A comparison of two rapid methods for dynamic sensory profiling: TDS and Temporal CATA

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My Goal for this Presentation

I want to make you curious about temporal sensory methods and what they do and don’t deliver. Especially Temporal Check-All-That-Apply, the method that I’m about to present.

I want you to become interested in its potential, to want to play with it, and to get real benefit from it in your work.

I also want you to learn from it, criticize it, tweak it, and to try to improve it. Then I want for you, and I, to take what we’ve learned and to create new methods that surpass it, so that we can throw it away, and start again with something even better.
How do Flavors evolve in this product
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Flavor Profile method
(cf. Caul, 1957)
Order of elicitation of Flavor characteristics is one aspect of the characterization of complex food... especially important is the early development of appropriate sensations.
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Temporal Dominance of Sensations (TDS) (Pineau et al., 2009) “...the new sensation popping up at a given time...”
TDS

Data provides a sequence of dominant sensations over time.
Check-All-That-Apply (CATA)

From the following list, check the words that describe the orange juice that you just tasted (check all that apply).

- Astringent
- Sourness
- Sweetness
- Off Flavor
- Bitterness
- Orange Flavor
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Temporal Check-All-That-Apply (TCATA)

• Extends CATA to continuously track sensory properties.
• Builds on earlier methods (Flavor Profile, TDS, ...)
• Could be used by trained assessors or consumers.
Temporal CATA

Check and uncheck words to track changes in the orange juice. At each moment, the words that are checked should describe the orange juice (check all that apply, in that moment).

Astringent
Sourness
Sweetness
Off Flavor
Bitterness
Orange Flavor
Temporal CATA

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- Off Flavor
- Orange Flavor
- Sourness
- Sweetness
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TQT is highly similar to TDS. The authors find evidence of assessors processing sensations in parallel.

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Temporal Dominance of Sensations (TDS) (Pineau et al., 2009)
“...the new sensation popping up at a given time...”
<table>
<thead>
<tr>
<th><strong>Respondent’s task</strong></th>
<th><strong>TDS</strong></th>
<th><strong>TCATA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicate the dominant attribute at each moment</td>
<td>Describe the sample at each moment</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Underlying model for processing sensations</strong></th>
<th><strong>TDS</strong></th>
<th><strong>TCATA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequential, slow</td>
<td></td>
<td>Sequential Parallel</td>
</tr>
</tbody>
</table>

<table>
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<tr>
<th><strong>Data</strong></th>
<th><strong>TDS</strong></th>
<th><strong>TCATA</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Multinomial (often treated as binomial for simplicity)</td>
<td></td>
<td>Binomial (straightforward statistics)</td>
</tr>
</tbody>
</table>
TCATA @ Sensometrics 2014
Orange Juice Study
(March 2014)

TDS consumers

TCATA consumers

Each panel evaluated the same 6 orange juices
Orange Juice Study
(March 2014)

TCATA consumers

6 orange juices
Orange Juice Study
(March 2014)

Did consumers check multiple attributes?

Did consumers uncheck attributes?

TCATA consumers

6 orange juices
Number of concurrent attributes selected by consumers in the TCATA orange juice evaluation
Odds

1.4 : 1
3 key findings:
TDS – TCATA
1. TCATA and TDS orange juice profiles are similar for several juices.

This tells us that both methods are capturing “signal” (not just noise).
Results for Orange Juice 4

TDS

TCATA
2. TDS shows a “kingmaker effect”.

We gain information about one attribute, at the expense of other attributes.
TDS Results for Orange Juice 2

![Graph showing the dominance rate of various flavors over time for Orange Juice 2. The graph includes lines for Astringent, Bitterness, Orange flavor, Soursness, Off flavor, and Sweetness. The y-axis represents the dominance rate, and the x-axis represents time in seconds. The graph shows an increase in the dominance rate of Orange flavor over time, reaching a peak around the 15-second mark, and then slowly decreasing. The 'chance' level is indicated by a horizontal line.](image-url)
TDS Results for Orange Juice 2

The graph shows the dominance rates of various tastes over time. The y-axis represents the dominance rate, ranging from 0.0 to 1.0. The x-axis represents time in seconds, ranging from 0 to 20. The graph includes lines for Astringent, Bitterness, Off flavor, Orange flavor, Sourness, and Sweetness. The line for Orange flavor is highlighted and shows a peak around the 10-second mark, suggesting it increases significantly during this time period.
TCATA allows multiple attribute selection so there is no "kingmaker effect".

We gain information about secondary attributes, at the expense of the primary attribute.
TCATA Results for Orange Juice 2

The chart above shows the proportion of different attributes over time for Orange Juice 2. The attributes include Astringent, Bitterness, Off flavour, Orange flavour, Sourness, and Sweetness. The y-axis represents the attributes, and the x-axis represents time. The color gradient on the right indicates the proportion, with darker shades representing higher proportions.
TCATA Results for Orange Juice 2

The diagram shows a heat map with attributes on the y-axis (Astringent, Bitterness, Off flavour, Orange flavour, Sourness, Sweetness) and time on the x-axis (0 to 20). The proportion is indicated by color intensity, with darker shades representing higher proportions. The x-axis values are not explicitly labeled, but they can be inferred from the context and the range of values on the y-axis.
3. TDS is affected by a “damping effect”.

Due to competition, the importance of several attributes is obscured.
TDS Results for Orange Juice 5

![Graph showing the dominance of various flavors over time.]

- Astringent
- Bitterness
- Off flavor
- Orange flavor
- Soursness
- Sweetness

The graph indicates the change in dominance over time, with a focus on the highlighted area showing the progression of various flavors.
In TCATA, there is no “damping effect”.

TCATA Results for Orange Juice 5

Citations vs Time for Different Flavors:
- Astringent
- Bitterness
- Off flavor
- Orange flavor
- Sourness
- Sweetness
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TQT method is highly similar to, but with more control than, TDS. The authors find evidence of assessors experiencing sensations in parallel, suggesting a limitation with TQT.

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Thank you for your attention!

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