



*Sensory and Consumer Science Division
2018 KoSFoST International Symposium and Annual Meeting
Busan, Korea*

Ensuring the Business Relevance of a Company's Internal Sensory Program

Presented by

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June 28, 2018

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Background

Methods of Sensory and Consumer Research

Can you tell the difference?

Triangle



Which sample is different from the other two?

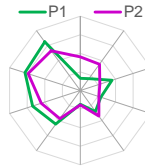


What is the difference?

1 2 3 4 5 6 7



- How sweet?
- How bitter?
- How fruity?
- How astringent?



Is the difference important?



Which sample do you prefer?



Why Use Discrimination Testing?



- Measure the size of the difference between products

- Two main objectives

- Prove products are different
 - “New and improved”, “Fresher, crisper taste”

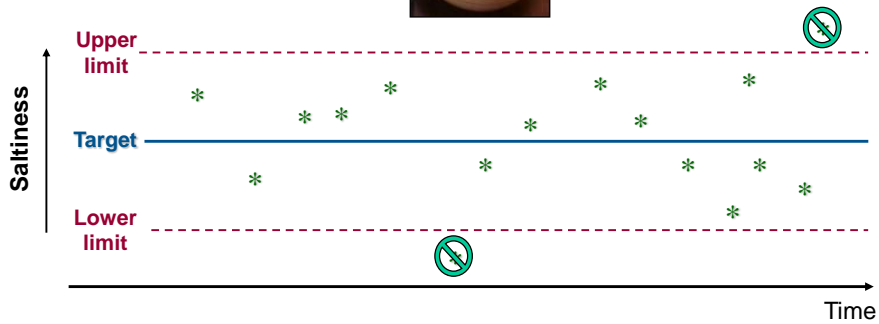


- Prove products are similar

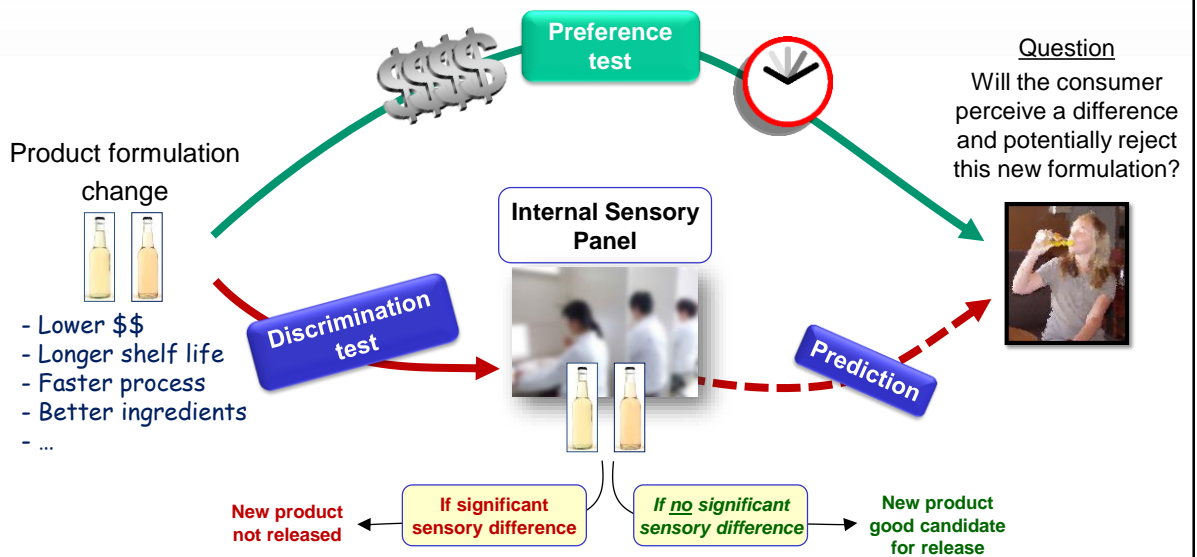
- Ingredient modification, cost reduction, change of supplier, government regulation (e.g., lowering of salt or sugar content)



Sensory Science and Quality Insurance



Studying Product Similarities

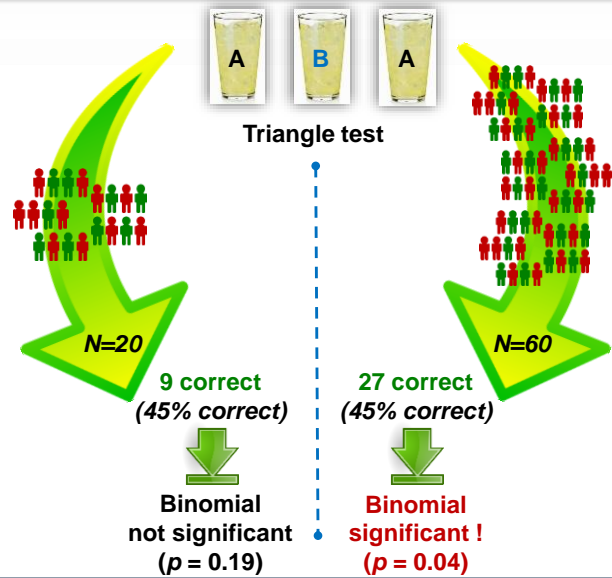


Effect of Experimental Sample Size

Statistical hypothesis testing is futile because with enough replications, the null hypothesis will always be rejected



Victor Chew (1977)



Apparent Discrepancy in Discrimination Testing Results

Case Illustration

A Preference, but No Significant Difference

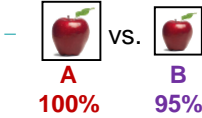


A Preference, but No Significant Difference



Ishii, O'Mahony, Rousseau (2014)

- Comparison of apple juices of different concentrations



- Two experimental protocols

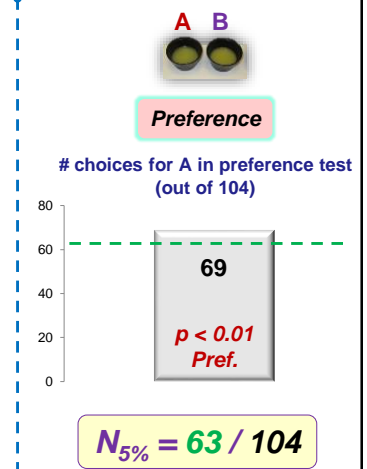
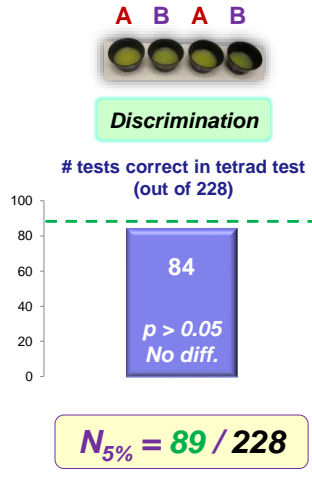
- Discrimination: Tetrad (N=228)



- Hedonic: Paired preference (N=104)



• Results

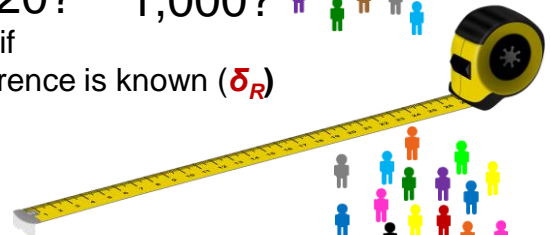
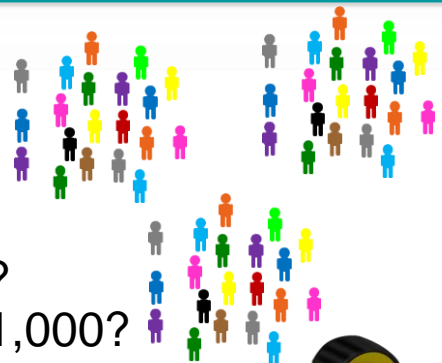


The Need for Information on Consumer Relevance



- Essential fact:
 - When comparing two products for similarity
 - Assuming that the sample size is large enough
 - *A statistically significant result will always be found*

- What is the optimal sample size? 12? 100? 20? 1,000?
- An optimal sample size can only be set if the size of the relevant difference is known (δ_R)





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How to Estimate and Use Consumer Relevance

Type I error

α

β

δ_R

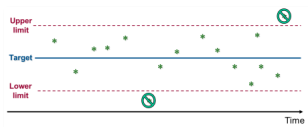
Size of the difference

Type II error
(Power = 1- β)

N

Sample size

Test

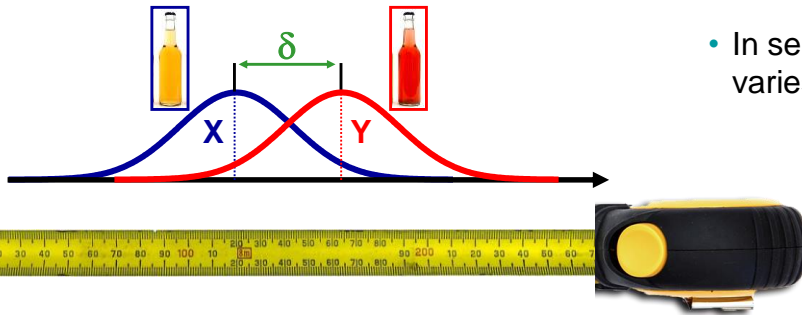


Measuring the Size of the Sensory Difference

Thurstonian Modeling

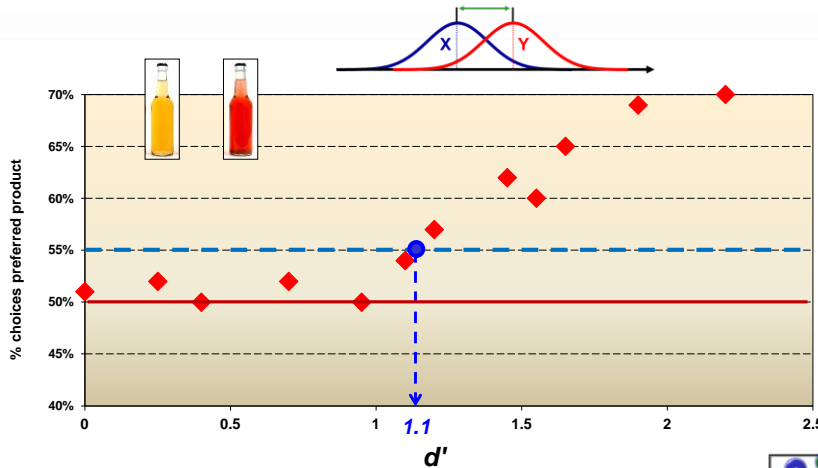
δ = Standardized measure of sensory difference

d' = Experimental estimate of δ

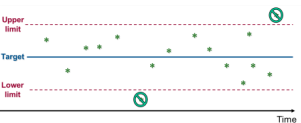


- In sensory testing, δ typically varies between 0 and 2

Option 1 – Estimating δ_R from Consumer Preference Tests



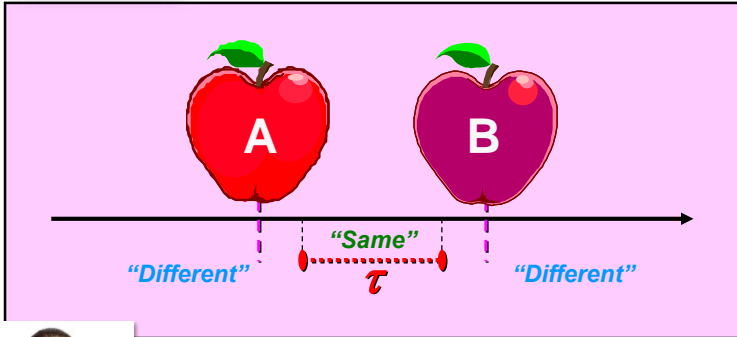
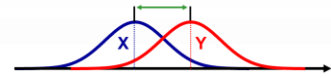
- The relevant threshold can be set at $\delta_R=1.1$
 - Using this value, the program's risk profile can be established
 - 2-AFC test
 - $\alpha=5\%$
 - Power=90%
 - $\delta_R=1.1$
- } N=28



Option 2 - Estimating δ_R from using the Same-Different Method



Are the two apples the same or different?



- ❖ 1.2 corresponds to the consumer threshold for "difference"
 - ❖ The program's risk profile can then be established
 - ❖ Tetrad test
 - ❖ $\alpha=5\%$
 - ❖ Power=80%
 - ❖ $\delta_R = 1.2$
- } N=39



"Different"



Power

• 5 linked components:

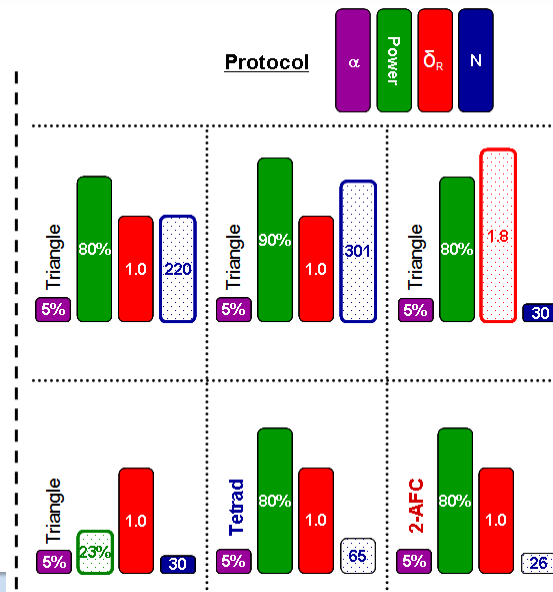
α : Probability of a **Type I error**
(wrongly concluding that a difference exists between the products)

β : Probability of a **Type II error**
(wrongly concluding that no difference exists between the products = 1-power)

δ_R : Size of the difference of interest

N : Sample size

Protocol





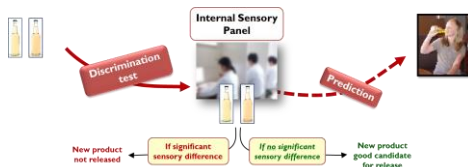
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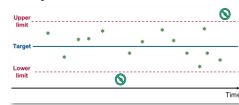
Conclusions

Conclusions

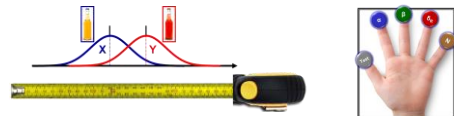
- ▶ Sensory evaluation and consumer science: Invaluable tools to the food and beverage scientist
- ▶ Internal sensory program: Beneficial to companies to increase testing speed and decrease costs
- ▶ However: Internal findings must be predictive of consumer perception and opinions



- ▶ Need to establish the threshold above which a sensory difference is meaningful to the consumer



- ▶ Theories available to quantify the size of sensory difference and estimate consumer relevance



- ▶ A sensory program can then be designed to optimize its relevance and maximize the likelihood of success of products released in the market place

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Thank You