

Effectiveness of Environmental Modifications to Improve Prophylaxis in Children with Autism

EDWARDS L, POLIDO J, STEIN DUKER LI, VIGEN C, CERMAK SA

HERMAN OSTROW SCHOOL OF DENTISTRY OF USC | ADVANCED PEDIATRIC DENTISTRY

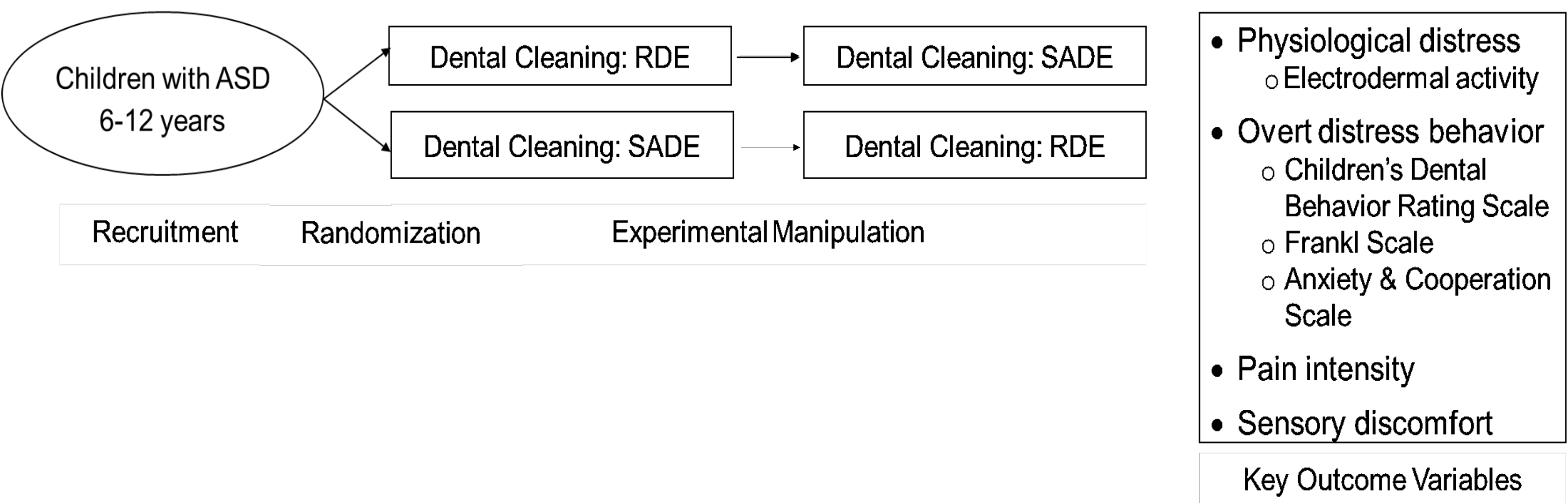
CHILDREN'S HOSPITAL LOS ANGELES | CHAN DIVISION OF OCCUPATIONAL THERAPY AND OCCUPATIONAL SCIENCE

PURPOSE

- Children with special healthcare needs such as autism spectrum disorder (ASD) are at greater risk for poor oral than the general population^{1,2}.
- Children with ASD experience greater oral care challenges at the dentist in comparison to typically developing children, and those challenges have been linked to over-responsivity to sensory stimuli^{3,4}.
- A sensory adapted dental environment (SADE) has reported preliminary efficacy in decreasing physiological and behavioral distress compared to a regular dental environment (RDE) in children with ASD and other developmental disabilities^{5,6,7}.
- This study evaluated if a higher quality dental prophylaxis was performed in SADE, compared to a regular dental environment (RDE), as measured by change in plaque scores before and after dental prophylaxis.

METHODS

This study is part of a larger randomized clinical trial which examined the efficacy of modifying sensory characteristics of the dental environment to reduce children's distress and enhance quality of care (see Figure 1).



Participants	<ul style="list-style-type: none">Children with ASD in the Los Angeles area (n=138; a total of 249 dental encounters).Inclusion Criteria: 6-12 years with a research-confirmed diagnosis of autism spectrum disorder with at least one previous dental visit, with an English- or Spanish-speaking caregiver.
Procedures	<ul style="list-style-type: none">A SOPROCare intraoral camera⁹ with plaque recognition technology was used to take photos of the buccal and lingual surfaces of six teeth (3, 7, 12, 19, 23, 38) before and after the prophylaxis. Remaining plaque was removed.Plaque severity observable in the photographs were scored later by a trained dental resident using a modified version of the Plaque Index¹⁰.
Data Analysis	<ul style="list-style-type: none">Repeated measure ANOVAs examined the within condition differences in plaque reduction by tooth and by average over all teeth.Mixed effects models investigated the interaction between condition (RDE/SADE) and amount of plaque before and after cleaning.

Figure 1. Study Design



Figure 2. SOPROCare Intraoral Camera⁹

Figure 3. (below) SADE modifications to the dental environment

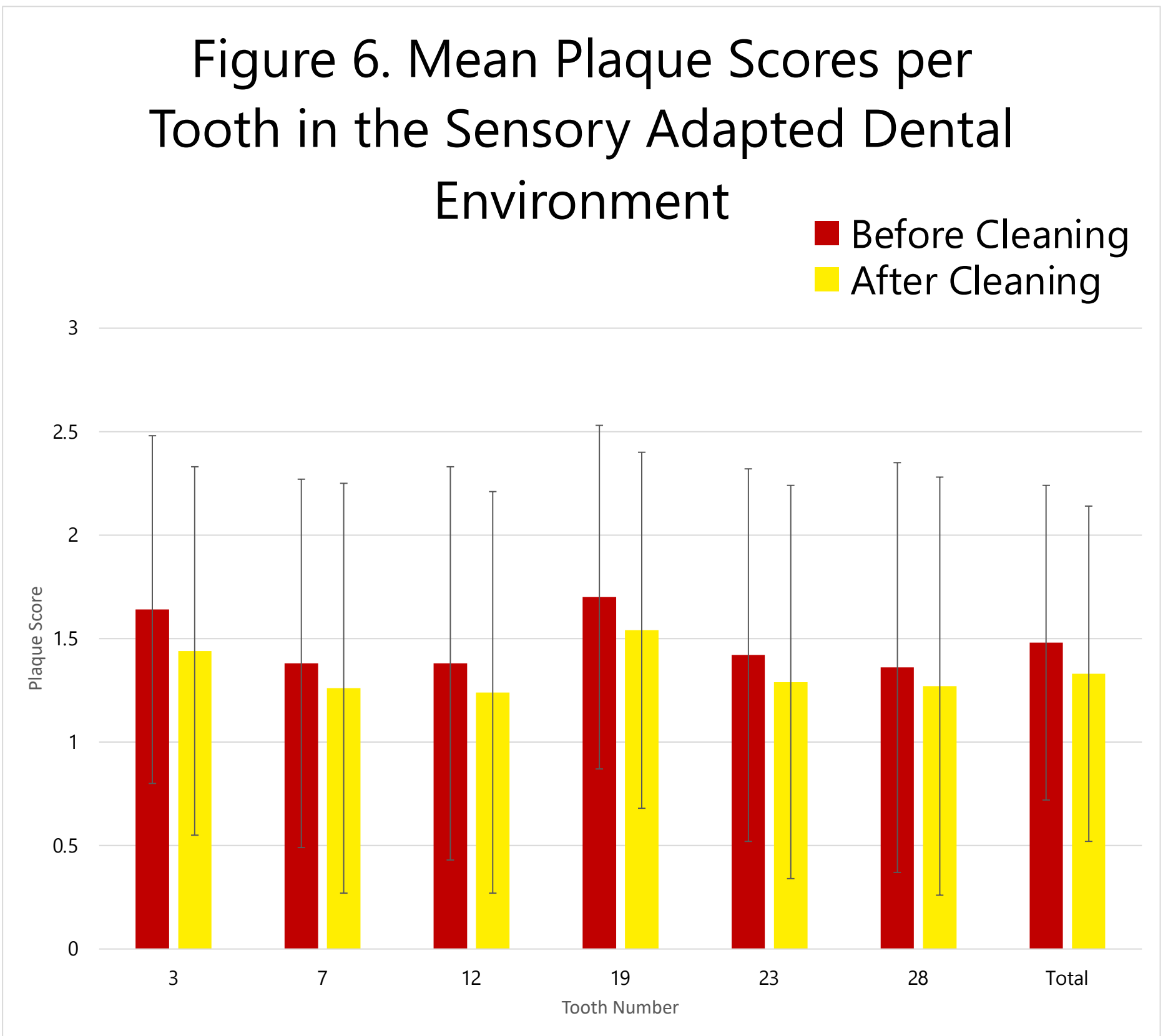
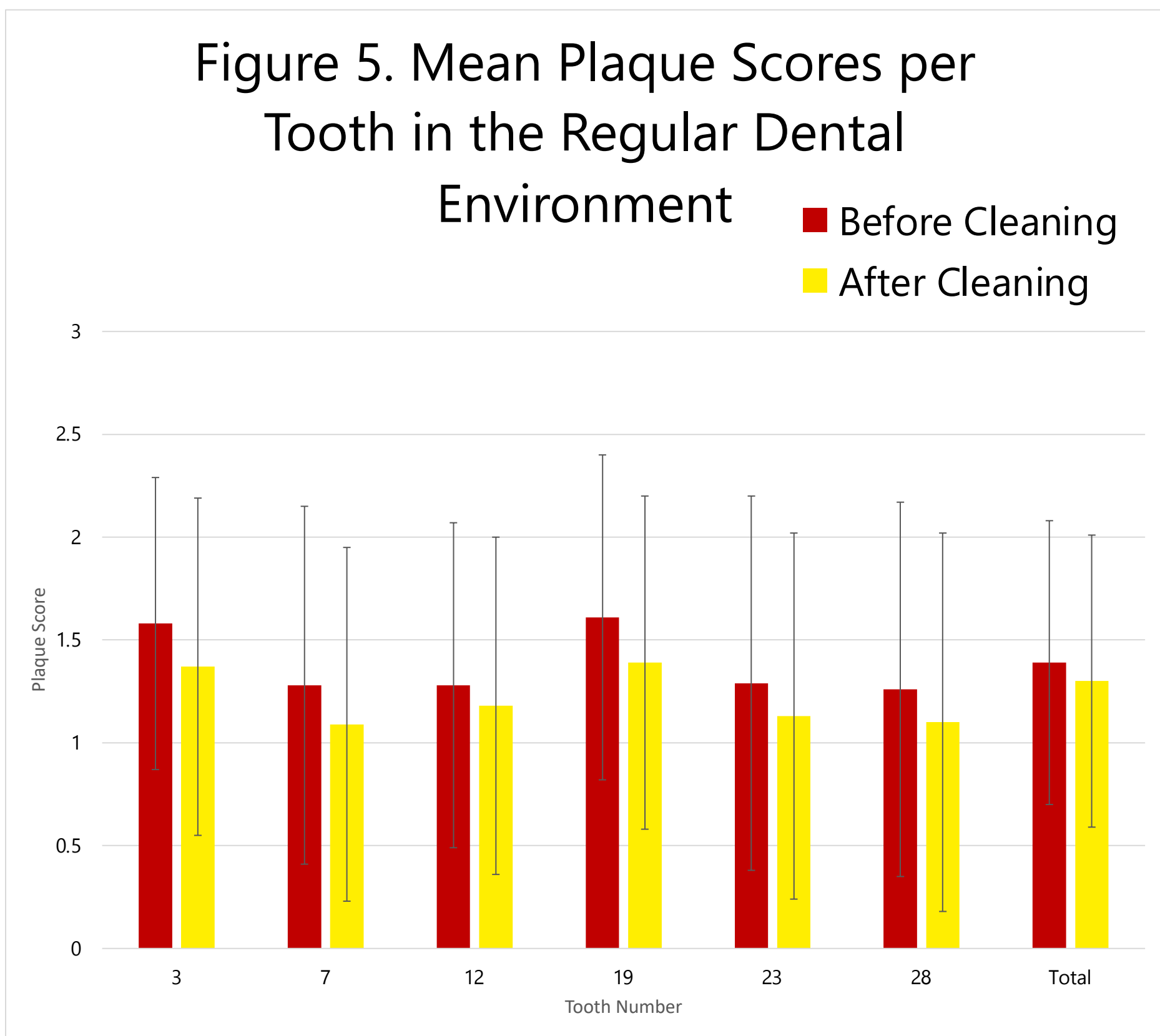
Visual	<ul style="list-style-type: none">Direct overhead fluorescent lighting and dental overhead lamp turned off; black-out curtains placed over windows.Slow moving visual color effects on ceilingDentist wears head-mounted lamp directed into the child's mouth, reducing bright lights shining in eyes.
Auditory	<ul style="list-style-type: none">Rhythmic music (Dan Gibson's Exploring Nature) projected via room speakers.
Deep Pressure	<ul style="list-style-type: none">A "butterfly" wrap fits over the dental chair.Weighted with a pediatric dental X-ray apron, the wings wrap around the child from shoulders to ankles, and provide uniform "hugging" pressure over the body.

Figure 4.

(right) Intraoral photo used for rater calibration demonstrating the "PERIO mode" on SOPROCare Camera. Scored: Left-Middle-Right, 1-1-2.



RESULTS



Tooth	Repeated Measure ANOVA		Mixed Model	
	p-value for timing	p-value for timing * tx	p-value for tx	p-value for timing * tx
3	0.012	0.940	0.2123	0.9852
7	0.092	0.697	0.04168	0.468
12	0.212	0.856	0.2234	0.8897
19	0.021	0.698	0.2418	0.5227
23	0.115	0.854	0.09858	0.8134
28	0.203	0.737	0.1707	0.4829
Total	0.029	0.787	0.09768	0.6847

Table 1. (above) There was a statically significant improvement in the plaque score between pre and post – prophylaxis measurements using the intraoral camera (p=0.029). There was not a statistical difference between SADE and RDE.

ACKNOWLEDGEMENTS

Study supported in part by the National Institute of Dental and Craniofacial Research (U01 DE024978-04S2).

DISCUSSION

- Participants experienced challenges tolerating intraoral photographs .
- The amount of plaque present on the patient's teeth before cleaning was minimal, with scores averaging 1.2 and 1.33 in RDE and SADE, respectively. As expected, there was a statistically significant reduction in the plaque scores before and after the prophylaxis (p=0.029).
- Findings suggest no difference in plaque reduction following cleanings in the SADE vs. RDE environments, indicating that quality of dental care was comparable in the RDE and SADE.
- Several factors influence one's decision to use SADE. This study did not show that SADE resulted in increased plaque removal. However, when making a decision to use SADE, it is important to examine the child's distress during cleaning, both physiologic and behavioral, their acceptance, satisfaction, and their cooperation.
- While receiving routine cleanings in a SADE, children with ASD experienced significantly less physiological stress as measured by electrodermal activity (sympathetic activation), with non-significant decreases in behavioral distress as measured by the Frankl Scale. Preliminary scores of behavioral distress from video-recordings suggest significant behavioral improvement in the SADE⁸.
- Parents and children were overwhelmingly satisfied with SADE, endorsing modifications individually and cumulatively. Parents strongly agreed that SADE made the dental visit better⁸.

CONCLUSIONS

Within the SADE, the quality of dental care is maintained, parent and patient satisfaction significantly increased, there is no additional training required to operate in this environment, and the cost is minimal. Therefore, there is a benefit to treating patients with ASD in SADE including reduced levels of physiological stress and creating improved feelings towards future dental care.

REFERENCES:

- Brickhouse TH. (2009). Barriers to dental care for children in Virginia with autism spectrum disorders. *Journal of Dentistry for Children*. (76), 188-193.
- Pi X., Liu C., Li Z., Guo H. (2020). Meta-analysis of oral health status of children with Autism. *J Clin Pediatr Dent*.
- Stein LI, Polido J.C., Najera S.O., Cermak S.A. (2012). Oral care experiences and challenges in children with autism spectrum disorders. *Pediatr Dent*. 34(5):387-91.
- Stein LI, Polido J.C., Cermak S.A. (2013) Oral care and sensory over-responsivity in children with autism spectrum disorders. *Pediatr Dent*. 35(3):230-5.
- Cermak S.A., Stein Duker LI, Williams M.E., Dawson M.E., Lane, C.J., & Polido J.C. (2015). Sensory adapted dental environments to enhance oral care for children with Autism Spectrum Disorders: A randomized controlled pilot study. *Journal of Autism and Developmental Disorders*. 2876-2888.
- Shapiro, M., Sgan-Cohen, H.D., Parush, S., & Melamed, R.N. (2009). Influence of adapted environment on the anxiety of medically treated children with developmental disability. *Journal of Pediatrics*. 15, 546-550.
- Kim, G., Carrico, C., Ivey, C., & Wunsch, P.B. (2019). Impact of sensory adapted dental environment on children with developmental disabilities. *Special Care in Dentistry*. 39, 180-187.
- Stein LI, Vigen C., Jolette C., Polido J.C., Cermak S.A. (2022). Preliminary efficacy of a sensory Adapted dental environment to improve dental care for children with ASD. (Poster). American Occupational Therapy Annual Conference.
- "SOPROCare". *Acteon*. <https://www.acteongroup.com/us/products/imaging/diagnostic-cameras/soprocare>.
- Munro L.L., Liang Z., Emechebe N., Chen X., Cairns P.L., Manani P., Hamilton L., Good G., Kip K. (2020). Evaluation of an automated digital scoring system of dental plaque. *J Dent Hyg*. 94(2):27-36. PMID: 32354849.