

Cognitive Comprehension of Dental Health Education Using a Busy Book “Ayo Sikat Gigi” in Down Syndrome Children

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Abstract

Children with Down Syndrome are developmentally delayed, particularly in cognitive ability and fine motor skills, and this affects oral health care comprehension. The educational toy busy book, *Ayo Sikat Gigi*, can be used as a special approach to educate them regarding the oral health care. We evaluated the cognitive comprehension scores of dental health education using this busy book.

This experimental clinical study included 25 Down Syndrome children (17 males, 8 females; age 7–12 years) from special primary schools in Jakarta. This age range was chosen after adjustment of mental age of children without Down Syndrome. The scores before and after dental health education using the busy book, *Ayo Sikat Gigi*, were analyzed and their differences measured. Scores were obtained from the objective test from the busy book, which is a picture-matching test on dental health education that is obtained from the book contents.

The scores after dental health education using the busy book were higher than the pretest scores, and this difference was statistically significant ($P < .05$). The educational toy busy book, *Ayo Sikat Gigi*, appears to be an effective learning tool for dental health education in Down Syndrome children.

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Introduction

Down Syndrome is a common chromosomal abnormality that was first discovered by John Langdon Down in England in 1866. This condition is also called trisomy 21, because 90% of the cases are caused by an extra copy of chromosome 21. Down Syndrome children are developmentally delayed, particularly in their cognitive abilities.^{1,2}

The most common cognitive difficulties faced by Down Syndrome children are delayed motor skills, auditory and visual impairment, delay in speech and language, short-term auditory memory, limited concentration span, and

difficulties in thinking, reasoning, and applying knowledge to their basic daily routine. Conversely, these children have strong visual learning skills that can benefit from use of sign and gesture, demonstration, and visual resources, such as pictures, photos, letters, diagrams, symbols, and concrete materials. From this explanation of the Down Syndrome learning profile, Down Syndrome children can be concluded to be visual learners. Therefore, it is important to have some teaching strategies in accordance with their needs.^{1,3,4}

Many studies have shown that the majority of Down Syndrome children have poorer oral hygiene compared with children without Down Syndrome. Special needs children have difficulties in maintaining oral hygiene due to having limitations in self-help skills and a lack of intellectual ability. Poor oral hygiene in Down Syndrome children also is aggravated by muscle hypotonia; therefore, mastication and oral self-cleansing action is limited, which causes the food remain in the mouth.⁵⁻¹⁰

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Children with intellectual disability, including those with Down Syndrome, have limitation in motivation and understanding of the importance of good oral hygiene. A special approach is required, adjusted to their capability, to educate Down Syndrome children in maintaining their oral hygiene. Educational toys will help children to learn and understand more about the material given. The busy book is an educational toy made of fabrics, usually flannel, with an attractive color and is safe for children. It contains soft toy activities that can be played by the children.^{1,11} Down Syndrome children may benefit in using the busy book to motivate and help themselves to understand how to maintain oral hygiene. Moreover, it may help them to memorize and improve their fine motor skills in brushing of teeth, which may result in better levels of oral hygiene. We evaluated the cognitive comprehension of dental health education, especially in oral hygiene maintenance, using the busy book *Ayo Sikat Gigi* as an educational toy in children with Down Syndrome.

Methods

The study was approved by the ethical committee of the Faculty of Dentistry, the University of Indonesia. This experimental clinical research design study was conducted at special schools in Jakarta and at Cheerful House for Down Syndrome which is founded by the Parent's Unity of Children with Down Syndrome (POTADS). The study participants comprised 25 Down Syndrome children (17 male, 8 female) of primary school age range who were diagnosed by the pediatrician with mild (IQ 50–70) and moderate (IQ 25–50) intellectual disability. We excluded participants with severe intellectual disability and those who could not cooperate during the procedure.

The busy book, which was titled *Ayo Sikat Gigi*, contains content on maintaining oral hygiene, such as identifying a healthy diet that is good for teeth, and sugar-containing food that is not good for teeth and which may cause cavities. It also identifies toothbrush and toothpaste and tells about the time and frequency of tooth

brushing in a day. Additionally, a tooth brushing simulation, which is performed by the children, is included in the busy book using the toothbrush. A picture-matching test on all the material was given before and after the busy book was used to obtain a score representing the cognitive comprehension of oral health care. The picture-matching test consists of picture of toothbrush to be matched with toothpaste, healthy tooth to be matched with healthy diet, and tooth with cavity to be matched with cariogenic food. Then the children were asked the time and frequency of tooth brushing in a day. The total score ranged from 0 (lowest) to 5 (highest).

Education and scoring were done on a one-to-one basis. First, the study aim was explained to the parents. After informed consent was obtained, dental health education was explained to the parents using the busy book. They also were instructed to play with the busy book once every day for 7 days with their child. The first score was recorded as the child played the picture-matching test in the busy book by himself/herself before dental health education using busy book. Then, the dental health education was given to the child using the busy book *Ayo Sikat Gigi*. After 7 days, the child was instructed to do the picture-matching test to obtain the score after education using the busy book.

The Wilcoxon test was used to compare the scores before and after dental health education using the busy book. $P < .05$ was considered statistically significant.

Results

To evaluate the cognitive score of dental health education in Down Syndrome children, changes in score before and after busy book use were recorded. Before analysis, the test of normality demonstrated that the data were not normally distributed. Therefore, the Wilcoxon test was used for statistical analysis, which demonstrated a significant difference in cognitive score before and after dental health education using the busy book, *Ayo Sikat Gigi* ($P = .001$, $P < .05$). Table 1 shows the median cognitive

comprehension score in Down Syndrome children before (score 3.00) and after (score 5.00) dental health education with the busy book, *Ayo Sikat Gigi*. This increase in cognitive comprehension score was statistically significant ($P < .05$, Wilcoxon test).

Education with busy book	n	Median (Min – Max)	P Value
Before	25	3.00 (0.00–5.00)	.001
After	25	5.00 (2.00–5.00)	

Table 1. Median cognitive comprehension score in Down Syndrome children before and after education with the busy book *Ayo Sikat Gigi*

Discussion

Down Syndrome children may present with mental and physical challenges that affect the level of oral care and oral hygiene. They may present with intellectual disability, medical conditions that affect gingival status, and compromised immune systems that may lead to more frequent and systemic infections and a high incidence of periodontal disease.¹²

Hypotonia, also found in patients with Down Syndrome, affects the muscles in many areas of the body, including oral and skeletal muscles. A previous study has found that cognitive capability affects oral muscular tone, that may lead to problems with chewing, swallowing, drooling, and speaking, and may result in lack of self-cleansing and poor oral hygiene.¹¹ Many studies have found that Down Syndrome children have poorer oral hygiene compared with children without Down Syndrome. Owing to these conditions, it is important to maintain good oral hygiene in children with Down Syndrome.^{6,9,12–14}

The intellectual disability in Down Syndrome children also affects their awareness and cognition regarding oral health and daily oral care, such as tooth brushing, flossing, and rinsing. This is because of the delay of cognitive development, that they have a moderate or low-level IQ, which also results in lack of fine motor skills. Their IQ ranges from approximately 50-70 and 35-50 in children with mild and moderate

Down Syndrome, respectively.^{4,15,16} Average IQ of the participants in this study was at the mild and moderate levels. It is important to determine the developmental stages of children; thus, the education method can be customized accordingly. Children with Down syndrome are developmentally delayed. Therefore, their mental age is below their chronological age. Based on this theory, the chronological age of the participants on this study was chosen after adjustment of their mental age.

Dental health education for Down Syndrome children is necessary. Oral health education is effective in improving the knowledge, attitude, and practice of oral health and in reducing plaque, bleeding on probing of the gingiva, and caries. A special approach adjusted to their condition is necessary in educating Down Syndrome children. Since these children are visual learners, using media or educational tools or toys and any visual resources will be beneficial.^{1,11,17}

The book helps children to learn and understand more about the material given through play.^{1,11} Playing can be a mediator in improving children's efficiency in social, communication, and cognitive development. Moreover, playing helps in the process of learning and development.¹⁸ In this case, the busy book *Ayo Sikat Gigi* was constructed and adjusted for Down Syndrome children to fulfill their needs in learning about dental health education. The attractive color helped motivate them to learn. The content helped Down Syndrome children to understand and practice fine motor skills. Repetition is key to learning and playing with the busy book every day helped the children to memorize the material given and transfer the knowledge for use in their daily routine, which would then improve their self-help skills, particularly in tooth brushing.

Comprehension of dental health education by Down Syndrome children increased significantly after education of oral health using the busy book, *Ayo Sikat Gigi*, as was demonstrated by the difference in pre- and post-test scores ($P < 0.05$). Our results suggested that dental health education using the busy book, *Ayo*

Sikat Gigi, was an appropriate strategy for increasing cognitive comprehension regarding oral health care in children with Down Syndrome.

Conclusions

The increased cognitive comprehension score in participants after testing indicated that the educational toy busy book, *Ayo Sikat Gigi*, appears to be an effective learning tool for dental health education in Down Syndrome children. This finding of the benefit of using this toy busy book is consequently a suggestion for its use by dentists, parents, and teachers regarding the importance of oral health care for Down Syndrome children and the use of an educational toy as a learning tool to provide awareness, comprehension, and self-help skills to achieve good oral hygiene.

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Declaration of Interest

The authors declare no conflict of interest in this research.

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