



INTRODUCTION

Children with autism spectrum disorder (ASD) often experience heightened anxiety and sensory overload in the dental setting, leading to challenging behavior, incomplete care, and increased reliance on pharmacologic management. Sensory triggers include bright lights, procedural sounds, and unfamiliar tactile input, which can make even preventive visits difficult. Traditional distraction tools, such as wall-mounted televisions or tablets, help some patients but may not fully address the visual and sensory needs of children with ASD. Augmented reality (AR) offers a new way to blend digital content with the real world so that children can watch preferred media while still seeing providers and parents. This mixed-reality approach may better match autistic children's strong preference for visual screen media while preserving communication and situational awareness.

PURPOSE

This pilot study evaluated whether AR glasses could act as a non-pharmacologic adjunct to improve dental desensitization visits for children with ASD compared with standard wall-mounted televisions. The specific aims were to compare AR glasses versus TV with respect to:

- Behavior** (Modified Frankl Behavior Scale, 1-4)
- Dental task completion** (Task Analysis Score [TAS], % of 59 standardized dental tasks completed (0–100%).)
- Parent satisfaction** (Visual Analog Scale, 0–10)

METHODOLOGY

Design and Setting

- Single-center, repeated-measures pilot study at the Mailman Segal Dental Clinic, a single-chair clinic specializing in desensitization visits for children with ASD.
- Each child served as their own control: one visit using a wall-mounted TV (control) and a subsequent visit using AR glasses (experimental).


Interventions

- Control:** Wall-mounted television playing preferred streaming content during a standardized preventive desensitization visit.
- Experimental:** Xreal Air 2 Pro AR glasses connected to a Samsung Galaxy smartphone playing preferred streaming content with adjustable immersion via electrochromic dimming (0%, 35%, 100%).


Analysis

- Descriptive statistics and paired t-tests comparing TV vs AR for Modified Frankl, TAS, and parent satisfaction.
- Significance set at $p < 0.05$.

EXPERIMENTAL DEVICE




(A)




(B)


Experimental Device (A)
Xreal Air 2 Pro AR glasses
(B) Holographic Display (C) Immersion Control via Electrochromic Dimming Levels (0%, 35%, 100%)
<https://www.xreal.com/air2/>



LEVEL 1
Level 1 is configured at 0% and slightly shaded, ideal for when users need to interact with the real world or in a darker environment.



LEVEL 2
Level 2 is set at 35%, reducing the amount of light passing through the lenses. This is ideal for a more immersive experience while still being aware of your surroundings.



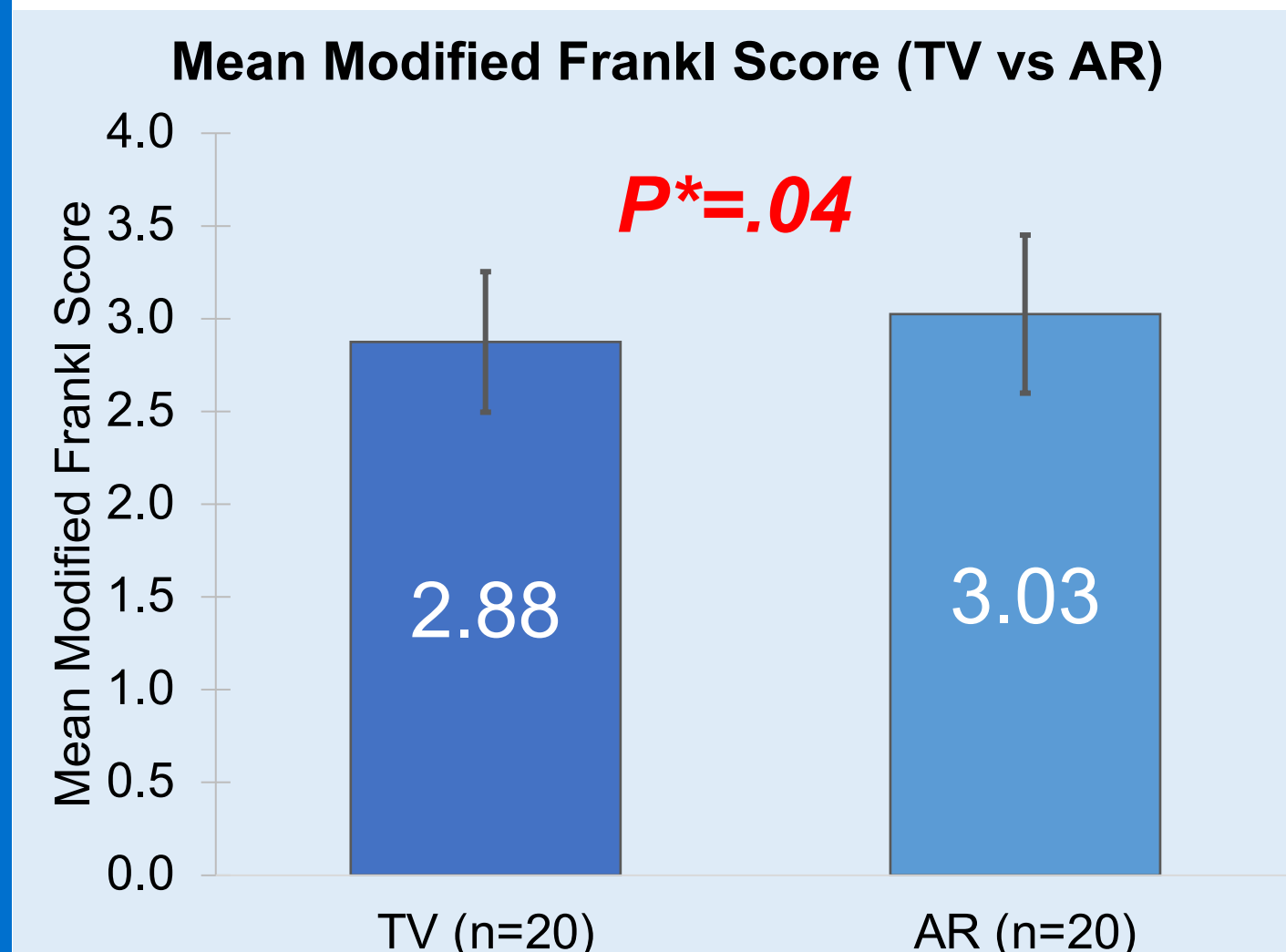
LEVEL 3
Level 3 is set at 100%, eliminating almost all ambient light to provide users with the most immersive experience in any lighting conditions, including outdoor environments.

RESULTS

Patient Demographics

- Sample:** 20 children with ASD (18 male, 2 female). Two additional children tried the glasses but did not assent to wearing them; they were not included in the analysis.
- Race/Ethnicity:** 40% Hispanic, 30% White, 20% African American, 5% Indian, 5% mixed.
- Age:** 8.35 ± 2.37 (range 4–11)
- Washout period between TV and AR visits:** 86.20 ± 72.44 days (range 30–365) [~3 months]

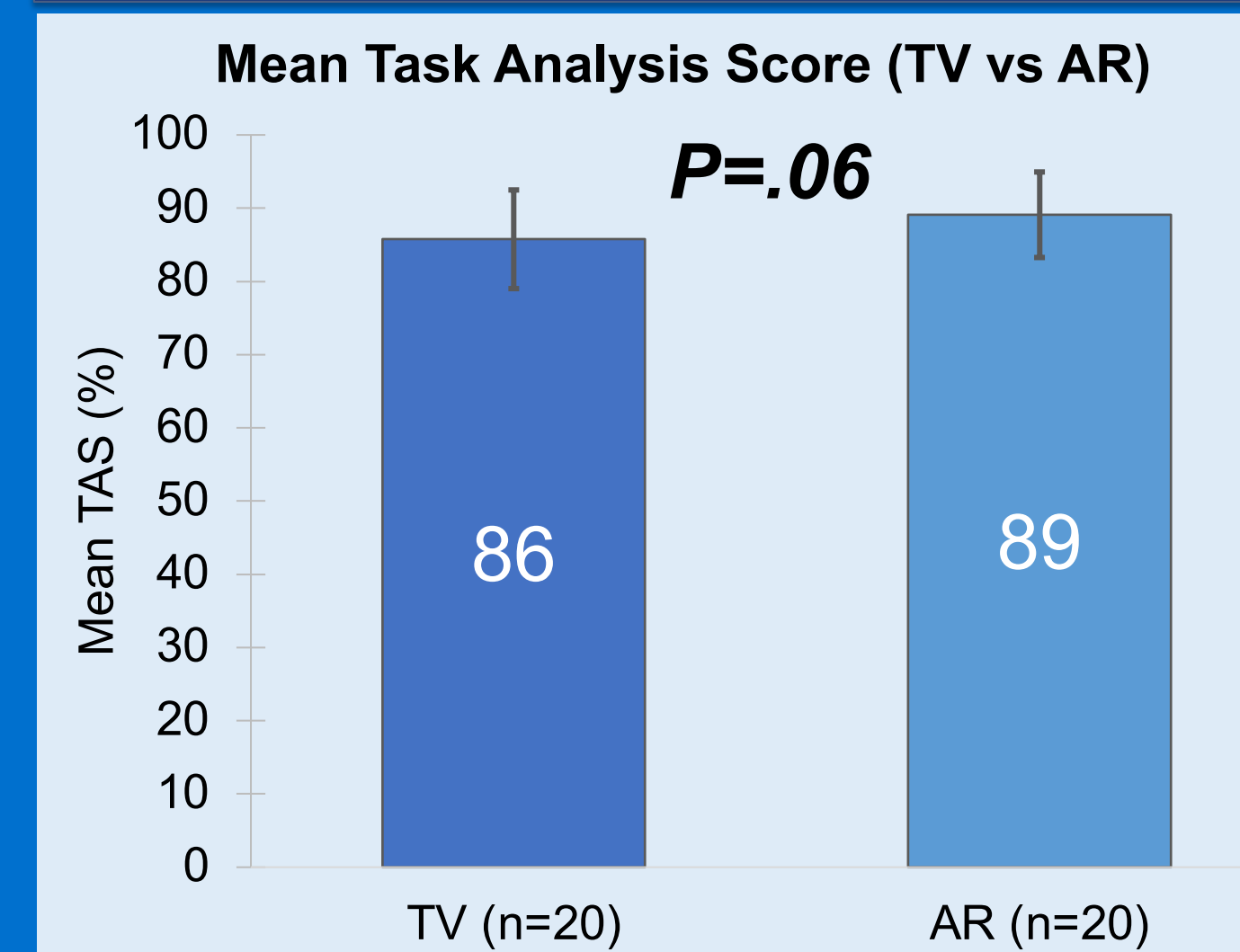
Patient Demographics		
	n	%
Gender		
Male	18	90
Female	2	10
Total	20	100
Race		
African American	4	20
Hispanic	8	40
White	6	30
Indian	1	5
Mixed	1	5
Total	20	100
	Mean ± SD	Range
Age (years), n=20	8.35 ± 2.37	4-11
Washout Period (in days), n=20	86.20 ± 72.44	30-365



Behavior

- TV (control):** Mean Modified Frankl = 2.88 (95% CI 2.50–3.25)
- AR glasses:** Mean Modified Frankl = 3.03 (95% CI 2.60–3.45)
- Children showed significantly more cooperative behavior when AR glasses were used compared with the wall-mounted TV ($P^* = .04$).

RESULTS

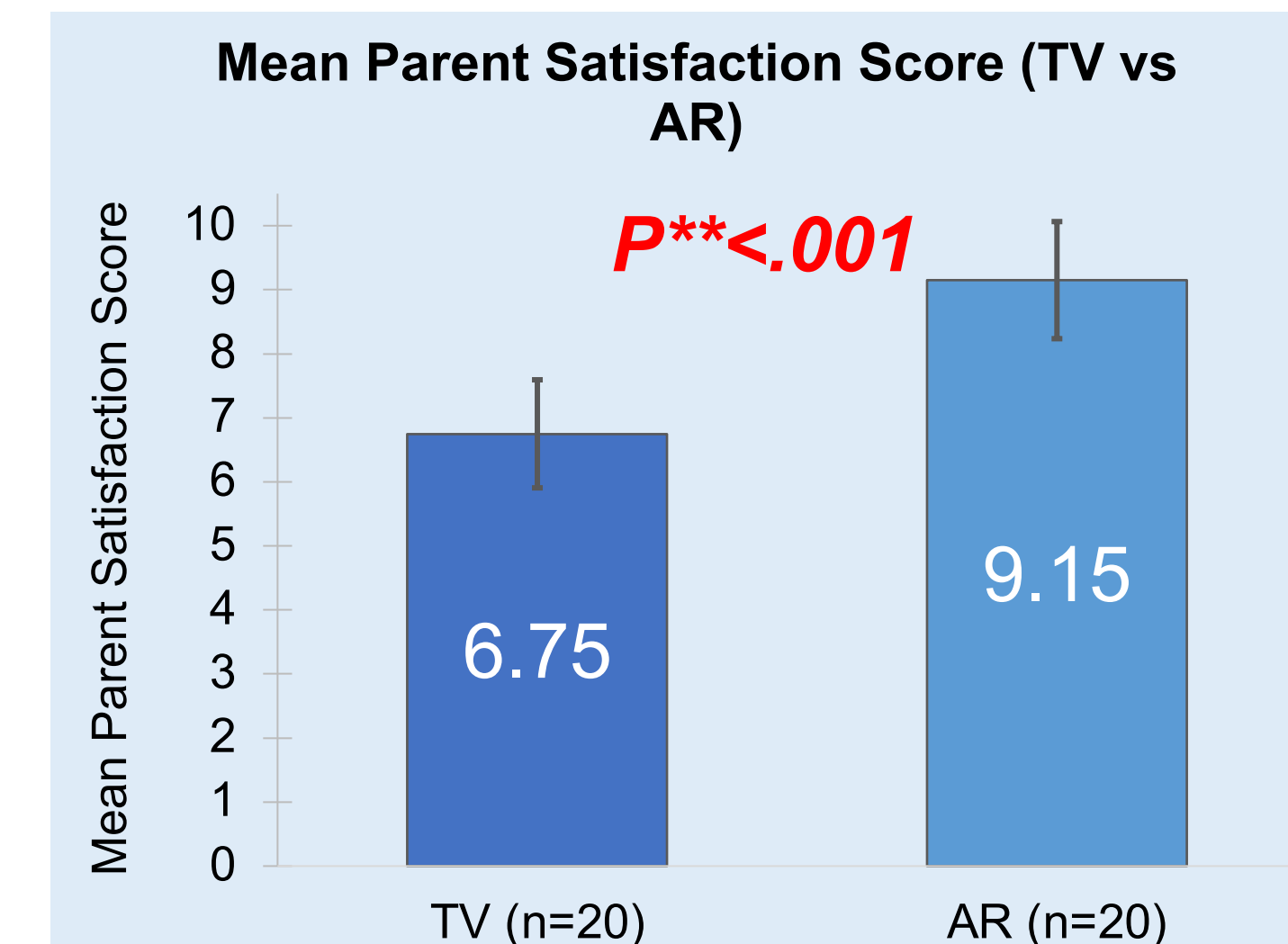


Dental Task Completion

- TV:** Mean TAS = 86% (95% CI 79–92)
- AR:** Mean TAS = 89% (95% CI 83–95)
- AR visits showed a trend toward higher task completion, but this difference did not reach statistical significance ($P = .06$), likely in part due to ceiling effects (many visits already had $TAS \geq 85\%$).

Parent Satisfaction

- TV:** Mean satisfaction = 6.75/10 (95% CI 5.91–7.59)
- AR:** Mean satisfaction = 9.15/10 (95% CI 8.24–10.06)
- Parents strongly preferred AR glasses over the wall-mounted TV ($P^{**} < .001$); 16 parents rated AR as 10/10.



CONCLUSIONS

In an ASD-focused pediatric dental clinic, AR glasses were a feasible, non-pharmacologic adjunct for many children: they produced a modest but statistically significant improvement in observed cooperation, a non-significant trend toward higher task completion, and a large, significant increase in parent satisfaction compared with wall-mounted televisions. Most families accepted the glasses and many children were highly engaged, but AR was not a one-size-fits-all solution—children with very high support needs were less likely to benefit (3 such cases showed lower or unchanged measures), and a small number declined or could not tolerate the device.

FUTURE DIRECTIONS

Larger studies should test AR during longer, more invasive procedures and across diverse clinics to identify which children benefit most. Child-sized hardware and ASD-tailored AR apps could further improve comfort, safety, and clinical impact.

REFERENCES



ACKNOWLEDGEMENTS

This project was supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) under grant number D88HP20126 and titled, "Postdoctoral Training in General, Pediatric and Public Health Dentistry and Dental Hygiene". This information or content and conclusions are those of the author and should not be construed as the official position or policy of, nor should any endorsements be inferred by HRSA, HHS, or the U.S. Government. The project was also supported by Nova Southeastern University, College of Dental Medicine # 334733