

REVIEW ARTICLE

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Appropriate Learning Methods for Autistic Children in Improving Tooth brushing Skills: a Review

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ABSTRACT Autistic children have poor oral hygiene levels higher than normal children. Dental and oral health problems that often occur in children with autism are the risk of dental caries which is higher than other dental and oral diseases. Frequent consumption of cariogenic foods and impaired coordination of the tongue muscles result in a tendency to eat food and difficulty swallowing, resulting in the formation of debris. The high value of debris causes calculus and if left further it will develop into worse tooth and gum damage. Objective: To describe appropriate learning methods for children with autism in improving their brushing skills. Methods: Search journals for 2016-2021 on Google Scholar, Pubmed, and Sciendirect databases. In the 8 journals used, 4 of them used quantitative research methods, 2 used prospective research methods, and 2 others used cross-sectional research methods. Results: The various methods obtained are the use of the PECS method; Yoga Therapy; iPads; Social Stories, TEACCH method, Puzzle Series; and Videos. Several kinds of learning methods are appropriate and can be recommended for children with autism, namely the video learning method which is considered better and can attract the attention of children with autism in improving their brushing skills.

INDEX TERM Autism, learning methods, brushing teeth

I. INTRODUCTION

Children with Special Needs (ABK) are children who have their own uniqueness in the types of needs and characteristics that distinguish them from normal children in general. Understanding of the nature of children with special needs is still very minimal, most of them think that children with special needs are children who do not have any abilities [1].

Another understanding relates to the terms normal and abnormal growth and development, in children with special needs it is abnormal, namely there is a delay in growth and development which usually appears at the age of toddlers as if they could only walk at the age of 3 years. Another thing that makes a child classified as having special needs is the growth and development characteristics of children who do not appear (absent) according to their developmental age such as not being able to say a single word at the age of 3 years, or there are growth and development deviations such as echolalia behavior or parroting in children. Autism [2].

Children who are categorized as having special needs in the physical aspect include abnormalities in the sense of sight (blindness), sense of hearing (deaf), ability to speak (impaired speech), and function of limbs (impaired).

Children who have needs in the mental aspect include children who have more mental abilities (super normal) who are known as gifted children or superior children and those who have very low mental abilities (abnormal) are known as mentally retarded. Children who have abnormalities in the social aspect are children who have difficulty in adjusting their behavior to the surrounding environment. Children who are included in this group are known as tunalaras [1].

Most studies that examine disease or damage to the teeth and mouth in people with autism state that disease or damage to the teeth and mouth experienced by autistic children are generally the same as normal people, namely the risk of dental caries and periodontal disease. Periodontal disease is experienced due to impaired coordination of the tongue muscles. Impaired coordination of the tongue muscles resulting in a tendency to eat food and difficulty swallowing [2][3].

Autism is a condition of a very complex developmental disorder, which usually occurs at the age of 3 years which shows communication disorders, social interaction and behavior, is unable to form social relationships and communicate normally, so isolated from human contact and immersed in their own world [2][4-6].

Several factors that can affect dental and oral health are health service factors, environment, heredity, and behavior. Based on the results of the 2018 Basic Health Research (RISKESDAS) report which shows that the prevalence of the population with dental and oral health problems in Indonesia is 57.6% [7-10][11].

Autistic children have problems at one of the stages in brushing their teeth, namely in carrying out exercises or practice they are still assisted, unable to recognize the stages in brushing their teeth independently, when brushing their teeth students are still not able to practice the correct way of brushing their teeth so that children with autism still brushing on certain parts only [12-14].

Health education is essentially an activity or effort to convey health messages to the community, group or individual. With the hope that with this message, people, groups or individuals can gain knowledge about better health. Media education or health promotion are all means or efforts to display messages or information to be conveyed by communicators, be it through print media, electronics, so that the target can increase his knowledge which is ultimately expected to change his behavior towards positive health [15].

Learning is essentially a process, namely the process of regulating, organizing the environment around students so that it can grow and encourage students to carry out the learning process. Learning is also said to be a process of providing guidance or assistance to students in carrying out the learning process. The role of the teacher as a mentor starts from the number of students who have problems. The learning process is characterized by educational interactions that occur, namely interactions that are aware of goals^[15].

Dental and oral health can affect overall body health because dental and oral health is an integral part of overall body health that cannot be separated from general body health [22]. According to Putri et al., (2012), measuring the cleanliness of a person's teeth and mouth is measured by an index. Index is a number that shows the clinical condition obtained at the time of examination by measuring the area of the tooth surface covered by plaque or calculus, thus the number obtained is based on an objective assessment [23].

Brushing your teeth is a commonly recommended way to remove various food debris adhering to the surface of your teeth and gums. The stages of brushing your teeth must be sequential so that no part is missed and it is recommended that the duration of brushing your teeth is approximately 2-5 minutes[10]. The brushing technique is a commonly recommended way to clean soft deposits on the surface of the teeth and gums and is a preventive measure towards success and optimal oral health. Therefore brushing teeth must be understood and carried out actively and regularly[16].

This roll method is a method that is considered to be able to clean plaque well and can be applied to children. Children with special needs, one of which is autistic children because of dental and oral health problems that are most often found in children with autism, namely dental caries, periodontal disease, damage to the oral cavity, tooth eruption abnormalities and trauma [9].

This oral motor coordination disorder also results in accidental self-biting on the lips or tongue. Children with autism often have poor muscle tone, poor coordination, constantly drooling, hyperactive knee movements, often accompanied by stabimus, and 30% have epilepsy. Poor oral habits often occur in people with autism, namely: bruxism, tongue thrusting, self-injury habits such as biting the lips or gingiva, biting objects such as cigarette butts or pens [2].

Research results from Othman and Kamarudin (2011) showed that the collaboration of 3D animation and music therapy made a significant contribution in helping autistic children remember the steps to brush their teeth. Not even that, this tool can be one of the learning and teaching tools for teachers and parents to teach autistic children [14].

Research result Santoso, (2016) learning by using audiovisual media, it turns out that the results are quite satisfactory. Learning activities that are carried out several times can have an effect on autistic children, namely imitating the movements shown in the video. For this reason, the use of audiovisual media will be able to attract the attention of autistic children and be able to follow the movements shown [15].

Based on the description above, it is necessary to conduct related searches about explaining appropriate learning methods for autistic children in improving teeth brushing skills.

II. METHOD

The literature search on appropriate learning methods for autistic children in improving tooth brushing skills was carried out for 3 weeks, namely at the end of March - April 2021. The data sources were obtained from several academic databases, namely: Google Scholar, PubMed, and Sciendirect. The planned number of journals is 8 journals, published in the last five years 2016 – 2021. Journal search using keywords: (Autism AND Tooth brushing).

TABLE 1
Inclusion Criteria and Exclusion Criteria

Criteria	Inclusion	Exclusion
Population	autistic child	Apart from autistic children
Interventions	Intervention on the method of learning brushing skills	Interventions other than brushing skills learning methods
Comparator	No comparator	-
Outcome	Learning methods that are suitable for autistic children in improving their teeth brushing skills	In addition to learning methods that are suitable for autistic children in improving teeth brushing skills
Study Design and Publication Types	Quantitative, non-experimental (cross sectional, retrospective, prospective) Type: original article	Qualitative, experimental (pre-experimental, quasi-experimental, pure experimental) Type: non original article
Publication year	2016 or later	Before 2016
languages	Indonesian and English	Apart from Indonesian and English

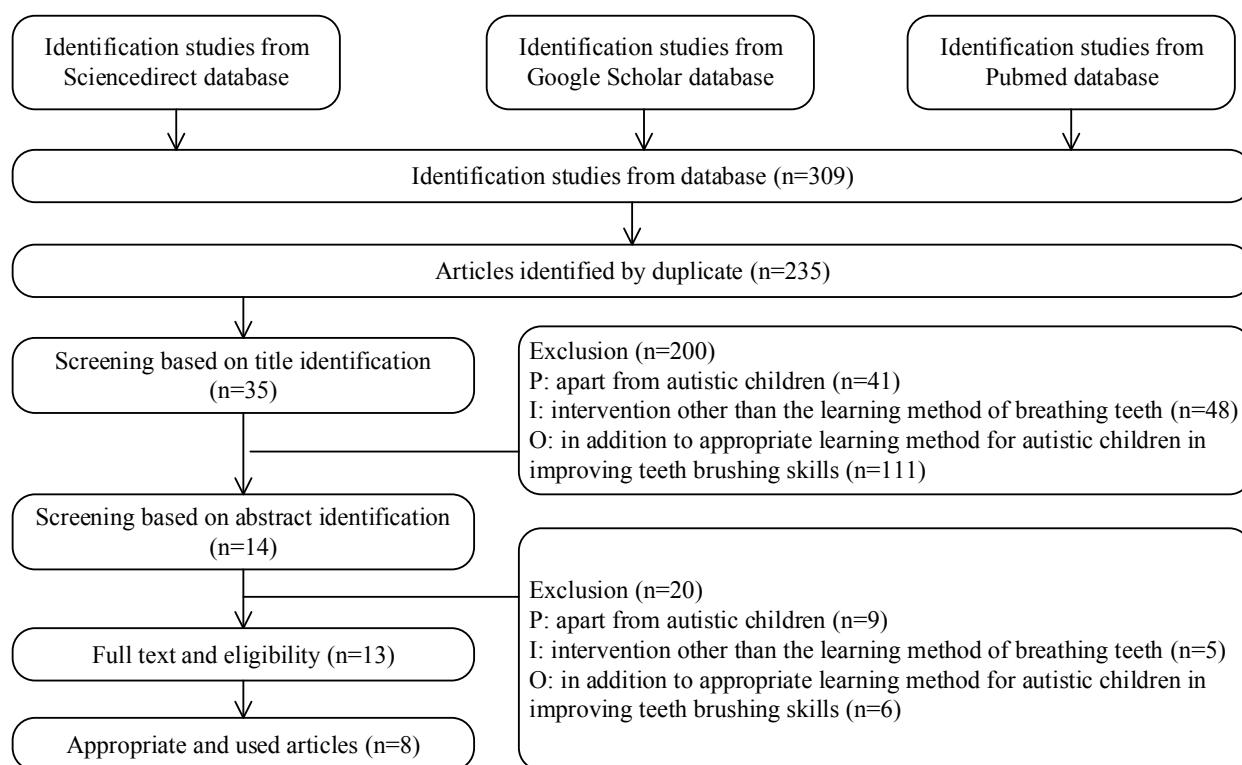


FIGURE 1. Procedure to select the literatures.

Based on a search of academic databases, namely Google Scholar, PubMed, and ScienDirect with the keywords “Autism”, “Tooth brushing”, several journals were obtained including: PubMed 2 journals, ScienDirect 17 journals and Google Scholar 290 journals. So that the total journals obtained are 309 journals. These 309 journals need to be identified to see duplication (FIGURE 1). The identification includes the title, year and name of the author. If similarities are found, it can be concluded that the journal contents are the same. After identification, it turns out that there are 74 of the same journals. A total of 309 journals were reduced by 74 journals of duplication so that 235 journals were obtained without duplication. Journals are screened based on title to get themes that match the criteria sought. A total of 235 journals, there are 35 journals that match the theme of literature review. 200 journals were excluded because they did not meet the inclusion criteria. The next stage, from 35 journals analyzed again based on the abstract, obtained as many as 14 journals that entered the inclusion criteria. There were 20 journals not included in the inclusion criteria were excluded, and 13 journals were analyzed again based on the availability of full text. Up to 8 journals that are included in the inclusion criteria (FIGURE 1)

III. RESULTS

Eight journal articles that have been assessed as worthy can be classified into 8 groups, namely tooth brushing skills, PECS method, iPad, yoga therapy, social stories, TEACCH method, videos and serial puzzles. In this case, there are 8 journals related to tooth brushing skills; two journals related to the PECS method; 1 journal related to

iPad; 1 journal related to yoga therapy; 1 journal related to social stories; 1 journal related to the TEACCH method; 1 journal related to Video and 1 journal related to Puzzle series (TABLE 2).

IV. DISCUSSION

Children with autism have a level of dental and oral hygiene that is worse than normal children. Dental and oral health problems that often occur in children with autism are the risk of dental caries which is higher than other dental and oral diseases^[4].

Factors that can affect dental and oral health problems in children with autism are frequent consumption of cariogenic foods and impaired coordination of the tongue muscles, resulting in a tendency to eat food and difficulty swallowing, so that debris can form if left unchecked will develop into tooth and gum damage [2]. This condition can be related to the habit of brushing teeth in children with autism and the lack of manual dexterity of children with autism to brush their teeth properly.

Toothbrushing is a self-care skill that plays an important role in maintaining oral and dental hygiene. Oral hygiene assessment was carried out using the Oral Hygiene Index (OHIS) in autistic children, i.e. there were no autistic children with good oral hygiene.^[8] Factors that influence autistic children to have difficulty brushing their teeth, namely most autistic children are not able to grip their toothbrush properly and have irregular brushing habits [23].

For autistic children brushing their teeth is not easy to do, because they are not interested in objects that tend to be difficult to do, including brushing their teeth. Autistic children who have difficulty in independent

TABLE 2
Summary of Literature Review Results

No	Author, Year	Title	Method (Design, Sample, Variable, Instrument)	Results
1	Reita Narulita, Indra Jaya, Mohammad Arif Taboer (2021).	Development of Media Puzzle Series to Help Improve the Ability to Brush Teeth in Autistic Children.	Design: This study uses the Research and Development R&D method Samples: The population of this study were all primary school autistic children Variable: Ability to brush teeth and development of serial puzzle media. Instrument: Questionnaire	Brushing teeth and Media puzzle serial: The overall average result that has been achieved is good, with a score of 56% according to media experts, 92.85% according to material experts and 92.85% according to autistic children's experts from a maximum value of 100%. The average value obtained, it can be concluded that this serial puzzle media is declared feasible and can be used to help children with autism in self-development of brushing their teeth.
2	Leni Ambar Cahyani (2017)	The Effectiveness of Self-Development Learning Based on the TEACCH Method on Increasing the Ability to Brush Teeth		Brush teeth: An increase in the score of the brushing test results from baseline 1 to baseline 2. At the baseline stage 1 the subject got a score of 55.83%. While at the intervention stage the score increased to 69.5% and at the baseline stage 2 it rose again to 76.6%. TEACCH methods: MThe TEACCH method is effective in improving the
3	Al-Batayneh, Nazer, Khader, AL Owais (2019)	Effectiveness Of a Tooth-Brushing Program Using the Picture Exchange Communication System (PECS) on Gingival Health of Children with Autism Spectrum Disorder	Design: This study uses a quantitative approach. Samples: The population of this research is 4th grade autistic students at Dian Amanah's autistic school Variables: Learning the TEACCH method and the ability to brush teeth. Instruments: Intra-oral examination, performance test to determine the ability to brush teeth.	ability to brush the teeth of autistic students at the Dian Amanah Autism School. So that by using the TEACCH method, autistic children will more easily understand and understand the material for brushing teeth given Oral hygiene: Most of the children did not have regular check-ups with the dentist (83.8%) in the last 6 months, and some had never been to the dentist for dental cleaning (43.2%). Most parents or caregivers reported that their children brushed their teeth twice a day (89.2%) they received assistance (59.5%)
4	Ni Zhou, Hai Ming Wong, Colman McGrath (2019)	Efficacy of Social Story Intervention in Training Tooth Brushing Skills Among Special-Care Children with and Without Autism	Design: This study uses a quantitative design Sample: A total of 87 children with autism and 94 children with Down syndrome Variable: Toothbrushing skills and social stories Instruments: Questionnaire and clinical examination	Brush teeth: A social story-based tooth brushing training program was conducted among preschool children with special care needs. Children's tooth brushing performance, oral hygiene status, and gingival hygiene status increased after the intervention for 6 months. Tooth brushing training with the help of social stories can improve tooth brushing performance among special care children with or without autism.

TABLE 2
(Continued)

No	Author, Year	Title	Method (Design, Sample, Variable, Instrument)	Results
5	Eswari Ramassamy, Prathima Gajula Shivashan Karappa, Sanguida Adimoulame, Ramanathan Meena, Hari Krishna Elangovan, Ezhumalai Govindasamy (2019)	Yoga Therapy as an Adjunct to Traditional Tooth Brushing Training Methods in Children with Autism Spectrum Disorder	Design: This study uses cross sectional, statistical analysis, comparison categorical variables between groups carried out by the chi-square test Samples: 72 Children aged 7 – 15 years Variable: Brushing teeth and yoga therapy Instruments:-	Yoga Therapy: The use of yoga therapy together with visual pedagogy and video modeling is beneficial in terms of brushing skills. Oral hygiene: The comparison of mean plaque score and gingival index between groups was statistically significant at the second month ($P=.039$ for PI and $P=.009$ for GI). Scores were statistically significant even at month 3 ($P = .001$ for PI and $P = .002$ for GI) and month 6 ($P = .001$ PI and GI), with children in Group II demonstrating better oral hygiene.
6	S. Lopez Cazaux, G Lefer, A. Rouches, P. Bourdon (2019)	Tooth Brushing Training Program Using an iPad for Children and Adolescents with Autism	Design: This study uses a cross sectional, cohort study Sample: 52 ASD (Autism Spectrum Disorder) children aged 3-19 years	Brush teeth: Tooth brushing is considered accomplished when the child has a score of 5 in all Steps. No child can do the 25 Steps to brush their teeth without any help. after 4 months 7.7% (4 children) were successful
7	Lilia Doichinova, Natalia Gateva, Krasimir Hristov (2019)	Oral Hygiene Education of Special Needs Children. Part 1: Children With Autism Spectrum Disorder	Variable: Brushing teeth and iPad Instruments Design: This study uses a quantitative design Samples: 30 autistic children aged 6-11 years Variable: Improving communication and oral hygiene in children (PECS method and tooth brushing technique)	and at the end of the training program, 19% (10 children) were successful. iPad Methods: Using the iPad app in a toothbrushing training program can also help improve tooth brushing skills in autistic children aged 3-19 years. Oral hygiene: Dental and oral hygiene assessment using the OHI-S oral hygiene index showed that among the children included in this study, there were no children with good oral hygiene. Children with poor oral hygiene dominate 93.3% and only a few have good oral hygiene 6.7%. Brush teeth: Observation of tooth brushing technique in autistic children showed that children used 83% horizontal and 17% circular movements. PECS Method: Can improve communication skills and habits to maintain dental and oral health of children with autism.
8	Sakshi Chawla, Mousumi Goswami, Aayushi Sangal (2021)	Validation of Indigenously Developed Video for Teaching Tooth Brushing to Children Autism Spectrum Disorder	Designs: This study uses a prospective Samples: Conducted on 10 participants aged 5 – 12 years Variables: Improvement of the child's brushing technique and ability to understand and follow instructions as shown in the video	Brush teeth: Most children with ASD (Autism Spectrum Disorder) are not able to grip their toothbrush properly and have a habit of brushing their teeth irregularly. The mean plaque score had increased from 2.04 approximately 0.65 to 2.03 ($P > 0.05$) at the second visit and increased significantly from the initial visit to the third visit ($P < 0.05$).

activities, namely the habit of brushing their teeth regularly, lack of manual dexterity in brushing their teeth properly. One of the causative factors in his tooth brushing habit is the lack of dental health learning which can be seen from the characteristics of those who experience communication problems and find it difficult to understand orders or instructions given by teachers, caregivers or parents [6].

Learning methods and media selection should be more considered with the limitations and problems experienced by autistic children, with the selection of media that is practical, safe and can attract attention, the autistic child can follow the movements or imitate them. During the lesson, the teacher teaches autistic children to develop themselves by brushing their teeth directly without using learning media and only using toothbrushes, namely toothbrushes, toothpaste and mouthwash cups. So that autistic children feel bored, cannot digest information properly and have no interest in practicing brushing their own teeth [6]. In this statement, autistic children need special learning methods by teachers or caregivers to train autistic children's ability to brush their teeth.

Based on the results of existing research, the use of the PECS learning method or image exchange communication system can improve learning to brush teeth independently and correctly in autistic children with a gradual introduction which shows that this non-verbal communication image system is suitable for teaching oral hygiene for autistic children including brushing. his teeth [3,8].

Children with autism need learning methods that are in accordance with the characteristics so that the material provided can be understood. The selection of the right and appropriate method greatly influences the success of brushing skills, using the TEACCH learning method can more easily understand the material and have an influence on the ability of autistic children to brush their teeth.^[6] The use of serial puzzles can improve fine motor skills and be developed to help improve the ability to brush teeth in autistic children[14].

Learning with mind-body interventions that teach autistic children to build connections with the outside world, namely the use of yoga therapy simultaneously with visual pedagogy and modeling videos that are beneficial in terms of increasing concentration and brushing skills of autistic children [17]. Using the iPad app, an attractive and easy-to-use tool in a toothbrushing training program, can also help improve highly efficient brushing behaviors^[13].

One of the barriers to brushing teeth in children with autism is sensory processing difficulties. Health learning through social stories that can be used to improve the performance of brushing teeth in autistic children. Parents are encouraged to show social stories to their autistic child before or during brushing their teeth[13].

The use of videos can provide more structured and lively instructional learning, which autistic children can learn. The difficulty in brushing teeth faced by autistic children is due to fine and gross motor disorders, mental disabilities, sensory problems, and the need for support from parents or caregivers. The effectiveness of this video is that there is an increase in tooth brushing behavior and acquisition after the intervention[7].

The effect of health promotion using audiovisual on brushing teeth in autistic children is mostly good^[5]. Learning using audiovisual media also obtained satisfactory results by imitating the movements shown in the video[18-20]. Based on this statement, learning methods for autistic children have different benefits and levels of effectiveness. However, learning using audiovisual media can be considered better and attracts the attention of autistic children in improving their brushing skills [21-23].

V. CONCLUSION

Based on the results of a literature review from 8 journals that have been reviewed, it can be concluded that the learning method obtained for children with autism in improving their tooth brushing skills is the use of the PECS method; Yoga Therapy; iPads; Social Stories; TEACCH method; Series Puzzle; and Videos. The appropriate method for learning in children with autism in brushing skills was found that some of these methods were suitable and which could be recommended for children with autism, namely the video learning method which was considered better and could attract the attention of children with autism in improving their brushing skills. The results of this literature review can be continued by further researchers to be used as information and can develop a wider study of literature with the same theme.

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