Personality traits: An important consideration while predicting hedonic rating and preference rank for basic taste solutions based on intensity perception and emotional responses

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Background
Objective
Approach
Results
Key takeaways
Where are we headed?
Thought starter!
Background

Objective

Approach

Results

Key takeaways

Where are we headed?
“The failure rate for new product introduction in the retail grocery industry is 70-80 percent.” – Dr. Inez Blackburn (Professor, University of Toronto)

- Multisensory attribute perception
- Emotional experience or food/beverage-evoked emotions

(Hall & Wengel, 2014; Blackburn, 2008; Hirschman & Holbrook, 1982)
Previous research

1. Self-reported questionnaires
2. Facial expression analysis
3. Autonomic nervous system responses
Do all consumers “feel” the same way?

“Emotional expression could vary with personality traits”
- (Riggio & Riggio, 2002)
Emotion, personality & taste intensity

Taste intensity

Associated with liking

Emotional responses

Personality trait

✓ Brain activation research
✓ Self-reported emotions
✓ For e.g. “alexithymia”

Still unclear

(Samant et al., 2017; Heshmati & Azmoodeh, 2017; Zverev & Mipando, 2008; Canli 2004)

Associated

Emotion, personality & taste intensity

Still unclear

Taste intensity

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Personality trait

✓ Brain activation research
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(Samant et al., 2017; Heshmati & Azmoodeh, 2017; Zverev & Mipando, 2008; Canli 2004)
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Key takeaways

Where are we headed?
Determine whether contributions by taste intensity and evoked emotions to prediction models of overall liking and preference rank among basic taste solutions could differ as a function of individuals’ personality traits.
**Approach**

**Orientation**

**Sample**

**Basic taste solutions:**
1. Sucrose (*sweet*)
2. Citric acid (*sour*)
3. Sodium chloride (*salty*)
4. Caffeine (*bitter*)
5. Water

<table>
<thead>
<tr>
<th>Taste quality</th>
<th>Concentration level</th>
<th>Universal scale rating</th>
<th>Concentration (% w/v)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweet</td>
<td>Low</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Sweet</td>
<td>High</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Sour</td>
<td>Low</td>
<td>5</td>
<td>0.10</td>
</tr>
<tr>
<td>Sour</td>
<td>High</td>
<td>10</td>
<td>0.15</td>
</tr>
<tr>
<td>Salty</td>
<td>Low</td>
<td>5</td>
<td>0.35</td>
</tr>
<tr>
<td>Salty</td>
<td>High</td>
<td>10</td>
<td>0.55</td>
</tr>
<tr>
<td>Bitter</td>
<td>Low</td>
<td>5</td>
<td>0.08</td>
</tr>
<tr>
<td>Bitter</td>
<td>High</td>
<td>10</td>
<td>0.15</td>
</tr>
</tbody>
</table>

**Hedonic response:**
- Self-reported (EsSense25)
- ANS responses (HR, ST, SC)
- Facial expressions

**Intensity response:**
15 cm line scale

**RANK PREFERENCE**

**Big Five Inventory**

*(Nestrud et al., 2016; John, Donahue & Kentle, 1991)*
Building prediction models

Sensory attribute perception measure

Taste intensity

Evoked-emotion response measures

Facial expressions analysis

Autonomic nervous system response

Self-reported emotion questionnaire

Overall liking (rating)

Multiple linear regression analysis

Preference rank (choice)

Logistic ordinal regression analysis

JMP Pro® 13 (SAS Institute, Cary, NC)
- Stepwise model
- Probability to enter: 0.25
- Probability to leave: 0.05
# Building prediction models

## Model comparison parameters

**Multiple linear regression (overall liking)**: $R^2_{adj}$, RMSE, $Cp$, $p$, AICc, BIC

**Ordinal logistic regression (preference rank)**: $R^2$, $-log-likelihood$, AICc, BIC

<table>
<thead>
<tr>
<th>Model code</th>
<th>Dependent variable</th>
<th>Independent variables</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Overall liking/Preference rank</td>
<td>Taste intensity</td>
</tr>
<tr>
<td>2</td>
<td>Overall liking/Preference rank</td>
<td>Self-reported</td>
</tr>
<tr>
<td>3</td>
<td>Overall liking/Preference rank</td>
<td>FE</td>
</tr>
<tr>
<td>4</td>
<td>Overall liking/Preference rank</td>
<td>ANS</td>
</tr>
<tr>
<td>5</td>
<td>Overall liking/Preference rank</td>
<td>Taste intensity, Self-reported</td>
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<td>6</td>
<td>Overall liking/Preference rank</td>
<td>Taste intensity, FE</td>
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<td>7</td>
<td>Overall liking/Preference rank</td>
<td>Taste intensity, ANS</td>
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<tr>
<td>8</td>
<td>Overall liking/Preference rank</td>
<td>Self-reported, FE</td>
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<td>10</td>
<td>Overall liking/Preference rank</td>
<td>FE, ANS</td>
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<td>Taste intensity, Self-reported, FE</td>
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<td>Taste intensity, Self-reported, ANS</td>
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<td>Taste intensity, FE, ANS</td>
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<td>14</td>
<td>Overall liking/Preference rank</td>
<td>Self-reported, FE, ANS</td>
</tr>
<tr>
<td>15</td>
<td>Overall liking/Preference rank</td>
<td>Taste intensity, Self-reported, FE, ANS</td>
</tr>
</tbody>
</table>

**Cohen’s $f^2$**

$$f^2 = \frac{(R^2_{adjAB} - R^2_{adjA})}{(1-R^2_{adjAB})}$$

**Key:**
- 0.15: small diff.
- 0.20: moderate diff.
- 0.35: large diff.
Contribution of facial expressions:
Cluster N versus Cluster E

**CLUSTER N**
(High Neuroticism)

- Self-reported emotion questionnaire
- Facial expressions analysis

$R^2_{adj} = 0.42$

Cohen's $f^2 = 0.21$

**CLUSTER E**
(High Extraversion)

- Self-reported emotion questionnaire
- Facial expressions analysis

$R^2_{adj} = 0.48$

Cohen's $f^2 = 0.02$

0.15: small difference; 0.20: moderate difference; 0.35: large difference
Contribution of taste intensity: Cluster N versus Cluster E

**Cluster N** (High Neuroticism)
- Self-reported emotion questionnaire
- Taste intensity
- Cohen’s $f^2 = 0.12$
- $R^2_{adj} = 0.42$

**Cluster E** (High Extraversion)
- Self-reported emotion questionnaire
- Taste intensity
- Cohen’s $f^2 = 0$
- $R^2_{adj} = 0.48$

0.15: small difference; 0.20: moderate difference; 0.35: large difference
Optimal model: Overall liking

- Sensory attribute perception measure
  - Taste intensity

- Evoked-emotion response measures
  - Facial expressions analysis
  - Autonomic nervous system response
  - Self-reported emotion questionnaire
Optimal model: Overall liking

- Highest $R^2_{adj}$ (0.54)
- Lowest RMSE (1.49)
- Lowest AICc (1103.46)
- Lowest BIC (1146.82)

CLUSTER N
(High Neuroticism)

- Highest $R^2_{adj}$ (0.49)
- Lowest RMSE (1.53)
- Lowest AICc (1383.72)
- Lowest BIC (1410.81)

CLUSTER E
(High Extraversion)
Why these personality-induced differences in prediction models?

1. Emotion expressiveness

High Extraversion: more explicit
High Neuroticism: less explicit, more implicit

Self-reported questionnaires

More explicit

Facial expression analysis

More implicit

(Verduyn & Brans, 2012; Rigio & Rigio, 2002)
Why these personality-induced differences in prediction models?

Predisposition to emotional valence

High Extraversion: predisposed toward positive emotions
High Neuroticism: predisposed toward negative emotions

Self-reported questionnaires
Measures higher # of positive emotions

Facial expression analysis
Measures higher # of negative emotions

(Verduyn & Brans, 2012; Rigio & Rigio, 2002)
Key Takeaways

➢ Personality traits should be taken into consideration in applied emotion research.

➢ Prediction models of overall liking and preference rank toward taste stimuli can vary as a function of personality traits.

➢ Facial expressions of emotions and taste intensity contributed more to the prediction model for participants with higher levels of neuroticism, while their contributions to the model developed for participants with higher levels of extraversion was minimal.
Where are we headed?

Orientation

Samples

Commercially available vegetable juices

Emotional response:
- Self-reported
- ANS responses
- Facial expressions

Intensity response:
15 cm line scale

Hedonic response:
9-point hedonic scale

Rank preference

Big Five Inventory

Purchase behavior
Personality traits: An important consideration while predicting hedonic rating and preference rank for basic taste solutions based on intensity perception and emotional responses

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Image Sources

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