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THE EFFECT OF USING BINGO CARDS ON HANDWASHING WITH SOAP COMPLIANCE AMONG SCHOOL-AGED CHILDREN

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ABSTRACT

Elementary school-aged children are vulnerable to infectious diseases because of poor handwashing with soap (HWWS) compliance, while conventional educational methods are often ineffective in developing hygienic habits. This study aimed to determine the effect of an educational bingo card game on HWWS compliance among school-aged children. A pre-experimental study with a one-group pre-test–post-test design was conducted among 80 students selected through purposive sampling from a population of 93 elementary school students in Mojokerto, Indonesia. HWWS compliance was measured using a valid and reliable 20-item observation checklist. Data were analyzed using the Paired Sample *t*-test. Before the intervention, all participants (100%) were categorized as non-compliant, whereas after the intervention all participants (100%) became compliant. Statistical analysis showed a significant improvement in HWWS compliance ($p < 0.001$). Educational bingo cards are an effective game-based health education medium for improving HWWS compliance among school-aged children.

Keywords: bingo card; handwashing with soap; compliance; elementary school students; health education.

INTRODUCTION

Elementary school children are a population vulnerable to infectious diseases due to their high level of social interaction, which is often not accompanied by adequate hygiene practices (Sidabutar et al., 2022). One of the most important Clean and Healthy Living Behaviors (CHLB) for preventing infectious diseases is handwashing with soap (HWWS) (Triana et al., 2024). Although handwashing with soap is a simple preventive measure, compliance among school-aged children remains low, thereby increasing the risk of diarrhea, acute respiratory infections (ARI), and other infectious diseases (Rahayu & Ummah, 2024). Globally, 42% of children do not have access to basic hygiene services in schools (UNICEF & WHO, 2022). In Indonesia, only 49.8% of the population practices proper handwashing with soap (Kemenkes RI, 2018), while compliance among school-aged children is estimated to range from 55% to 60% (Kementrian Kesehatan Republik Indonesia, 2023). A similar situation was identified at the study site, where preliminary observations revealed that students had not consistently practiced proper handwashing with soap.

Previous studies have demonstrated that game-based educational media are effective in improving health-related behaviors among school children (Fajar et al., 2025). (Prahayu et al., 2024) reported that educational games significantly improved students' knowledge and handwashing practices, while (Salsabila et al., 2022) found that a gamification approach effectively promoted clean and healthy living behaviors. In addition, (Detha et al., 2024) concluded that card-based educational media were more effective than conventional lecture methods in improving health behaviors. However, studies specifically examining the use of educational bingo card games to improve handwashing with soap compliance through direct observation among elementary school students remain limited,

particularly among elementary school students in Indonesia. This indicates an important research gap that requires further investigation (Lestari et al., 2022).

Based on these conditions, this study aimed to analyze the effect of an educational bingo card game on handwashing with soap (HWWS) compliance among school aged children. This study also provides empirical evidence regarding the effectiveness of educational bingo cards in improving HWWS compliance among school-aged children.

This study contributes empirical evidence regarding the effectiveness of educational bingo card games as a gamification-based health education medium for improving handwashing with soap compliance among elementary school students. The findings are expected to provide an innovative alternative for school-based health promotion programs and serve as a reference for schools and healthcare professionals in developing effective strategies to promote clean and healthy living behaviors among school-aged children (Kementrian Kesehatan Republik Indonesia, 2023).

METHOD

This study employed a pre-experimental one-group pre-test–post-test design to analyze the effect of an educational bingo card game on handwashing with soap (HWWS) compliance among school-aged children. The study was conducted at an elementary school in Mojokerto, Indonesia. The population consisted of 93 students in Grades 1–6, and 80 participants were selected using purposive sampling.

Data collection consisted of three stages: preparation, implementation, and data analysis. During the preparation stage, research permission and ethical approval were obtained, and the research instruments were prepared. During the implementation stage, participants completed a pre-test using a valid and reliable 20-item HWWS compliance observation checklist with a 4-point Likert scale. Participants then received the educational bingo card intervention, followed by a one-week practice period using a daily monitoring card. A post-test was conducted using the same observation instrument.

Data were analyzed using SPSS. Descriptive statistics were used to summarize participant characteristics and HWWS compliance. Data normality was assessed using the Kolmogorov–Smirnov test. Since the data were normally distributed ($p > 0.05$), differences between pre-test and post-test scores were analyzed using the Paired Sample *t*-test. Statistical significance was set at $p < 0.05$.

FINDING AND DISCUSSION
RESEARCH RESULT
GENERAL DATA

Table 1: Distribution of Respondents by Gender

No	Gender	Frequency (f)	Percentage (%)
1	Male	43	53.8%
2	Female	37	46.3%
Total		80	100%

Source: General Data, 2026

Based on Table 1, of the total 80 the respondents, the majority were male, accounting for 43 students (53.8%), while 37 students (46.3%) were female. These findings indicate that the respondents in this study were predominantly male.

Table 2: Distribution of Respondents by Grade

No	Grade	Frequency (f)	Percentage (%)
1	I	15	18.8%
2	II	10	12.5%
3	III	11	13.8%
4	IV	20	25.0%
5	V	15	18.8%
6	VI	9	11.3%
Total		80	100%

Source: General Data, 2026

Based on **Table 2,** the largest proportion of respondents was from **Grade IV**, comprising **20 students (25.0%)**. In contrast, the smallest proportion was from **Grade VI**, with **9 students (11.3%).** The remaining respondents were distributed across **Grades I, II, III, and V**, each representing less than 20% of the total sample. These findings indicate that the respondents were distributed across all grade levels, providing representation of students from **Grades I to VI**.

SPECIFIC DATA

The specific variable examined in this study was handwashing with soap (HWWS) compliance among school-aged children. Compliance was measured using a 20-item observation checklist with a 4-point Likert scale. Data were collected through pre-test and post-test assessments conducted before and after the educational bingo card intervention.

Table 1: Descriptive Statistics of HWWS Compliance Scores Before and After the Intervention

Variable	N	Minimum	Maximum	Mean	Standard Deviation
Pre-test	**80**	**27**	**48**	**37.36**	**5.020**
Post-test	**80**	**65**	**77**	**71.76**	**2.973**
Valid N	**80**				

Source: Specific Data, 2026

Based on Table 1, the results of handwashing with soap (HWWS) compliance measurements before and after the educational bingo card game intervention were obtained from 80 respondents.

During the pre-test, the minimum score was 27, the maximum score was 48, the mean score was 37.36, and the standard deviation was 5.020. Following the intervention (post-test), the minimum score increased to 65, the maximum score increased to 77, the mean score increased to 71.76, and the standard deviation decreased to 2.973.

The respondent with the lowest pre-test score (27) demonstrated a substantial improvement, achieving a post-test score of 76, representing an increase of 49 points. Furthermore, the overall mean HWWS compliance score increased from 37.36 to 71.76, with a mean difference of 34.40 points after the educational bingo card game intervention. The standard deviation also decreased from 5.020 to 2.973, indicating that the post-intervention data were more homogeneous. This finding suggests that the intervention not only improved HWWS compliance but also produced a more consistent improvement across the respondents.

Table 2: Frequency Distribution of Handwashing with Soap (HWWS) Compliance Before and After the Intervention

Table A. Frequency Distribution of Handwashing with Soap Compliance (Pre-test)

No	Category	Frequency	Percentage (%)
1	Compliant	0	0%
2	Non-compliant	80	100%
	Total	80	100%

Source: Specific Data, 2026

Table B. Frequency Distribution of Handwashing with Soap Compliance (Post-test)

No	Category	Frequency	Percentage (%)
1	Compliant	80	100%
2	Non-compliant	0	0%
Total		80	100%

Source: Specific Data, 2026

Based on Tables A and B, all respondents (100%) were categorized as non-compliant during the pre-test, with scores ranging from 27 to 48. Item-level analysis showed that the lowest compliance scores were observed for items P4, P5, P9, P10, P11, P12, P16, and P19.

Following the educational bingo card game intervention, all respondents (100%) were categorized as compliant, with scores ranging from 65 to 77. The highest post-test scores were observed for items P1, P2, P3, P4, and P5, with all respondents achieving the maximum score for these items. Meanwhile, items P12, P16, and P19 showed relatively lower scores than the other items, although they still demonstrated improvement compared with the pre-test.

Overall, all observation items demonstrated higher scores in the post-test than in the pre-test. The greatest improvements were observed in items P4 and P5, which recorded the lowest compliance scores during the pre-test and the highest scores following the intervention. These findings indicate that the educational bingo card game was effective in improving handwashing with soap (HWWS) compliance among elementary school students.

DISCUSSION

1. Identifying Handwashing with Soap (HWWS) Compliance Among School-Aged Children Before the Bingo Card Intervention

Before the educational bingo card intervention was implemented, all students (100%) were categorized as non-compliant with handwashing with soap (HWWS), with a mean compliance score of 37.36. Observation results indicated that students had not correctly performed the six steps of HWWS, frequently washed their hands without soap, and did not consistently practice HWWS at critical times. These findings suggest that proper handwashing behavior had not yet become a daily habit among the students, highlighting the need for educational methods that promote active participation and the development of healthy behavioral habits.

These findings are consistent with ***Social Learning Theory*** (Bandura, 1977), which explains that behavior is learned through observation, imitation, and reinforcement from the surrounding environment. The results are also in line with previous studies reporting that HWWS compliance among elementary school children remains low prior to educational interventions due to limited knowledge, inadequate habit formation, and the use of less engaging educational media (Hockenberry et al., 2023).

2. Identifying Handwashing with Soap (HWWS) Compliance Among School-Aged Children Students After the Bingo Card Intervention

Following the educational bingo card intervention, all students (100%) were categorized as compliant, with the mean compliance score increasing to 71.76. Improvements were observed in the use of soap, the correct performance of the six steps of HWWS, and handwashing practices at critical times. These findings indicate that the educational bingo card effectively improved students' knowledge and practical skills in performing proper handwashing through an active and enjoyable learning process.

These findings support ***Social Learning Theory*** (Bandura, 1977), which states that behavioral change occurs through observation, practice, and reinforcement. The results are also consistent with previous studies demonstrating that **game-based learning** is effective in improving knowledge, motivation, and health-related behaviors among school-aged children.

3. Analyzing the Effect of the Bingo Card Intervention on Handwashing with Soap (HWWS) Compliance Before and After the Intervention

The results of the **Paired Sample t-test** showed a significance value of **p = 0.000 (p < 0.05)**, indicating that the educational bingo card intervention had a significant effect on handwashing with soap (HWWS) compliance among **school-aged children**. The increase in the mean compliance score from 37.36 before the intervention to 71.76 after the intervention demonstrates that the bingo card was effective in improving students' compliance with proper handwashing procedures. These findings indicate that game-based educational media can facilitate positive health behavior changes among school-aged children.

These findings are consistent with ***Social Learning Theory*** (Bandura, 1977) and are supported by previous studies reporting that **game-based learning** effectively improves health behaviors through interactive and participatory learning approaches.

This study has several limitations. It employed a pre-experimental design without a control group, was conducted in only one elementary school, and handwashing practice was carried out using the ablution area because dedicated handwashing facilities were unavailable. These limitations may affect the generalizability of the findings. Therefore, future studies are recommended to employ experimental designs with control groups, include larger sample sizes, and involve schools with different characteristics to provide more comprehensive evidence regarding the effectiveness of educational bingo cards. From a practical perspective, educational bingo cards may serve as an effective health promotion medium that can be integrated into classroom learning activities and the School Health Program (SHP) to improve sustainable handwashing with soap compliance among elementary school students.

CONCLUSION

The educational bingo card game significantly improved handwashing with soap (HWWS) compliance among school-aged children. Before the intervention, all students were categorized as non-compliant, whereas after the intervention, all students became compliant. Statistical analysis using the Paired Sample *t*-test showed a significant effect of the educational bingo card game on HWWS compliance ($p < 0.05$). These findings indicate that the educational bingo card game is an effective health education medium for improving HWWS compliance among school-aged children. Future studies are recommended to involve

larger samples, include control groups, and be conducted in different school settings to improve the generalizability of the findings.

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