

Oral health in children with autism spectrum disorder: A Narrative Review and a design concept of toothbrush (AUTIbrush)

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Abstract:

Maintaining optimal oral health is a fundamental component of overall health and wellness. However, it is often disregarded in children with autism spectrum disorder (ASD). Youngsters diagnosed with ASD frequently encounter a multitude of obstacles that can potentially affect their oral health. Dental procedures can be overwhelming for children with ASD, but improved communication can make the experience less stressful and more positive. In turn, this can lead to better oral health outcomes for this population. Brushing can be an extremely unpleasant or intolerable experience for some individuals with ASD due to their hypersensitivity to textures, tastes, or smells. The Autibrush toothbrush has been specifically designed to address the oral hygiene needs of autistic children, who often experience difficulties with brushing their teeth. The dual brush heads and ultra-soft bristles of the Autibrush toothbrush reduce the amount of time needed for brushing while also being comfortable for children with sensory issues. The development of AUTIbrush represents an exciting new frontier in oral healthcare for children with ASD. By combining cutting-edge technology with a user-centered design, AUTIbrush has the potential to revolutionize oral hygiene practices and improve the overall health and well-being of children with ASD.

Keywords: Autism; Autism spectrum disorder; Dental; Oral health; AUTIbrush

Introduction

Autism Spectrum Disorder (ASD) is a complex neurodevelopmental condition affecting individuals of all ages, races, and genders, characterized by challenges in social communication and interactions, as well as repetitive behaviors and restricted interests⁽¹⁾. The severity and nature of these symptoms can vary widely⁽²⁾. The precise cause of ASD is not fully understood, but research suggests a multifactorial origin involving genetic and environmental factors⁽³⁾. Genetic factors include mutations affecting synaptic function, neural development, and immune response⁽⁴⁾, while environmental factors encompass prenatal exposure to chemicals, infections, and obstetrical complications⁽⁵⁾.

The incidence of ASD has risen notably over recent decades. According to the World Health Organization (WHO), approximately 70 million people globally, or about 1 in 160 children, are diagnosed with ASD. Prevalence varies by region due to differences in diagnostic practices⁽⁶⁾. Developed countries, with heightened awareness and diagnostic practices, often report higher incidence rates. In the U.S., the Centers for Disease Control and Prevention estimates 1 in 54 children are diagnosed with ASD. In Europe, rates range from 1 in 100 to 1 in 160, with Sweden and Denmark showing even higher rates. Asian estimates range from 0.6 to 2.6 per 1,000 children, though data is limited⁽⁷⁾. The increasing prevalence highlights the urgent need for better understanding, diagnosis, and treatment of ASD.

Problems Faced by Children with ASD

Sensory Processing Issues

Children with ASD often experience sensory processing issues, which affect their response to stimuli such as textures, tastes, and smells^(8,9). For instance, the sensation of toothbrush bristles or toothpaste can be overwhelming or unpleasant, leading to reluctance to brush⁽¹⁰⁻¹²⁾. Conversely, some children may be hyposensitive, struggling to feel the toothbrush's effect, which can impair effective brushing⁽¹⁰⁻¹²⁾. Strategies to address these issues include desensitization techniques, gradual introduction of brushing, and using soft-bristled toothbrushes and mild toothpaste^(5,13-15). Additionally, providing sensory input before brushing, such as through activities like jumping on a trampoline, and using visual schedules or social stories can help⁽¹⁶⁾. Experimenting with brushing methods, such as gentle brushing or different motions, may also be beneficial⁽¹¹⁾.

Motor Coordination Difficulties

Motor coordination difficulties can hinder a child's ability to perform fine motor tasks like toothbrushing. ASD affects hand-eye coordination and motor planning, making it hard for children to manipulate the toothbrush and clean all areas of their mouth^(15,26,41,47). This may result in missed areas and inadequate cleaning, leading to poor oral health and increased risk of dental problems^(15,26,41,43,44,47,48).

Fear or Anxiety

Fear or anxiety related to toothbrushing can arise from past negative dental experiences, aversion to brushing sensations, or fear of choking or gagging⁽⁴⁹⁾. Sensory sensitivities to sounds, smells, and tastes associated with dental care can exacerbate anxiety^(39,41,45-47,49,50). Using sensory-friendly products, such as mild-flavored toothpaste and quiet electric toothbrushes, can reduce anxiety^(39,41,45-47,49,50). Techniques to gradually introduce toothbrushing and using alternative methods like gum massagers or soft cloths can also be helpful^(39,41,46,47,49).

Difficulties with Communication

Children with ASD may struggle with communication, impacting their ability to maintain oral hygiene^(2,4). Impaired social communication, delayed language acquisition, and difficulties with nonverbal cues can hinder effective toothbrushing⁽²⁾. Using visual aids like picture cards or social stories and employing clear, simple language can aid communication and support during brushing⁽²⁾. Techniques such as using a weighted blanket or experimenting with different brushing tools may also help^(3,13). Patience and consistency are crucial, as each child's needs are unique



Design Innovation for Autistic Children's Oral Hygiene

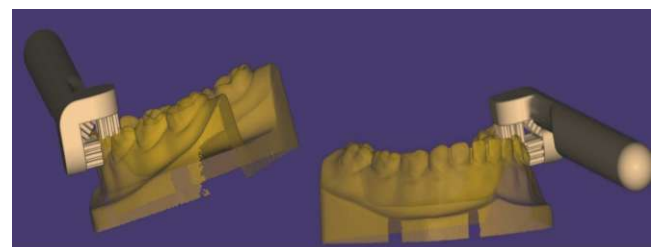
The Autibrush toothbrush has been developed to meet the specific oral hygiene needs of children with autism, who often face significant challenges with brushing their teeth. Its innovative features, including dual brush heads, ultra-soft bristles, and a flexible neck, are designed to improve the brushing experience for these children.

The Autibrush features a dual brush head design oriented 90 degrees from each other, allowing it to clean two surfaces of the tooth simultaneously. This design reduces the time and effort required for brushing, which is particularly beneficial for children with motor skill difficulties and sensory sensitivities. By minimizing the number of required brush strokes, the Autibrush helps make the brushing process more manageable and less intimidating for children with autism.

Sensory issues are common among autistic children, often making traditional toothbrushing uncomfortable. The Autibrush addresses this by providing a gentler brushing experience. Its ultra-soft bristles and reduced brushing time contribute to a less intrusive and more comfortable brushing routine. This can help alleviate anxiety and resistance associated with brushing.

Additionally, the Autibrush includes a timer function to support the development of good brushing habits. The timer ensures that children brush for an adequate duration and gives attention to all surfaces of their teeth. This feature aids parents and caregivers in establishing consistent oral hygiene routines, promoting better dental health and reducing the risk of dental issues.

The child-friendly design, featuring appealing brush heads shaped like cute animals, further engages children and makes brushing a more enjoyable experience. The Autibrush represents a significant advancement in addressing the specific needs of autistic children and improving their overall dental care.



Working of toothbrush on anterior teeth Working of the toothbrush on posterior teeth

Figure 5: Working of a new design concept of a toothbrush for autistic children

Design Details:

This design has been registered as a patent design with the Indian patent office (Registration number: 372028-001 date of registration: 04/10/2022).

1. **Dual Brush Heads:** Positioned 90 degrees from each other, these heads clean two surfaces of the tooth simultaneously, increasing efficiency and reducing brushing time. This is especially useful for children with motor coordination issues.
2. **Ultra-Soft Bristles:** Gentle on teeth and gums, these bristles cater to children with sensory processing issues, minimizing discomfort during brushing.
3. **Flexible Neck:** The brush's flexible neck allows it to adapt to the contours of the mouth, making it easier to reach all areas and enhancing comfort during brushing.
4. **Ergonomic Handle:** Designed for easy gripping, the ergonomic handle reduces fatigue and supports longer, more effective brushing sessions.
5. **Child-Friendly Design:** Featuring brush heads shaped like appealing animals, the Autibrush makes brushing more engaging and enjoyable for children.

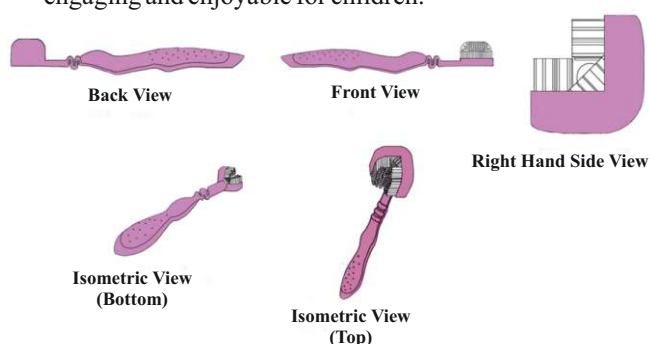


Figure 4: A new design concept of a toothbrush for autistic children

Conclusion

In conclusion, oral hygiene is an essential aspect of overall health, and it is particularly important for children with Autism Spectrum Disorder (ASD) who may have difficulties with sensory processing, motor coordination, and communication. The Autibrush toothbrush has been specifically conceptualised to address some of these challenges and make brushing teeth easier and more effective for autistic children. The dual brush heads and ultra-soft bristles of the Autibrush toothbrush reduce the amount of time needed for brushing while also being comfortable for children with sensory issues. The development of AUTibrush represents an exciting new frontier in oral healthcare for children with ASD. By combining cutting-edge technology with a user-centered design, AUTibrush has the potential to revolutionize oral hygiene practices and improve the overall health and well-being of children with ASD.

Conflict of Interest: Nil**Source of Support:** Nil

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