

Evaluation of Oral Hygiene in Children with Down Syndrome Using the Busy Book *Ayo Sikat Gigi* as an Educational Toy

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Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 19 February 2019 / Accepted: 12 July 2019 / Published: 31 July 2019

Abstract

Objective: To evaluate the oral hygiene status of children with Down syndrome using the busy book *Ayo Sikat Gigi* as an educational toy. **Material and Methods:** We ran an experimental study involving 25 educable and trainable children with Down syndrome, comprising 17 males and 8 females aged 7–12 years, who were free from other disabilities and did not use orthodontic or prosthodontic appliances. Parents were instructed to educate their children using the busy book *Ayo Sikat Gigi* and also to guide their children in brushing their teeth effectively at home. We evaluated the OHI-S score over two visits, one before and the other after education using the busy book *Ayo Sikat Gigi* over a 7 day period. The Wilcoxon test with the p-value set at 0.05 was used. **Results:** It was noted a statistically significant decrease in the OHI-S scores of children with Down syndrome ($p < 0.05$), reflecting an improvement in their dental health, after education using the busy book *Ayo Sikat Gigi* (median scores before and after education: 2.30 and 1.84, respectively). **Conclusion:** The busy book *Ayo Sikat Gigi* is a highly effective educational toy for children with Down syndrome, and in our study, it was demonstrated to decrease their OHI-S scores after education for 7 days.

Keywords: Down Syndrome; Oral Hygiene Index; Health Education, Dental.

Introduction

Down syndrome or trisomy 21, described by John Langdon Down in 1866, is a genetic disorder caused by the presence of a third copy of chromosome 21 [1]. Among the many specific characteristics in children with Down syndrome, most have intellectual functioning at a moderate mental retardation level (IQ 25–50), a condition classified as trainable mentally retarded [2,3]. They also have other problems, such as limitations in cognitive and motor development [4]. Children with Down syndrome often have poor oral hygiene levels, which leads to periodontal disease due to the accumulation of dental plaque, debris, and calculus [5–7].

To prevent the occurrence of periodontal disease, the maintenance of oral hygiene is very important; however, because of their intellectual limitations, low IQ, and low memory, this activity is difficult for children with Down syndrome [8,9]. An educational toy aiming specifically at educating children with Down syndrome, such as the busy book, is needed. Busy books are books made of flannel, containing simple, bright-colored games and activities designed to educate young children and improve their creativity, cognitive, and fine motor skills - for instance, educating them in an enjoyable way on how to brush their teeth properly [10]. The busy book *Ayo Sikat Gigi* can be the best way to improve oral hygiene in children with Down syndrome because they displayed good visual-motor skills, so they can learn about dental health effectively when information is presented with objects, pictures, or gestures [11].

To date, no study exists evaluating the oral hygiene of children with Down syndrome using educational toys. We, therefore, aimed to assess the oral hygiene of children with Down syndrome using the busy book *Ayo Sikat Gigi* as an educational toy.

Material and Methods

Study Design and Sample

We performed this experimental study in four type C special needs schools and a cheerful house for Down syndrome children which is funded by the Parent's Unity of Children with Down Syndrome (POTADS) in DKI Jakarta. We enrolled 25 children with Down syndrome aged between 7 and 12 years. We included in the study children with Down syndrome who were categorized as educable mentally retarded (IQ 50–70) and trainable mentally retarded (IQ 25–50) without other disabilities or any medical problem related to periodontal diseases – such as diabetes mellitus – who could cooperate in following the examination procedure. We excluded children with Down syndrome who used an orthodontic or prosthodontic appliance or had been taking antibiotics and receiving oral prophylaxis from a dentist within the last three months.

Data Collection

We conducted this study over two visits. At the initial visit, an examiner conducted an examination of the OHI-S and then proceeded to educate children with Down syndrome using the busy book *Ayo Sikat Gigi*. This book contains games requiring the children to group good and bad

foods for oral health, pictures depicting correct brushing and cleaning of the tooth surface, and a toothbrushing simulation using a toothbrush and a mirror correctly. Seven days after the initial visit, the same examiner reevaluated the children with Down syndrome and measured their OHI-S.

The oral hygiene of children with Down syndrome is evaluated using the Simplified Oral Hygiene Index (OHI-S) by Greene and Vermillion. This index has two components: the debris index (DI-S) and the calculus index (CI-S), and both these indices were measured on four posterior teeth and two anterior teeth. The DI-S and CI-S assessed for the OHI-S were examined on the labial surfaces of 11, 16, 26, and 31, and the lingual surfaces of 36 and 46. The OHI-S was assessed using disposable instruments, a periodontal probe, and a diagnostic lamp. Using disclosing gel, the examiner then disclosed the teeth and determined the DI-S on the labial surfaces of 11, 16, 26, and 31, and the lingual surfaces of 36 and 46. The criteria for classifying debris are 0 = no debris on the tooth surface; 1 = soft debris covering not more than one-third of the tooth surface or presence of extrinsic stain without debris in the tooth surface; 2 = soft debris covering more than one-third, but not more than two-thirds, of the tooth surface; and 3 = soft debris covering more than two-thirds of the tooth surface. The debris scores are summed up and divided by the number of teeth scored to obtain the DI-S. At least two of the six teeth must have been examined in order to calculate the score. The same methods are used to obtain the CI-S. The DI-S and the CI-S are summed up to obtain the OHI-S.

Data Analysis

We performed statistical analysis using the Wilcoxon test with the p-value set at 0.05 to evaluate the differences in oral hygiene between the baseline scores and those obtained at 1-week follow-up after the education. Data were analyzed using IBM SPSS Statistics for Windows Software, version 22 (IBM Corp., Armonk, NY, USA).

Ethical Aspects

The Dental Research Ethics Committee, Faculty of Dentistry, University of Indonesia, approved the protocol of this study and provided ethical clearance. Informed consent was obtained from the parents of the selected children.

Results

The OHI-S score in children with Down syndrome was determined before and after education with the busy book *Ayo Sikat Gigi*. In Table 1, the median of the OHI-S score in the initial visit before being educated with the busy book *Ayo Sikat Gigi* was 2.30, whereas on the next appointment, after being educated with the busy book, the median OHI-S score dropped to 1.84. Compared with the OHI-S score before being trained with the busy book, there was a statistically significant difference in the OHI-S score after being educated ($p < 0.05$).

Table 1. The median of OHI-S scores in children with Down syndrome before and after being educated with the busy book *Ayo Sikat Gigi*.

OHI-S Scores	N	Median (Minimum-Maximum)	p-value
OHI-S Before	25	2.30 (1.00–4.83)	0.004
OHI-S After	25	1.84 (0.83–3.67)	

Discussion

Because of limitations in cognitive domains such as memory, concentration, learning, and communication, the learning progress proceeds more slowly in children with Down syndrome than in other children of the same chronological age [9,12]. Communication difficulties in children with Down syndrome result in their receiving instruction at a slower pace. Parental guidance is, therefore needed – especially in young children with Down syndrome [13].

Motor development in children with Down syndrome also exhibits limitations due to muscle hypotonia, reducing children's opportunities for exploring and learning about the world around them and therefore, further affecting cognitive development [12].

Because such limitations in cognitive and motor development in children with Down syndrome can affect their oral hygiene, they require more assistance and supervision from their parents to maintain their daily oral health care [14,15]. The initial median OHI-S score of children with Down syndrome in our study was 2.30, which falls into the “fair” category of OHI-S. A previous study conducted in 25 children with Down syndrome with IQs between 25 and 70 indicated that most children with Down syndrome had fair to poor oral hygiene status and severe periodontal disease [16]. Such children were categorized as having mild to moderate mental retardation so that it is still possible for them to be trained and educated on dental health education [13]. The number of children participating is one of the limitations of the study because of the limited number of children with Down syndrome in Jakarta.

Our results showed that there was a significant decrease in OHI-S (and thus an improvement in oral health) from 2.30 to 1.84 ($p < 0.05$) after being educated using the busy book *Ayo Sikat Gigi* for 7 days. Our study demonstrated that education with the busy book *Ayo Sikat Gigi* was effective in reducing the OHI-S score. The use of educational toys promoting dental health education to prevent oral disease is very useful for children with Down syndrome. Such children can learn more effectively when information is presented with the support of objects, pictures, and gestures, all of which are integral to the choice of the busy book as an educational toy. Parents are instructed to educate their children repeatedly using the busy book *Ayo Sikat Gigi* every day at home in order to improve the cognition, memory, and skills of their children.

The busy book *Ayo Sikat Gigi* contains simulations of how to brush teeth on the model and activities in which they brush their own teeth using a mirror and a toothbrush. This educational toy has a simple design, is easy to understand, and is presented in bright, attractive colors. It is expected to improve the cognitive, motor, and psychomotor abilities of children with Down syndrome in brushing their teeth.

Conclusion

The use of the busy book *Ayo Sikat Gigi* as an educational toy for children with Down syndrome is very effective in improving their cognitive, motor, and psychomotor skills, as evidenced by the significant decrease in their OHI-S scores after education with the busy book for 7 days.

Authors' Contributions: RVR designed the study, performed the data collection, data analysis and interpretation, and wrote the manuscript. MS and SBB designed the study, performed the data collection, data analysis and interpretation, wrote the manuscript, and reviewed the manuscript. HS, ISI, MFR, and EF reviewed the manuscript. All authors declare that they contributed to the critical review of intellectual content and approval of the final version to be published.

Financial Support: This research was supported by Hibah PITTA 2018, funded by DRPM Universitas Indonesia No. 4672/UN2.R3.1/HKP.05.00/2018.

Conflict of Interest: The authors declare no conflicts of interest.

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