



HAL
open science

Differences in sensory drivers of beer satisfaction between users and non-users of reduced-alcohol beer alternatives

Takahiro Wakihira, Michel Visalli, Pascal Schlich

► **To cite this version:**

Takahiro Wakihira, Michel Visalli, Pascal Schlich. Differences in sensory drivers of beer satisfaction between users and non-users of reduced-alcohol beer alternatives. 11. European Conference on Sensory and Consumer Research: A Sense of Global Culture (EuroSense 2024), Sep 2024, Dublin, Ireland. <hal-04700629>

HAL Id: hal-04700629

<https://hal.inrae.fr/hal-04700629v1>

Submitted on 17 Sep 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



ETALAB - Open licence

Differences in sensory drivers of beer satisfaction between users and non-users of reduced-alcohol beer alternatives



Takahiro Wakihira^{1,2*}, Michel Visalli^{2,3}, Pascal Schlich^{2,3}

¹ Brewing Science Laboratories, ASAHI QUALITY & INNOVATIONS, LTD.

² Centre des Sciences du Goût et de l'Alimentation, AgroSup Dijon, CNRS, INRAE, Université Bourgogne

³ INRAE, PROBE Research Infrastructure, ChemoSens Facility



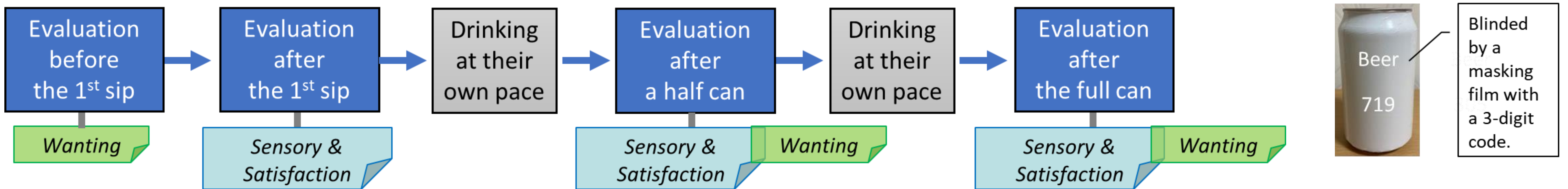
Introduction and Objective

- ✓ Although the aim of non-alcoholic beer (NAB) is to deliver enjoyment to consumers without any intake of alcohol, non-alcoholic beer is often less well liked than regular beer.
- ✓ The objective of this study was to identify the differences in sensory drivers of beer satisfaction between users and non-users of reduced-alcohol beer alternatives with the aim of providing guidance to the formulation of NABs that are better accepted by non-users.

Materials and Methods

Test design

- ✓ Japanese beer consumers (N = 271) tasted and evaluated six beers, with alcohol by volume levels of 5%, 0.5%, or 0% (2 products for each alcohol level).
- ✓ Of the 271 participants, 137 were users of beer alternatives with less than 1% alcohol content, while 134 were non-users.
- ✓ The consumers blindly tasted the beers (i.e., no brand names or alcohol content information was displayed).
- ✓ The consumers evaluated full portions of the beers (one per day) at home based on satisfaction and 5-point scales of 10 sensory attributes at three time points during tasting: the first sip, halfway through the beer, upon finishing the beer.
- ✓ Data were collected using the TimeSens© V2 web app (INRAE, Dijon, France).



A 3-step approach was applied to reveal changes in evaluations over time while drinking. The results for "step effect" are presented in P2.031 (previous poster). Here, the presentation focuses on differences in satisfaction and its sensory drivers between users and non-users of alternative beers, based on the data averaged across the three steps for each product.

Data analysis

- ✓ ANOVA model for Satisfaction: $Satisfaction = ProductType + NAB_User + ProductType * NAB_User + Panelist(NAB_User) + error$

Note: "ProductType" refers to the average score assigned by panelist to regular beers (P1 and P2) or alternative beers (P3, P4, P5 and P6). "NAB_User" refers to users or non-users of beer alternatives. "ProductType" and "NAB_User" were treated as fixed effects. "Panelist" was treated as a random effect.

- ✓ Regression model for sensory drivers: $SatisfactionD = AftertasteD + AlcoholD + BitterD + BodyD + CarbonationD + FruityD + MaltyD + RefreshingD + SourD + SweetD + error$

Note: "D" refers to the difference between the two product types (P1/P2 vs. P3/P4/P5/P6). For each variable, the average score for regular beers was deducted from that for alternative beers to calculate "D". The analysis was conducted to reveal sensory gaps between regular and alternative beers that contribute to the satisfaction gap between the product types.

- ✓ ANOVA models for Sensory perception: $Attribute = ProductType + NAB_User + PreferenceSegment + ProductType * NAB_User + ProductType * PreferenceSegment + NAB_User * PreferenceSegment + ProductType * NAB_User * PreferenceSegment + Panelist(NAB_User) + error$

Note: "Attribute" refers to each of 10 sensory attributes. "PreferenceSegment" refers to consumer segments of BAA, RBP-M and RBP-S, based on the difference in satisfaction scores by panelist.

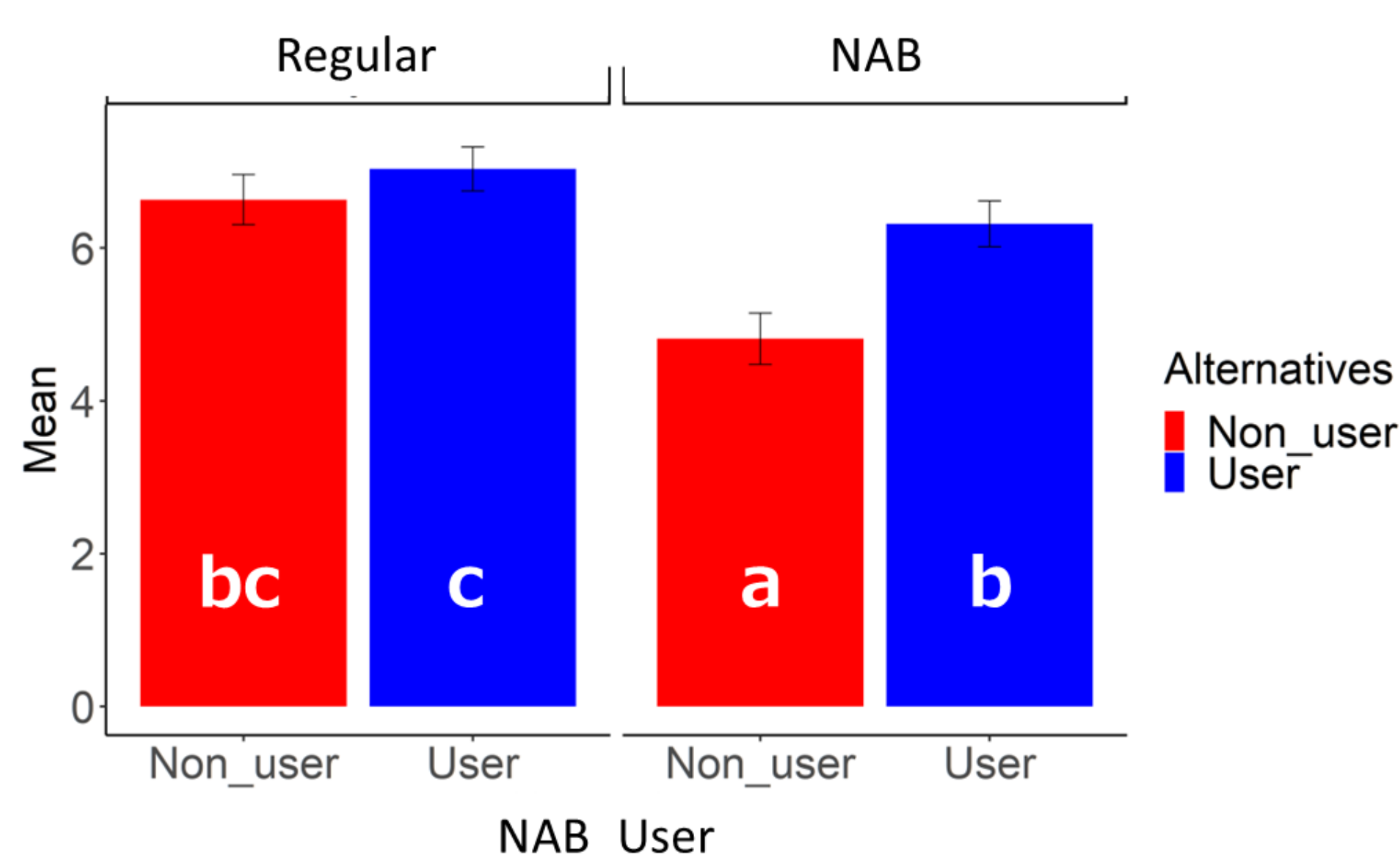
Beer Alternative Acceptors (BAA): Satisfaction difference score ("Alternative" minus "Regular") was greater than zero (n = 65).
Regular Beer Preferer Moderate (RBP-M): Satisfaction difference score was between zero and minus two (n = 119).
Regular Beer Preferer Strong (RBP-S): Satisfaction difference score was smaller than minus two (n = 87). (see Fig. 4)

Results

Satisfaction

- ✓ Satisfaction scores were significantly lower for the beer alternatives, particularly among the non-users (Fig. 1).

Fig. 1. Satisfaction by product type.



Note: "Regular" refers to regular beers (P1 and P2). "NAB" refers to alternative beers (P3, P4, P5 and P6). Note: Means with two different letters are significantly different ($p < 0.05$).

Segmentation analysis

- ✓ Compared with "Beer Alternative Acceptors (BAA)", "Regular Beer Preferer Strong (RBP-S)" rated the beer alternatives significantly lower for *aftertaste*, *alcohol feeling*, *bitter taste*, *body*, and *malt-like aromas*. (Fig. 3)

Regression analysis

- ✓ For both users and non-users, *body* was potentially the most important attribute to be intensified in beer alternatives (Fig. 2).
- ✓ Additionally, *alcohol feeling* and *refreshing aromas* were found to be positive drivers of *satisfaction* among users, while *bitter* and *sour* were negative for them (Fig. 2).
- ✓ Among non-users, *carbonation* was found to be a positive driver in addition to *body* (Fig. 2).

Fig. 3. Sensory perception of NAB by preference segment.

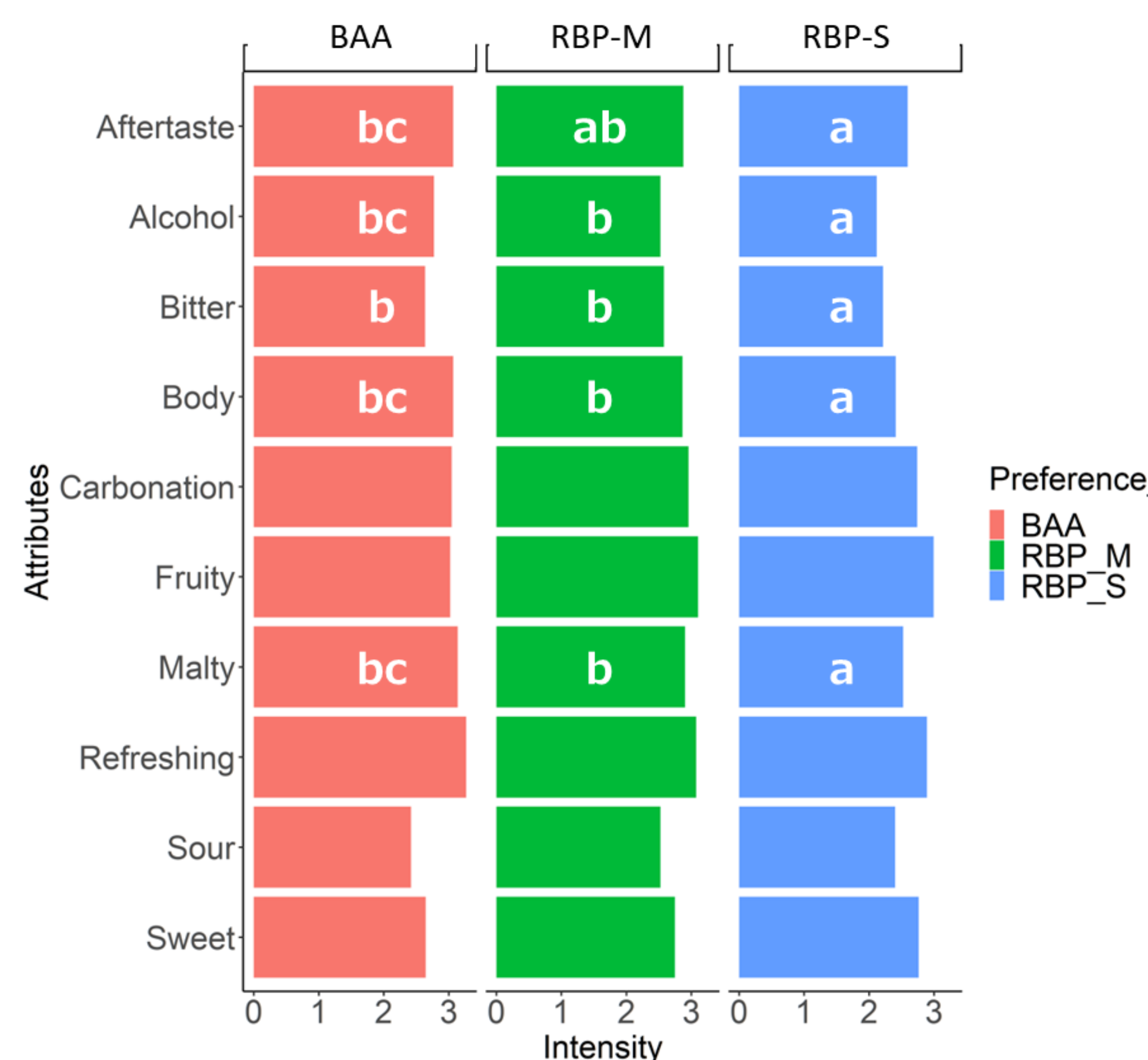
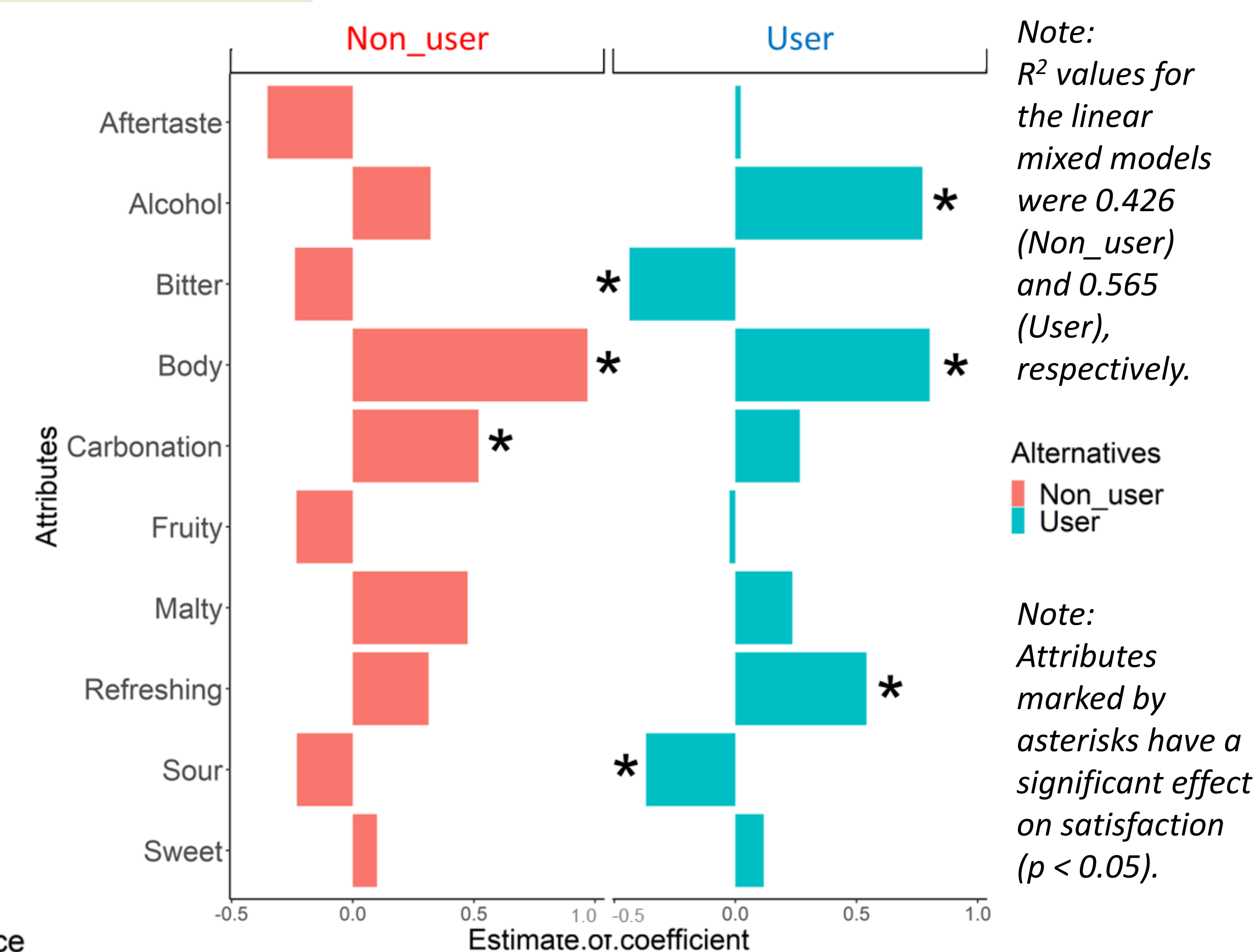


Fig. 2. Results of regression model.



Note: R^2 values for the linear mixed models were 0.426 (Non_user) and 0.565 (User), respectively.

Note: Attributes marked by asterisks have a significant effect on satisfaction ($p < 0.05$).

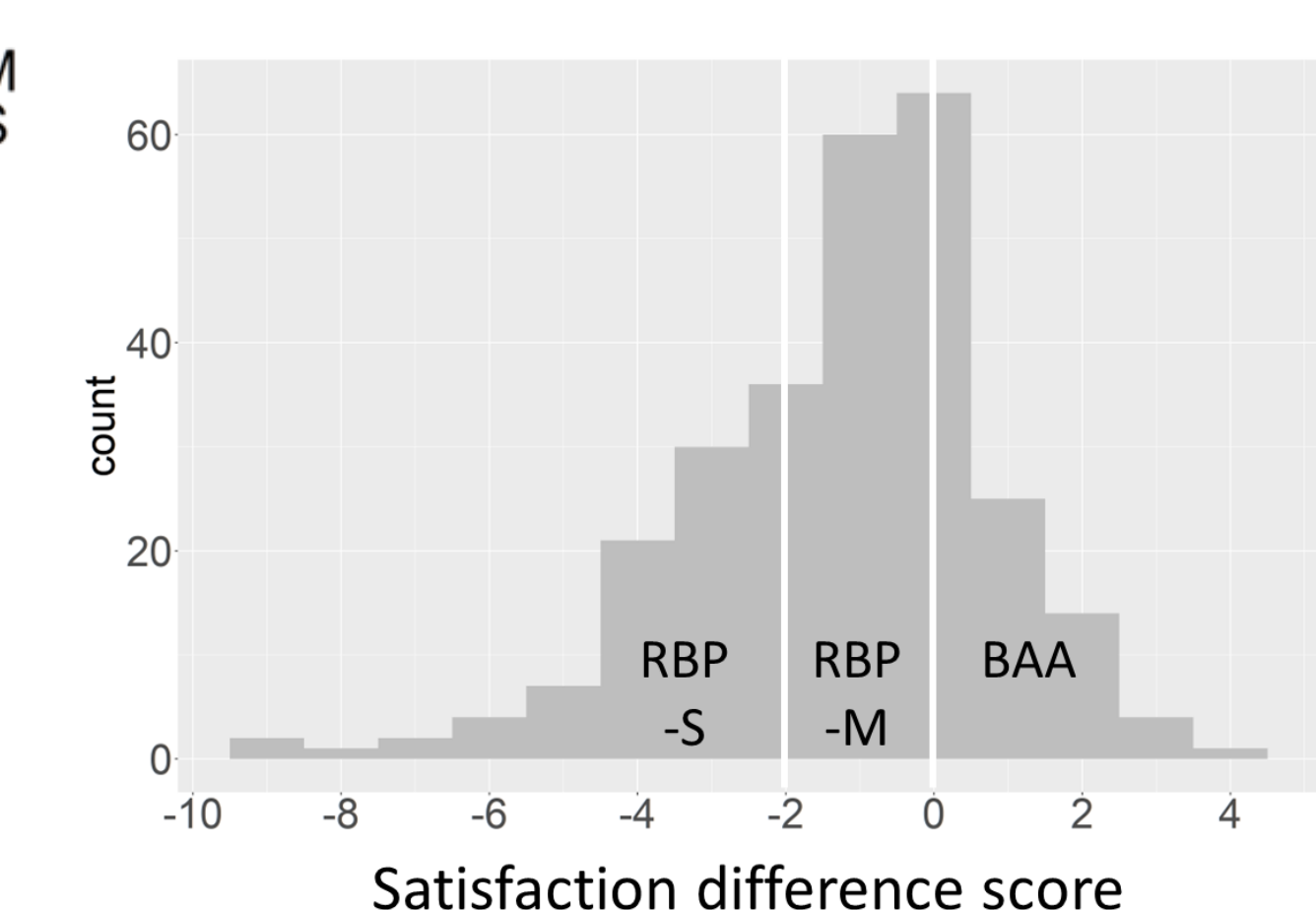


Fig. 4. Histogram of satisfaction difference score used to segment consumers.

Conclusions

- ✓ The results showed a clear gap in satisfaction between regular and alternative beers, with the latter doing poorly in terms of satisfying consumers, particularly non-users of beer alternatives.
- ✓ The gap analysis between regular and alternative beers revealed that *body* was potentially the most important attribute to be intensified in beer alternatives, and that sensory drivers differed between users and non-users. These findings will facilitate the development of alternative beer products that are more palatable to current non-users who want to lower their alcohol consumption.