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The effect of colour on the perception of sweetness in non-alcoholic beverages and its potential applications in healthcare

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- **Background.** Reducing sugar consumption is a core task to decrease the risk impacting heart attack and stroke derived from higher blood pressure, weight gain, diabetes, and fatty liver disease. Therefore, innovative principles of reduced sugar intake are of particular importance. Our study is elaborated within the framework of cross-modal perception where systematic links between different perceptual domains are experimentally explored.

- **Aim.** The first aim of the current study is to determine the impact of colour on the perception of sweetness. The second aim is to elaborate principles enabling to reduce the amount of sugar without decreasing the flavour enjoyment.

- **Methods.** In a between-group quasi-experimental setting hedonic, associative, and emotional ratings were measured regarding different colours and two different containers (n1=67, n2=63); additionally, the taste of two non-sweetened coloured drinks (Ūdenāde) were tested (n=32).

Experiment 1 N=67, online



Experiment 2 N=63, online



Experiment 3 N=32, co-present

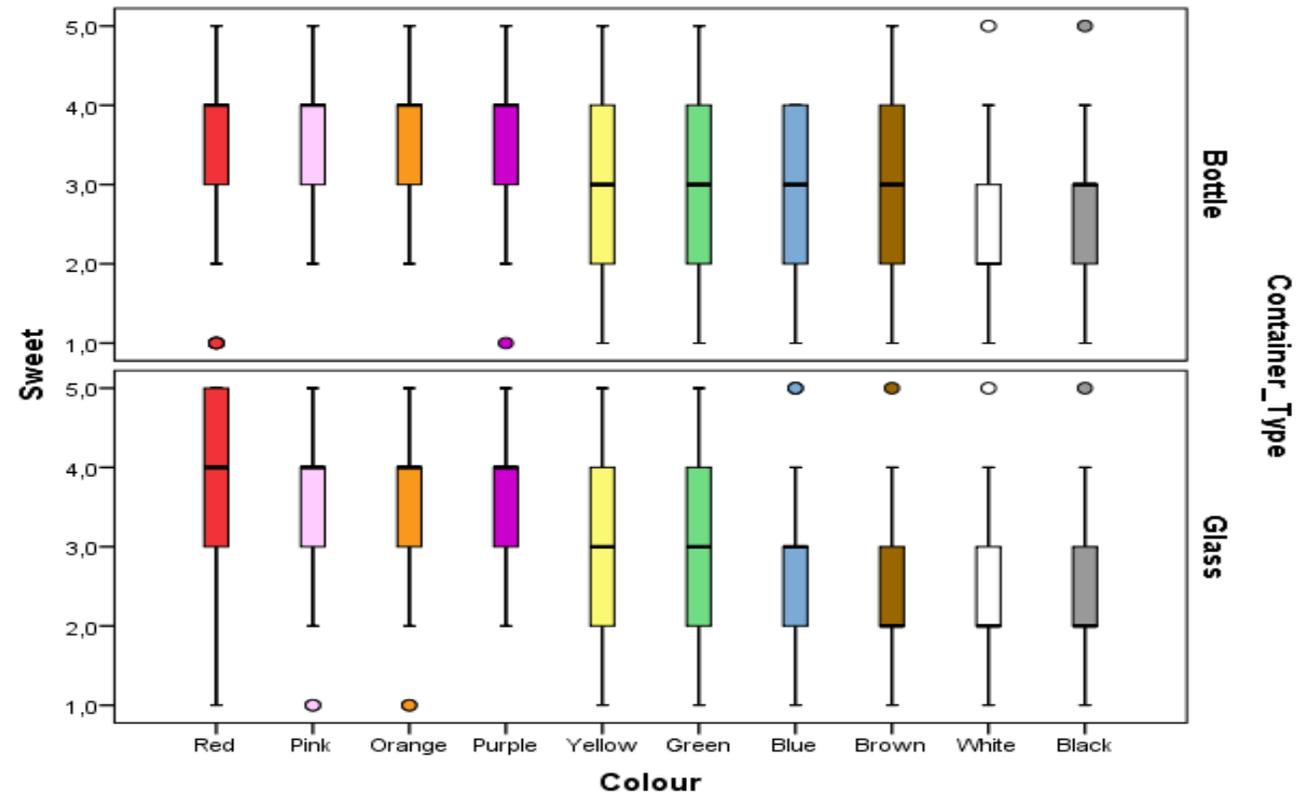


Results

- According to Likert 5-point scale **red**, **pink**, **orange**, and **purple** (average values 3.7, 3.7, 3.6 and 3.6) were the colours with the highest ratings of sweetness.
- These were followed by yellow and green with relatively similar proportions of participants agreeing/disagreeing about the statement that the visually presented drink is sweet (average values 3.1 and 3.0).

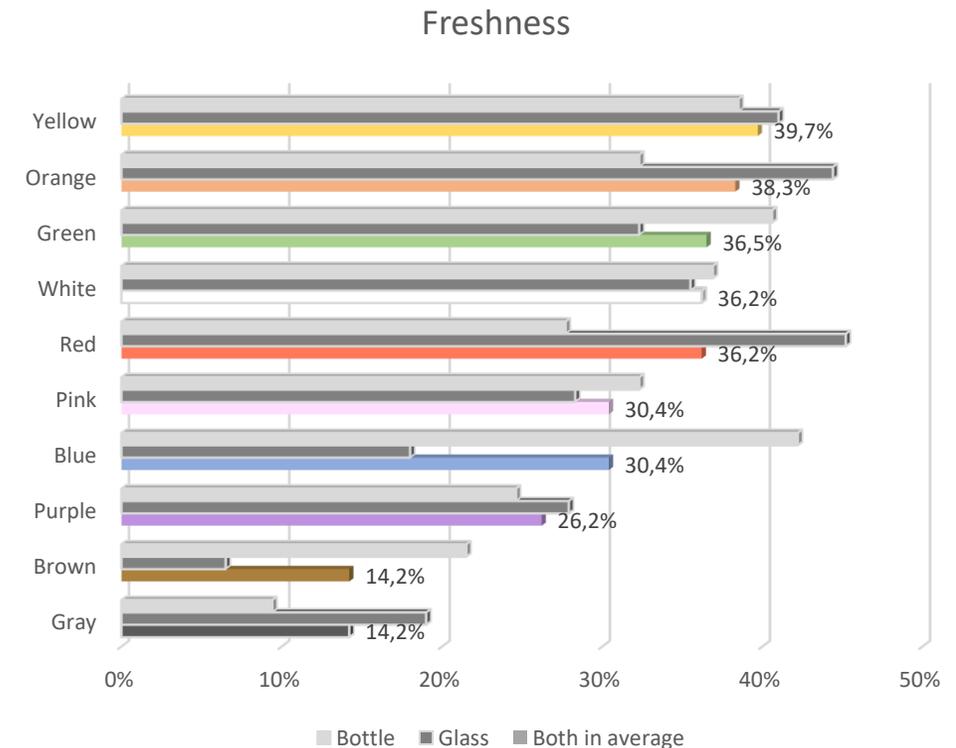
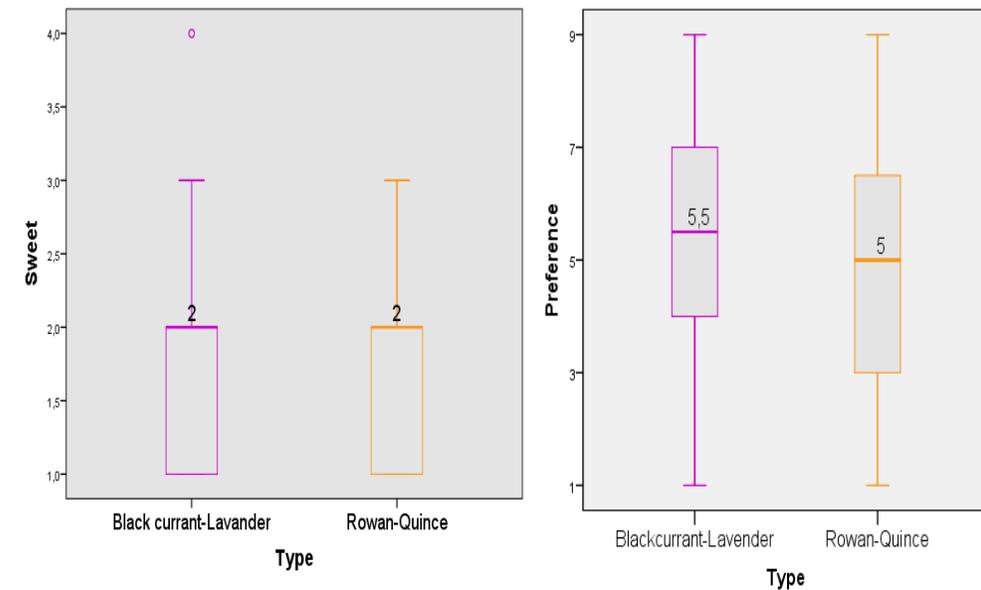
	Bottle	Glass	Average
Red*	3,508	3,903	3,701
Pink	3,754	3,600	3,680
Orange	3,631	3,540	3,586
Purple	3,585	3,541	3,563
Yellow	3,092	3,033	3,063
Green	3,031	3,016	3,024
Blue	2,719	2,770	2,744
Brown*	2,877	2,339	2,614
White	2,508	2,484	2,496
Black	2,531	2,365	2,449

*Significant difference ($\alpha=0,05$, ANOVA, Tukey) depending on container type



Results

- When testing the gustatory perception, the drinks were not evaluated as sweet 90% (Black currant-Lavander) and 75% (Rowan-Quince) subjects disagreed with the statement that the drink is sweet; average values 1.6 and 1.7).
- However, the rating on a 9-point hedonic scale indicated that the drink evaluated as less sweet is more preferred (average values 5.1 and 4.7).
- Also, the sense of **freshness** modulates the likeability of the flavour. 40% of participants indicate this as an important feature for non-alcoholic beverages.
- The most refreshing colours for drinks are yellow, orange, red, white, and green (referred by 35–40 % participants as refreshing).
- When testing the gustatory perception 50% of participants evaluated Black currant-Lavander drink as fresh and 55% perceived Rowan-Quince drink as fresh.



Conclusions

- Applying orange and red, as well as pink and purple to non-alcoholic beverages can provide some crossmodal sense of sweetness.
- Green, yellow and white colours might increase the sense of refreshment.
- These two general findings can be used to improve the design of healthy food.

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