

Effect of the Snake and Ladder Game on Behavior and OHI-S Index of Deaf Children



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ABSTRACT: Deafness in children is one of the obstacles in gaining knowledge about dental and oral health. It also has an impact on attitudes and behavior of maintaining dental health. Therefore, dental health education accompanied by the right tools is needed to help in conveying information to deaf children in order to ensure the message is received clearly. This research aims to determine the effect of dental health education on the behavior and index of dental and oral hygiene of deaf children by using snake and ladder game. Methods: A quasi-experimental method with a non-randomized control group pre and post-test design was used, while 123 students aged 10-12 years were taken as a sample from 3 Special Schools in the Region of Yogyakarta, Indonesia. The variables measured were the behavior of maintaining dental health and the Oral Hygiene Index Simplified (OHI-S). Afterward, data were analyzed using the Wilcoxon and the Mann-Whitney tests. Results: The results of the Wilcoxon test showed that there were significant differences in dental health maintenance behavior and the OHI-S index in the treatment group ($p < 0.05$). While the Mann-Whitney test showed significant differences between the treatment and control groups ($p < 0.05$). Conclusions: The snake and ladder game are able to improve dental and oral health maintenance behavior as well as reduce the OHI-S index in deaf children.

KEYWORDS: dental health education, snake and ladder game, behavior, OHI-S index

I. INTRODUCTION

Children with special needs are often faced with dental and oral hygiene problems because they have limitations and are not able to fully utilize all their physical, mental, and social abilities (Ningrum, et al., 2021). The categories of these children include visually impaired, mentally retarded, physically handicapped, autism, and multiply handicapped. In Indonesia, the age ranges and respective percentages of the children with special needs include, 5-9 years old (2.5%), 10-14 years old (3.5%), and 15-17 years old (4.2%) (Kementerian Kesehatan RI, 2019).

Generally, deafness is when someone experiences verbal communication disorders due to partial or complete loss of hearing (Veriza, et al., 2020), while speaking disorders is difficulties in communicating. However, deaf people are able to communicate optimally by using the sense of sight (Alphianti and Rahma, 2021). In fact, this category of people has their language for communicating, known as sign language, which is often gotten through education. This communication is either expressive, which is the ability to produce a language that is understood by others, or receptive, which is being able to understand the intentions (Sadimin, et al., 2018).

To improve dental and oral health, the understanding and knowledge of these children need to be increased. This is because, Knowledge often causes changes in a person's attitudes and behavior, and eventually have an impact on everyday life. For example, providing dental health education influences human behavior, and stir up the desire to change for the better (Almoslem, 2021). When the knowledge, attitudes, and behavior towards the maintenance of dental and oral hygiene are better, the oral health status will also be better (Fukuhara, 2020).

To increase the knowledge of deaf children in maintaining oral and dental health, it is necessary to carry out dental health education by selecting the right media which are classified into two, namely traditional and modern. One of the traditional games commonly played by children is the snake and ladder. This game is a cooperative play that is cheap and easy where children learn to work together and compete healthily, thereby helping children to socialize with their peers and learn while playing (Labibah, 2015).

Based on this background, research needs to be carried out to determine the effect of dental health education with the snake and ladder game method on children's behavior as well as dental and oral hygiene index of the deaf.

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II. METHODS

The quasi-experimental method with non-randomized control group pre-test and post-test design was used in this research, and the changes observed include dental health maintenance behavior and OHI-S. A total sampling of 123 deaf children was taken according to the research criteria. Furthermore, informed consent is given by parents or guardians concerning their approval or refusal for the children to participate in the activities from beginning to the end without any coercion.

In this research, the sample was divided into 2 groups, namely the treatment and control. The treatment entails the children who are educated through the snake and ladder game which is often played by at least one child using a computer program. When the dental health is well maintained, the player goes up the stairs to a higher level and get a reward, known as the state of healthy teeth and mouth. However, when behaves badly, toothache penalty is gotten and the score goes down following the snake's head to its tail. On the other hand, the control group entails the children who receive dental health education through lectures accompanied by pictures.

This implementation of dental health education was carried out 3 times, for 15 minutes on the following days, namely 1, 5, and 10. The aim of this repetition is to ensure that the information conveyed is reinforced and stored in long-term memory to deepen understanding (Dini,2021). Furthermore, the variables include 1) children's behavior concerning dental and oral health maintenance which was measured using a questionnaire consisting of 10 question items. These behavioral scores are described as low when it is between 0-5 and high when it is between 6 - 10. 2) Oral hygiene is measured based on the Simplified Oral Hygiene Index known as OHI-S (Green and Vermilion), which include components of the debris and calculus index using a 0-3 scale. In addition, the tooth surfaces measured include: 1.6 and 2.6 on the buccal surface, 1.1 and 3.1 on the labial, 3.6 and 4.6 on the lingual. The OHI-S scoring criteria is categorized as good when the score is between 0.0 - 1.2, moderate when it is between 1.3 - 3.0, and bad when it is between 3.1 - 6.0. Additionally, measurement of behavior and OHI-S index was carried out 1 day before (pre-test) and the 15th day after dental health education (post-test).

Hence, the normality test was carried out using the Kolmogorov-Smirnov in both pre-test and post-test groups and a p-value < 0.05 was obtained, thereby showing that the data is not normally distributed. Based on the result, Wilcoxon is used for the pre and post-test analysis in one group, while the Mann-Whitney is used in two groups.

III. RESULTS

The research shows that 57 deaf respondents are in the treatment group, while 56 are in the control group. Table 1 provided the data on the respondent characteristics. The data on the respondent characteristics are as follows:

Table 1. Description of the respondent characteristics

Characteristics	Criteria	Treatment		Control	
		N	%	N	%
Gender	Male	32	56.14	28	50
	Female	25	43.86	28	50
Age	9-10 years old	35	61.40	31	55.36
	11-12 years old	32	38.60	25	44.64
Parental education	Elementary School	6	10.53	4	7.14
	Junior High School	24	42.11	23	41.07
	Senior High School	21	36.84	24	42.86
	College	6	10.52	5	8.93
Work	Private employees	28	49.12	31	55.36
	Civil Servant/Army/Police	9	15.79	6	10.71
	Entrepreneur	12	21.05	13	23.21
	Farmer/fisherman	3	5.26	1	1.79
	Freelance	5	8.78	5	8.93

The descriptions of respondents in the treatment group were mostly male (56.14%) with age 9-10 years (61.40%), having parental education at Junior High School (42.11%) and private employees (49.12%). Meanwhile, in the control group, the average respondents were male and female (50%), aged 9-10 years (55.36%), with parental education at Senior High School (42.86%) and private employees (55.36%).

The results of the oral and dental health behaviour in the treatment group are shown in Table 2.

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Table 2. The results of pre-test and post-test behavior in the treatment group

Variable	Mean+SD	p-Value*
Behavior on pre-test	4.61+1.61 (low)	0.000
Behavior on post-test	8.11+1.64 (high)	

According to Table 2, the mean behaviour of the pre-test treatment was 4.61 + 1.61 in the low category, while the post-test is in the high category with 8.11+1.64. Hence, the results of the Wilcoxon test in the treatment group showed a significant difference in behavior with p-Value = 0.000 ($p < 0.05$).

The differences in the control group are determined by using the Wilcoxon test as shown in Table 3.

Table 3. The results of pre-test and post-test behavior in the control group

Variable	Mean+SD	p-Value*
Behavior on pre-test behavior on post-test	6.64+2.59 7.63+2.30	0.062

Based on Table 3, the distribution of pre-test behaviour in the control group was 6.64 + 2.59 in the high category, while post-test is 7.63 + 2.3. By using the Wilcoxon test, a p-value of 0.62 was obtained which showed no significant behavioural difference from p-value = 0.062 ($p > 0.05$).

The results of the Wilcoxon test in determining the OHI-S index pre-test and post-test in the treatment group are shown in Table 4.

Table 4. The results of OHI-S pre-test and post-test in the treatment group

Variable	Mean+SD	p-Value*
OHI-S index on pre-test	2.84+0.97 (moderate)	0.000
OHI-S index on post-test	1.12+0.6 (low)	

Table 4 shows that the average OHI-S index in the control group with 2.84 + 0.9 is in the moderate category, while the post-test is in the low category of 1.12 + 0.40. The results showed that there was a significant difference in the OHI-S index with p-Value = 0.000 ($p < 0.05$).

The results of the OHI-S index measurement in the control group are shown in Table 5.

Table 5. Results of the OHI-S index pre-test and post-test in the control group

Variable	Mean+SD	p-Value*
OHI-S index on pre-test	2.16+0.83 (moderate)	0.058
OHI-S index on post-test	1.88+0.98 (moderate)	

The results in Table 5 show that the OHI-S index pre-test and post-test in the control group are moderate, namely 3.16 + 0.83 and 1.88 + 0.98. Also, the Wilcoxon test showed that there was no significant difference in the OHI-S index pre-test and post-test with p-value = 0.058 ($p > 0.05$).

The results of the Mann-Whitney test in Table 6 are in accordance with the one of Wilcoxon in Table 3, which shows that there is a significant difference between the pre-test and post-test behavior of maintaining dental health in the treatment and control groups with p-value = 0.004 (< 0.05).

Table 6. Different test results in the treatment and control groups

Variable	Z	p-Value (sig)*
Dental health maintenance behavior	-2.848	0.004
OHI-S Index	-6.290	0.000

IV. DISCUSSION

From Table 2, there is an increase in the behaviour of deaf children because the snake and ladder game is equipped with interesting pictures and not too dense writings which are related to the counselling content and message conveyed. Each column has a different colour, thereby making the game to be more enticing to the children (Atika and Suyadi, 2021). Basically, the snake and

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ladder is an educational game that is used to learn how to concentrate in dealing with problems, socialize with playmates, develop children's intellectuals such as counting, as well as learn shapes and sizes. Furthermore, this game is usually carried out among groups of children who are able to regulate their behaviour, assess their abilities, etc. (Rikawarastuti, et al., 2018). In delivering the material, guidance needs to be provided on how to play as well as attractive rewards should be given in order to make the children more enthusiastic about understanding the material provided. This game was created as a stimulus to increase children's motivation in absorbing behaviours about dental and oral diseases obtained during the process (Fauziah, et al., 2020). Consequently, most respondents have a supportive attitude towards dental and oral health because the post-test counselling is carried out by using illustrated stories as well as snake and ladder games (Atika and Suyadi, 2021).

Based on Table 3, the distribution of pre-test behaviour in the control group was no significant difference. This is in accordance to previous research, which describes that deaf people are slower than normal children in the process of reading comprehension. Similarly, the understanding process of using sign language, pictures, and writing takes longer because it must be expressed in real terms through motion or directly with easy-to-understand language (Agusta and Firdausy, 2014). Table 4 showed that there was a significant difference in the OHI-S index in the treatment group, with p-Value = 0.000 ($p < 0.05$). Hence, the games' materials which include brushing teeth, choosing healthy foods for dental health, and having regular dental checkups with the dentist helps to improve the children knowledge and behavior (Srinivasan, 2019). For example, they were able to understand the importance of maintaining healthy teeth and mouth, specifically the importance of brushing teeth. Therefore, children who have the habit of brushing their teeth twice a day by using a manual toothbrush have an impact on a low dental and oral hygiene index (Alyafei, et al., 2020).

According to the Table 5, there was a significant difference in the OHI-S index in the control group, with p-Value = 0.000 ($p < 0.05$). That is because the educational media lectures accompanied by pictures are less effective in increasing knowledge and behaviour. In addition, there is no increase in the dental and oral hygiene index, hence, the information received by deaf children, specifically about dental and oral health, is not captured optimally, thereby forming an inappropriate behaviour as well as affecting dental and oral hygiene (Kantohe, et al., 2016)

The OHI-S index criteria in this control group are moderate, probably because the child's saliva is mucus and high volume, thereby leading to self-cleansing and reduction in debris accumulation (Merić, et al., 2020). Saliva helps to prevent plaque and calculus by maintaining the balance of ion exchange on the tooth surface (Lee, et al., 2021). The composition of saliva contains calcium, fluorine, phosphate, sodium, potassium, chloride, and bicarbonate. Also, the consistency of food increases the flow and buffering capacity of saliva which causes the bicarbonate content to be high, thereby having an impact on dental hygiene (Abbas, et al., 2020).

Table 6 shows that that there is a significant difference between the pre-test and post-test behavior of maintaining dental health in the treatment and control groups. This is probably because different media often affects the level of children's mindset in understanding the content. For example, deaf children are more interested in educational media in the form of games because it involves an interaction with their playmates (Nur, et al., 2015). Also, the effectiveness of dental health education is influenced by the use of appropriate methods to the targeted group. Therefore, the factor that the audience uses frequently affects the understanding and improvement of the target's behavior, and also changes the behavioral patterns and habits for the better (Kantohe, et al., 2016).

The senses obtained by most respondents from this education are through vision, and were given direct counseling because they are deaf. Hence, choosing a method of direct dental health education helps to improve children's understanding by practicing directly, for example how to brush teeth (Fauziah, et al., 2020). The snake and ladder game is in line with the cognitive development of children with ages 8-11 years old, thus, they accept its objective reason and logic. Furthermore, their activities in playing are more controlled by the rules of the game (Atika and Suyadi, 2021). Therefore, this visual-based learning media in the form of a snake and ladder game is an effective medium to increase absorption and understanding of lessons, specifically the discussions that are difficult to accept without media intermediaries. It also improves the behavior, attitudes, and practices towards dental and oral health as well as the application of how to brush teeth properly and correctly (Rikawarastuti, et al., 2018).

V. CONCLUSIONS

Conclusively, dental health education with snake and ladder games is able to improve dental health maintenance behavior and reduce the OHI-S index in deaf children. Moreover, further research needs to add measure variables in order to compare with other audio-visual media.

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