after being given an intervention at school. Parents' perceptions of the COVID-19 vaccination after being given the pinball game combination poster can be seen in Table 4. Parents showed positive perceptions. This perception is based on the theory of planned behavior with positive attitude variables and subjective norms. Regarding positive attitudes, it was found that parents generally agreed that parents would consider co COVID-19 vaccination for their children who were still in elementary school. This is felt by parents about the importance of the COVID-19 vaccine for children. This is one way to prevent the transmission of COVID-19 that occurs in children. Parents also have a good perception of the effectiveness of the COVID-19 vaccination. The effectiveness of the COVID-19 vaccine is the reason for someone to make a decision to vaccinate and control the spread of COVID-19 (Bakrie et al., 2022).

Promotional media for the invitation to COVID-19 vaccination in Indonesia range from print to digital, with various targets from children to the elderly. The promotional media for the invitation to the COVID-19 vaccination uses a communication strategy so that the target audience can understand well, maintain motivation, and accept the information that has been provided. Print media is one of the media that can be used for public service advertisements. Posters calling for COVID-19 vaccination for children are aimed explicitly at elementary school-age children (6-12 years). This poster contains a call for COVID-19 vaccination, vaccination functions, and places for vaccination services. Besides that, it is equipped with pinball games. This pinball game is intended for children, and parents or teachers can also accompany this game. The pinball game in the vaccination invitation poster can attract children, so children will often be exposed to information from the poster or the pinball game.

CONCLUSION

The combination of posters and pinball games on the call for COVID-19 vaccination can be an alternative media for public service advertisements, especially in elementary schools. This can be seen based on the increase in elementary school children's knowledge scores before and after the intervention, and there is a significant difference. Parental knowledge of vaccination is at a fair to good level. The attitude of parents toward the COVID-19 vaccination after being given posters and pinball games at school showed a positive attitude. It is hoped that knowledge and a positive attitude will form positive actions toward the invitation to vaccinate against COVID-19 for elementary school-age children. The weakness in this study is that the intervention was only carried out for two weeks, so changes in behavior could not be seen; The number of samples between children and parents should have been the same; The media, particularly in pinball design, remains very rudimentary, necessitating further enhancements to foster heightened levels of student engagement and attentiveness and this study did not pretest media directly to children. Suggestions are for schools and health centers to be able to collaborate to increase children's and parents' knowledge regarding health, including information about vaccination invitations, so that vaccination coverage is wider. One of the media that can be used to disseminate information is posters combined with games.

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