

# How Sensory Cues Affect Snacking Behavior: A Case Study of Apples

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## Abstract

Snacking behavior among Americans is on the rise, with snacks often replacing full meals. As consumers are also becoming more health-conscious, demand for healthy snacking alternatives is increasing. In fact, fast food restaurants such as Subway, Wendy's, McDonalds and Chick-fil-a now offer fresh fruit as a side item, as an alternative to French fries or chips. Apples in particular are of interest because of their wide popularity and recent availability as a pre-sliced and individually packaged food item.

Our research aims to better understand the sensory cues of a variety of apples and how these cues affect behavior and snacking choices, with a specific focus on women and their children.

Descriptive analysis was conducted on 25 different apple varieties, including 3 pre-sliced and pre-packaged apples. Data was analyzed by PCA resulting in 4 flavor dimensions (26 flavor attributes) and 5 texture dimensions (20 texture attributes). From the results 3 apple varieties were selected to be shown to consumers in a Community Narrative Panel, preselected to be mothers of school-age children. These apple varieties were shown to consumers both raw and dried. Consumer discussion focused on sensory cues that suggest whether a product is good for their child, themselves, or both. Insight was gathered on the trade-off between convenience and taste.

Results from the descriptive and qualitative are two-fold; to provide insight as to which apple varieties are the best for convenience snacking, and to provide insight into consumer attitude and behavior terminology, which may be used for quantitative consumer questionnaires and other consumer testing.

## Objectives and Methodology

### Objectives

- To descriptively profile 25 varieties of fresh and pre-sliced apples, to understand sensory similarities and differences in terms of flavor and texture.
- To characterize snacking behavior in moms and their children in order to understand:
  - What are the needs a snack must fulfill for both mothers and their children.
  - How apples (fresh and dried) fill those needs and how they may better fill those needs – benefits and "trade-offs."
- To link consumer attitude and behavior language to descriptive language in terms of apple flavor and texture.

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### Methodology: Descriptive Analysis

- The samples were analyzed for flavor and texture by eight – ten members of the Sensory Spectrum Food Panel, trained in the Spectrum Method and experienced in flavor and texture evaluation.
- The strength of each attribute was rated on the 15-point Spectrum Scale, where 0 = none and 15 = very strong.
  - This scale incorporates the ability to use tenths of a point and therefore has the potential of 150 scale differentiations.
  - The scale may be expanded beyond 15 points to include extreme ratings if necessary.
- The panelists evaluated each sample using the following procedure:
  - Each panelist received four apples to evaluate flavor and a second set of four slices to evaluate texture. More sample was provided if necessary.
  - All samples were expectorated.
  - Panelists recorded individual ratings, then each attribute was discussed until a consensus was reached and recorded.
  - All samples were evaluated immediately after slicing, with the exception of the pre-sliced (bagged) apples.

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### Methodology: Community Narrative Panel

- Half day session on May 11, 2012 with the Sensory Spectrum Community Narrative Panel (SCAN) was held in New Providence, NJ.
- The participants (n=7) were members of our SCAN panel, led by a trained facilitator.
- SCAN panelists are a group of creative consumers who have built a community within their group. SCAN is used for describing and articulating properties using consumer language and techniques that probe beyond surface consumer attitudes, behaviors, and motivations.
- SCAN members may or may not be the user of a product or the ultimate target demographic, however all the participants were moms.

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## Results

### SCAN

#### SCAN Insights: Snacking with Apples

##### IN GENERAL

- Healthy, portable and sweet snack Moms like for themselves and their children
- The #1 choice for Moms, but some children dislike the skins and browned flesh
- Slices/pieces work well for smaller children: portion size & easy breakdown
- Alternatives to apples include berries, grapes, banana, oranges, and other hand-to-mouth snacks such as pretzels, popcorn, cookies and chocolate
- In order for kids to eat more apples, or to create a different flavor combination, apples are paired with peanut butter, yogurt, chocolate, cheese & crackers, nuts & pretzels.

##### FRESH APPLES

- Flavor and texture are key drivers of variety choice
- Children may not eat apple skins because they are thick, chewy or interfere with braces
- Some children won't eat apples that have turned brown because they are ugly or perceived to be bad/rotten

##### DRIED APPLES

- Panelists felt the sample apples were not dried enough, contributing to a rubbery, chewy, gummy and/or sticky texture. The shriveled edges and discoloration are also a turn-off to children.

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### Snacks for Self: Preference by Time of Day

Morning	Afternoon	Evening
<ul style="list-style-type: none"><li>More likely to be healthy (fruit or yogurt)</li><li>Energy giving (caffeine, protein)</li><li>Small portion</li><li>Quick and on-the-go</li><li>Portable/pre-packaged</li></ul>	<ul style="list-style-type: none"><li>Often a treat</li><li>May be eaten with the kids</li><li>"Me time" reward, before kids get home</li></ul>	<ul style="list-style-type: none"><li>Often dessert</li><li>Before bedtime snack, while watching TV</li></ul>
<b>Taste Preference:</b> salty or sweet, usually sweet	<b>Taste Preference:</b> salty or sweet, crisp/crunchy, chocolate	<b>Taste Preference:</b> sweet & soft or creamy, chocolate

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### Descriptive Analysis

#### Summary of Perceptual Maps

##### Factor Analysis Results of Flavor Profiles (79% variability explained)

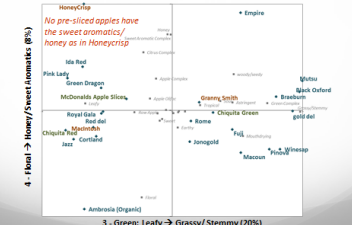
% Var	Factor Name	Low	High
34%	1. Sour/Tart → Other Fruity	Sour, tartness, citrus	Other Fruity, stone fruit, soft
21%	2. Chlorine → Apple	Chlorine	Raw Apple, sweet
20%	3. Green: Leafy → Stemmy	Leafy	Grassy/Stemmy
8%	4. Floral → Sweet Aromatics	Floral	Honey, Sweet Aromatics

##### Factor Analysis Results of Texture Profiles (76% variability explained)

% Var	Factor Name	Low	High
18%	1. Surface Rough → Surface Moist & Cohesive	Surface roughness	Surface moistness, Cohesiveness of taste
17%	2. Hard & Crisp	Soft, less dense	Hardness, denseness, Crispness
16%	3. Uniform → Fibrous, grainy & "Tough" skin	Uniform Bite/ Chew	Force to Grind/Peel/Seeds, Astringent Skin (Chewiness), Gravy
16%	4. Cohesive Bite → Moist & Juicy	Cohesive 1 <sup>st</sup> Bite	Moist Mass, Juiciness (8 & 10 chew)
12%	5. Chalky	No chalk	Chalky solids and mouthcoats

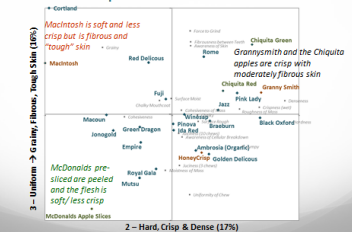
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#### Flavor Map: Factors 3 vs. 4



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#### Texture Maps: Factors 2 vs. 3



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### Linking Language

#### Consumer vs. Descriptive

Apple Variety	Consumer Terms	Descriptive Attributes
Granny Smith	Flavor: Tart, Bright, Earthy/Green Texture: Crunchy, Crisp, Juicy, Wet, Tough/Leathery Skin	Flavor: Raw apple, grassy, leafy, citrus, mineral/firm, more sour than sweet Texture: Hard, higher wet crisp, high awareness of skin
Honey Crisp	Flavor: Mild, sweet, sour, not tart, tastes like applesauce Texture: Crisp, thin skin, soft	Flavor: Raw apple, leafy, honey, more sweet than sour Texture: Higher wet crisp, lower awareness of skin, lower fibrousness b/w teeth
Macintosh	Flavor: Watered down, dusty/dull, not sweet Texture: Not crisp, mealy, soft, mushy, skin separates from flesh and is left in mouth	Flavor: Fermented and raw apple, citrus, floral, earthy Texture: Less hard but higher force to grind (skin), lower wet crisp, lower roughness of meat (grain)

Granny Smith and Honey Crisp are seen as good snacks for both adults and children (flavor and texture are liked). Macintosh is not seen as suitable, overall, mainly due to texture.

Honey Crisp may be the best choice, due to overall sweet and floral character.

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### Top Choices for Snacks

- Moms seek to fill emotional and functional needs with snacks.
- Moms want healthy and filling/satisfying snacks for their children, which are also portable (i.e. not messy "on-the-go").

	Moms	Children
1 <sup>st</sup> Choice	Chocolate <ul style="list-style-type: none"><li>Indulgent</li><li>Satisfying</li><li>Mood-enhancer</li></ul>	Fruit <ul style="list-style-type: none"><li>Healthy</li><li>Filling</li><li>Unlimited servings</li></ul>
2 <sup>nd</sup> Choice	Coffee <ul style="list-style-type: none"><li>Energy giving</li><li>Curbs appetite</li></ul>	Goldfish/Cereal <ul style="list-style-type: none"><li>Portable</li><li>Healthy</li></ul>

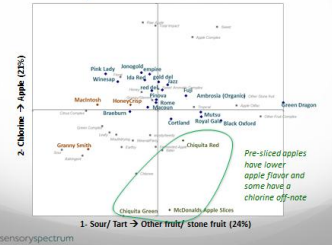
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### "Must-Haves" for Snacks

Moms	Children
<ul style="list-style-type: none"><li>Healthy</li><li>Part of a routine</li><li>A treat</li><li>"My time", "I deserve it"</li></ul>	<ul style="list-style-type: none"><li>"What I want my kids to eat"</li><li>"Early dinner" (filling snack after school)</li></ul>
<b>Specific foods:</b> <ul style="list-style-type: none"><li>Sweets (cakes, cookies)</li><li>Salty snacks (chips, pretzels, nuts)</li><li>Cheese and crackers</li><li>Cheese, cheese sticks</li><li>100-Calorie Packs</li></ul>	<b>Specific Foods:</b> <ul style="list-style-type: none"><li>Cheese and crackers</li><li>Cheese, cheese sticks</li><li>Heated items (pizza rolls, chicken fingers, etc.)</li><li>Granola bars</li><li>Sweets</li><li>Pudding</li></ul>
<ul style="list-style-type: none"><li>Moms seek to fill emotional and functional needs with snacks.</li><li>Moms want healthy and filling/satisfying snacks for their children, which are also portable (i.e. not messy "on-the-go").</li></ul>	

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#### Flavor Map: Factors 1 vs. 2



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## Conclusions

- Moms do not perceive dried apples to have any benefits over pre-sliced apples.
- Pre-sliced apple flavor should be improved – should have characteristics of Honey Crisp or similar apples.
- There is room to grow in the pre-sliced apple category in terms of flavor improvement.
- Pre-sliced apples can be improved as snacks by providing dipping sauce (e.g. chocolate, caramel, yogurt). This appeals to both moms and children.

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