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Effects Of Video Modeling And The Visual Pedagogy Module In Reducing Stress Levels Among Children With Autism, As Evaluated Using Salivary Alpha Amylase Levels

Research Article

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Abstract

Objective: This study aimed to compare the efficacy of video modeling and the visual pedagogy module Berkunjung ke Dokter Gigi (VPM-BDG) in reducing stress level among children with autism spectrum disorder (ASD) during dental care.
Material and Methods: This is a clinical experimental study.To assess salivary alpha amylase (sAA) levels, saliva samples were collected before and after interventions. We included 20 children with ASD who were aged 6_10 years, diagnosed by a pediatrician or psychiatrist, able to follow simple instructions, and in good health, who had never visited a dentist and had no comorbid abnormalities. The participants were divided into two groups: the video modeling intervention group (n = 10) and the VPM-BDG intervention group (n = 10). The Shapiro_Wilk test and Mann_Whitney U test were used to compare the efficacy of video modeling and the VPM-BDG in reducing stress levels, as evaluated based on sAA level changes.
Results: A decrease in the sAA level was observed after video modeling and the VPM-BDG. The median sAA levels after video modeling and the VPM-BDG were 16.50 and 15.50, respectively. The Mann_Whitney U test obtained a p value = 0.970 (p> 0.05), which indicated no significant difference between the two interventions.
Conclusion: Both video modeling and the VPM-BDG can reduce the stress level of children with ASD during dental care as evaluated based on changes in the sAA concentration.

Keywords: Autism; Alpha Amylase; Saliva; Pedagogy.

Introduction

Autism spectrum disorder (ASD) is a neurological development disorder that can be detected as early as before the age of 2 years. Its characteristics include delayed speech, impaired socialization, and rigid, repetitive, and automatic behaviors that interfere with one's overall functioning [1]. This disorder is more common in boys than in girls and can occur in all races, ethnicities, and socio-economic groups [2]. The exact cause of autism is still unknown, and theories of its etiology have changed over the years [3].

Stress is a behavioral or mental adaptive response to overcome a stressor, including the need for increased attention to perform mentally demanding tasks [4]. A physiological stress response is a permanent adaptation to normal daily stressors. It triggers the metabolic adaptation of acute stressors, which activate the autonomic nervous system. Then, the adrenal medulla releases significant amounts of epinephrine. One of the negative effects caused by stress is anxiety. In children with ASD, difficulties with communicationand social interaction cause cognitive and emotional problems associated with increased stress, which results in inappropriate social behavior [4].

Several methods, including social training and communication that do not involve medical procedures, such as sedation and restrain, can be used to reduce anxiety during dental care [5]. The literature has shown that electronic media, such as television and video, are educational tools that are ideal for children with ASD because this population is more likely to have a great interest in visual stimulation [6]. A previous survey on caregivers has shown that children with ASD have greater interest in watching television and videos than using computers. Picture cards and promo-

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tional videos are good choices for children with severe ASD who depend on caregivers for activities requiring good motor skills. Currently, in Indonesia, the visual pedagogy module, Berkunjung ke Dokter Gigi (VPM-BDG), has been developed for children with autism [7]. This module includes video describing the stages of visits to the dentist. Regular dental visits and visual learning can help children with ASD follow dental instructions and reduce stress or anxiety during a dental visit.

The anxiety levels of children with ASD can be assessed by measuring the levels of stress biomarkers, such as salivary alpha amylase (sAA) [8, 9], cortisol, and immunoglobulin A. sAA is one of the main salivary proteins secreted by the epithelial acinar cells; it is a non-invasive indicator that is based on body changes correlated to stress. The current study aimed to compare the efficacy of video modeling and the VPM-BDG in reducing stress levels among children with ASD during dental care.

Material and Methods

This study was approved by Ethical Committee of Faculty of Dentistry of Universitas Indonesia (No. 050420419). Theclinical experimental study used intervention, such as video modeling and the VPM-BDG. We included 20 children with ASD who were aged 6_10 years, diagnosed by a pediatrician or psychiatrist, able to follow simple instructions, and in good health, who had never visited a dentist and had no comorbid abnormalities. The participants were divided into two groups: the video modeling intervention group (n = 10) and the VPM-BDG intervention group (n = 10). Before the video modeling intervention, the video's validity was assessed on five children by measuring their anxiety levels during a dental examination, using the sAA level as an indicator. The video was considered valid if there was a decrease in anxiety levels during the dental examination. The result indicated that the five children had decreased sAA levels after the video modeling intervention.

This research was conducted at the Children's Dental Clinic, Dental and Oral Hospital, Faculty of Dentistry, Universitas Indonesia. Before the study, the parents or guardians of the participants provided informed consent. The research procedure was started by measuring the sAAlevel before the intervention by placing the sAA strip for 10 seconds under the tongue; then, the Cocoro Meter was used to measure the sAA level. Each participant received an intervention (either video modeling or the VPM-BDG). Then, oral prophylaxis was provided. Saliva sample were obtained after the intervention, and the sAA value was measured. The data were analyzed using the Shapiro_Wilk test and Mann_Whitney U test to compare the decreases in sAA levels between the video modeling and VPM-BDG intervention groups.

Result

Based on the normality test, the data of the video modeling intervention group had an abnormal distribution. Table 1 provides the sAA levels of the video modeling group before and after the intervention. The Wilcoxon signed-rank test was used to assess significant differences in the sAA levels. Results showed that the median values (min_max) before and after the video intervention were 42 (24_166) and 28.5 (15_87), respectively, with a p value of 0.009,which indicated significant decreases in sAA levels.

The median sAA levels of the VPM-BDG intervention group had anormal distribution. Table 2 shows the values before and after the intervention. The paired t-test was used to assess significant differences in sAA levels. Results showed that the mean ± standar deviation (SD) values, before and after the VPM-BDG intervention, were 61 ± 34.13 and 36.50 ± 17.28, respectively,

Table 1. sAA level before and after the video modeling intervention.

	Median (min_max)	p value
Before the intervention	42 (24_166)	0.009*
After the intervention	28.50 (15_87)	

*Wilcoxon signed-rank test, p value < 0.05

Table 2. sAA levels before and after VPM-BDG interventions.

	Mean ± SD	p value
Before the intervention	61 ± 34.13	0.038*
After the intervention	36.50 ± 17.28	

* Paired t-test, p value < 0.05

Table 3. Delta value of the sAA levels between the two intervention groups.

Intervention	Median (min_max)	p value
Video modeling	16.50 (-2_81)	0.970*
VPM-BDG	15.50 (2_110)	

* Mann_Whitney U test, p value < 0.05

with ap value of 0.038 ($p < 0.05$), which indicated significant differences in the sAA level.

Based on the normality test, the delta value of the video modeling and VPM-BDG intervention groups did not have a normal distribution. Table 3 shows the sAA levels between the two intervention groups. The Mann_Whitney U test was used to assess significant differences in sAA levels after the video modeling and VPM-BDG intervention. A p value = 0.970 ($p > 0.05$) was obtained, which indicated no significant differences in sAA levels.

Discussion

Due to communication deficiencies, poor social interaction causes higher stress levels in children with autism than in healthy children [10]. Dental care causes stress to numerous individuals, particularly children [9]. Dental procedures, including dental examinations, that require opening the mouth are a major threat to children with autism [10]. A research study has shown that children with autism have a high prevalence of poor oral hygiene, dental caries, and periodontal disease [6].

Stress can activate the sympathetic nervous system and release epinephrine and norepinephrine from the adrenal center, which increases sAA secretion from the parotid and submandibular acinar cells [11]. Alpha amylase, a major salivary protein plays an important role in carbohydrate metabolism by hydrolyzing the 1,4-α-D-glycosidic linkages of starch, glycogen, and various oligosaccharide components to form maltose. In this study, sAA was used as it is considereda reliable clinical stress biomarker.The saliva collection method is non-invasive and, therefore, does not cause stress [12]. A salivary alpha monitor (Cocoro Meter, Nipro Corporation) is used to measure the sAA level.

The median values (min_max) before and after the video modeling intervention were 42 (24_166) and 28.50 (15_87), respectively, with a p value of 0.009, indicating significant decreases in sAA levels. These results also indicated that video modeling was effective in enhancing thesocial and motor skills of children with ASD. Video modeling is an easy-to-use, non-invasive observational tool [13]. Moreover, with this method, a child can watchvideos that describesomeone doing a task the child will experience [14]. Thus, this method can be used to provide instructions to children with ASD and is effective in teaching various types of skills, such as self-help, social, and academic skills. During dental care, video modeling can be used as a behavior management technique to reduce anxiety among children with ASD [15, 16]. A research study has revealed that video modeling can show behavior that can be imitated by children with ASD. Thus, this method is quite effective in developing the skills of children with ASD.

Similar results were obtained in individual who received the VPM-BDG intervention.The sAA levels (mean ± SD) before and after the interventionwere 61 ± 34.13 and 36.50 ± 17.28, respectively, with a p value of 0.038, indicating significant decreases in sAA levels. The visual pedagogy helps children familiarize processes and treatment tools using a set of coloring pictures [17]. A previous research study has found that children with autism who use visual pedagogy during dental care were more cooperative than control children, and the tool was effective in teaching children with autism how to brush their teeth [3]. Other studies have shownthat the visual pedagogy can improve cooperation and oral health and reduce the plaque index among children with autism [17].

The delta value of video modeling and the VPM-BDG was $p=0.970$ ($p>0.05$), which indicated no significant difference in the sAA level between the two intervention groups. Thus, the effectof video modeling was similar to that of the VPM-BDG. These results were similar to those of previous studies showing that video modeling can be used effectively to teach various skills to children with ASD [14].

Conclusion

Video modeling and the VPM-BDG are effective in reducing stress levels among children with ASD.

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Regulatory Statement

This study was conducted in accordance with all provisions of the guidelines and policies of the Ethical Committee of the Faculty of Dentistry, Universitas Indonesia with an approval number: 050420419.

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