Journal of Oral Biology and Craniofacial Research 11 (2021) 507–510

Contents lists available at ScienceDirect

Journal of Oral Biology and Craniofacial Research

journal homepage: www.elsevier.com/locate/jobcr

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Bridging the communication gap in autistic children, one picture at a time

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ARTICLE INFO

Keywords:
Autism spectrum disorder
Interventions
Oral hygiene care
Picture exchange communication system
Socio-communicative skills

ABSTRACT

One of the main domains of paediatric dentistry is providing oral health care, especially to the children with special needs, like those affected with autism spectrum disorder (ASD). Such children exhibit poor oral hygiene primarily due to their limited communication ability, lack of joint attention, oversensitivity to sensory stimuli and motor coordination deficits. In such cases, multiple studies suggest and emphasize on the importance of early use of interventional services. Children affected with ASD tend to be visual learners, and therefore, are better suited for visual interventional methods. Amongst which, picture exchange communication system (PECS), originally developed by Bondy-Frost, is gaining rapid momentum. It is suggested to help individuals to initiate requests and communicate their needs via picture cards; hence aid in acquiring functional communication and speech, improve socio-communicative impairments, and decrease the behavioural problems. This scoping review aims to raise awareness on PECS amongst the dental fraternity, by emphasizing its usage pertaining to dentistry. PECS though rated hard, has proved to be beneficial in improving oral hygiene practices among autistic children.

1. Introduction

The term "*autism*", first coined by Bleuler (1911), was a name given to denote a specific abandonment behaviour disorder seen in schizophrenic patients.[1] Over the past several years, the criteria used to describe autism have changed notably but the most accepted definition is by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), that states Autism spectrum disorders (ASDs) as a group of disorders with severe, pervasive neuro-developmental impairment; characterized by a triad of substantial qualitative impairments in reciprocal social interaction and communication; and restricted repetitive patterns of behaviour, interests and activities.[2]

The National Institute on Deafness and Other Communication Disorders (2010) reports that nearly 25% of autism affected individuals are unable to use speech as their primary mode of communication. Early interventional services are thus, proven to be more beneficial in them.[3] Autistic behaviour pattern usually gets noticed as early as 12–14 months of age. Thus, early prevention and maintenance of oral hygiene in children affected with ASD is a serious challenge to paediatric dentists/general dentists, primarily due to difficulties in interpersonal contact, and lack of motor coordination among children.

2. Classification

The American Psychiatric Association (2013) merged four distinct autism diagnoses into one umbrella diagnosis of autism spectrum disorder (ASD) namely; Autistic Disorder, Asperger's Syndrome, Pervasive Developmental Disorder (PDD) and Childhood Disintegrative Disorder.[2]

3. Prevalence and aetiology

According to a systematic review by Anil Chauhan et al. (2019),autism is more prevalent in rural population (14:10,000) than in urban population (12:10,000) in India; which were relatively lower than those reported in the United States and United Kingdom.[4] It does not show racial, ethnic, and socioeconomic predilections, but boys are reported to be affected more.[5] The current research suggests the aetiology to be multifactorial, involving genetic mutations, neuro-psychopathy, exposure to heavy metals and foetal exposure to the medications (valproic acid or thalidomide).[6]

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https://doi.org/10.1016/j.jobcr.2021.07.005
Received 11 February 2021; Received in revised form 3 May 2021; Accepted 10 July 2021
Available online 15 July 2021

4. Clinical manifestations

Leo Kanner described the characteristic symptoms of autism: seclusion, performing ordinary actions with compulsion, exceptional memory, echolalia, oversensitivity to sensory stimulus and a limited range of interests.[7] They also lack joint attention, difficulty with memory tasks.[8] Thus, they experience difficulty in learning and adapting oral hygiene practices,[9,10] often requiring repeated oral hygiene instructions with extensive involvement of parents and/or care providers.[11] The most common oral findings in these children are increased incidence of carious lesions, generalised gingivitis, gingival hypertrophy,increased plaque index and periodontal disease and masochistic oral habits.[12] Bhalla et al.(2006) suggest that the primary need for an autistic patient is prevention of oral diseases before their clinical presentation. Hence there is a need for a functional communication tool that educates children on oral hygiene practices and helps them develop their communication skills.

Techniques incorporated in clinical practice:

Various techniques used by paediatric dentists either singly or in combination, are as follows:

a) *Tell-show-do method*, wherein the clinician explains and demonstrates the procedure prior to the treatment and is a great method to familiarize and desensitize children with treatment procedures but is less effective due to lack of joint attention in people with ASD.[13]
b) *Voice control*, where in the clinician uses an authoritative tone, to tame the unaccommodating behaviour/tantrums thrown by children.[14] But the children with ASD might not have the ability to understand and respond to this technique.[15]
c) Praises and smiles act as *positive reinforcement.* However, it might not guarantee the desired behaviour in children with ASD unless it was conditioned as a reinforcer.[16]
d) Autistic kids were shown to learn by imitation, therefore, some clinicians adopted *"Just like me" and modelling techniques* to reinforce the desired behaviour.[16]
e) The use of *physical restraints* has been a controversial topic. Some clinicians and researchers use the "deep pressure theory" to justify its use, which reports that experiencing deep pressure can have a calming to the over-sensory systems in individuals affected with ASD.[17]
f) Most importantly, such children need utmost *tender love and care* while treating them.[18]
g) *Augmentative and Alternative Communication (AAC)*:

As mentioned above, the speech in these children ranges from no speech to primitive speech with echolalia.[19] The present strategies like AAC systems, focuses on the development of functional communication. This includes the use of manual signs, speech generating devices, and various picture-based systems; most popular of all is *Picture Based Communication System (PECS)*.

It often gets difficult for clinicians to choose the intervention that is best suited for these individual and the decision is based on the function of the individual and their pre-treatment characteristics.[20] Significant research is lacking to date, that recommends clear guidelines for determination and implementation of the most effective communication strategy in a child with ASD. Thus, the aim of this review is to analyse the current literature available for the Picture Exchange Communication System (PECS) and raise awareness of PECS among dental peers, to help them implement this system in their daily practice.

5. Picture exchange communication system

The Picture Exchange Communication System (PECS) is a method of augmentative communication system (ACC), requiring repeated instructions which are reported to be better reinforced with pictorial depictions as autistic children are visual learners.[21] As a result, they respond and adapt better with visual tools as it facilitates functional communication, improve severe impairments of functional speech, and decrease the behavioural problems.

It combines evidence-based procedures,[22] does not require an additional language system or any prerequisite skill requirements, like imitation or intentional abilities.[23] This method was developed to help young children with ASD learn to initiate requests and communicate their needs via picture cards. The ability of the child to match a picture with an object is considered a prerequisite before employing this method. PECS is a specific, manualized protocol, which relies on the principles of applied behaviour analysis like reinforcement, delay, and generalization. It consists of six phases:

- Prior to Phase I, a *reinforcer sampling* must be conducted, which includes an informal inventory of items and activities that are of particular interest to the learner.
- *Phase I: The Physically Assisted Exchange*: the child is taught to hand a blank picture card to a communicative partner.
- *Phase II: Expanding Spontaneity*: a pictorial communication book is introduced, and increased distance is placed between the child and communicative partner. The child is required to select a picture symbol from the communication book and approach the communicative partner to request for that item.
- *Phase III: Picture Discrimination*: the child is taught to discriminate among multiple pictures on the PECS board.
- *Phase IV: Sentence Structure:* The child seeks out their PECS board, creates a "sentence'' on the sentence strip by combining the "I want card'' and the card of a desired item. Further which they approach their communicative partner and gives him/her the sentence strip.
- *Phase V: Responding to "What Do You Want?":* The child is taught to respond to the question, "what do you want?''
- *Phase VI: Responsive and Spontaneous Commenting*: The child is taught to respond to the question, "What do you see?'' by selecting a card depicting the same object and combining it with an "I see''[21]

Literature Review on PECS:

While there have been several studies conducted on the efficacy of PECS, some notable ones that provide substantial evidence are as follows:

SL. NO	AUTHORS	TITLE OF THE STUDY	METHODOLOGY	CONCLUSION
1.	Flippin, M., Reszka, S., & Watson, L.[24]	Effectiveness of the picture exchange communication system (PECS) on communication and speech for children with autism spectrum disorders: A meta-analysis	A systematic review of articles about PECS written between 1994 and June 2009 was conducted. Quality of scientific articles was assessed, and used as an inclusion criterion. They were assessed separately for single-subject and group studies for communication and speech outcomes.	i)This study reports increase in communication and relative lack of improvement in speech across the PECS literature for children with ASD. ii) Phase IV was identified as a possibly influential step, characteristic for speech outcomes.
2.	Stephanie L. Hart, Devender R. Banda.[25]	Picture Exchange Communication System with Individuals With Developmental Disabilities: A Meta-Analysis of Single Subject Studies	This article reviews 13 published single-subject studies to examine the effectiveness of PECS, its effects on speech and problem behaviours, generalization,	i) Results indicate that PECS helped increase functional communication in all except 1 participant. ii) Additionally, PECS was reported to decrease problem

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SL. NO	AUTHORS	TITLE OF THE STUDY	METHODOLOGY	CONCLUSION
			and social validity of the intervention.	behaviours and increased speech in some individuals.
3.	Paul Yoder, Wendy L. Stone.[26]	A Randomized Comparison of the Effect of Two Prelinguistic Communication Interventions on the Acquisition of Spoken Communication in Pre-schoolers With ASD	Each treatment was delivered to children for a maximum of 24 h over a 6-month period. Spoken communication was assessed in a diligent test of generalization at pre-treatment, post-treatment, and 6-month follow-up periods	i) Increase in nonimitative spoken communication acts and different nonimitative words used at the posttreatment period noted more in PECS than RPMT group ii) 59% of children who had PECS training developed independent speech, and 30% of children developed speech in conjunction with PECS

PECS since then, has been adapted in various clinical and social settings for children with ASD. It is relatively simple to use and teach, inexpensive, and therefore, is a promising intervention. This intervention has previously been used in psychological medicine to develop communication skills, reinforce adaptive behaviour and self-help skills, and to decrease problematic behaviour.[27] Multiple studies have since been conducted using PECS in clinical dentistry by incorporating picture cards/visual guide to educate children on proper tooth brushing techniques, oral hygiene instructions, and to familiarize them with preventive and emergency dental procedures. These studies have reported improvement of oral and gingival health, decrease of fear/anxiety among the subjects and better acceptance of treatment. A few studies that have used PECS are summarized as follows:

SL.NO	AUTHORS	TITLE OF THE STUDY	METHODOLOGY	CONCLUSION
1.	O. B. Al-Batayneh, T.S. Nazer, Y. S. Khader, A.I. Owais.[28]	Effectiveness of a tooth-brushing programme using picture exchange communication system (PECS) on gingival health of children with autism spectrum disorders	37 children with ASD and their parents/ caregivers were trained for tooth brushing technique, using PECS as a picture-cards series	i) Improvement in Gingival index (GI) and Periodontal Index (PI) score was seen in the participants ii) Children acquired PECS in a short amount of time.
2.	Lilia Doichinova, Natalia Gateva, Krasimir Hristov.[29]	Oral hygiene education of special needs children. Part I: children with autism spectrum disorder	1-year oral hygiene training programme based on PECS was given to 30 children with ASD, depicting the sequence of actions involved in maintaining oral hygiene.	Improvement in Oral Hygiene Index and overall oral hygiene among children with ASD, suggesting that PECS was a suitable visual method for even non-verbal children with ASD.
3.	Ichijiro Morisaki, T. T. Ochiai, Shigehisa Akiyama, Jumpei Murakami.[30]	Behaviour guidance in dentistry for patients with autism spectrum disorder using a structured visual guide	A 5-year-old boy with autistic disorder was trained with a structured visual guide with TEACHH norms to familiarize the child with emergency dental care management procedures	This method of behaviour guidance was means of psychological desensitisation, graduated exposure, and familiarization with respect to dental procedures, thereby allowing children to accept treatment with minimal or no fear and anxiety.
4.	Adriana Gledys Zink, Michele Baffi Diniz, Maria Teresa Botti Rodrigues dos Santos, Renata Oliveira Guaré.[31]	Use of a Picture Exchange Communication System for preventive procedures in individuals with autism spectrum disorder: Pilot Study.	26 patients with ASD, (with no prior use of PECS) were divided into two groups: with no previous experience of dental treatment, and with previous experience and trained for Son-Rise Program that represented the routine of the dental office to make them accept preventive dental procedures.	i) PECS facilitated patient-professional communication during preventive procedures, including those ASD patients with previous dental experience. ii) The patients without previous dental experience required a lower number of attempts to accept the following PECS
5.	Dr Nameeda K S, Dr Anagha Saseendran, Dr. Fathimath Nihala K, Dr Richa Lakhotia, Dr Keshav Bajaj, Dr Priya Nagar.[32]	Effectiveness of Picture Exchange Communication System (PECS) on dental plaque and oral health of children with autism	A prospective interventional study was done on children with ASD. Based on PECS, a series of pictures that showed method and technique of tooth brushing were used. These pictures were placed in the bathroom, at home and/or at the autism centre. OHI–S and PI were recorded at each clinical visit (pre and post).	i) Statistically significant change in OHI and PI score was observed. (p value < 0.001) ii) PECS can be used in children with ASD to maintain oral hygiene and to communicate before and during the preventive dental treatment procedures.

6. Conclusion

PECS is greatly being used in socio-communicative training for children with ASD. This system is suggested to help develop functional communication among children with ASD, which promotes interpersonal interactions between the child and the dentist. Hence, it stands as a promising tool. Being in the dental fraternity, nothing is as rewarding as watching our patients wear a healthy and confident smile. In the wake of the era of inclusivity, it is our duty as budding dentists and paediatric dentists to slowly evolve and incorporate new interventional methods in our clinical practice that will aid in providing quality oral

care to special children. Future research to characterise affected children based on cognitive level, age, and disability might predict gains in speech during PECS training. Additional research on efficiency of PECS would increase its level of acceptance and implementation in clinical settings and help clinicians make informed decisions for children affected with ASD.

Source(s) of support

Nil.

Presentation at a meeting

Nil.

Declaration of competing interest

Nil.

References

1. Bleuler E. *Dementia Praecox or the Group of Schizophrenias*. 1950.
2. *Diagnostic and Statistical Manual of Mental Disorders*. fifth ed. Arlington, VA: American Psychiatric Association; 2013.
3. Myers SM, Johnson CP. Management of children with autism spectrum disorders. *Pediatrics*. 2007;120(5):1162–1182.
4. Chauhan A, Sahu JK, Jaiswal N, et al. Prevalence of autism spectrum disorder in Indian children: a systematic review and meta-analysis. *Neurol India*. 2019 Jan 1; 67(1):100.
5. Baio J, Wiggins L, Christensen DL, et al. Prevalence of autism spectrum disorder among children aged 8 years—autism and developmental disabilities monitoring network, 11 sites, United States, 2014. *MMWR Surveillance Summaries*. 2018;67(6):1.
6. Lyall K, Croen L, Daniels J, et al. The changing epidemiology of autism spectrum disorders. *Annu Rev Publ Health*. 2017;38:81–102.
7. Kanner L. Follow-up study of eleven autistic children originally reported in 1943. *J Autism Child Schizophr*. 1971;1(2):119–145.
8. Kasari C, Patterson S. Interventions addressing social impairment in autism. *Curr Psychiatr Rep*. 2012;14(6):713–725.
9. DeMattei R, Cuvo A, Maurizio S. Oral assessment of children with an autism spectrum disorder. *American Dental Hygienists' Association*. 2007;81(3):65.
10. Morales-Chávez MC. Oral health assessment of a group of children with autism disorder. *J Clin Pediatr Dent*. 2017;41(2):147–149.
11. Sarnat H, Samuel E, Ashkenazi-Alfasi N, Peretz B. Oral health characteristics of preschool children with autistic syndrome disorder. *J Clin Pediatr Dent*. 2016;40(1): 21–25.
12. Vajawat M, Deepika PC. Comparative evaluation of oral hygiene practices and oral health status in autistic and normal individuals. *J Int Soc Prev Community Dent*. 2012; 2(2):58.
13. Taylor BA, Hoch H. Teaching children with autism to respond to and initiate bids for joint attention. *J Appl Behav Anal*. 2008 Sep;41(3):377–391.
14. Pierce WD, Cheney CD. Aversive control of behaviour. In: *Behaviour Analysis and Learning*. New York City: Psychology Press; 2008:121–147.
15. Philip RC, Whalley HC, Stanfield AC, et al. Deficits in facial, body movement and vocal emotional processing in autism spectrum disorders. *Psychol Med*. 2010.
16. American Academy of Pediatric Dentistry. American academy of pediatric dentistry reference manual 2011-2012. *Pediatr Dent*. 2011;33(6).
17. Grandin T. Calming effects of deep touch pressure in patients with autistic disorder, college students, and animals. *J Child Adolesc Psychopharmacol*. 1992;2(1):63–72.
18. Mirenda P. *Toward Functional Augmentative and Alternative Communication for Students with Autism*. Language, speech, and hearing services in schools; 2003.
19. Gernsbacher MA, Morson EM, Grace EJ. Language and Speech in Autism.
20. Lord C, Wagner A, Rogers S, et al. Challenges in evaluating psychosocial interventions for autistic spectrum disorders. *J Autism Dev Disord*. 2005;35(6): 695–708.
21. Bondy AS, Frost LA. The picture exchange communication system. *Focus on autistic behaviour*. 1994;9(3):1–9.
22. Kravits TR. Increasing Communication Skills for an Elementary-Aged Student with Autism Using the Picture Exchange Communication System (Doctoral dissertation, University of Kansas, Human Development and Family Life).
23. Charlop-Christy MH, Carpenter M, Le L, LeBlanc LA, Kellet K. Using the picture exchange communication system (PECS) with children with autism: assessment of PECS acquisition, speech, social-communicative behaviour, and problem behaviour. *J Appl Behav Anal*. 2002;35(3):213–231.
24. Flippin M, Reszka S, Watson L. Effectiveness of the picture exchange communication system (PECS) on communication and speech for children with autism spectrum disorders: a meta-analysis. *Am J Speech Lang Pathol*. 2010;19(2):178–195.
25. Hart SL, Banda DR. Picture exchange communication system with individuals with developmental disabilities: a meta-analysis of single subject studies. *Remedial Special Educ*. 2010;31(6):476–488.
26. Yoder P, Stone WL. A randomized comparison of the effect of two prelinguistic communication interventions on the acquisition of spoken communication in pre-schoolers with ASD. *Journal of Speech, Language, and Hearing*. 2006;49(4):698–711.
27. Ganz JB, Parker R, Benson J. Impact of the picture exchange communication system: effects on communication and collateral effects on maladaptive behaviours. *AAC (Augmentative Altern Commun)*. 2009 Dec 1;25(4):250–261.
28. Al-Batayneh OB, Nazer TS, Khader YS, Owais AI. Effectiveness of a tooth-brushing programme using the picture exchange communication system (PECS) on gingival health of children with autism spectrum disorders. *Eur Arch Paediatr Dent*. 2019 Oct 18:1–7.
29. Doichinova L, Gateva N, Hristov K. Oral hygiene education of special needs children. Part 1: children with autism spectrum disorder. *Biotechnol Biotechnol Equip*. 2019 Jan 1;33(1):748–755.
30. Morisaki I. Behavior guidance in dentistry for patients with autism spectrum disorder using a structured visual guide. *J Disability Oral Health*. 2008;9(3):136–140.
31. Zink AG, Diniz MB, Rodrigues dos Santos MT, Guaré RO. Use of a Picture Exchange Communication System for preventive procedures in individuals with autism spectrum disorder: pilot study. *Spec Care Dent*. 2016 Sep;36(5):254–259.
32. Effectiveness of Picture Exchange Communication System (PECS) on dental plaque and oral health of children with autism. *European Journal of Molecular & Clinical Medicine*. 2021;7(10):3351–3357.