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Single vs. multiple evaluations of satisfaction paired with Just-About-Right scales on full portions of beer at home



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Introduction and Objective

- ✓ Consumers' responses are usually collected retrospectively after consumption of a product in home use tests, which requires the consumers to recall their perceptions on aromas or tastes.
- ✓ Eating and drinking experiences are rather variable during consumption of the full portion, which implies the importance of collecting data over different periods of consumption.
- ✓ The objective of this study was to determine if a 3-step multiple evaluation with full consumption of a product can provide additional information compared to a single evaluation after full consumption in home use tests.

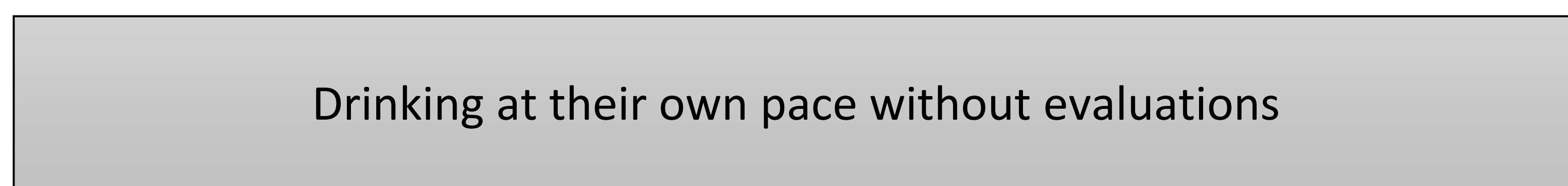
Materials and Methods

Test design

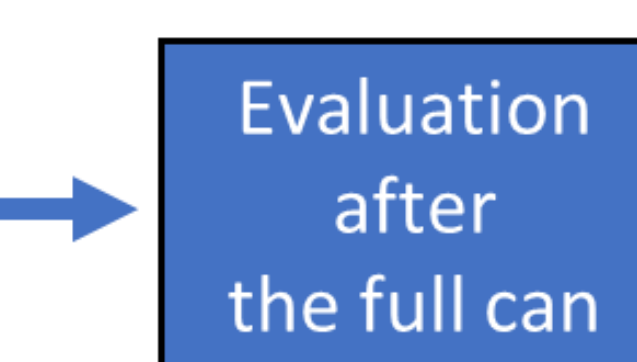
- ✓ A total of 447 Japanese beer consumers were recruited to taste four beers, whose alcohol by volume was 5% (P1), 0.5% (P2), 0.5% (P3), and 0% (P4), each one on a different day at home.
- ✓ P1 and P2 were tested twice (P1_rep, P2_rep) by each consumer without letting them know that they were the same (i.e., different sample codes). Therefore, the consumers had to taste six samples on six different days that they could choose as they wanted. Tasting order of the six samples was designed to be balanced according to Williams Latin squares.
- ✓ The consumers were separated into two panels. Both panels evaluated the beers based on satisfaction paired with Just-About-Right (JAR) scales, with their own smartphones at home. One of the panels (SING panel) evaluated the beer only once, after finishing the full portion. The other panel (MULT panel) evaluated the same questions three times repeatedly, after the first sip, after half of the portion, and after the full portion (i.e., 3-step evaluations).
- ✓ The beer consumers included both users and non-users (20-39 years old) of beer alternative products with less than 1% alcohol content.
- ✓ Following the instructions displayed on their own smartphone screens, each consumer tasted a full portion of a beer at their own drinking pace.
- ✓ Data were collected using the TimeSens© V2 web app (INRAE, Dijon, France).

Method

SING panel

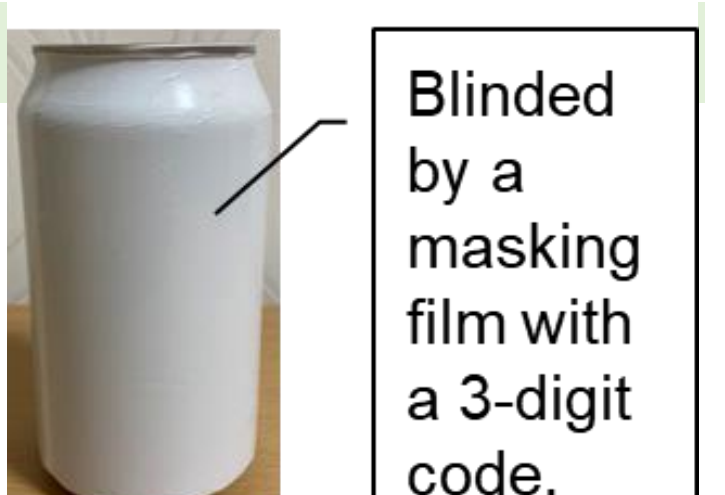


10 sensory attributes with Just-About-Right (JAR) scales:
Sweet taste, Sour taste, Bitter taste, Body of tastes, Stimulation of carbonation, Aftertaste, Alcohol feeling, Malt-like aromas, Fruity aromas, Refreshing aromas

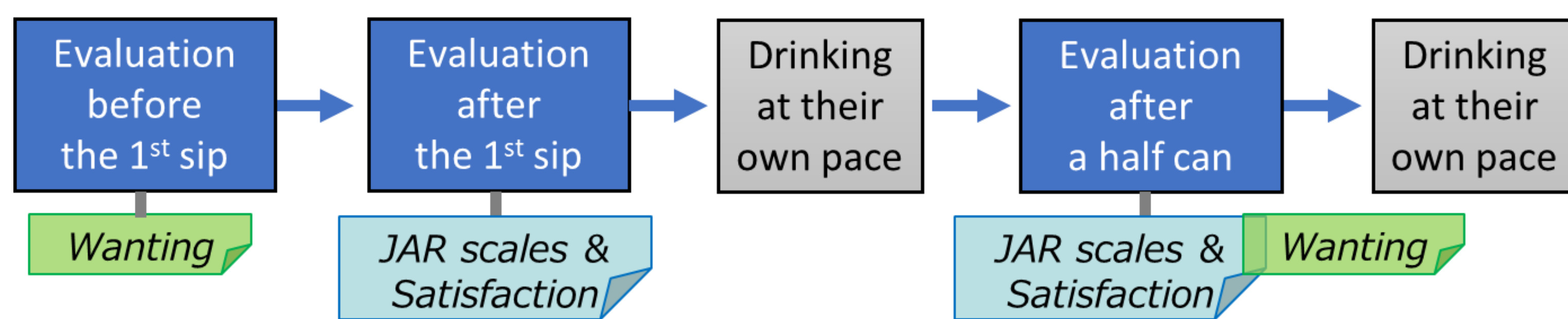


JAR scales & Satisfaction
Wanting

Test product



MULT panel

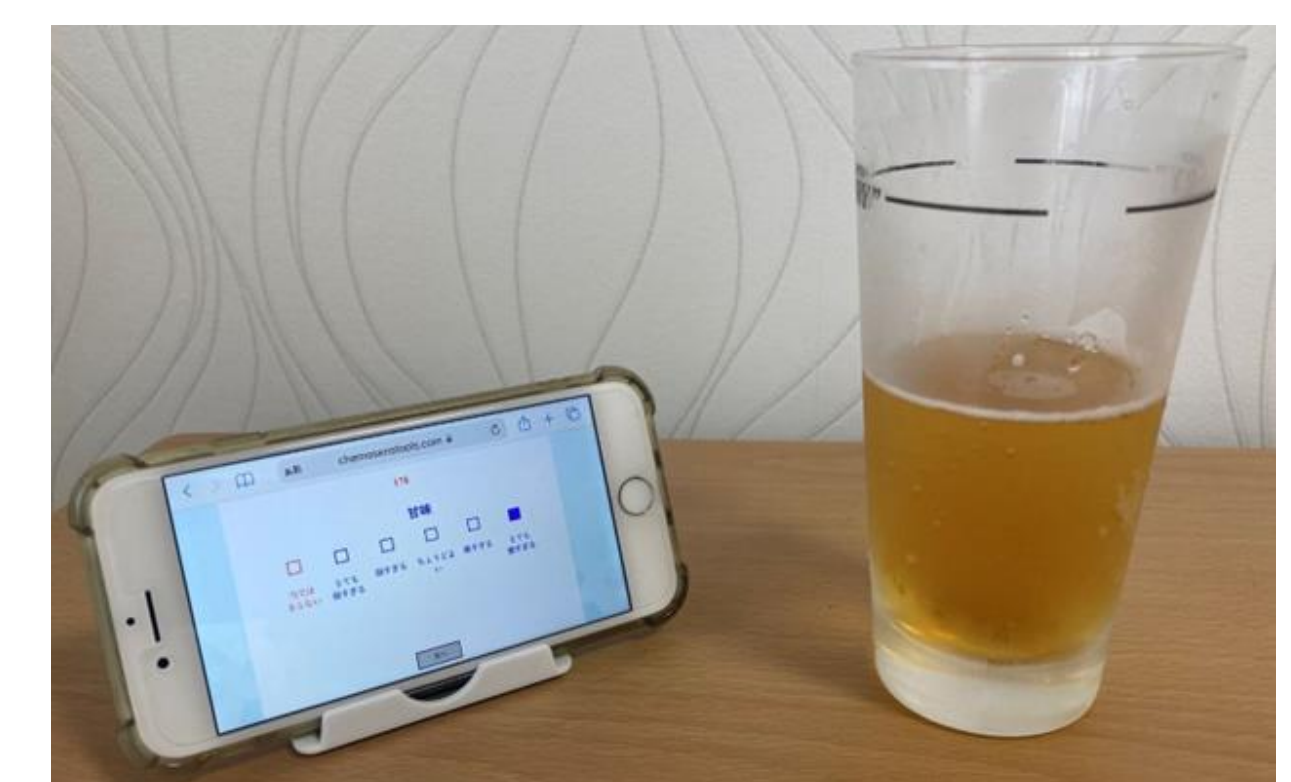


Wanting

JAR scales & Satisfaction

JAR scales & Satisfaction
Wanting

JAR scales & Satisfaction
Wanting



Note: Smartphone stand to facilitate data entry while drinking (for MULT panel).

Data analysis

- ✓ ANOVA model for Satisfaction: Satisfaction = Product + Method + User + Product*Method + Product*User + Method*User + Product*Method*User + Panelist(Method*User) + error
Note: "Method" refers to SING or MULT panel. "User" refers to users or non-users of beer alternative products. Data collected after the full can were used for both panels in this model.
- ✓ ANOVA models for JAR scales: Attribute = Product + Method + User + Product*Method + Product*User + Method*User + error
Note: "Attribute" refers to percentages of Just-About-Right, Not Enough, Too Much, respectively for each attribute. Data collected after the full can were used for both panels in this model.
- ✓ ANOVA model for evolution of Wanting: Wanting = Product + Step + User + Product*Step + Product*User + Step*User + Product*Step*User + Panelist(User) + error
Note: "Step" refers to "after the first sip," "after half of the portion," and "after the full portion." Data collected from the MULT panel were used in this model. (SING panel data not used.)

Panelist: a random effect. All the others: fixed effects.

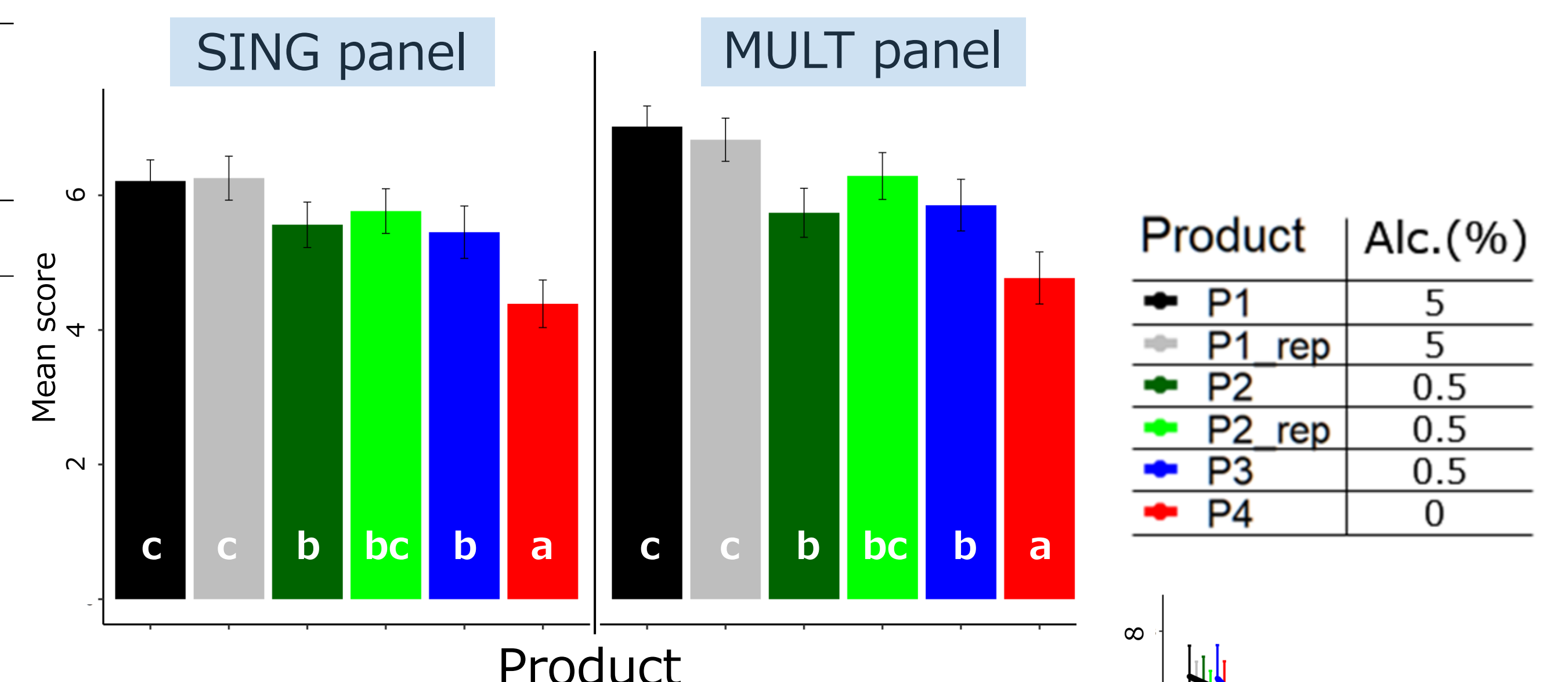
Results

ANOVA of Satisfaction

- ✓ Product rankings and statistical differences of satisfaction were consistent among SING and MULT panels. No interaction was observed between product and method, indicating no methodological bias caused by the repeated questions in the 3-step approach.
- ✓ The MULT panel showed higher satisfaction scores than the SING panel. Satisfaction scores after the 1st sip among the MULT panel were higher than those of the SING panel after the full can, and the MULT panel had unchanged levels of satisfaction for the tested beers across the three evaluations. (Data tables not shown in this poster.)

Product	Method	User	p-values of tests of fixed effects			Method LS-Means		User LS-Means		
			Product*Method	Product*User	Method*User	SING panel	MULT panel	Non-users	Users	
			0.622	0.179	0.626	0.544	5.715a	6.218b	5.597a	6.337b

Note: Means with two different letters are significantly different ($p < 0.05$).



ANOVA of Just-About-Right perception for products

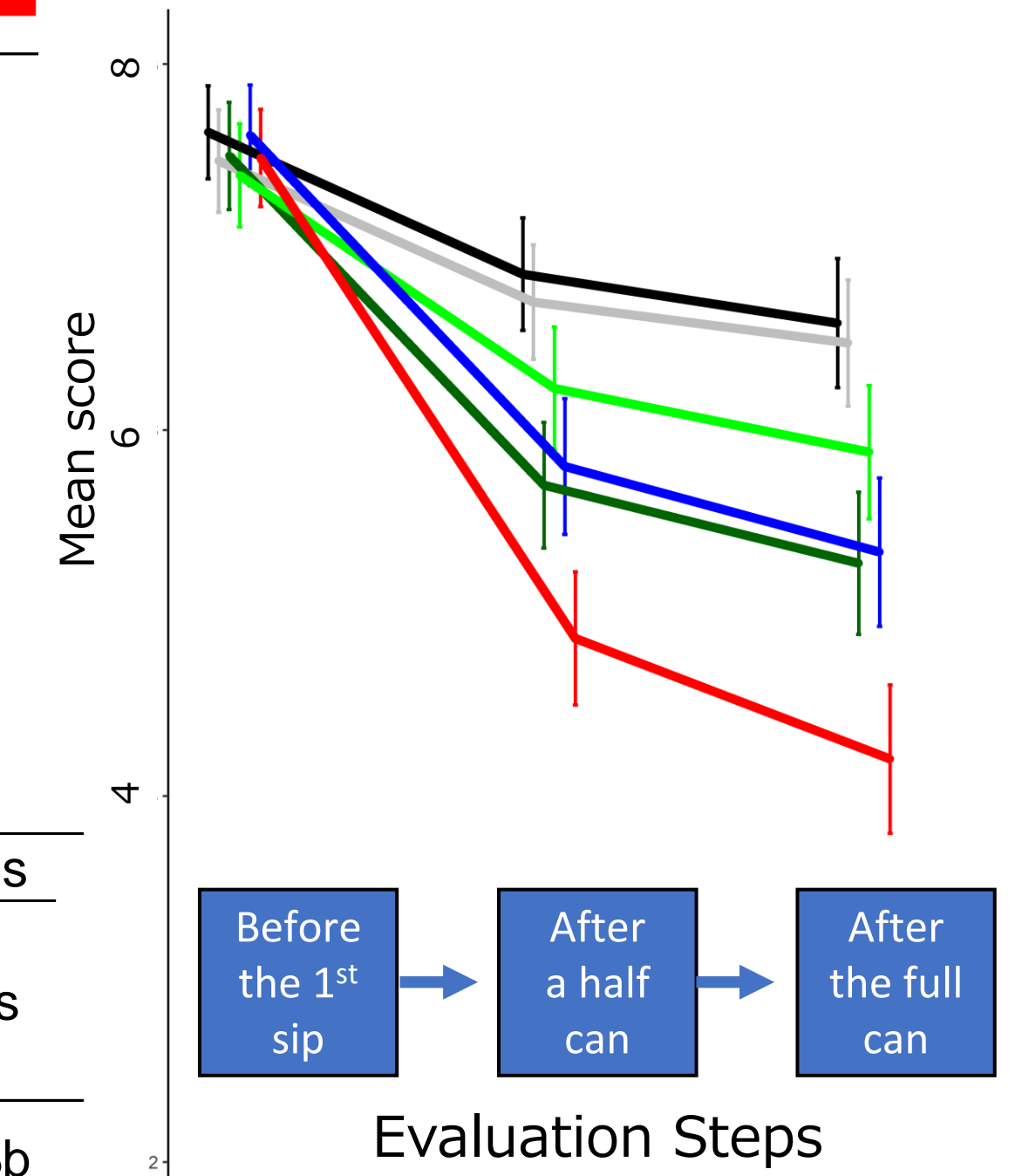
- ✓ No interaction was observed between product and method (with the exception of Refreshing). The MULT panel showed higher proportions of Just-About-Right perception for products than the SING panel.

	p-values of tests of fixed effects			Method LS-Means	
	Just-About-Right			Just-About-Right	
	Product	Method	Product*Method	SING panel	MULT panel
Aftertaste	0.012	0.670	0.973	0.579a	0.588a
Alcohol	0.034	0.102	0.601	0.612a	0.657a
Bitter	0.001	0.025	0.127	0.529a	0.566b
Body	0.002	0.002	0.302	0.529a	0.616b
Carbonation	0.020	0.312	0.183	0.644a	0.659a
Fruity	0.106	0.046	0.311	0.458a	0.529b
Malty	0.001	0.004	0.065	0.497a	0.574b
Refreshing	0.005	0.010	0.028	0.592a	0.642b
Sour	0.004	0.004	0.774	0.605a	0.671b
Sweet	0.044	0.118	0.273	0.551a	0.601a

Evolution of Wanting

- ✓ Wanting significantly decreased while drinking ($p < 0.001$).
- ✓ Step by product interaction was significant ($p < 0.001$) indicating that the decrease in wanting was stronger for non-alcoholic or reduced-alcohol beers.
- ✓ User effect ($p < 0.001$) and step by user interaction ($p = 0.005$) were observed, with non-users showing a greater decrease in wanting.

Product	Step	User	p-values of tests of fixed effects			User LS-Means					
			Product*Step	Product*User	Step*User	Product*Step*User	Non-users	Users			
			< 0.001	< 0.001	< 0.001	< 0.001	0.013	0.005	0.820	6.141a	6.878b



Conclusions

- ✓ Comparing results of the SING and the MULT panels proved the consistency in both hedonic and sensory evaluations toward the beers.
- ✓ The MULT panel, who had unchanged levels of satisfaction across the three evaluations, showed higher satisfaction scores than the SING panel.
- ✓ Non-users of beer alternative products with less than 1% alcohol content were less satisfied with the tested beers than users.
- ✓ The results from 3-step multiple evaluations revealed the changes in wanting for drinking a beer during a whole drinking experience.
- ✓ The research design applied in this study was useful at home, and would add greater value to product development and marketing.

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