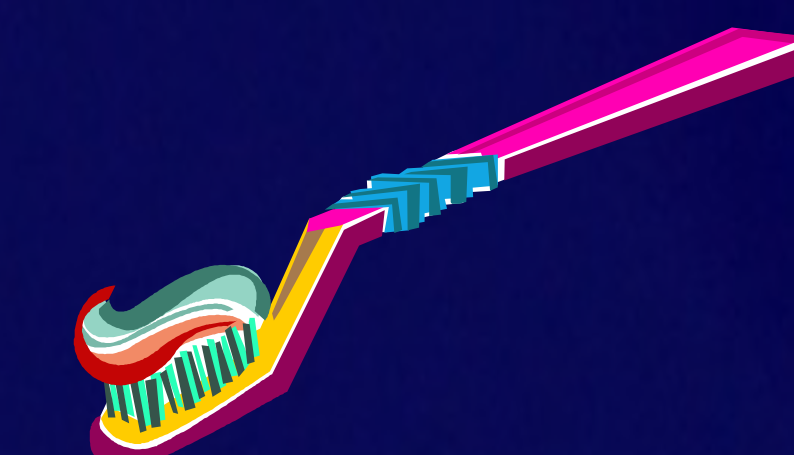


DESCRIPTIVE SENSORY ANALYSIS OF TOOTHPASTE FLAVOR & TEXTURE USING TWO DISTINCT SAMPLING METHODS: BRUSHING VS. SPOON TASTING



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INTRODUCTION

Repeated testing of toothpaste using a brushing method can lead to dental sensitivity which could compromise the effectiveness of descriptive evaluations. Researchers seeking to use atypical sampling methods for various reasons (i.e. sample screening, limited resources, reducing evaluator's fatigue) especially for products such as toothpaste must consider the objectives of a study and how an alternative technique will affect the outcome of the research.

A highly trained descriptive sensory panel evaluated five commercially available toothpastes using two distinct delivery regimens.

The objective of this research was to compare flavor and texture evaluations of toothpaste using two methods, toothbrushing or spoon tasting, for product sampling in a descriptive sensory analysis test.

This research establishes that altering the traditional delivery method for toothpaste (brushing) during descriptive analysis has an impact on some flavor and texture evaluations, but an alternative method might be used in some situations.

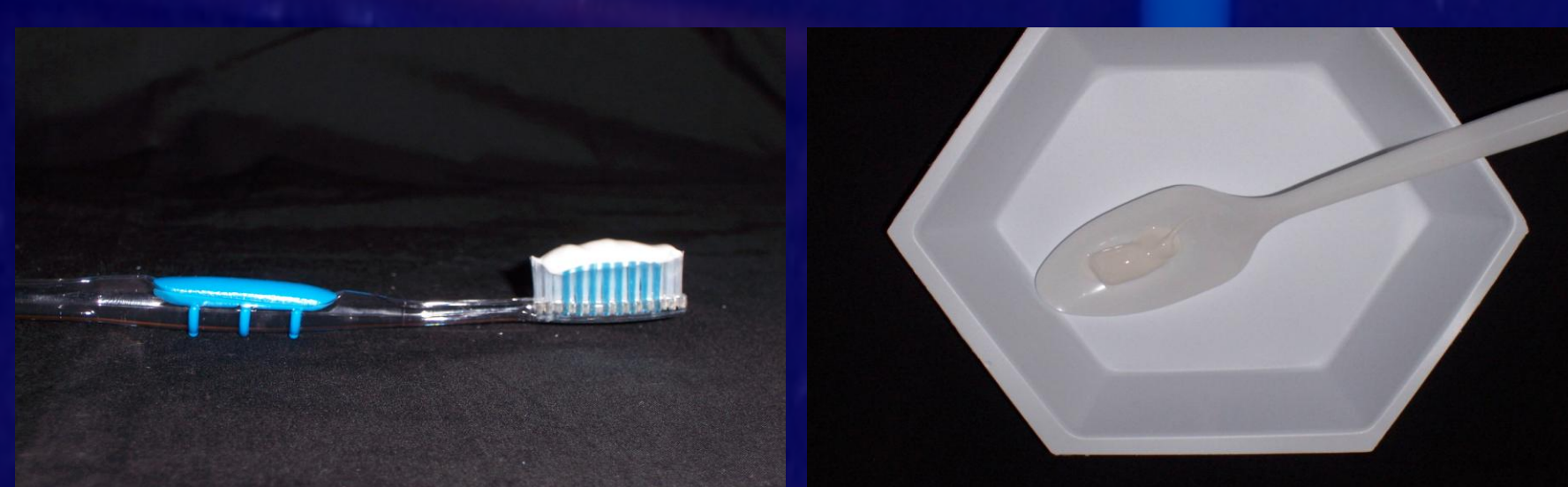
Keywords: toothpaste, descriptive analysis, sensory, sampling methods, delivery, brushing

MATERIALS/ METHODS

Toothpaste Samples: 5 commercially available solid white base pastes varying in mint flavor and/or presence of baking soda were used.

Product Names
Arm & Hammer - Complete Care, Intense Freshening + Whitening Paste
Colgate - Tartar Control + Whitening Crisp Mint Paste
Pepsodent - Whitening with Baking Soda
Crest - Tartar Protection, Whitening, Cool Mint Paste
Tom's of Maine - Natural Anti-cavity, Spearmint Paste

Sample Preparation: 1.0g toothpaste was served either on moisten Oral-B® Advantage toothbrush (Oral-B, Belmont, CA) or white plastic spoon, depending on the condition selected for evaluation.



Evaluation Techniques: **Brushing-** Teeth brushed for 30 seconds minimizing brushing of the gums, and excluding tongue brushing.

Spoon- Entire sample placed on the tongue and manipulated for ~30s until entire sample dissolved.

General- Samples held in the mouth for 15s for initial attribute evaluation; Oral contents expectorated, attributes evaluated; 30s after expectorating, mouth rinsed with water, attributes evaluated.

Descriptive Analysis: A highly trained descriptive panel (>1000 h of general sensory testing experience, including foods, beverages, and personal care products) from the Sensory Analysis Center at Kansas State University was used for descriptive analysis of the toothpastes.

Data Analysis: Analysis of Variance (ANOVA) and Least Square Means (LSMEANS) or p-values for paired differences (pdiff) were computed using SAS (SAS Institute, Cary, NC).

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RESULTS AND DISCUSSION

There were significant ($P \leq 0.05$) product, method, and method by product interaction effects for various attributes.

Delivery Method Effect

- Changing the sample delivery method significantly affected chemical feeling attributes such as burn and nasal cooling, as well as toothetch and associated flavor attributes such as overall mint, menthol, and bitter, but no interaction of delivery technique and product was found (Table 1).
- Attribute intensities were consistently higher when the spoon method was employed. This likely is because the sample is in more direct contact with chemoreceptors and taste papillae when it is pulled from the spoon onto the tongue than when it is brushed onto the teeth.
- Differences in delivery technique does not impact the ability to understand differences among the specific products tested. Therefore, researchers must simply understand that the specific intensity values obtained under a spoon delivery system may not "match" those in a brushing technique, but comparison among products still can be valid.

Product Effect

- The five toothpaste brands were significantly different for flavor attributes- overall mint, menthol, green (viney), overall sweet, and salty (Figure 1). These differences certainly are the intent of manufacturers who often wish to differentiate their products from others in the category.

Figure 1. Flavor Attributes with significant effects of Product type ($p < .05$)

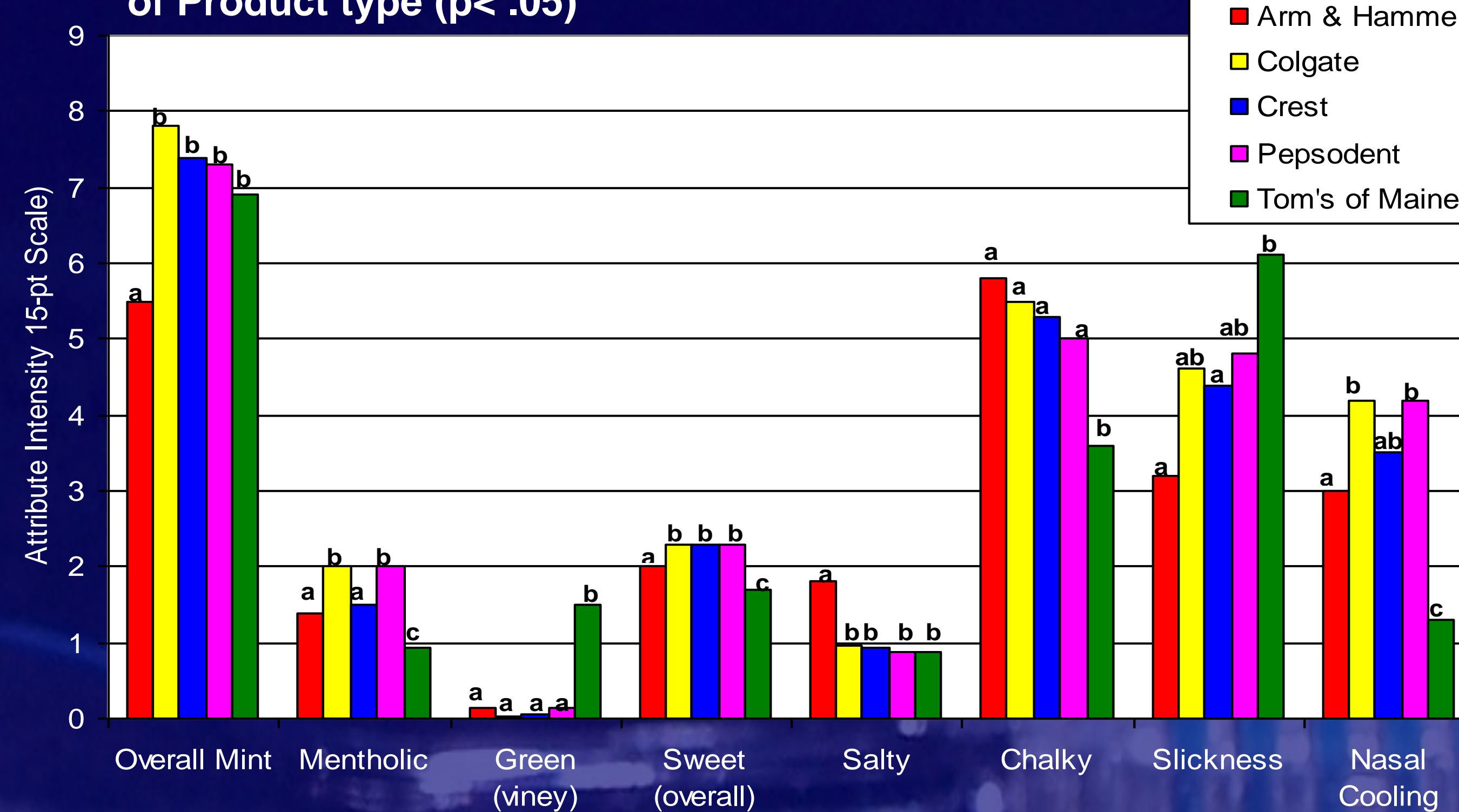
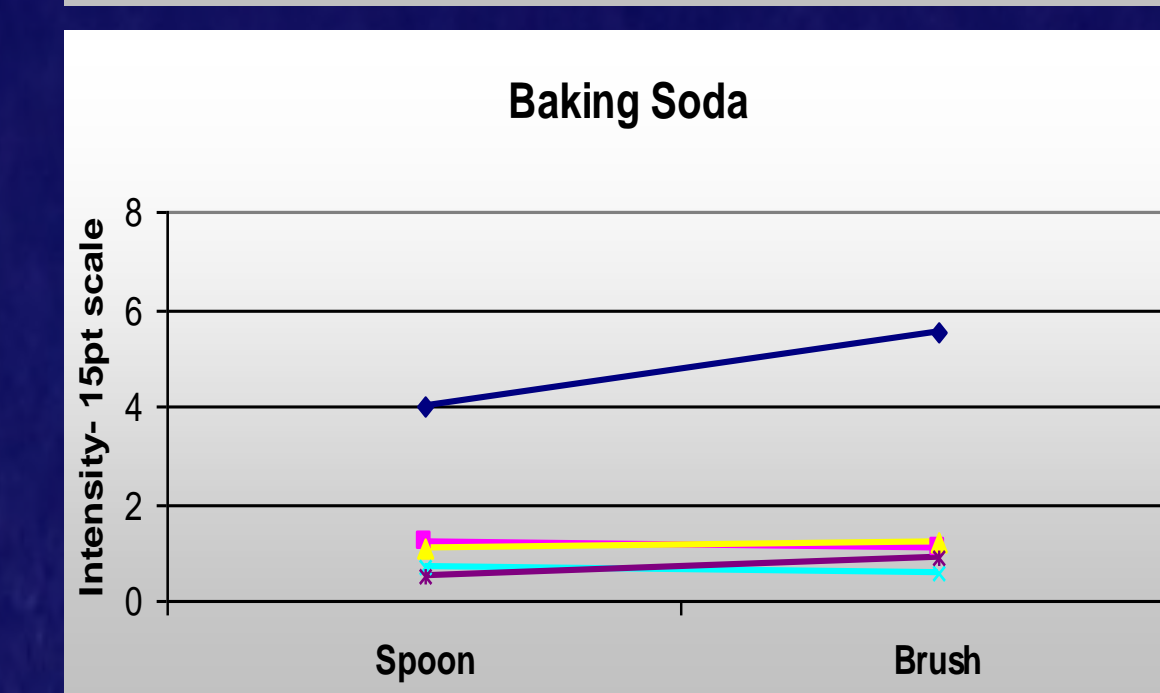
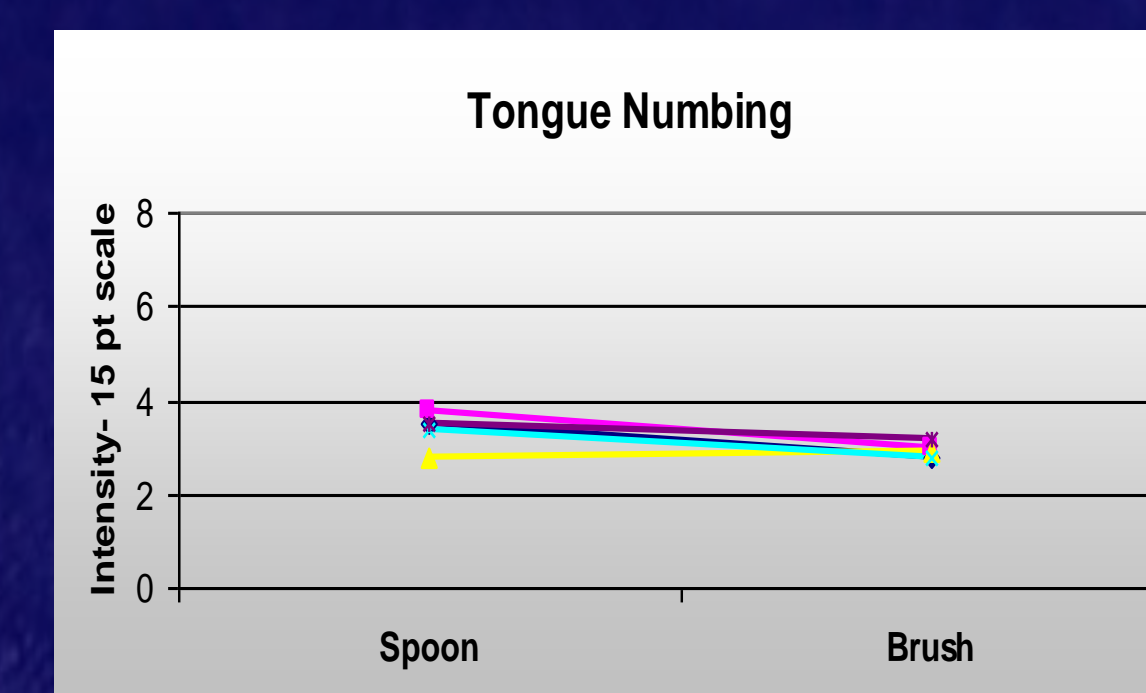
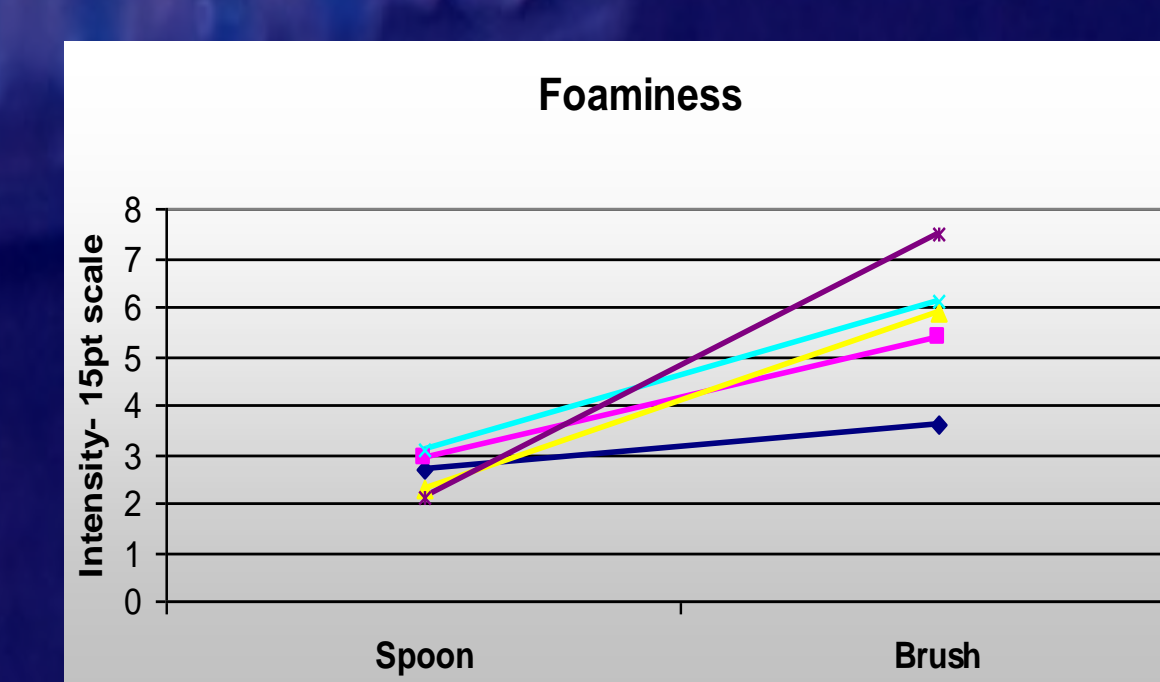
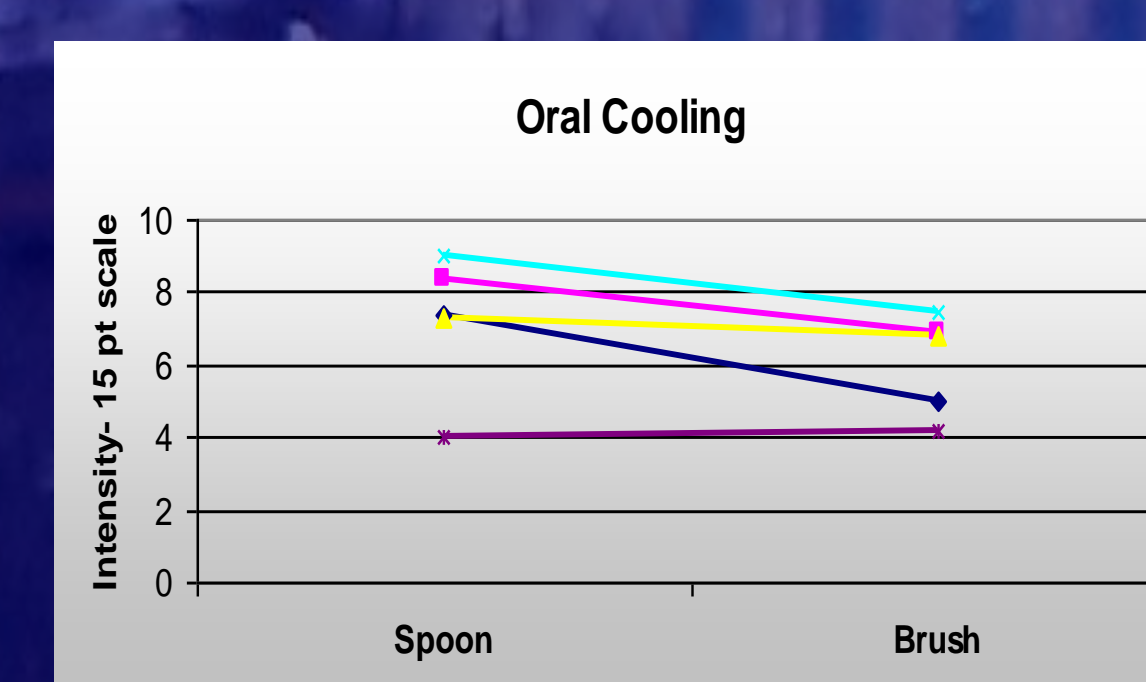
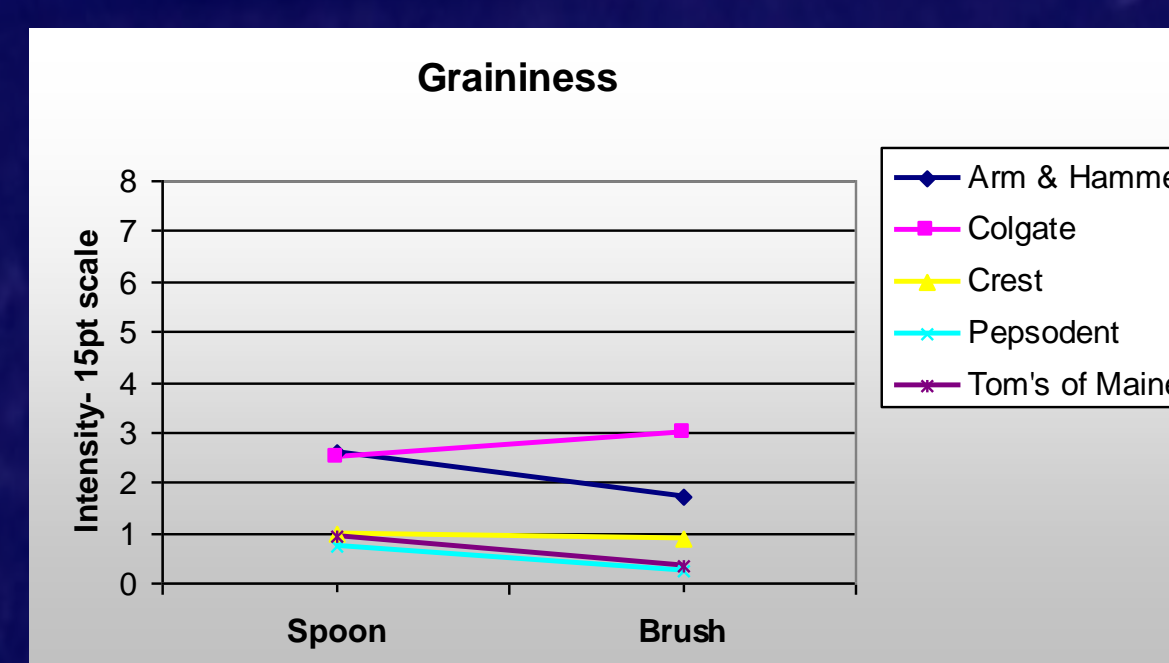


Table 1. LSMEANS for attributes with significant method effects ($P \leq 0.05$)

Attribute	Brush	Spoon
Burn	2.5a	3.3b
Overall Mint	5.9a	8.0b
Menthol	1.3a	1.8b
Bitter	1.9a	2.4b
Nasal Cooling	2.3a	4.2b
Burn after rinsing	3.1a	4.0b
Toothetch	4.8a	5.9b

Figures 2-6. Interaction Profile Plots



Product by Delivery Method Interaction

- The attributes influenced by an interaction of product and delivery method were graininess, foaminess, baking soda, oral cooling, and tongue numbing (Figures 2-6). In general, only one or two toothpastes had an impact on any given attribute where there was a product by method interaction.
- The product by method interaction effects suggest that differences may be the result of interactions of variations in product ingredients and the delivery method. Thus, researchers should take into account the natural differences of the ingredients of products prior to selecting a suitable method for descriptive sensory testing, most importantly for texture and mouthfeel attributes.

Summary/Applications

This research established that the delivery method of toothpaste during descriptive analysis has an impact on the flavor evaluations. It is possible to use an alternative such as a spoon for toothpaste evaluations with the understanding that key attributes such as cooling and mint flavor will be amplified. The spoon method can be useful in screening when there is a need to efficiently gather information on a myriad of similar products, but probably needs to be avoided in situations where products differ widely or key attributes are compromised.

The decision whether or not the spoon sampling method is appropriate depends on the objectives and key attributes of a study. Because the alternative spoon sampling method for toothpaste does not provide exactly the same information as a brushing method, researchers must give consideration to how an alternative will affect the outcome of the research.