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The Relationship between Sweet Taste Perception and Dietary Intake

A thesis presented in partial fulfilment of the requirements for the degree of

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New Zealand

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Abstract

Background: Since the late 20th century, a high sugar intake has been related to the increased prevalence of obesity and non-communicable diseases like Type-2 diabetes, and some forms of cancer. Therefore, there is an urgent call to reduce sugar intake worldwide. Many studies have suggested that sweet taste perception plays an important role in the dietary intake of sugar. However, limited studies investigate this and conflicting results are found.

Aim: To better understand the link between sweet taste perception and dietary intake in healthy women

Methods: The current study included 44 healthy New Zealand European women aged 20 to 40 years. Their sweet taste intensity and hedonic liking were assessed via general Labelled Magnitude Scales (gLMS) at glucose solutions of 125mM, 250mM, 500mM, and 1000mM concentrations (20 °C). Their current dietary intake was assessed via a four-non-consecutive-day weighed food record.

Results: Results showed that the sweet taste intensity and hedonic liking are positively correlated at 125mM (r = 0.540; p < 0.001) and negatively correlated at 500mM (r = -0.748; p < 0.001) and 1000mM (r = -0.764; p < 0.001) concentration of glucose solutions. Moreover, sweet taste intensity perceived at 1000mM glucose concentration was negatively correlated with dietary intake of total energy (r = -0.403; p = 0.009), carbohydrates (r = -0.449; p = 0.003), total sugars (r = -0.421; p = 0.006), glucose (r = -0.411; p = 0.008), fructose (r = -0.408; p = 0.008), and maltose (r = -0.325; p = 0.038). Also, the sweet hedonic liking at 1000mM glucose concentration was positively correlated with dietary intake of total energy (r = 0.324; p = 0.039), carbohydrates (r = 0.360; p = 0.021), total sugars (r = 0.437; p = 0.004), glucose (r = 0.418; p = 0.007), fructose (r = 0.391; p = 0.012), and maltose (r = 0.463; p = 0.002).

Conclusion: These results suggest an important link between sweet taste perception and dietary intake and support the theory that people who are more sensitive to sweet taste require a lower level of sweetness to achieve equal satisfaction, thus consume less sweet foods and beverages than those who are less sensitive to sweet taste.
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## Abbreviations

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<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AMDRs</td>
<td>Acceptable Macronutrient Distribution Ranges</td>
</tr>
<tr>
<td>AMPM</td>
<td>Automated Multiple-Pass Method</td>
</tr>
<tr>
<td>BIA</td>
<td>Bioelectrical Impedance Assessment</td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
</tr>
<tr>
<td>CHO</td>
<td>Carbohydrates</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence Interval</td>
</tr>
<tr>
<td>CRD</td>
<td>Chronic Respiratory Diseases</td>
</tr>
<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>DP</td>
<td>Degree of Polymerization</td>
</tr>
<tr>
<td>FFQ</td>
<td>Food Frequency Questionnaire</td>
</tr>
<tr>
<td>gLMS</td>
<td>General Labelled Magnitude Scale</td>
</tr>
<tr>
<td>GPCR</td>
<td>G-Protein Coupled Receptors HDL</td>
</tr>
<tr>
<td></td>
<td>High-Density Lipoprotein</td>
</tr>
<tr>
<td>IP3</td>
<td>Inositol-Trisphosphate</td>
</tr>
<tr>
<td>IP3R3</td>
<td>Isoform 3 of the IP3 Receptor</td>
</tr>
<tr>
<td>LDL</td>
<td>Small Dense Low-Density Lipoprotein</td>
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<tr>
<td>LMS</td>
<td>Labelled Magnitude Scale</td>
</tr>
<tr>
<td>MoH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>NCDs</td>
<td>Non-Communicable Diseases</td>
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<tr>
<td>TRPM5</td>
<td>Transient Receptor Potential M5</td>
</tr>
<tr>
<td>PLC-β2</td>
<td>Phospholipase C-B2</td>
</tr>
<tr>
<td>RCTs</td>
<td>Random Controlled Trials</td>
</tr>
<tr>
<td>SEM</td>
<td>Standard Error of the Mean</td>
</tr>
<tr>
<td>SSBs</td>
<td>Sugar-Sweetened Beverages</td>
</tr>
<tr>
<td>T2D</td>
<td>Type 2 Diabetes</td>
</tr>
<tr>
<td>TRCs</td>
<td>Taste Receptor Cells</td>
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<tr>
<td>USDA</td>
<td>United States Department of Agriculture</td>
</tr>
<tr>
<td>VAS</td>
<td>Visual Analogue Scale</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
<tr>
<td>%E</td>
<td>Percent of Total Energy Intake</td>
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