Individual Variation in perception: Relative effects of PROP and Thermal Taster Status

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Introduction: Individual variation in perception

Individual Variation in perception:
- Age
- Gender
- Ethnic Origin
- Experience
- Environment
- Phenotypes
PROP Taster Status (PTS)

**PROP Taster Status:**
- Supertaster (pST)
- Medium taster (pMT)
- Nontaster (pNT)

**TAS2R38:**
- pST: PAV/PAV
- pMT: PAV/AVI
- pNT: AVI/AVI

**Fungiform papillae:**
- pST: 98±5/cm²
- pMT: 73±5/cm²
- pNT: 54±5/cm²

**Sensory perception:**
- pST perceive taste and texture stimuli more intensely

Source: www.bbc.co.uk/science

Thermal Taster Status (TTS)

Thermal Taster (TT)

‘Phantom’ Taste

Temperature

Temperature Alone

Thermal non-taster (TnT)

Cruz & Green (2000), Thermal Stimulation of Taste
Objectives

Examine the impact of TTS and PTS on perception:

• Detection thresholds
• Intensity perception at supra-threshold levels
• Across a range of gustatory, trigeminal and olfactory

Investigate the relative effects of TTS and PTS on oronasal sensitivity
**TTS and PTS Screening**

**Thermal Taster Status (TTS)**

1) Pathway Pain and Evaluation System (Medoc, Israel)

2) Thermode in use.

3) Thermode top

**PROP Taster Status (PTS)**

- Single solution of 0.32mM PROP was used (cotton bud) - gLMS scale

Detection Threshold Measurement

Subjects:
- 89 to 100 volunteers participated

Stimuli:
**Taste modality**
- Sucrose
- Sodium chloride
- Caffeine

**Trigeminal modality**
- Capsaicin
- WS3

**Olfactory modality**
- Ethyl butyrate (retronasal)
- Isoamyl acetate (retronasal)

Method:
- ASTM E679 Standard

Which sample is different from the other two?
Measuring perceived intensity (supra-threshold)

Subjects:
• 112 volunteers participated

Stimuli:
Taste Modality
• Sucrose
• Sodium chloride
• Caffeine
• Citric acid

Trigeminal Modality
• Capsaicin
• Temperature

Olfactory Modality
• Ethyl butyrate
  ▪ Retronasal
  ▪ Orthonasal
• Two concentrations: Low and High

Method:
• Saturated cotton buds
• Rating intensity on gLMS scale
• Training on scale use
• Data was log transformed
Data Analysis

• One-way ANOVA was used to examine the difference within each phenotype

• Chi-square and two-way ANOVA were used to examine the relationship and interactions between the two phenotypes.
Results: Detection threshold - TTS

- TTs have a significantly lower sucrose threshold than TnTs
- No clear trend was observed for any other stimuli.
Perceived Intensity Rating (Supra-threshold) - **TTS**

**Individual Attribute:**

- TTs generally rated higher than TnTs for most stimuli

**By modality:**

- TTs rated taste and trigeminal sensations significantly higher, but not aroma intensity
- No clear trend was observed.
• pST rated intensities significantly higher than pNT

• Ratings: ST>MT>NT
Relative effect of TTS and PTS on perceived Intensity Ratings

Relationship between TTS and PTS groupings (Chi-square):
• No significant correlation was observed between TTS and PTS classification indicating they are independent phenotypes.

Interaction between TTS and PTS:
• Two-way ANOVA on each modality revealed:
  ✓ Significant interaction on Taste modality (p<0.05) and approaching significant interactions on both trigeminal and olfactory modality (p<0.1).
• Further data analysis was applied by comparing TTS at each PROP taster group
Relative effect of **TTS** and **PTS** on perceived Intensity Ratings

**Highlight:**
- pMT are upgraded to ST status if they are TT
Possible mechanisms for altered perception in TTS

- 'phantom taste'
- Increased intensity perception
- Limited effect on aroma perception

In taste bud: Trigeminal nerves and taste nerves are intertwined.
**Possible explanation of relative effect of PTS and TTS**

<table>
<thead>
<tr>
<th>Within PROP Supertaster</th>
<th>Within PROP medium-taster</th>
<th>Within PROP non-taster</th>
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<tbody>
<tr>
<td><strong>TTS Impact on intensity:</strong> TT&lt;TnT</td>
<td><strong>TTS Impact on intensity:</strong> TT&gt;TnT</td>
<td><strong>TTS Impact on intensity:</strong> No clear trend</td>
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<td><strong>Number of FP:</strong></td>
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<tr>
<td>- No further increase in perception for these already supersensitive individuals?</td>
<td>- TTs add on to perceived intensity of oral stimuli</td>
<td>- Limited impact of TTS on perceived intensity</td>
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Source: www.bbc.co.uk/science
Summary

• TTs have an increased perception to oral stimuli, while not for aroma, suggests the mechanism of TTS may at the periphery.

• No significant correlation between TTS and PTS classification.

• However, pMT TT shows as sensitive as pST, this could be linked with number of fungiform papillae.

• This study has advanced our understanding of how combinations of different phenotypes can affect oronasal sensitivity.

• Further studies will be looking at how such variation might influence food intake behaviour and food preference.
Thank you

Questions?

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