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## ‘SENYUM’, an effective method in dealing with Down syndrome students’ oral health issues

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**Abstract (in English):** This is a research and development (R & D) study which is combined with a needs analysis study to measure the efficiency of a produced product. This study was carried out through stages of developing learning multimedia using the ADDIE development model. The study was carried out at the Special School (SLB) in Karanganyar Regency, Central Java, Indonesia. The study engaged 30 people, 15 in the control group and another 15 in the intervention group. Each group had 5 teachers, 5 parents of Down syndrome students, and 5 Down syndrome students. The results of this study revealed that education and training in the form of the "SENYUM" module can improve parents' and teachers' knowledge, attitudes, and behaviors for maintaining Down syndrome students' oral health. Increased oral health maintenance measures for DS students is the direct consequence of parents and teachers improved oral health behaviors. In addition, results suggested that monitoring and corrections using the 'SENYUM' card could improve oral health maintenance activities for Down syndrome students. The 'SENYUM' method is an innovative method to handling the oral health issues of Down syndrome students.

**Keywords** SENYUM; Down syndrome students; oral health issues; parents and teachers.

“SENYUM”是处理唐氏综合症学生口腔健康问题的有效方法。

**Abstract (Chinese):** 这是一项研究和开发 ( R & D ) 研究，结合了需求分析研究，以衡量所生产产品的效率。该研究通过使用ADDIE开发模型开展，主要在印度尼西亚中爪哇省Karanganyar地区的特殊学校 ( SLB ) 进行。该研究纳入了30名参与者，其中控制组15人，干预组15人。每组包括5名教师，5名唐氏综合症学生的家长，以及5名唐氏综合症学生。该研究的结果显示，以“SENYUM”模块形式进行的教育和培训可以提高家长和教师对于维护唐氏综合症学生口腔健康的知识、态度和行为。家长和教师改善口腔健康行为直接导致了对唐氏综合症学生口腔健康维护措施的增加。此外，研究结果表明，使用“SENYUM”卡进行监测和纠正可以改善唐氏综合症学生的口腔健康维护活动。“SENYUM”方法是处理唐氏综合症学生口腔健康问题的创新方法。

**Keywords:** SENYUM; 唐氏综合症学生; 口腔健康问题; 家长和教师。

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## 1. Introduction

Down syndrome (abbreviated DS) Students are more likely than other students to experience dental health issues. Malocclusion is common in children with DS due to the characteristics of typical oral teeth. This issue is one of the reasons why students with Down syndrome experience a higher rate of periodontal disease than other students [1]. One of the variables contributing to poor periodontal health in students with DS is orofacial characteristics [2]. In DS students, orofacial or mouth muscular hypotonia can induce hypersalivation (drooling), mastication issues, and poor oral hygiene. Lack of dental care, poor dietary habits, drug use, poor oral hygiene, and a lack of parental understanding of the need of oral dental hygiene are further influencing variables [3].

A systematic review revealed that DS students require regular early dental care to avoid and reduce future oral health issues [4], DS students receive dental care more frequently than regular students, despite having a higher rate of dental caries [2]. A survey of 100 parents of DS students in Belgium revealed that 66% of children received dental care in the previous 6 months, approximately 20% of them received no specific oral hygiene instructions, and many brushed their teeth only once a day [5]. In Sweden, 101 students with Down syndrome with poor oral health had difficulty performing dental procedures [6]. DS Students in Makasar were unwilling and avoid disclosing the condition of their oral cavity to dentists or their families, making it difficult to maintained oral dental health [7], the oral hygiene index of DS students at Special School in Bandung (11 students each) was found moderate (54, 5%), the prevalence of permanent dental caries is still high (above 80%), and the average permanent dental caries index (DMF-T) as determined by WHO was moderate (3.5) [8].

The results of Dinasti's study [9] at Special School (SLB) ABC Swadaya Kendal indicated that 73.33% of the oral dental hygiene index (OHI-S) is in the sufficient category, 33.33% have a caries index for milk teeth or permanent teeth (def-t/DMF) -T) in the moderate category, and 53.33% have angle class III malocclusion. A preliminary study conducted in 2019 at Anugerah Special School in Colomadu, Karanganyar, Central Java found that 83% of the 12 DS students tested had permanent tooth caries, 73% had gingivitis, and 30% had periodontitis. As many as 30% have an oral hygiene index (OHI-S) in the poor group and 70% in the moderate category. The results of observations regarding tooth brushing practices revealed that 58% were still in the less group and 42% were in the sufficient category. Unfortunately, the implementation of the *Usaha Kesehatan Gigi Sekolah* (UKGS) 'School Dental Health Program' at Anugerah SLB, Colomadu, Karanganyar has not been optimally operated.

DS Students have weaker functioning skills than typical students and a greater reliance on caretakers or caregivers. Because of functional skill deficiencies, DS students face challenges when doing activities of daily living (ADL) [10]. An activity of daily living is a normal routine that young individuals and healthy adults may perform without the need for help. This inability to carry out everyday activities might result in perilous circumstances and a decreased standard of life. There are six types of ADL: 1) Ambulating (individual capacity to move independently by walking); 2) Feeding (individual ability to feed himself); 3) Dressing (individual's ability

to choose proper clothes and wear them alone); 4) Personal hygiene (an individual's ability to bathe and clean themselves, including dental hygiene, hair, and nails); 5) Continence (individual's ability to manage the timing of urine and feces); 6) Toileting (individual ability to independently go to a bathroom and use the toilet properly and cleanly) [11]. It is widely understood that DS students struggle with personal hygiene, particularly oral hygiene. Because DS children have the same eligibility as students in general, special attention from teachers and parents is required to train independence, including oral health maintenance activities [12]. Many parental programs have been intended to provide specific, intense, and prolonged disease prevention treatments for students. To attain the intended outcomes, parents and teachers must serve as role models. Some motor skills of Down syndrome students improve with parental support as role models [13]. Role model learning is a key method of learning for transmitting on information, skills, and values to others [14].

There have been numerous prior studies that are identical, one of which is Sandy's (2018) study on the influence of parents on teeth and mouth brushing skills in children with intellectual disabilities, which revealed no significant relationship. The limitation of this study is that no parental intervention was observed by researchers for a length of time. Data on the role of parents and students' toothbrushing skills were collected concurrently (cross sectional approach), implying that further studies using experimental methods is needed. The primary difference between this study and the one carried out is that this study focuses on a population with intellectual disabilities, whereas this study is more particular on DS students. Choi and Ahn [15] conducted a similar study and found that including moms in monitoring students' oral dental health at home substantially improved students' behavior in maintaining their dental health. The differences between the current study with the previous related one is that the population is normal students in public elementary schools, whereas the research population in this study is parents, teachers and DS students in a special school.

Another difference is that the monitoring intervention uses a short message system (SMS), which requires the use of a mobile phone, whereas the research will be performed through intervention using the 'SENYUM' method, which uses modules and cards to monitor and correct oral health maintenance actions. Stensson et al., [6] found that support from parents is critical for maintaining dental health. The distinction between the present study and the previous one is that the earlier one is observational research, a survey of parents' perceptions using an online questionnaire, and the current study is experimental research with intervention using the 'SENYUM' method. The parents that comprise this dissertation research are not mainly fathers or mothers, but rather parents who share regular contact with DS students. Therefore, the participants in this study could represent either fathers or mothers. Additionally, this study includes physical education and health teachers who run the School Health Enterprises (*Usaha Kesehatan Sekolah - UKS*) program. Teachers hold a significant role in providing psychological support, verbal reinforcement, material support, and social support to DS students [16].

The current study aimed to figure out whether the 'SENYUM' method is helpful in improving the behavior and oral health care of DS students' teachers and parents. This study eventually contributes to the body of knowledge about how the 'SENYUM' type of intervention can enhance oral health maintenance habits in DS students. To the best of the researchers' knowledge, neither study has been conducted using an integrated method to collaborate with parents and teachers to enhance oral dental health maintenance practices for DS students. This study implemented a Research and Development method that have never been used in previous studies on the same issue. The materials developed as the outcome of this study can be modified for the appropriate target population. Furthermore, in this study, continuous data was obtained, allowing researchers to assess the product efficiency during each monitoring and evaluation period. The study offers an opportunity to serve as a practical reference for related agencies in developing oral dental health maintenance programs for students with Down syndrome. In addition to recommending novel approaches to improving oral health care for Down syndrome students.

## **2. Methods**

This is a research and development (R & D) study which is combined with a needs analysis study to measure the efficiency of a produced product. This study was carried out through stages of developing learning multimedia using the ADDIE development model which consists of 5 stages, namely: 1. Analysis; 2. Design; 3. Development; 4. Implementation; and 5. Evaluation [17]. The study was carried out at the Special School (SLB) in Karanganyar Regency, Central Java, Indonesia. This study location was selected after initial research at SLB Anugerah in the Karanganyar Regency area. The data collection techniques include interviews, questionnaires, and observations, which are subsequently studied for validity and reliability to determine the accuracy and consistency of the instrument's items. Both tests made use of SPSS software.

The media designed by researchers is a method that involves parents and teachers in an effort to solve problems in maintaining the oral health of DS students, including *Sikat Gigi dengan benar dan tepat waktu* [brush your teeth correctly and on time], *Evaluasi konsumsi makanan dan minuman manis* [evaluate consumption of sweet foods and drinks], *Nilai kondisi rongga mulut* [examine the condition of the mouth cavity], *Yuk periksa ke fasilitas pelayanan kesehatan gigi mulut (fasyankesgigit)* [let's go to the oral dental health service facility],

*Upayakan ganti sikat gigi tiap bulan, Makan buah dan sayur* [Try to change your toothbrush every month, eat fruit and vegetables]. The prior approach was successful in producing two types of products: training modules for parents and teachers, featuring materials on preserving dental health, and guidelines for using intervention media for Down syndrome students. After the 'SENYUM' product in module and card forms were developed, a trial was conducted on a limited number of 30 participants, 15 in the control group and 15 in the intervention group. Each group had 5 teachers, 5 parents of DS students, and 5 DS students.

### 3. Results

In this study, the trial used a limited number of participants of 30 people, who were divided into 15 control groups and 15 intervention groups. Each group includes 5 teachers, 5 DS students' parents, and 5 DS students. The results obtained at this stage include the pretest-posttest assessment of the behavior of DS students' teachers and parents, as well as the pretest-posttest measurement of oral health care measures for DS students (Table 3.1).

Variables	N	Pretest	Posttest	P-value	
Knowledge	Control	10	16 ± 3,46	16,2 ± 3,22	0,555 <sup>a</sup>
	Treatment	10	13,9 ± 3,31	16 ± 2,83	<b>0,027<sup>b</sup></b>
Behavior	Control	10	27,2 ± 3,77	27,3 ± 4,16	0,655 <sup>b</sup>
	Treatment	10	26,4 ± 5,58	28,4 ± 5,17	<b>0,026<sup>a</sup></b>
Action	Control	10	18,4 ± 3,20	18,3 ± 3,71	0,739 <sup>a</sup>
	Treatment	10	20,2 ± 4,94	22,4 ± 3,44	<b>0,026<sup>b</sup></b>
Total Behavior	Control	10	61,6 ± 9,17	61,8 ± 9,47	0,619 <sup>b</sup>
	Treatment	10	60,5 ± 12,04	66,4 ± 9,81	<b>0,011<sup>a</sup></b>

Table 3.1: Pretest and Posttest Results for Teachers and Parents

- a. Paired T-Test
- b. Wilcoxon Signed Rank Test

The results of the limited trial on 20 people indicated that the average level of knowledge in the control group at the pretest was  $16 \pm 3.46$  and  $16.2 \pm 3.22$  at the posttest, with a p value = 0.555. Meanwhile, the pretest in the intervention group was  $13.9 \pm 3.31$  and the posttest was  $16 \pm 2.83$ , with a p=0.027. This shows there was a substantial increase in the mean level of knowledge in the intervention group, instead of in the control group.

The control group's average variable attitude level was  $27.2 \pm 3.77$  at pretest and  $27.3 \pm 4.16$  at posttest, with a p value of 0.655. Meanwhile, in the intervention group, the pretest was  $26.4 \pm 5.58$  while the posttest was  $28.4 \pm 5.17$ , with a p value = 0.026. This indicates that the intervention group's average attitude level increased significantly, but the control group's did not.

The average variable level of action in the control group was  $18.4 \pm 3.20$  at the pretest and  $18.3 \pm 3.71$  in the posttest, with a p value = 0.739. Meanwhile, the pretest in the intervention group was  $20.2 \pm 4.94$  and the posttest was  $22.4 \pm 3.44$ , with a p=0.026. This demonstrates that the average level of action increased significantly in the intervention group rather than in the control group.

The average variable level of the control group's whole behavior during the pretest was  $61.6 \pm 9.17$  and  $61.8 \pm 9.47$  during the posttest, with a p value of 0.619. Meanwhile, the intervention group had a pretest score of  $60.5 \pm 12.04$  and a posttest score was  $66.4 \pm 9.81$ , with a p value = 0.011. This indicates that the intervention group's mean overall behavior level increased significantly, nonetheless the control group's did not. Based on the results, the 'SENYUM' training and module can be used as a medium for oral health education for teachers and parents of DS students.

#### 'SENYUM' Method on Oral Dental Health Behavior in DS Students

Previous studies have shown that even with parental understanding, the rates of oral dental issues in DS students is extremely important where continuous training and monitoring is needed to achieve the optimal results [18]. DS students' early learning experiences with success and failure, as well as how others respond to their attempts at understanding the physical and social world, are likely to have an impact on the learning strategies they use when learning new skills [19]. In addition, considering DS students have characteristics that require specific attention, parent and teacher stimulation is needed to raise their motivation [20].

Teachers, parents, and DS students will benefit from the SENYUM module and cards. This product has been refined through discussions with both parents and teachers who will be using it. Several criticisms and suggestions were obtained from the interview results regarding the 'SENYUM' module and cards, such as the module and cards folding easily, the need for better print quality, the limited trial phase (implementation & evaluation-1), training was conducted to 20 teachers, and people parents were divided into control and treatment

groups. The level of parental and teacher oral health behavior were examined before and after the intervention. The data collected suggests that the 'SENYUM' training and module could be used as a medium for oral health education for teachers and parents of DS students. Based on the results of the interviews, parents and teachers felt that the 'SENYUM' training, modules, and cards were definitely helpful. During the time-limited trial phase (implementation & evaluation-1), 5 DS students were divided into control and treatment groups. Efforts taken to maintain the oral health of DS students were evaluated before and after the intervention. Based on the data collected, there is a significant increase in oral health maintenance treatments for DS students.

The total score of 'SENYUM' is used to assess oral health behavior in DS students. The study of the total score of 'SENYUM' in monitoring and assessment for a period of 10 weeks divided into five monitoring periods indicated no significant difference between the control and treatment groups in the first monitoring period ( $p=0.527$ ). This shows that before the intervention, the two groups were homogenous. The average score in the intervention group increased to 40.2 during the second monitoring and evaluation period, meanwhile it decreased by 1.3 in the control group. In this period, there was a significant difference ( $p=0.003$ ) between the control and treatment groups. The intervention group's average score increased to 46.5 during the third monitoring and evaluation period, while the control group's score decreased to 0.6. There was a significant difference ( $p<0.001$ ) between the control and treatment groups in this period.

The intervention group's average score increased to 13.8 in the fourth monitoring and evaluation period, whereas the control group's score increased to 1.6. In this period, there was a significant difference between the control and treatment groups ( $p<0.001$ ). The intervention group's average score increased to 20.9 during the fifth monitoring period, whereas the control group's score increased to 22.8. There was a significant difference ( $p<0.001$ ) between the control and treatment groups in that period. Using repeated measures during the five monitoring and evaluation periods, researchers found that there was a significant increase in the intervention group ( $p=0.001$ ), compared to no change in the control group ( $p=0.079$ ). This indicates that the 'SENYUM' method, by monitoring the 'SENYUM' score, is able to enhance oral health behavior. DS Students struggle with oral and dental health. To improve the effectiveness of oral dental care, parents and teachers must serve as role models [15], [21]. After the 'SENYUM' model was implemented, the oral health behavior of DS patients improved because their parents and teachers were trained to be positive role models for DS students.

### Parental and Teacher Behavioral Levels on Oral Dental Health Care Actions in DS Students

		Dependent Variable: Students' Oral Health		
		Type III Sum of Squares	Mean Square	P-Value
Variables	Level of Parental Behavior	41575,44	41575,44	0,003a
Moderator	Teacher Behavior Level	42611,11	21305,56	0,009a
	Age	968,87	968,87	0,607b
	Father's Education	2321,54	2321,54	0,428b
	Mother's Education	4460,74	4460,74	0,276b
Confounding Variables	Monthly income	42,19	42,19	0,914b
	Monthly Expenditures	830,96	830,96	0,634b

Table 3.2 Statistical Test of the Influence of Parents' and Teachers' Behavioral Levels on the Oral Dental Health of DS Students

- a. Two-way ANOVA Test
- b. ANCOVA Test

Table 1 shows the results of statistical tests using Two-way ANOVA, which reveal that the degree of parental behavior ( $p=0.003$ ) and teacher behavior ( $p=0.009$ ) has a substantial effect on oral dental health of DS people. The ANCOVA test revealed insignificant results on intervening variables such as age ( $p=0.607$ ), father's education ( $p=0.428$ ), mother's education ( $p=0.276$ ), monthly income ( $p=0.914$ ), and monthly expenditures ( $p=0.634$ ).

There is evidence that the improvement in oral health care activities in DS students is the result of an increase in the behavior of trained parents and teachers using the Two-way ANOVA test. Based on the test results, the level of behavior of parents ( $p=0.003$ ) and teachers ( $p=0.009$ ) had a significant effect on the oral health behavior of DS students.

To prevent bias induced by confounding influences such as socioeconomic status, the researchers used an ANCOVA test to show that these confounding variables had no effect on the results of the study. Based on the ANCOVA test results, age ( $p=0.607$ ), father's education ( $p=0.428$ ), mother's education ( $p=0.276$ ), monthly income ( $p=0.914$ ), and monthly expenses ( $p=0.634$ ) showed no significant effect on oral health behavior in DS students.

## 4. Discussion

The results of present study are in line with prior studies indicating that role models had a significant impact on the behavior of DS students. With an improvement in oral health behavior in parents and teachers, DS children will follow their role model's oral dental health behavior [13], [22]. Changes in the oral health maintenance routines of DS students are becoming stronger and are anticipated to continue since parents and teachers consistently offer reinforcement in the form of praise right after the activity. This is in line with a concept of reinforcement, which is founded on the primary principle that training or reinforced experience can result in relatively permanent changes in behavior [23]. Reinforcement is the immediate effect of a certain activity that results in the individual's tendency to engage in such behavior in the future. A reinforcement agent is a key component in modifying behavior. If there is an increase in frequency, duration, intensity, or speed (decreased latency), the behavior will intensify [24].

The training was designed to support parents and teachers who serve as role models for DS students. Based on prior studies, role models play a significant role in encouraging DS students to develop positive behaviors [13], [22]. The present study aims to provide appropriate and effective training for parents as well as teachers to serve as role models for DS students, in turn maintaining their oral health. Based on a prior study, the parents and teachers of DS students had poor oral dental health, with the majority falling into the less-moderate category. This could be implemented as teachers and students' parents being aware that oral health is important nevertheless not optimally carried out, therefore training remains necessary to achieve the best results. This is in line with prior research results [15], [21].

Prior to conducting this study, pretest characteristic data revealed that teachers' oral health behavior was better than that of their parents. This is supported by previous studies, which found that oral health awareness was highly associated to education level [25]. This study discovered a very substantial rise in scores for parents and teachers related oral dental health behavior ( $p < 0.001$ ). This is in line with previous studies on teachers, which suggests that oral dental health training could significantly improve oral dental health behavior [26]–[28]. This study found that after the training, the behavioral aspects of understanding, attitudes, and actions increased significantly ( $p < 0.05$ ). The increase occurs simultaneously, which is in line with prior studies showing that knowledge, behaviors, and actions are associated with and directly appropriate to oral dental health behaviors [29], [30].

## 5. Conclusion

The results of this study concludes that training with learning in the form of the 'SENYUM' module can increase knowledge, attitudes, and behaviors for maintaining oral health in both parents and teachers' DS students. The increased oral health behavior of parents and teachers has been reflected in increased oral health maintenance measures for Down syndrome (DS) students. The results additionally showed that monitoring and correction using the 'SENYUM' card can be helpful in improving oral health maintenance activities for DS students. Thus, the 'SENYUM' method is an innovative approach to addressing the oral health issues of DS students. This study implies that more qualitative data can be explored by conducting related studies over a longer period of time.

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