

Plaque Identifying Toothpaste & Child Patient Motivation

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Introduction to Plaque Identifying Toothpaste & Child Patient Motivation

- ❑ Plaque identifying toothpaste is a toothpaste that allows you to visibly notice the plaque that is on your teeth. Creating this visual is hypothesized to improve plaque reduction and also lower hs-CRP, which is a C-reactive protein that is a sensitive marker for cardiovascular disease.
- ❑ Ways to motivate patients has many variations and can depend on how the dental professional will think to inspire the patient for the better. For adults, it may be easier as they're more understanding, but children are always the toughest to initiate good habits. That's why one way to motivate children is to incorporate games into their brushing routine.



Why we chose this topic..

Being dental professionals, we understand the consequences of plaque build up and the challenges that come along with motivating not only adult patients, but children patients to utilize good oral hygiene. Finding studies that allow us to be more knowledgeable and help our patients create and maintain excellent oral health is a key factor to our success as dental professionals. These studies based on plaque identifying toothpaste and children mobile games for toothbrushing has shown significant success for oral health improvement overall.

Evaluating Child Toothbrushing Behavior Changes Associated with a Mobile Game: A Single Arm Pre-Post Pilot Study

In “Evaluating Child Toothbrushing Behavior Changes Associated with a Mobile Game: A Single Arm Pre-Post Pilot Study” published in Pediatric Dentistry July 15, 2019. Dov Jacobson, Jesse Jacobson, Traci Leona et al. conducted a study that took place in Atlanta, Georgia. This pilot study had the aim of analyzing improvements in toothbrushing behaviors associated with a mobile game device. Tooth decay is a multifactorial disorder that can be avoided through routine toothbrushing. The hypothesis that game play would be related to changes in the consistency of the toothbrushing.

Purpose:

The purpose of study is to highlight the importance of developing strategies for enhancing toothbrushing in childhood. Reports indicate about 80 per cent of children brush twice daily, but actual rates may be lower due to over reporting.

Methods:

Children aged 5–6 years were taught how to use the Brush Up game and played it at home once a day for 7 days (N=34). The primary result was the consistency of the toothbrushing, measured as length and distribution. The paired t-test was used to determine changes from pre / post and to modify the Holm procedure for multiple testing ($\alpha=0.05$).

Results & Conclusion

Results: For the 34 children examined after seven days of game play, the mean age was 73.7±6.6 months, 29.4% were female and 47.1% White. After seven days, the length of the toothbrushing considerably increased (P<0.001). With increased brushing of the lingual, maxillary occlusal, and posterior buccal surfaces, toothbrushing coverage improved.. For kids who played the game for 14 days (n=15), even greater changes were observed in consistency and distribution as data showed in table 1: differences between 7 and 14 days post baseline. Improvements in toothbrushing did not continue one year later without further use of the app, but improvements were observed which may be clinically important as data showed in table 2: post differences 1yr after baseline.

Conclusion: After all evaluation, toothbrushing games in terms of total brushing time and delivery will theoretically improve the quality of the toothbrushing in children. Interventions must be designed to achieve sustainable, long-term changes in toothbrushing and oral health. Future research will continue to evaluate mobile games in disadvantaged child communities as part of intervention strategies to strengthen oral health habits and outcomes.

Table 1

Tooth Surfaces	Baseline n=34 Mean (SD)	After 7 Days n=34 Mean (SD)	Pre/Post Difference Mean (SD)	95% CI**	P-value**
All surfaces	46.2 (31.3)	69.4 (30.4)	23.1 (31.5)	12.2, 34.1	0.0002 [±]
Lingual surfaces	0.9 (2.3)	13.2 (14.1)	12.3 (14.2)	7.4, 17.3	<.0001 [±]
Buccal surfaces	30.1 (28.6)	38.0 (21.7)	7.8 (21.9)	0.2, 15.4	0.045
Occlusal surfaces	15.2 (10)	18.2 (10.5)	3.0 (11.0)	-0.8, 6.8	0.12
Maxillary occlusal surfaces	5.9 (6.1)	9.2 (6.3)	3.3 (5.9)	1.2, 5.4	0.0028 [±]
Mandibular occlusal surfaces	9.3 (6.7)	9.0 (5.6)	-0.3 (7.9)	-3.1, 2.5	0.83
Posterior buccal surfaces	15.7 (17.7)	22.8 (14.9)	7.1 (12.8)	2.6, 11.6	0.0027 [±]
Anterior buccal surfaces	14.5 (14.3)	15.2 (10.2)	0.7 (12.5)	-3.7, 5.1	0.74
Tooth Surfaces	Baseline n=15 Mean (SD)	After 14 Days n=15 Mean (SD)	Pre/Post Difference Mean (SD)	95% CI**	P-value**
All surfaces	39.9 (21.0)	108.9 (47.6)	69.0 (51.2)	40.7, 97.3	0.0001 [±]
Lingual surfaces	0.9 (1.6)	36.0 (22.3)	35.1 (22.1)	22.8, 47.3	<.0001 [±]
Buccal surfaces	24.5 (18.3)	45.4 (18.0)	20.9 (18.0)	10.9, 30.8	0.0005 [±]
Occlusal surfaces	14.4 (10.8)	27.5 (17.0)	13.1 (18.6)	2.7, 23.4	0.017 [±]
Maxillary occlusal surfaces	6.5 (7.3)	13.1 (9.8)	6.7 (10.5)	0.8, 12.5	0.028
Mandibular occlusal surfaces	7.9 (5.6)	14.3 (7.9)	6.4 (10.0)	0.9, 11.9	0.026
Posterior buccal surfaces	13.5 (11.5)	28.4 (11.4)	14.9 (11.9)	8.3, 21.5	0.0003 [±]
Anterior buccal surfaces	11.1 (9.2)	17.0 (7.6)	5.9 (7.6)	1.7, 10.1	0.0089 [±]

Table 2

Tooth Surfaces	Baseline Mean (SD)	After 7 Days Mean (SD)	After One Year Mean (SD)	Pre/Post Difference Mean (SD)	95% CI**	P-value**
N=14 children who used app for 7 days						
All surfaces	40.6 (23.8)	68.3 (34.9)	53.9 (47.4)	13.3 (54.2)	-18.0, 44.6	0.38
Lingual surfaces	0.4 (1.3)	13.5 (14.9)	0.9 (3.3)	0.5 (3.7)	-1.6, 2.7	0.60
Buccal surfaces	26.2 (27.4)	36.6 (24.3)	35.5 (34.8)	9.3 (45.6)	-17.0, 35.6	0.46
Occlusal surfaces	14.0 (8.9)	18.1 (11.7)	17.5 (15.5)	3.5 (12.8)	-3.9, 10.8	0.33
Maxillary occlusal surfaces	4.6 (5.0)	8.9 (6.6)	5.0 (5.8)	0.3 (5.2)	-2.7, 3.3	0.82
Mandibular occlusal surfaces	9.4 (7.6)	9.2 (7.2)	12.5 (13)	3.1 (13.7)	-4.8, 11.1	0.41
Posterior buccal surfaces	12.7 (18.8)	20.7 (17.5)	21.5 (24.8)	8.8 (28.2)	-7.5, 25.1	0.26
Anterior buccal surfaces	13.5 (14.0)	15.9 (12.0)	14 (18.6)	0.5 (26.9)	-15.0, 16.0	0.95
Tooth Surfaces	Baseline Mean (SD)	After 14 Days Mean (SD)	After One Year Mean (SD)	Pre/Post Difference Mean (SD)	95% CI**	P-value**
N=10 children who used app for 14 days						
All surfaces	45.7 (23.6)	119.1 (49.7)	60.8 (58.1)	15.1 (55.1)	-24.3, 54.6	0.41
Lingual surfaces	0.8 (1.7)	38.8 (23.8)	10.3 (20.2)	9.5 (20.5)	-5.2, 24.2	0.18
Buccal surfaces	28.8 (21.4)	49.8 (18.4)	37.7 (37.4)	8.9 (35.7)	-16.7, 34.4	0.45
Occlusal surfaces	16.1 (12.5)	30.5 (19.7)	12.9 (8.0)	-3.2 (16.8)	-15.2, 8.8	0.56
Maxillary occlusal surfaces	7.8 (8.6)	14.9 (11.1)	5.7 (5.1)	-2.1 (10.0)	-9.3, 5.0	0.52
Mandibular occlusal surfaces	8.3 (4.6)	15.6 (9.4)	7.2 (4.1)	-1.1 (7.7)	-6.6, 4.4	0.66
Posterior buccal surfaces	14.9 (13.9)	30.2 (12.1)	22.7 (20.5)	7.8 (18.5)	-5.5, 21.0	0.22
Anterior buccal surfaces	13.9 (10.2)	19.6 (7.5)	15.0 (21.6)	1.1 (22.1)	-14.7, 16.9	0.88

Correlation Between Oral Health and Systemic Inflammation (COHESION): A Randomized Pilot Follow-Up Trial of a Plaque-Identifying Toothpaste.

Scientists from Florida Atlantic University Schmidt College of Medicine, Marshfield Clinic Research Institute, and the University of Wisconsin School of Medicine and Public Health, collaborated on a randomized trial to further explore whether Plaque HD[®] (TJA Health), a plaque identifying toothpaste, reduces high sensitivity C-reactive protein (hs-CRP). Inflammation is closely involved in the pathogenesis of atherosclerosis and is accurately measured by hs-CRP, a sensitive marker for future risks of heart attacks and strokes.

Purpose:

The Correlation between Oral Health and Systemic Inflammation (COHESION) trial was designed to test the hypothesis that PlaqueHD, a plaque-identifying toothpaste, reduces hs-CRP.

Method:

In the study 112 subjects (aged 21 to 84 years) with an hs-CRP level of between 0.5 and 10.0 mg/L received an identical brushing protocol together with a 30-day supply of toothpaste containing either Plaque HD or a placebo toothpaste. To assess hs-CRP, levels were measured by Quest Diagnostics using an enzyme linked immunosorbent assay.

Result: Of the 112 randomized subjects, 103 had baseline and follow-up data and, therefore, made up the intention to treat sample. Of the 103 subjects with baseline and follow-up data, 54 subjects were randomized to the plaqueHD group and 49 to the placebo group. For the plaqueHD group average age was 51.2 years and for the placebo group 49.3 years age. 71 subjects were women and 32 were men. 42 of the 71 women and 12 of the 32 men were assigned to the plaqueHD group. There is no significant change between two groups ($P=.615$) (Table 1). But second data (table 2) showed a significant reduction in hs-crp in the prespecified group that include 40 patients with a baseline hs-crp level of higher than 2 mg/L but lower than 10 mg/L and the result supports the hypothesis that statistically significant decreases in CRP levels in the PlaqueHD group compared to placebo, only in subjects displaying elevated CRP levels at baseline.

Table 1 Results of the Intention-to-Treat Analysis of Subjects with Baseline High-Sensitivity C-Reactive Protein >0.5 and <10.0

Group	n	Baseline Mean (SD)	Follow-up Mean (SD)	Absolute Difference from Baseline to Follow-up	Absolute Difference Between Treatment Groups on Log Scale (95% CI)*	P Value
PlaqueHD	54	3.23 (2.67)	3.75 (4.59)	0.52 (3.79)	1.07 (-1.12, 0.13)	.615
Placebo	49	2.09 (1.79)	2.46 (2.47)	+0.37 (1.20)		

*Absolute difference on arithmetic scale and 95% confidence limits: 0.15 (-0.97, 1.27). CI = confidence interval; SD = standard deviation.

Table 2 Results of the Prespecified Subgroup Analysis of Subjects with Baseline High-Sensitivity C-Reactive Protein >2.0 and <10.0

Group	n	Baseline Mean (SD)	Follow-up Mean (SD)	Absolute Difference from Baseline to Follow-up	Absolute Difference on Log Scale (95% CI)*	P Value
PlaqueHD	25	5.00 (2.10)	4.42 (2.69)	-0.58 (2.26)	-1.51 (1.01-2.27)	.047
Placebo	15	4.33 (1.68)	4.88 (1.84)	+0.55 (1.36)		

*Absolute difference on arithmetic scale and 95% confidence limits: -1.14 (2.45-0.17). CI = confidence interval; SD = standard deviation.

Conclusion: All this study essentially tells us is that better teeth cleaning can possibly lower levels of a systemic inflammation. Inflammatory markers were significantly associated with poor oral health behaviour. Future experimental studies will be needed to confirm whether the observed association between oral health behaviour and cardiovascular disease is in fact causal or merely a risk marker.

Randomized Trial of Plaque Identifying Toothpaste: Decreasing Plaque and Inflammation

This trial of plaque identification toothpaste was conducted by Kim Fasula, Carla A. Evans, Linda Boyd et al. The randomized control trial took place in Illinois and was funded by the University of Illinois College of Dentistry and was approved by Institutional Review Board of the University of Illinois.

Data regarding plaque identifying toothpaste and whether or not it significantly reduces plaque and inflammation is sparse. Inflammation is measured by the C-reactive protein(hs-CRP), which is a sensitive marker for cardiovascular disease. The hypothesis in this randomized control trial was that plaque identifying toothpaste significantly reduces plaque and measures of hs-CRP were also taken to prove reduced risk in cardiovascular disease.

Purpose: The purpose of this trial was to test the effectiveness of reduction of dental plaque and high sensitivity C-reactive protein(hs-CRP) using plaque identifying toothpaste.

Methods:

- ❑ There were 61 subjects, aged between 19 and 44, who were assigned at random to use the plaque identifying toothpaste for 60 days.
- ❑ Subjects were told to use the same brushing protocol for the entirety of the 60 days.
- ❑ Changes in dental plaque and hs-CRP were recorded and evaluated from the start and to follow up.
- ❑ All subjects used a fluorescein mouth rinse and intraoral photographs were taken under black light imaging. Adobe Photoshop CS5 and Matlab were used to conduct a digital plaque analysis of cropped images of the 12 maxillary and mandibular anterior teeth.
- ❑ Custom software was used to calculate mean plaque ratios, which was $(\text{plaque pixels})/(\text{plaque} + \text{teeth pixels}) \times 100\%$.
- ❑ Changes in hs-CRP in milligrams per liter were assessed by Quest Laboratories using an enzyme linked immunosorbent assay.

Results & Conclusion

Results:

- ❑ Out of 61 subjects, 31 were given plaque identifying toothpaste and other 30 were given placebo.
- ❑ Table 1 showed no significant differences between the treatment groups in the baseline characteristics. This was in either the intention to treat analyses of dental plaque or pre-specified subgroup analyses of hs-CRP.
- ❑ Table 2 showed significant differences with a 0.51 showing a 49% reduction in the plaque identifying toothpaste group. The placebo toothpaste group of 0.76 shows a 24% decrease. The average hs-CRP at follow up was 2.22 in the plaque identifying toothpaste group and was 2.89 in the placebo group. The analyses had a mean ratio for hs-CRP of 0.71, which indicates a 29% decrease in plaque identifying toothpaste group, the mean for hs-CRP in placebo group was 1.25 and that indicates a 25% increase, which was statistically significant.

Conclusion: The authors concluded that the plaque identifying toothpaste had significant reductions in dental plaque as well as hs-CRP. These findings help support the hypothesis of a reduction in risks of cardiovascular disease. The authors believe if this study was done at a larger scale and a sufficient size and duration, it would help dramatically for our future in public health.

Table 1 Baseline Characteristics by Treatment Assignment

Demographic	Intention to Treat (ITT)		P-Value	Prespecified Subgroup (PSS)*		P-Value
	Placebo (n = 30)	Plaque HD (n = 31)		Placebo (n = 19)	Plaque HD (n = 19)	
Age, y	27.1 (6.1)	28.4 (7.1)	.439	26.9 (6.2)	30.0 (8.0)	.200
Sex, female	18 (60.0%)	16 (51.6%)	.688	11 (57.9%)	11 (57.9%)	>.999
Race			.752			.874
African American	5 (16.7%)	6 (19.4%)		1 (5.3%)	3 (15.8%)	
Asian	10 (33.3%)	13 (41.9%)		6 (31.6%)	6 (31.6%)	
Hispanic	7 (23.3%)	4 (12.9%)		5 (26.3%)	4 (21.1%)	
White	8 (26.7%)	8 (25.8%)		7 (36.8%)	6 (31.6%)	

Reported as mean (SD) and frequency (%).
 *Prespecified subgroup (PSS) analysis for high-sensitivity C-reactive protein (hs-CRP) of 38 randomized subjects with baseline levels >0.5, all CRP ≤10.0, and follow-up ≤60 days.

Table 2 Means and Mean Ratios for Dental Plaque and hs-CRP by Time and Treatment

Outcome	Condition	Baseline			Follow-Up			Mean Ratio		
		Placebo	Plaque HD	P†	Placebo	Plaque HD	P†	Placebo	Plaque HD	P†
Dental plaque	ITT	7.46	10.24	.083	5.68	5.20	.273	0.76	0.51	.001
hs-CRP	ITT	2.47	2.31	.657	4.47	2.18	.306	1.81	0.94	.459
	PSS*	2.32	3.13	.352	2.89	2.22	.377	1.25	0.71	.041

hs-CRP — high-sensitivity C-reactive protein.
 *Prespecified subgroup (PSS) for hs-CRP of 38 randomized subjects with baseline levels >0.5, all CRP ≤10.0, and follow-up ≤60 days.
 †All P-values are based on repeated-measures analyses of variance of log-transformed data.

The Importance and Relevance to Dental Hygiene

- ❑ - Helps children develop good home care habits and techniques.
- ❑ - Removal of Biofilm
- ❑ - Arrests the build-up of any plaque formation.
- ❑ - Create a positive and fun path to oral health.
- ❑ - Brushing helps avoid bad breath, which may potentially hinder the creation of deeper interpersonal relationships with friends, colleagues and family members.
- ❑ - Prevent gum disease and eventual tooth loss if not controlled.
- ❑ - Mobile games encouraging and motivating patients brushing.
- ❑ - Teaching proper home care.
- ❑ - Dental decay is the nation's most common chronic childhood disease, affecting 16.5 million children.

The Importance and Relevance to Dental Hygiene

- ❑ Greatly decreases plaque and inflammation.
- ❑ Brushing helps prevent tooth decay that can lead to dental cavities.

Importance/Relevance Explained:

These facts imply its importance to Dental Hygiene and how it's necessary to be able to prevent any diseases, while motivating our patients to maintain consistent upkeep of their oral health. In order for us to be able to provide our patients with the proper knowledge, understanding trials like these that provide informative tips and facts will allow us in Dental Hygiene to have success and not only success in dental hygiene, but also public health in general.

References

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