Teaching oral hygiene to children with autism

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Summary. *Background.* The need for improved oral hygiene routines in individuals with disabilities has been documented in many reports. The aim of this study was to evaluate whether visual pedagogy is a suitable way to teach children with autism how to brush their teeth.

Methods. The investigation took the form of a prospective study including clinical examinations and structured interviews. Based on visual pedagogy, a series of pictures were produced that showed a structured method and technique of tooth brushing. The pictures were placed in the bathroom or wherever tooth brushing was performed. Fourteen children with autism aged between 5 and 13 years (mean age = 9.3 years), and their parents participated.

Results. Before the study, all parents found it difficult/very difficult to maintain good oral hygiene in their child. All children had visible plaque on their maxillary incisors and canines. After 12 months, the amount of visible plaque was reduced. After 18 months, most parents found maintaining good oral hygiene easier than before the study. All but one child/parent adopted the programme.

Conclusions. Visual pedagogy is a useful tool in helping people with autism to improve their oral hygiene.

Introduction

In 1943, Leo Kanner, a child psychiatrist, described a group of children (boys) with similar behavioural problems, i.e. autism, for the first time [1]. Many myths about the condition originate from the works of Kanner; for example, the cause of autism being 'cold intellectual mothers', 'children with autism are from the upper social classes', 'the children are unwilling to speak', and 'the first and only child' theory. All these myths have now been abandoned and it is clearly understood that there is always a neurobiological cause for autism [2].

The diagnosis of autism is established after a thorough medical, psychological and neurological examination. Four absolute criteria must be fulfilled [3]:

- severe abnormality of reciprocal social relatedness;
- severe abnormality of communication development, often including spoken language;
- restricted, repetitive and stereotypical patterns of behaviour, interest and imagination; and
- early onset (before the age of 3–5 years).

The impairments described above characterize an individual who has great difficulties interacting with other people, and in understanding and following instructions. Therefore, affected children may be incapable of cooperating in the dental setting. In addition to these characteristics, subjects often show increased sensitivity to sounds, light, odours and colours, a feature that also makes achieving good oral health very difficult.

A majority of children with autism have a cognitive disability and about 50% do not achieve spoken language [4]. The prevalence rate of autism has been reported to vary between four and 13 children per 10 000 [5–7]. Today, the generally accepted prevalence value is one in 1000 children [8].

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Studies comparing individuals with disabilities to similarly aged individuals with normal development have shown poorer oral hygiene and increased periodontal disease within the handicapped group [9-13]. It is well known that good oral hygiene, particularly tooth brushing with fluoride toothpaste, is also important for keeping the teeth free from caries [14-16]. Maintaining good oral hygiene in children with autism is a significant task for both the parents or carers of the child, and dental staff.

Over the years, new treatment methods, both medical and psychological, have been developed for autism. Since the end of 1980, the psychoanalytic view has been abandoned and a more pedagogic approach has been advocated. People with communicative disabilities have been shown to benefit from structure in time and space [17]. Based on these findings, a comprehensive pedagogic concept called Treatment and Education of Autistic and other Communication Handicapped CHildren (TEACCH) has been developed [18]. Visual pedagogy is one part of the TEACCH concept, and appears to be an effective technique to teach children with autism both at home and in school [19].

In a previous study, visual pedagogy was used to introduce dentistry to pre-school children with autism [20]. Through visualization, the actual dental procedure could be studied at home before visiting the clinic helping the child to understand the different parts of the treatment. The programme was also of value to the accompanying parents, helping them to feel safe and secure in knowing what demands were to be made of their child.

Therefore, the aim of this study was to evaluate the use of visual pedagogy as a method of teaching oral hygiene to children with autism.

Methods

Patients

A total of 15 children with autism and their parents were invited to participate in the study. A child psychiatrist had made the diagnosis of autism in all the children included. The children were patients referred for specialized paediatric treatment at the Dental School, Umeå, Sweden, by the Public Dental Health Service. For all these children, maintaining good oral hygiene was considered to be a problem by their parents. Effective tooth brushing could not be performed in the same way as in their siblings without autism. The parents received verbal and written information about the study. They were also informed that participation was voluntary, did not affect other contacts with dentistry and that they were free to withdraw from the study at any time without having to explain. Written consent was obtained. One parent chose not to participate, and therefore, the final study group consisted of 14 boys aged 5–13 years (mean age = 9.3 years).

Questionnaire

Participating parents completed a questionnaire regarding the following aspects of their children's lives:

- general health;
- number of siblings;
- medical history;
- method of communication;
- · dental history; and
- oral hygiene habits.

In Sweden, local multidisciplinary teams, 'Team Autism', monitor rehabilitation of children with autism. The team includes a psychologist, a teacher and a social worker. All 14 children in this study were well known to the team. The children's families were also familiar with visual pedagogy at home and/or at school. In cooperation with the team psychologist, the 14 children were classified into one of two levels, based on their communicative abilities. Level I was the mildest form of autism, i.e. the children have a spoken language and are able to conduct simple conversation. Level II included children with low communicative abilities, i.e. they have no or very little spoken language, and are unable to conduct a conversation. The distribution of the children according to their ability and mode of communication is shown in Table 1. For two children in level II, it was not certain that they had the capacity to 'read' pictures, but as a strategy and a mode of support for the family, these two were still trained according to visual pedagogy. All the children attended special schools for children with autism.

Dental examinations

One of the authors (C.P.) performed all the dental examinations of the children. Caries was registered according to World Health Organization criteria [21]. Bitewing radiographs were available for 10 of the 14 children, and these were independently evaluated

Level/capacity of communication	Pictures at home	Pictures at school	Pictures both at home and at school	Able to use words
I (<i>n</i> = 7)	2	4	2	3
II $(n = 7)$	4	7	4	_

Table 1. Distribution of the 14 children according to their communicative ability level and mode of communication.

by both authors after calibration. Full consensus was obtained in 99.1% of the surfaces examined. Disagreements were resolved by discussion.

The amount of plaque on the buccal surfaces of the maxillary incisors and canines was measured visually according to the modified criteria of Silness & Löe [22] using the following grades: (0) no visible plaque; (1) visible plaque; and (2) an abundant amount of visible plaque.

Tooth brushing programme

In cooperation with Team Autism, colour prints of a series of pictures of tooth brushing were produced (Fig. 1). The pictures were placed in a sequence demonstrating the systematic brushing of all teeth and tooth surfaces, i.e. the occlusal, buccal and lingual surfaces on the right- and on the lefthand sides for both the maxillary and the mandibular teeth. To further emphasize the structure and time needed for a good result, two toothbrushes were used in the programme, a red one for the maxillary teeth and a blue one for the mandibular teeth. The final image of the series was either of a box of fluoride tablets or the Swedish word slut, meaning 'the end'. A total of 13 pictures were included, and each picture was 7×5 cm in size and laminated in plastic. The parents were instructed that the pictures were to be placed at home in the bathroom or wherever tooth brushing is performed, and were given explicit information and instruction on how to use them.

Follow-up

After 2 weeks, a follow-up check was made by telephone, but during the entire study period, the parents were given opportunities to ask questions on the programme and/or come to the clinic for additional instruction. Clinical examinations were made after 8 and 12 months, respectively. In addition to measuring the amount of plaque, parents were asked the following questions:

- Where is the picture programme placed?
- Is it still in use or when did you stop using it?
- Does the child look at the pictures?

After 18 months, questionnaires were sent to the parents to evaluate:

- oral hygiene habits; and
- use of the picture programme.

Ethical approval

Before commencing, an application for ethical approval was submitted and agreed upon by the Ethical Committee of Umea University (Ref:-dnr 99-303).

Results

Apart from the diagnosis of autism, all children were medically healthy with no pharmacological treatment except for three children with allergic reactions to pollen and/or animal fur. Two of the 14 children had additional diagnoses: one child had fragile-X syndrome, and one had disintegrative disturbances. The number of siblings varied from one to four and none of the subjects was an only child.

Oral health

The distribution of caries is shown in Table 2. Five children were caries-free, although no bitewing radiographs were available for three of these subjects. Six children had received treatment under general anaesthesia and/or by means of preoperative sedation, and three children (all level I) had been able to cooperate sufficiently for conventional treatment.

At the beginning of the study, all children had plaque on their front teeth (Table 3).

All parents considered tooth brushing very difficult or difficult (Table 4) and they all stated that they















SLUT

Fig. 1. Pictures included in the programme.

tried to help their children with tooth brushing at least daily. The children classified as level I usually brushed without help in the morning and received help with tooth brushing in the evening. Two children occasionally used electric toothbrushes; otherwise, different kinds of conventional brushes were used. Toothpaste with fluoride was used by all but one child, who brushed with water only.

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Patient number	Age (years)	Sex	Level of communication	Bitewing radiographs available	dmfs	DMFS	Dental treatment under general anaesthesia
1	9	М	2	+	12	4	Yes
2	8	Μ	1	+	2	0	No
3	9	Μ	2	+	7	0	Yes
4	10	Μ	1	+	3	2	No
5	9	Μ	2	-	0	0	No
6	10	Μ	1	+	6	4	At 6 years of age, later conventional
7	11	Μ	2	+	10	0	Yes
8	12	Μ	2	+	0	0	No
9	12	Μ	1	+	0	0	No
10	10	Μ	1	+	2	0	No
11	11	Μ	2	+	0	3	Yes
12	9	Μ	2	_	0	0	No
13	5	Μ	1	_	4	_	No
14	6	Μ	1	_	0	-	No

Table 3. Amount of plaque on the buccal surfaces of the

maxillary incisors and canines in the 14 patients.					
Amount of plaque	Before the study	After 8 months	After 12 months		
Abundant	8	2	3		
Visible	6	5	7		
No visible plaque	0	7	4		

Table 4. The parent's opinion of the difficulties in tooth brushing.

Parents opinion	Before the study	After 18 months
Easy	0	8
Difficult	5	4
Very difficult	9	2

The amount of plaque present on examination before the study, and after 8 and 12 months, respectively, is shown in Table 3. The three children who still had abundant amounts of visible plaque after 12 months belonged to level II. One of the children with no visible plaque after 8 months and/or 12 months belonged to level II, the others were boys with highfunctioning autism and good communicative ability.

Compliance with the programme

The telephone call after 2 weeks served as a reminder: four of the families had not yet started the programme. For all but two children, the pictures were placed in the bathroom where teeth were brushed. One family had taken the pictures to the son's school where his assistant performed the tooth brushing, one child could accept only one or two pictures at a time, becoming upset while looking at the whole series. Repeated information was given to all children/parents.

Compliance with the programme is shown in Fig. 2. After 8 months, nine of the 14 children/parents used the programme according to the plan. Two children (both level I) had abandoned the pictures after having learnt how to brush. One boy reacted very strongly to the pictures, which could only be used with caution and not according to plan. One boy on level II could not use the pictures at all. The mother of the second child who could not understand the pictures benefited from the programme herself while brushing her child's teeth. After 12 months, one more boy had left off using the pictures and two children used the programme irregularly.

After 18 months, two children still used the pictures every day, and one boy still used the blue and red toothbrushes. Five children no longer needed the pictures to manage tooth brushing. For four children, the pictures served as an occasional support and reminder.

The parent's opinion of how easy it was to perform tooth brushing is shown in Table 4. After 18 months, three children brushed independently, four children were completely dependent on their parents, and for the remaining seven, both parents and children were involved with brushing. At the end of the study, four children used electric toothbrushes and all but one child used fluoridated dentifrice. No conclusions could be drawn on the connection between the number of siblings and oral hygiene. Because of the small number of children included in this study, no



Fig. 2. Compliance with the programme.

attempt has been made to draw definite conclusions regarding the connection between communicative ability and the capacity to comply with the programme.

Discussion

Studies of dental health and dental health conditions in children with autism are sparse. The complicated disability itself makes clinical research difficult. Although the aetiology for autism is neurobiological, emotional and psychosocial factors must also be considered. People with autism are usually extremely sensitive to varying environmental factors, and are very dependent on routines and continuity in treatment. Thus, unfamiliar dental staff cannot easily examine them. This fact explains the absence of a control group in the present study. The patients were regarded as their own controls, and they were evaluated at the beginning of the project and after one year. The same person (C.P.) performed all clinical examinations and evaluations. This may not be methodologically ideal, since it precludes blinding, but it was a prerequisite for the study in this group of subjects. Difficulties in clinical examination also mean that the measurement of plaque could not be performed according to standard methods using disclosing solution and calculation of plaque indices. The methods applied must be considered a compromise, but are nevertheless valid. The fact that the amount of plaque was less after 8 months than after 12 months, however, could be partly a result of this methodological weakness.

The present study shows that visual pedagogy is a suitable method to teach this special group of children/parents oral hygiene, i.e. how to perform tooth brushing. The programme also fulfils their need for routines and continuity. The one boy who could not cooperate at all was a refugee child. It is not unreasonable to conclude that his social situation and related difficulties might have affected his and the family's ability to cooperate. The second child with profound difficulties in coping is perceived as being oversensitive orally since the mere sight of the pictures upset him. It could be argued that the results obtained are caused by improved manual dexterity, since the children grew older during the project. The variation in age at the beginning of the project (range = 5-13 years), however, shows that the ability to perform tooth brushing did not simply increase with age. Over the years, efforts had been made to improve the subjects' oral hygiene according to traditional methods, but without positive results. In addition, it has been shown, that plaque levels do not necessarily decrease as a child gets older [23].

The most important reason for good, effective and regular tooth brushing is to preserve the health of the oral cavity. It is also safe to conclude that, if proper tooth brushing habits are established at home, the clinical situation is more easily accepted. Early establishment of good oral hygiene habits may also play a role in the child with a communication disability's 'oral perception' [24].

In a recent study, a correlation was found between attention-deficit hyperactivity disorder (ADHD) and a high risk for dental caries [25]. Children with ADHD are characterized by learning and behaviour problems. The reason for the high caries risk might be multifactorial, but it is easy to imagine the problems likely to be involved in performing oral hygiene in these hyperactive and impulsive children. Just like children with autism, they have a strong need for structured and proper instructions, and this group may also benefit from the use of visual pedagogy.

Plaque-dependent dental diseases have declined dramatically in Sweden over the past few decades [26]. The major reason for this development is understood to be the frequent use of fluoride toothpaste. High sensitivity to taste and food consistency is common in people with autism, and it is important that dental staff are aware of this fact and, if necessary, recommend other forms of fluoride administration. In this study, however, only one boy did not accept the taste of toothpaste.

One purpose of the study was to emphasize the need for continued research into the treatment of children with disabilities and to explore new treatment methods for these children. Interdisciplinary approaches and cooperation could provide dentistry with new methods and procedures, and better serve the patients and the dental staff. Benefits may also occur in the other direction, i.e. via interdisciplinary cooperation, knowledge of the importance of good oral health in children with disabilities is increased and provides benefits in the broader coordinated rehabilitation of the child.

Conclusion

Visual pedagogy is widely used as a tool for communication in school and at home for individuals with autism. The present study shows that it is also a useful method of teaching oral hygiene, i.e. how to perform tooth brushing, and that dentistry benefits from applying the same pedagogic approach as has been used elsewhere in teaching this group.

Acknowledgements

The Västerbotten County Council financially supported this study.

Résumé. Arrière-plan. Le besoin d'une hygiène buccale régulière améliorée chez des personnes avec déficience a été documenté dans de nombreuses études. L'objectif de cette étude a été d'évaluer si la pédagogie visuelle est un moyen adapté pour enseigner aux enfants autistes comment se brosser les dents.

Méthodes. C'est une étude prospective comprenant des examens cliniques et des entretiens structures. Basée sur une pédagogie visuelle, une série d'images a été réalisée montrant une méthode et technique structurée de brossage de dents. Les images ont été placées dans la salle de bain ou partout où se déroulait le brossage. Quatorze enfants autistes âgés de 5 à 13 ans (moyenne 9,3), ainsi que leur parents, ont participé.

Résultats. Avant l'étude, tous les parents trouvaient difficile/très difficile de maintenir une bonne hygiène buccale chez leur enfant. Tous les enfants avaient de la plaque visible au niveau des incisives et canines maxillaires. Après 12 mois, la quantité de plaque visible a été réduite. Après 18 mois, la plupart des parents trouvaient que maintenir une bonne hygiène était plus facile qu'avant le début de l'étude. Tous ont adopté le programme sauf un enfant/parent.

Conclusion. La pédagogie visuelle est un outil utile pour aider les personnes autistes à améliorer leur hygiène buccale.

Zusammenfassung. *Hintergrund.* Die Erfordernis verbesserter Mundhygienegewohnheiten für Individuen mit Behinderungen wurde in zahlreichen Studien dokumentiert. Ziel dieser Studie war es, die

Anwendbarkeit visueller Pädagogik zur Mundhygieneinstruktion autistischer Kinder zu untersuchen. *Methoden.* Diese Studie wurde prospektiv mit klinischen Untersuchungen und strukturierten Interviews durchgeführt. Basierend auf visueller Pädagogik wurde eine Bilderserie produziert, die eine strukturierte Methode und Tecknik des Zähneputzens zeigt. Diese Bilder wurden dort platziert, wo das Zähneputzen stattfand. 14 autistische Kinder im Alter von 5–13 Jahren (Mittel 9.3) sowie ihre Eltern nahmen an der Untersuchung teil.

Ergebnisse. Vor der Studie waren alle Eltern der Ansicht, dass es schwierig sei, die Mundhygiene bewi ihrem Kind zu gewährleisten. Alle Kinder wiesen sichtbare Plaque an Oberkiefer Schneidezähnen und Eckzähnen auf. Nach 12 Monaten fanden es die meisten Eltern einfacher als vorher, die Mundhygiene aufrechtzuerhalten. Das Programm wurde mit nur einer Ausnahme angenommen.

Schlussfolgerungen. Visuelle Pädagogik ist ein nützliches Hilfsmittel um Menschen mit Autismus zu helfen, ihre Mundhygiene zu verbessern.

Resumen. Antecedentes. La necesidad de mejorar las rutinas de higiene oral en individuos con discapacidades está documentada en muchos estudios. El objetivo de este estudio fue evaluar si la pedagogía visual es una manera deseable de enseñar a los niños con autismo la manera de cepillarse los dientes.

Métodos. Se trata de un estudio prospectivo que incluye exámenes clínicos y entrevistas estructuradas. Basándose en la pedagogía visual, se realizaron una serie de cuadros, que mostraban un método estructurado y una técnica de cepillado de dientes. Los cuadros se colocaron en el baño o en los lugares donde se realizaba el cepillado dentario. Participaron catorce niños con autismo de 5-13 años (media 9,3) y sus padres.

Resultados. Antes del estudio todos los padres encontraban difícil/muy difícil mantener una buena higiene oral en sus hijos. Todos los niños tenían placa visible en los incisivos y caninos superiores. Después de 12 meses se redujo la cantidad de placa visible. Después de 18 meses la mayoría de padres encontraron que el mantenimiento de una buena higiene oral era más fácil que antes del estudio. Todos menos uno, niño/padre adoptaron el programa.

Conclusiónes. La pedagogía visual es una herramienta útil para ayudar a la gente con autismo a mejorar su higiene oral.

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