Penalty Analysis with Resampling Method for Sensory Evaluation

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Penalty analysis is the most widely accepted approach in consumer-oriented testing for sensory evaluation dealing with just about right (JAR) data. However, performing test of significance of penalizing sensory attribute on the overall acceptability of a product is limited due to the absence of mean drop's standard error. To address this limitation, this paper applied alternative approaches using bootstrap and jackknife resampling. Using sensory evaluation data of the soft serve vanilla-based ice cream of a certain fast food company, the ordinary and the proposed jackknifing penalty analyses yielded similar results. While both analyses found that "too much sweetness" as the most troublesome attribute, bootstrapping penalty analysis showed having a "too weak vanilla flavor" has an effect of 0.45 mean drop point from the product's overall acceptability. Through empirical validation, jackknife mean drop estimates were found to be closer to the original mean drops and have smaller estimates of standard error as compared with the bootstrap mean drop estimates. Overall, bootstrapping penalty analysis was more conservative in determining critical sensory attributes. Moreover, the proposed jackknifing penalty analysis was able to depict similar results of the ordinary penalty analysis with further ability to calibrate problematic sensory attributes based on statistical evidence. This can offer a more powerful and useful evaluation tool for product development in the food industry.

Keywords: bootstrapping, jackknifing, just about right scale, 9-point hedonic score, mean drop, product development