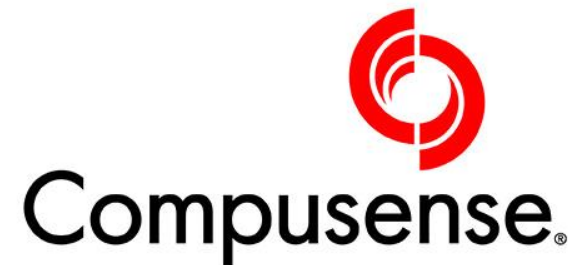


Recent Advances in Sensory Science



Chris Findlay & John Castura
February 23, 2016
CIFST



Overview

- Increased discrimination test power
- Temporal Check-All-That-Apply (TCATA)
- Individual Differences

Increased discrimination test power

Neither the Triangle and Tetrad test methods required the nature of the difference to be stated, but the Tetrad test requires dramatically fewer assessors to achieve the same statistical power.

Sensory Discrimination Testing



triangle

VS.



tetrad

Triangle test method

Select the odd sample.



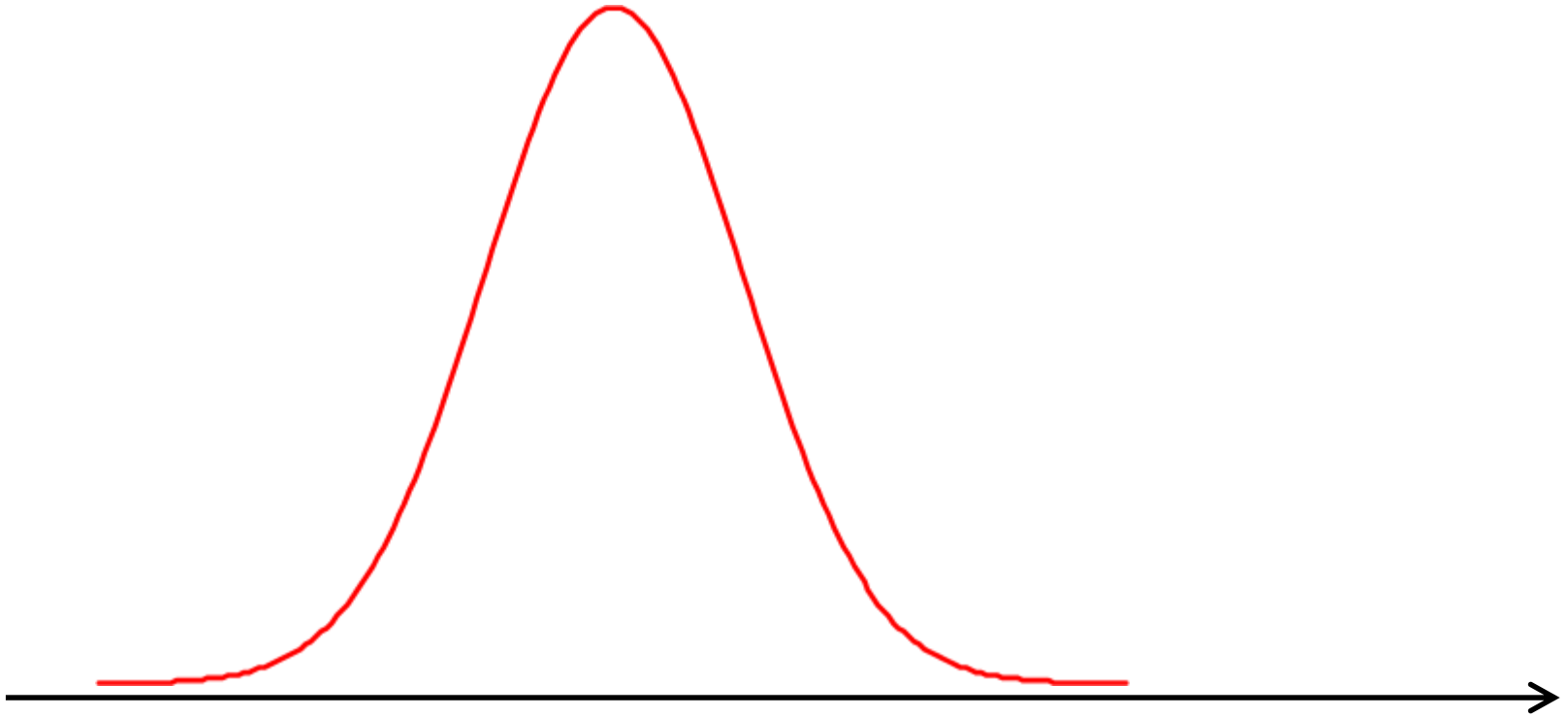
Select the cookie
that is different.

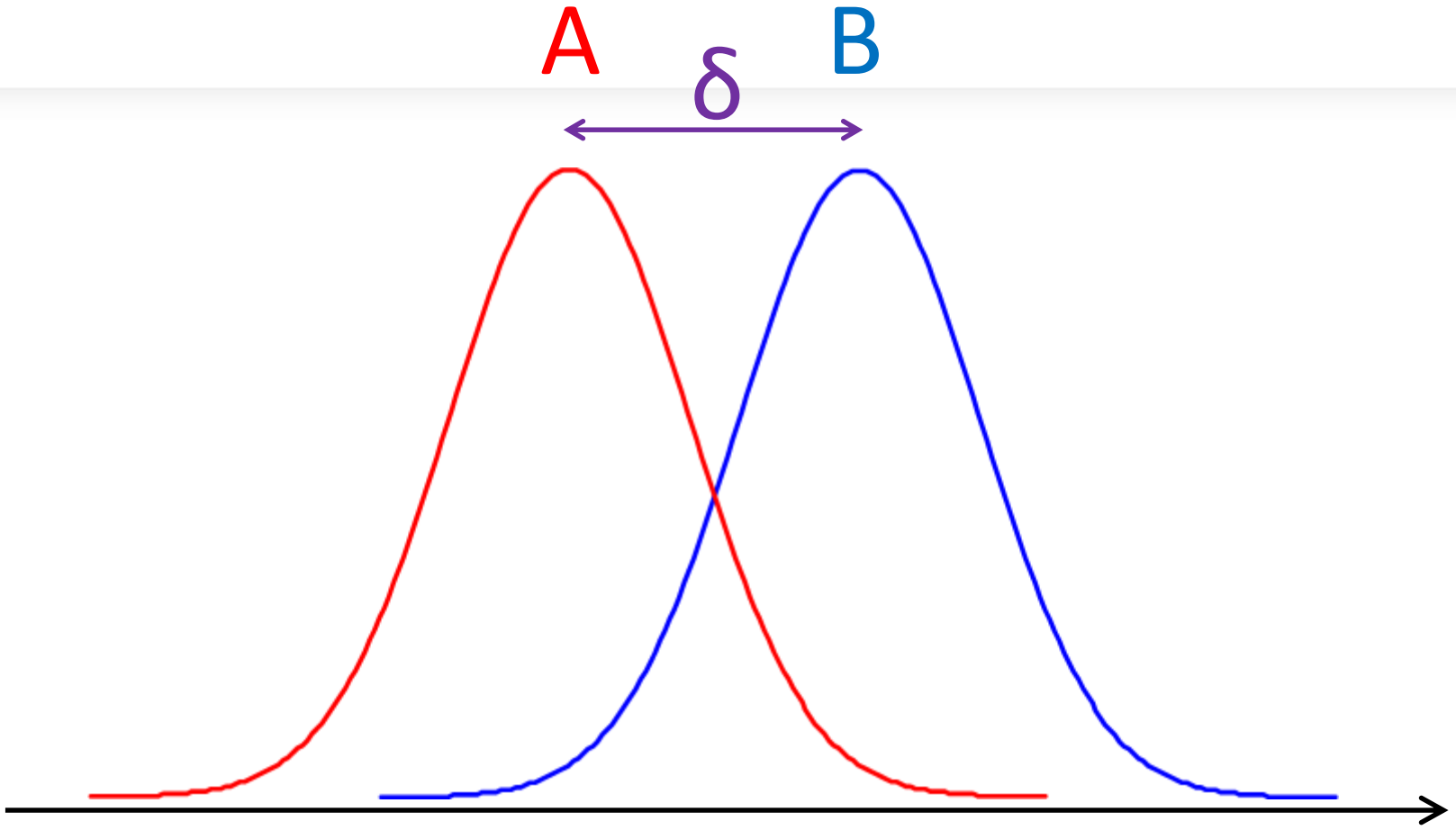
N total responses

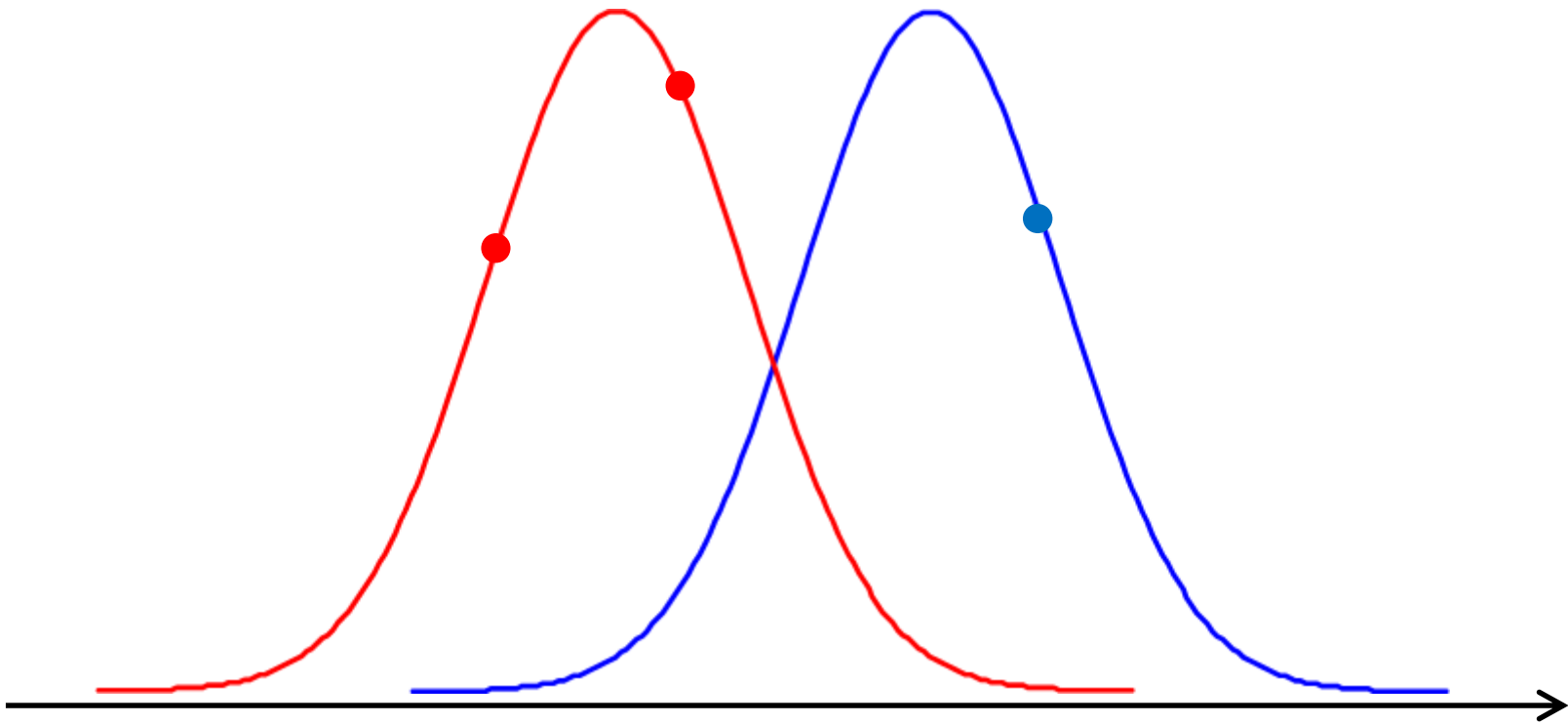
x correct responses

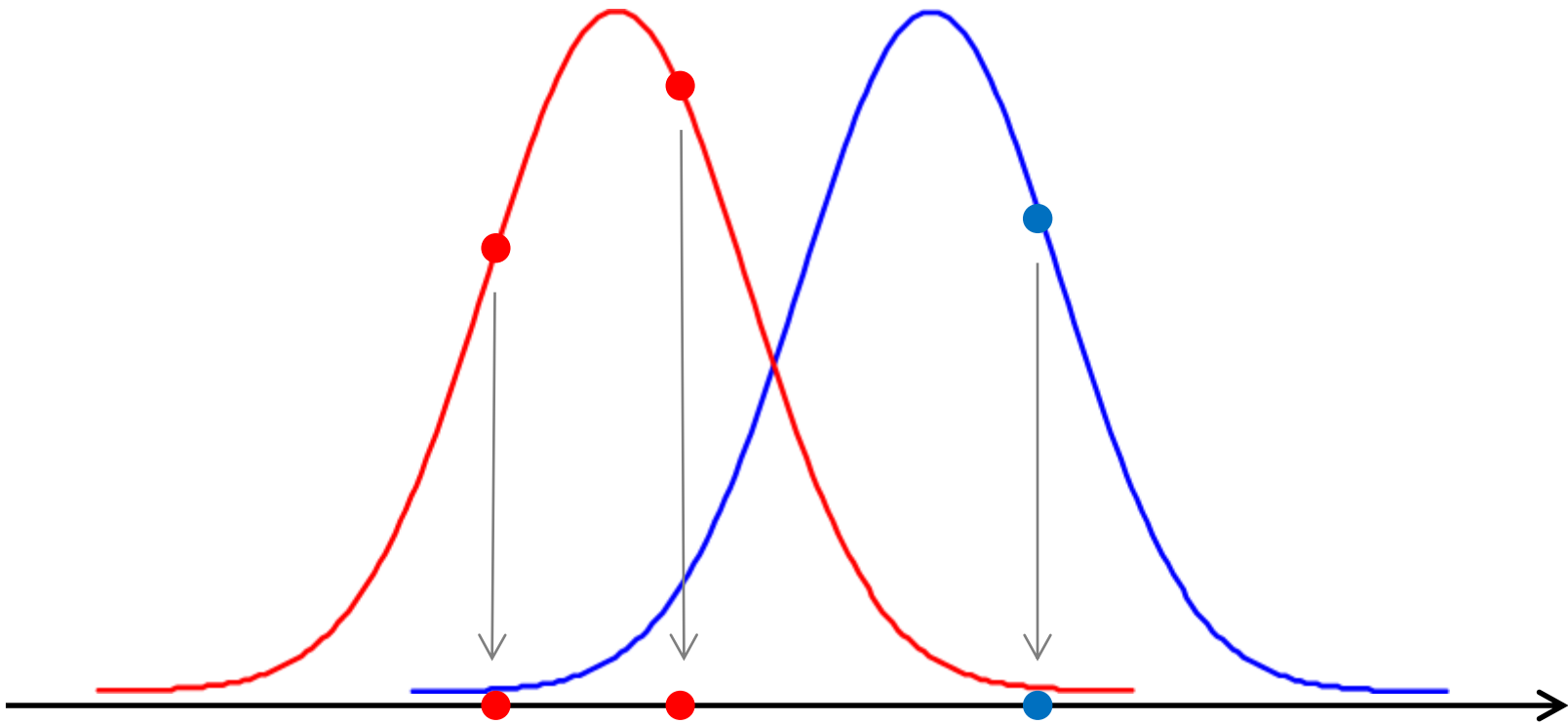
p_0 chance probability (1/3)

A

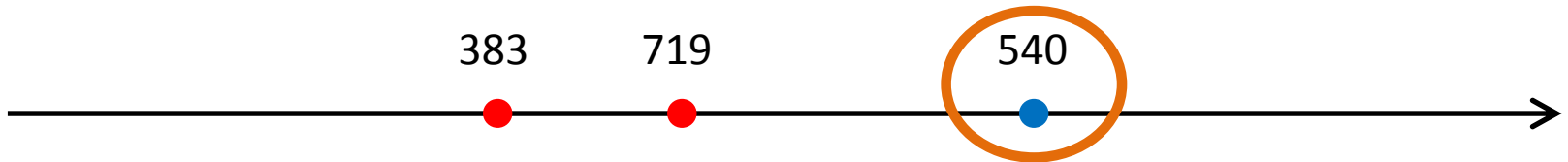


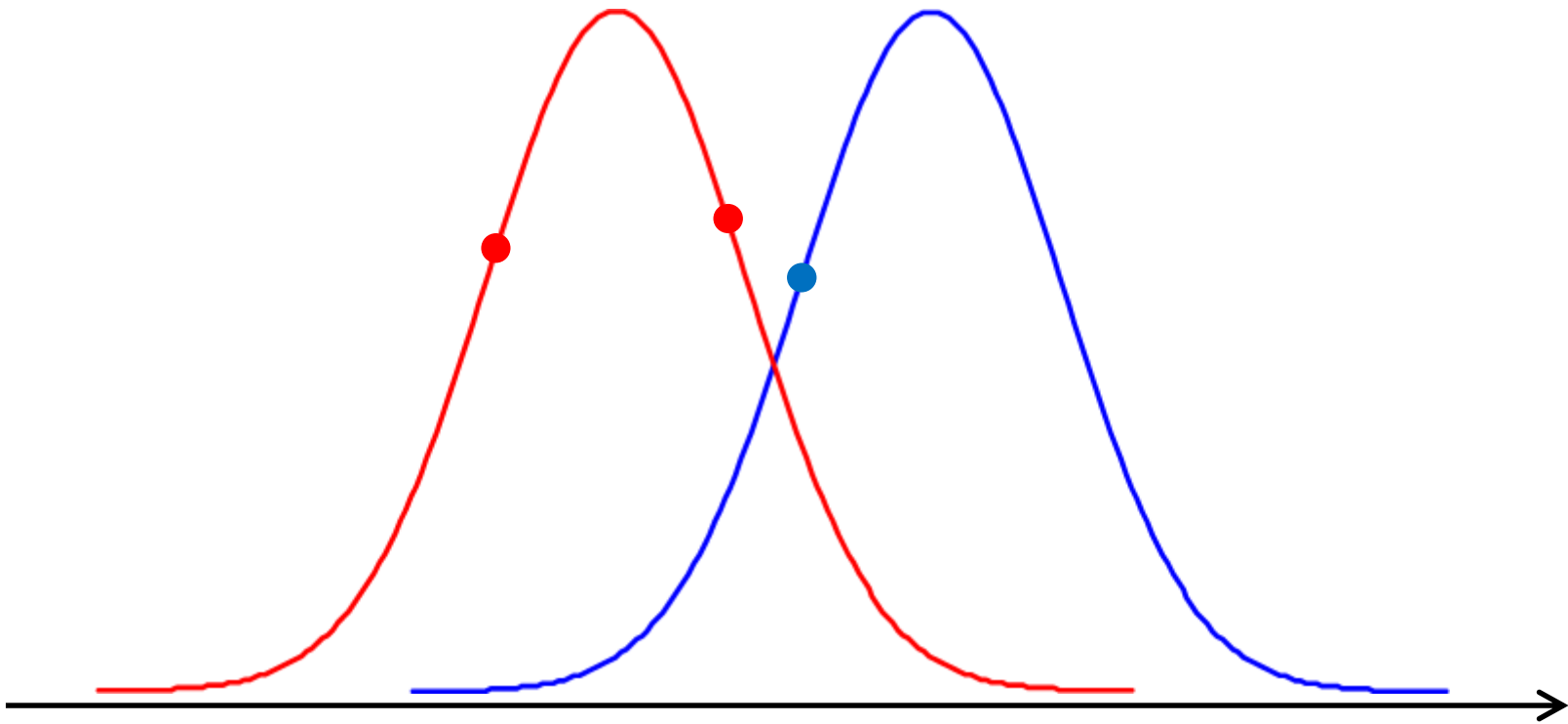


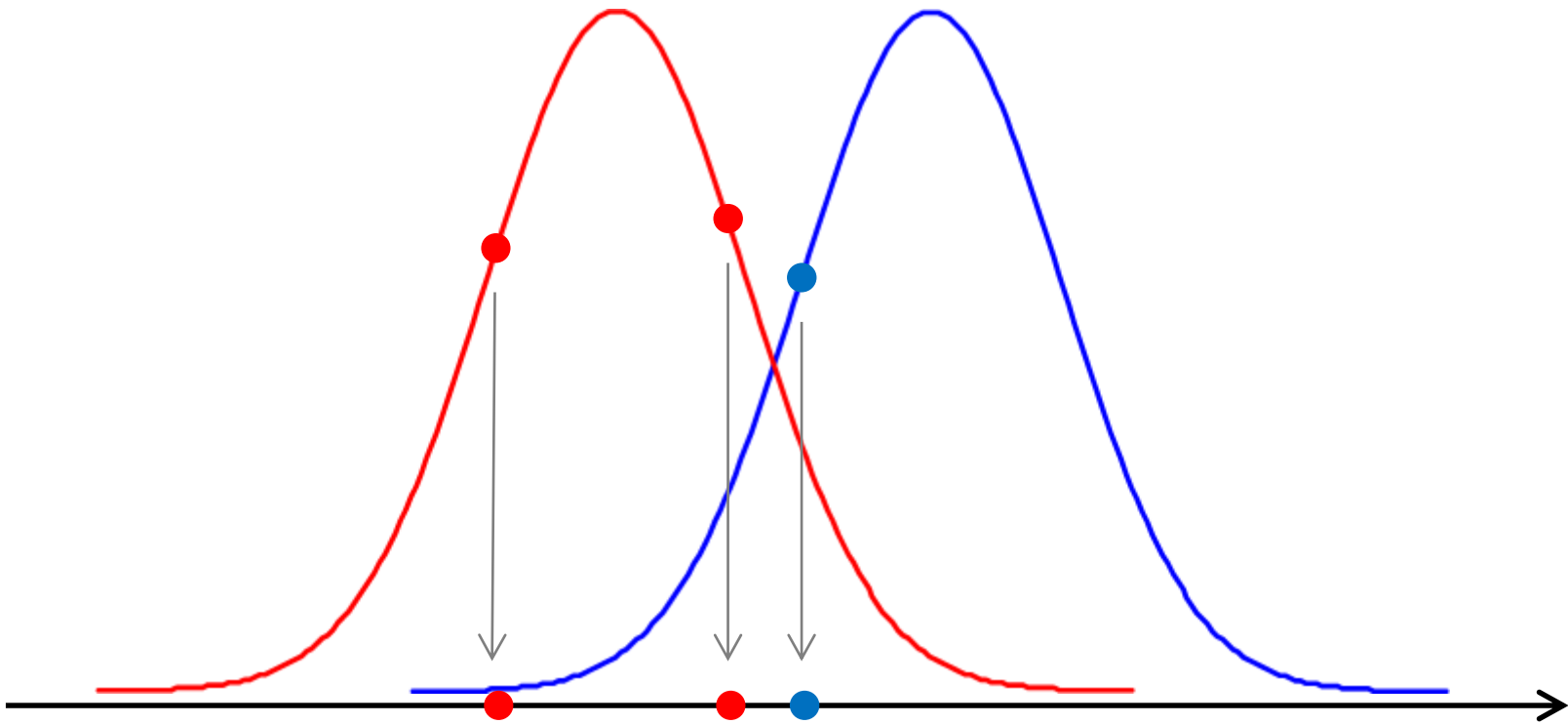




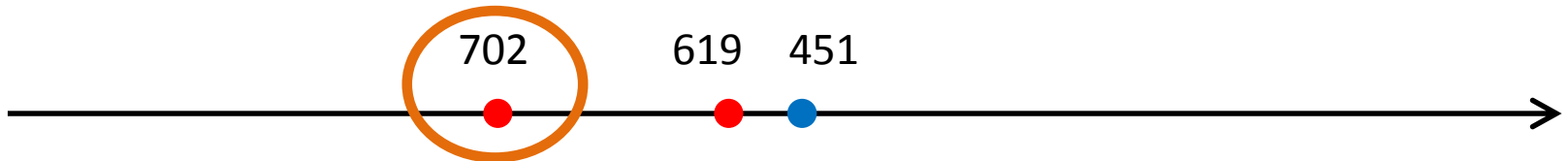
Select the cookie that is different.







Select the cookie that is different.



Tetrad test method

*Group samples into 2 groups of 2
by similarity*

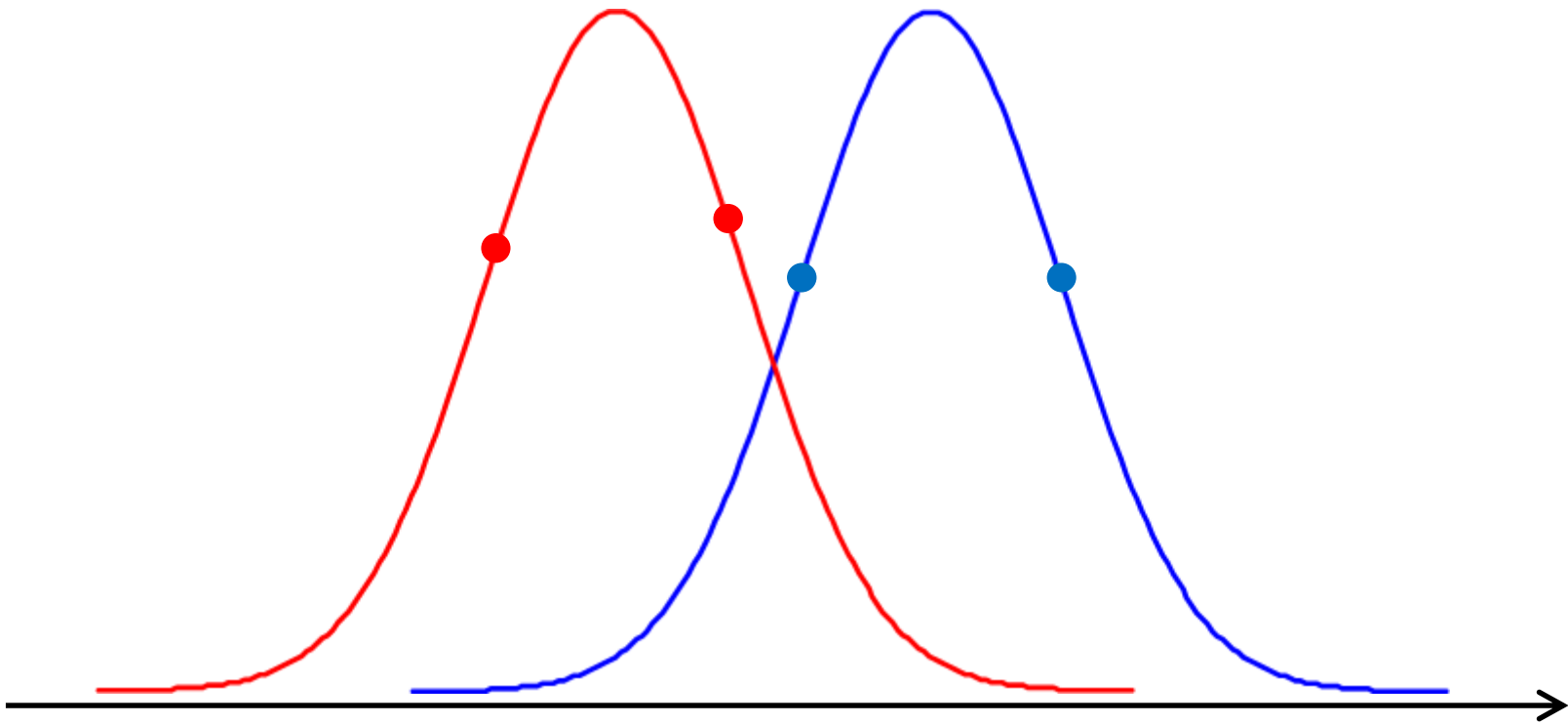
Tetrad test method

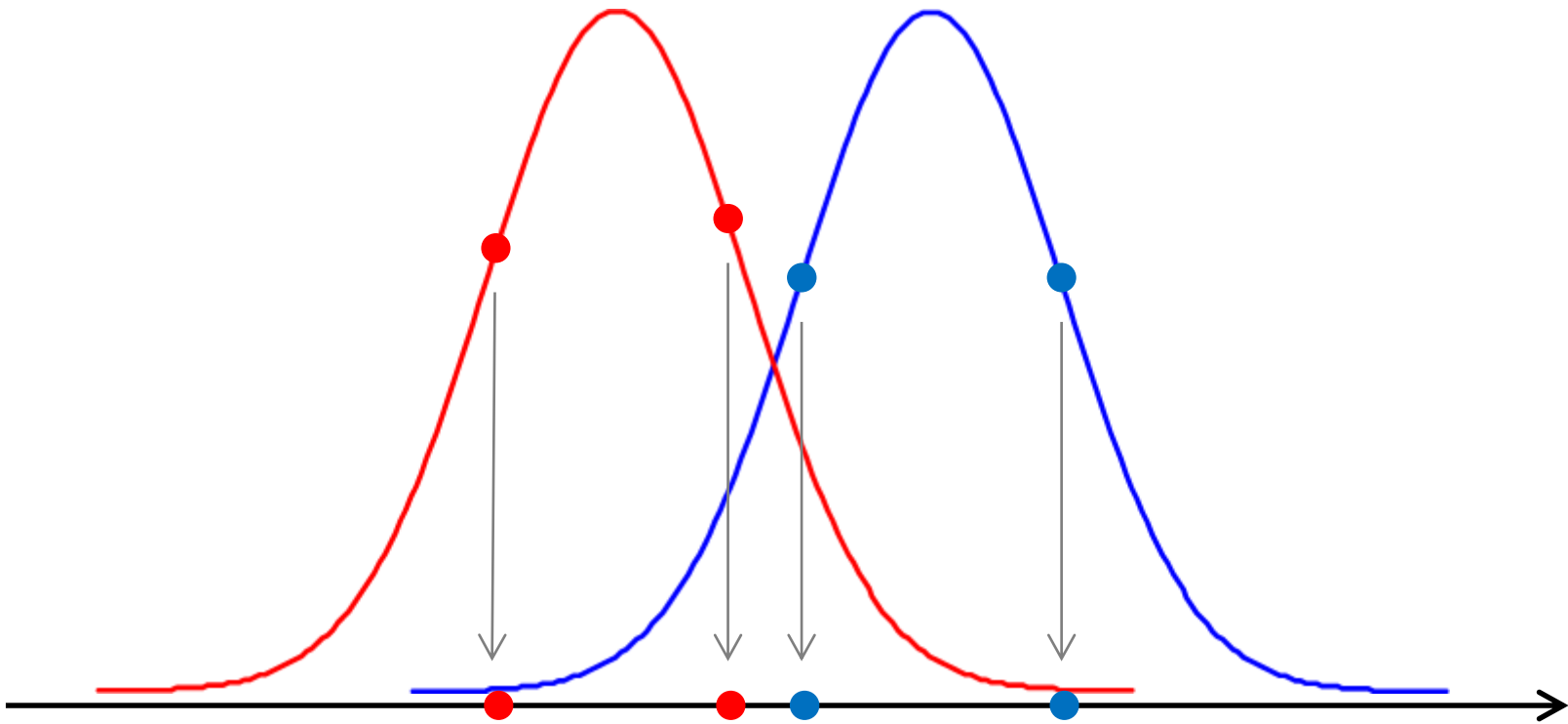
Claim: provides better operational power than the triangle test.

N total responses

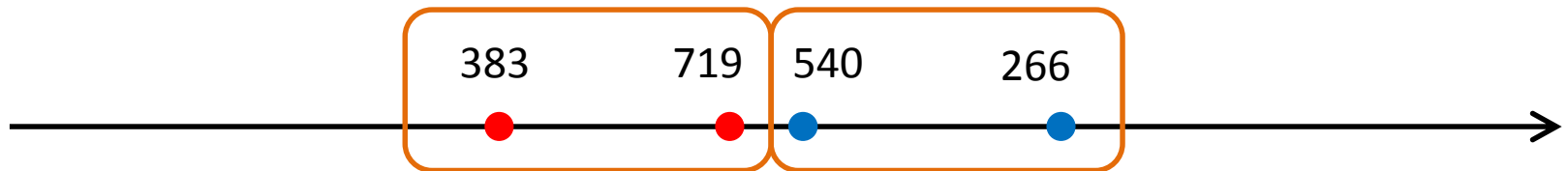
x correct responses

p_0 chance probability (1/3)





Group samples
into 2 groups of 2
by similarity.



Sample sizes ($\alpha=0.05$; power=0.8)

Delta	Tetrad	Triangle
1.00	65	220
1.25	34	102
1.50	20	57

Ennis, J.M. & Jesionka, V. (2011). The Power of Sensory Discrimination Methods Revisited. *Journal of Sensory Studies*, 26, 371-382.

Temporal Check-All-That-Apply (TCATA)

TCATA summary

- Extends CATA to *continuously track sensory properties*.
- Builds on earlier non-intensity methods
(Flavor Profile, Time-Quality Tracking, Temporal Dominance of Sensations, Temporal Order of Sensations, ...)
- Used with *trained panelists* or *consumers*

TCATA question

Check and uncheck words to track changes in the orange juice. At each moment, the words that are **checked** should **describe** the **orange juice** (check *all* that apply, in that moment).



0:20

Astringent

Off Flavor

Sourness

Bitterness

Sweetness

Orange Flavor

TCATA question

Check and uncheck words to track changes in the orange juice. At each moment, the words that should describe the orange juice (check all that apply, in that moment).

Timer starts when **Start** button is clicked



Astringent

Off Flavor

Sourness

Bitterness

Sweetness

Orange Flavor

TCATA question

Check/uncheck attributes to describe the sample

...in the orange juice. At each moment, the words that are checked should describe the orange juice (check all that apply, in that moment).

...immediately

Astringent

Off Flavor

Sourness

Bitterness

Sweetness

Orange Flavor

TCATA question

Check/uncheck attributes to describe the sample...
that moment).



0:15

Astringent

Sourness

Sweetness

Orange Flavor

or *after a waiting period*
(e.g. after swallowing)

TCATA question

Check and uncheck words to track change in juice. At each moment, the words that are shown should be checked (check all that apply).

Instructions related to evaluation protocol could be provided

Swallow the sample now...

Astringent

Off Flavor

Sourness

Bitterness

Sweetness

Orange Flavor

TCATA question

Check and uncheck words to track changes in the orange juice. At each moment, the words that are **checked** should **describe** the **orange juice** (check *all* that apply, in that moment).



0:45

Astringent

Sourness

Sweetness

Off Flavor

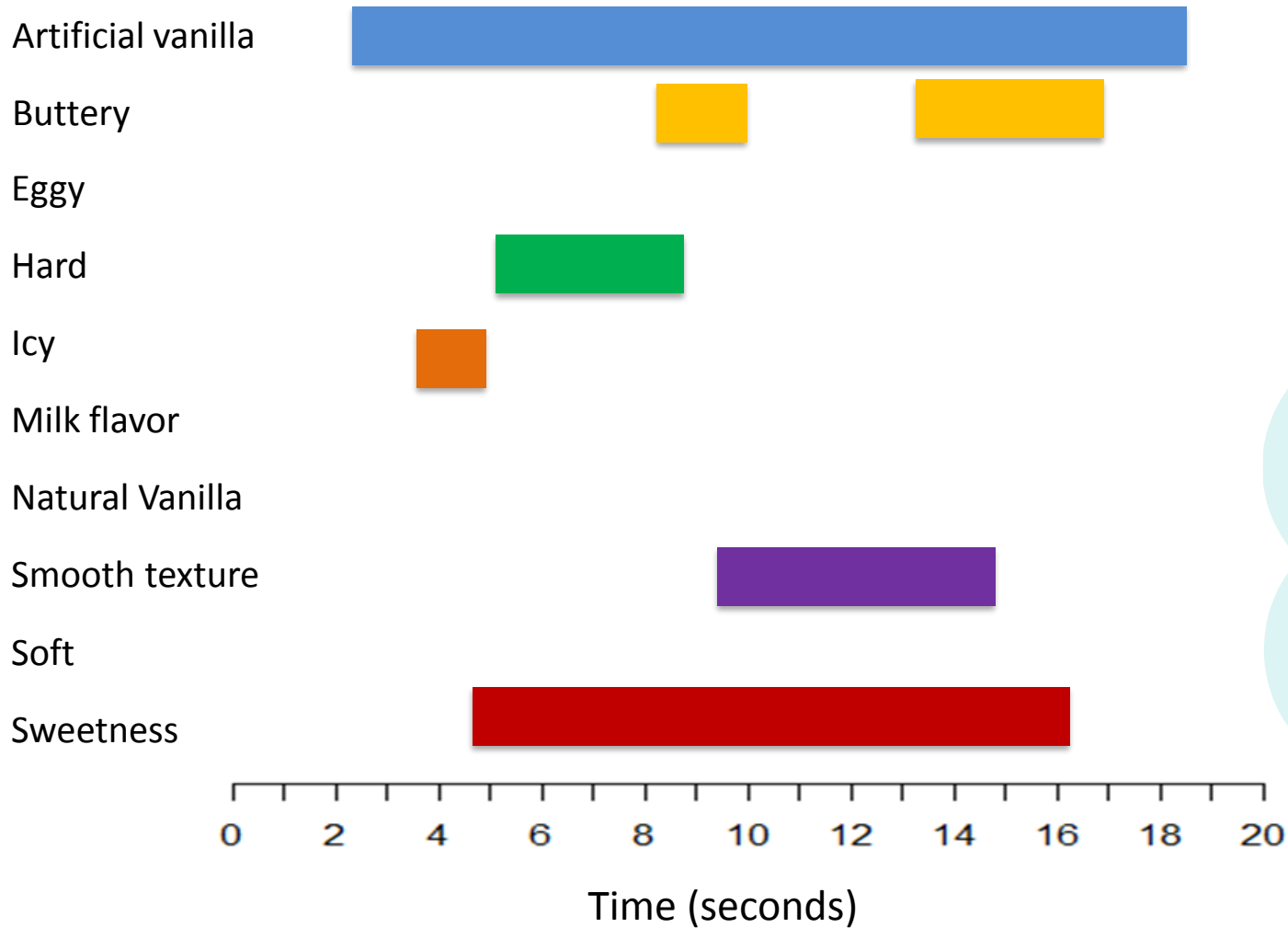
Bitterness

Orange Flavor

Evaluation ends at a set time

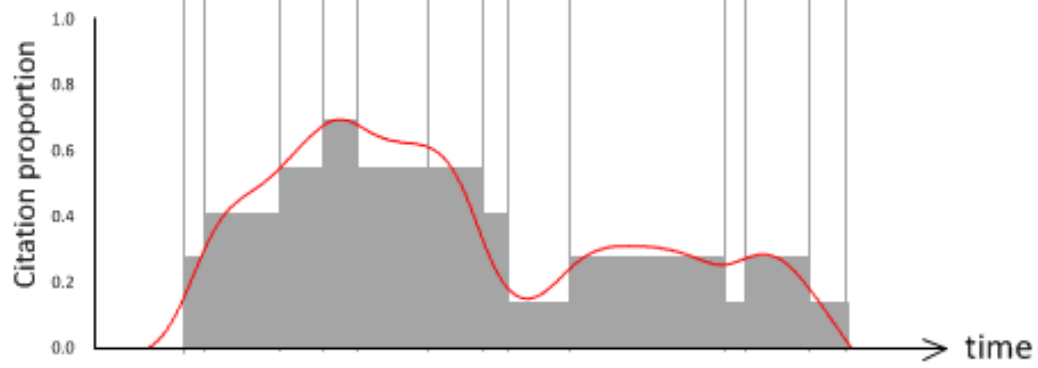
(determined by study objectives)

TCATA raw data

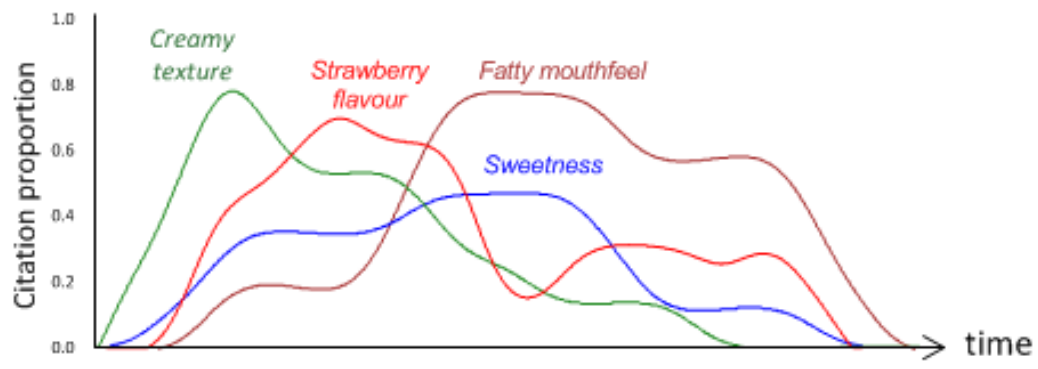




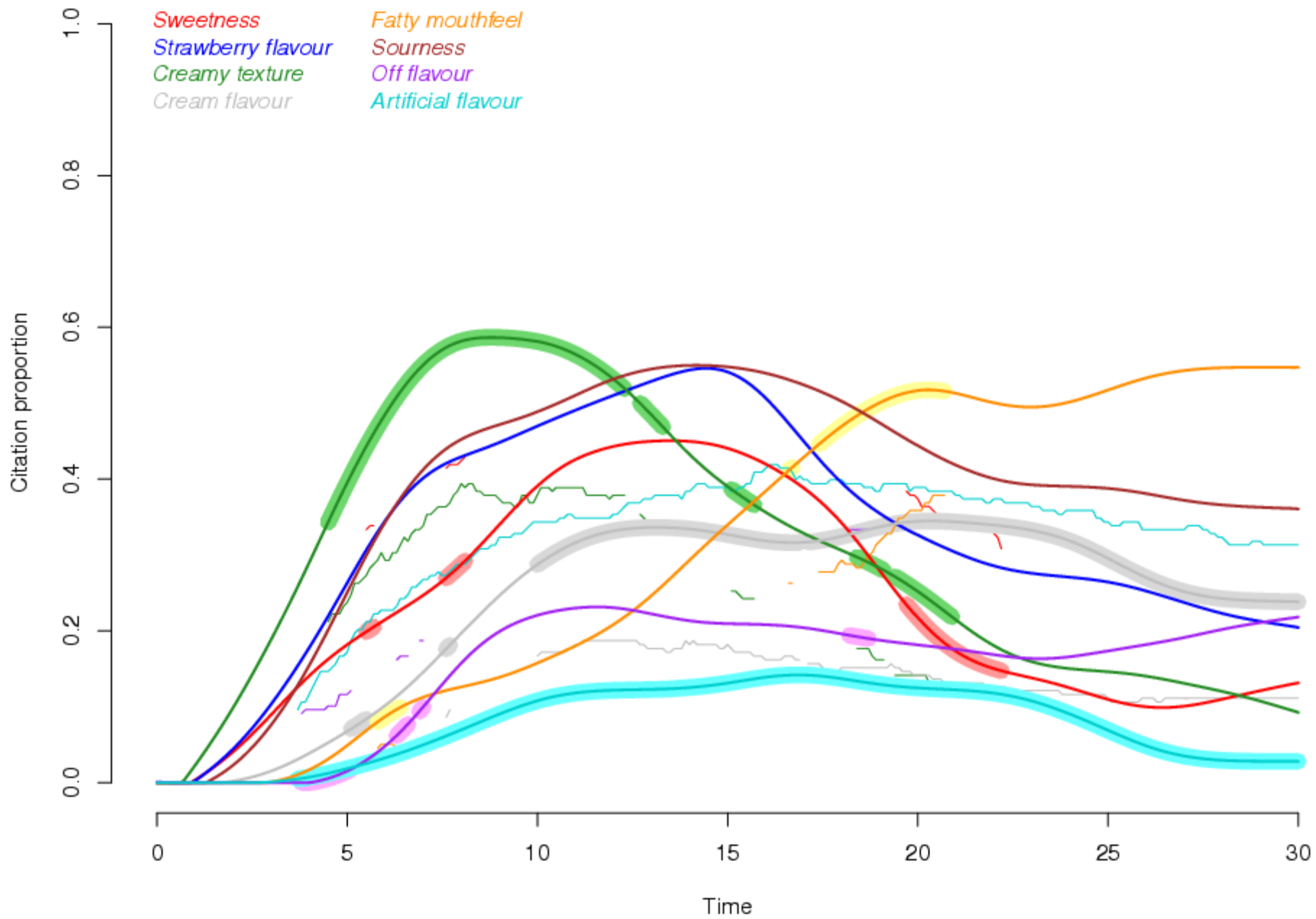
Aggregate TCATA data to get citation proportions for Strawberry flavour
(with optional smoothing)



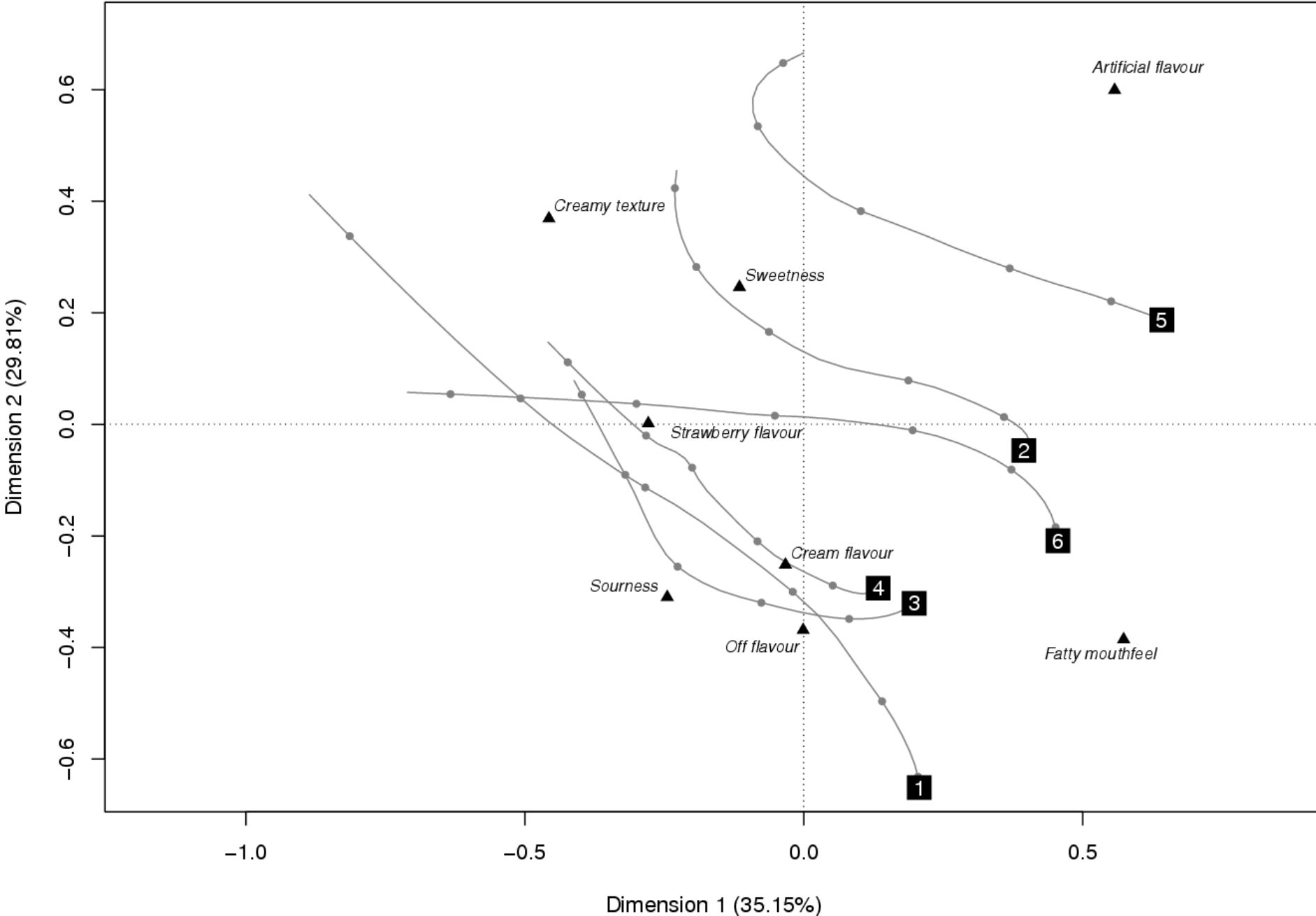
Present TCATA curves for all attributes



TCATA reference lines



Product trajectories



Refereed Publications

- Ares, G., Jaeger, S. R., Antúnez, L., Vidal, L, Giménez, A., Coste, B., Picallo, A., & Castura, J. C. (2015). Comparison of TCATA and TDS for dynamic sensory characterization of food products, *Food Research International*, 78, 148-158. <http://dx.doi.org/10.1016/j.foodres.2015.10.023>
- Boinbaser, L., Parente, M. E., Castura, J. C., & Ares, G. (2015). Dynamic sensory characterization of cosmetic creams during application using Temporal Check-All-That-Apply (TCATA) questions. *Food Quality and Preference*, <http://dx.doi.org/10.1016/j.foodqual.2015.05.003>
- Castura, J. C., Antúnez, L., Giménez, A., & Ares, G. (2016). Temporal Check-all-that-apply (TCATA): A novel dynamic method for characterizing products. *Food Quality and Preference*, <http://dx.doi.org/10.1016/j.foodqual.2015.06.017>
- Oliveira, D., Antúnez, L., Giménez, A., Castura, J. C., Deliza, R., & Ares, G. (2015). Sugar reduction in probiotic chocolate-flavored milk: Impact on dynamic sensory profile and liking. *Food Research International*, <http://dx.doi.org/10.1016/j.foodres.2015.05.050>

Open access

Selected Conference Presentations

- Castura, J. C., Baker, A. K., & Ross, C. F. (2015). Characterizing wine finish using TCATA product contrails. In *1st Afrosense Conference*. 23-26 November. Stellenbosch, South Africa. (Submitted abstract).
- Castura, J. C., King, S. C., Li, Q., & Serrano, D. (2015). Using Temporal Check-All-That-Apply (TCATA) to understand the relationship among hedonic, emotion, and sensory attributes. In *11th Pangborn Sensory Science Symposium*. 23-27 August. Gothenburg, Sweden. Scientific Poster Presentation. (Forthcoming).

Individual Differences

Is it possible to create products for individuals?

New Basic Tastes

Oleogustus and Kokumi

Understanding Genetic variation

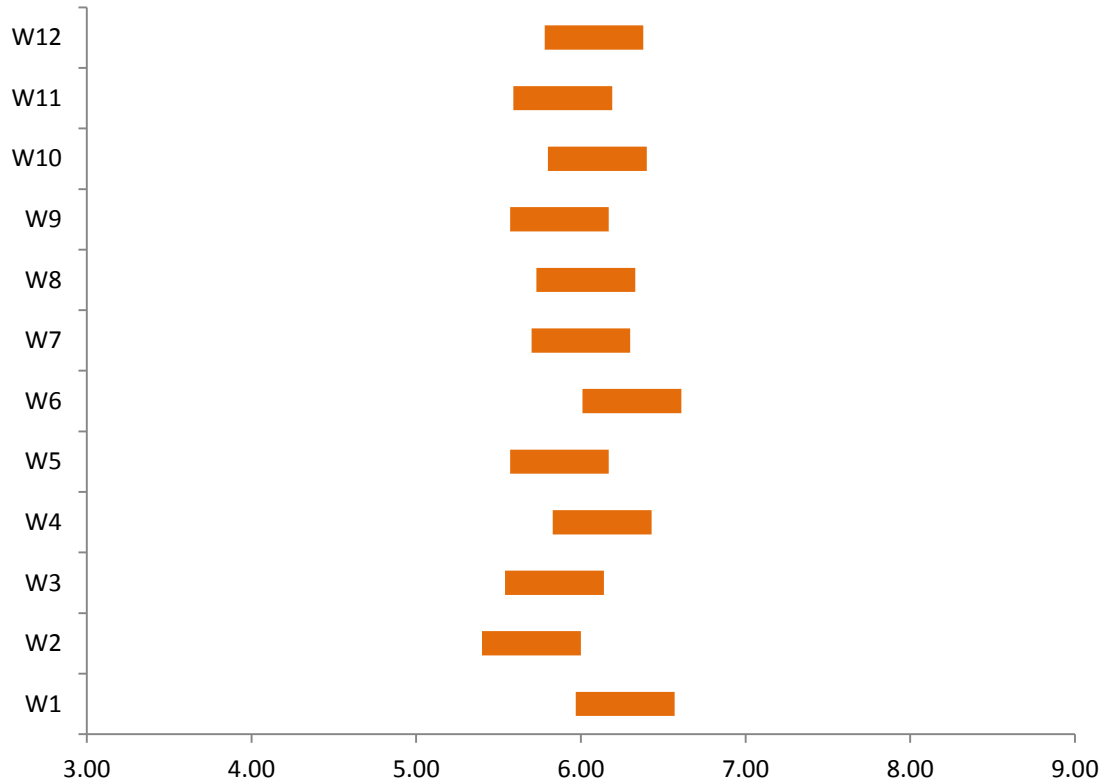
Specific Anosmia

Super Tasters and Bitter Blindness

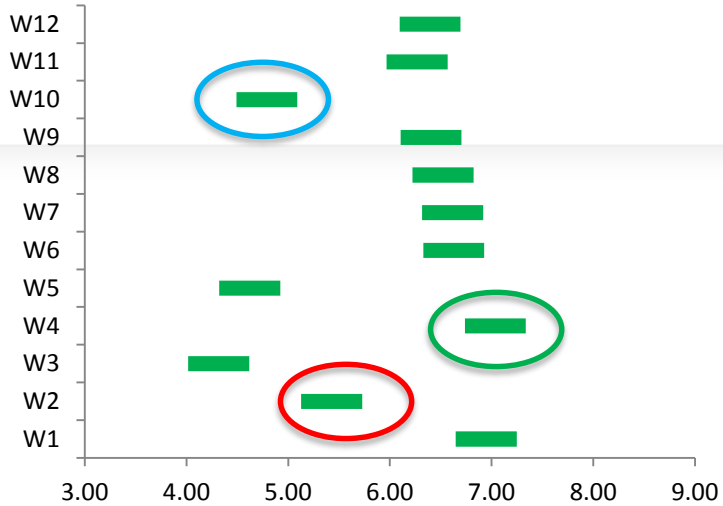
What do we know ?

- There is no product that is “universally” liked, even water.
- Optimization of products is essential to achieve efficiency and market success
- To optimize, you must have a **clear target**.
- Unless you segment your consumers based upon their sensory preference you will not have a clear target.

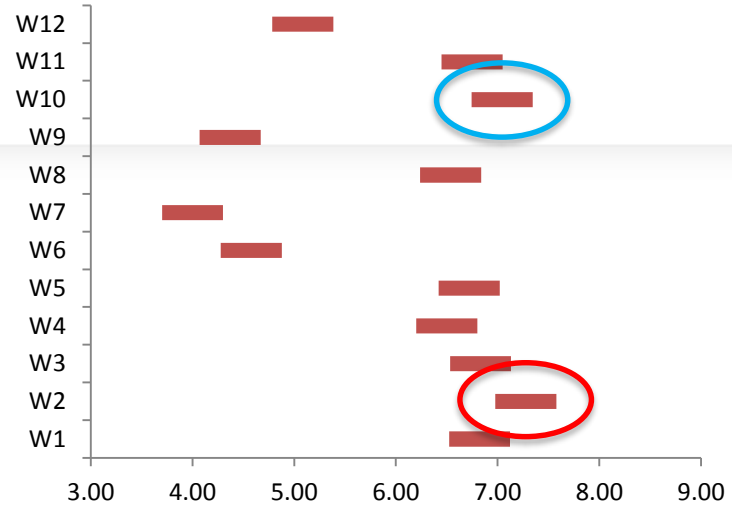
Cabernet Sauvignon Mean Liking



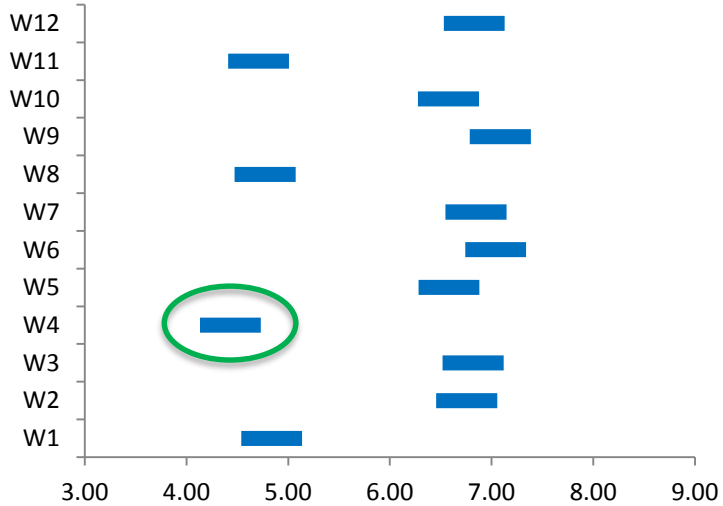
Cluster 1 – 28%



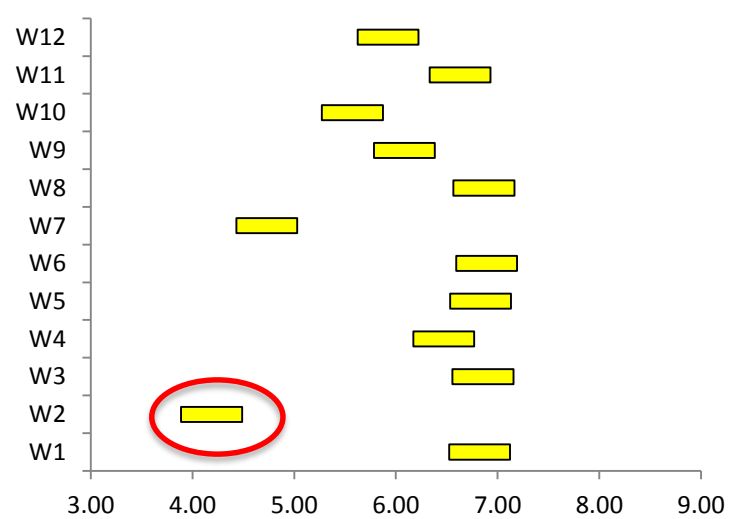
Cluster 2 – 23%



Cluster 3 – 32%

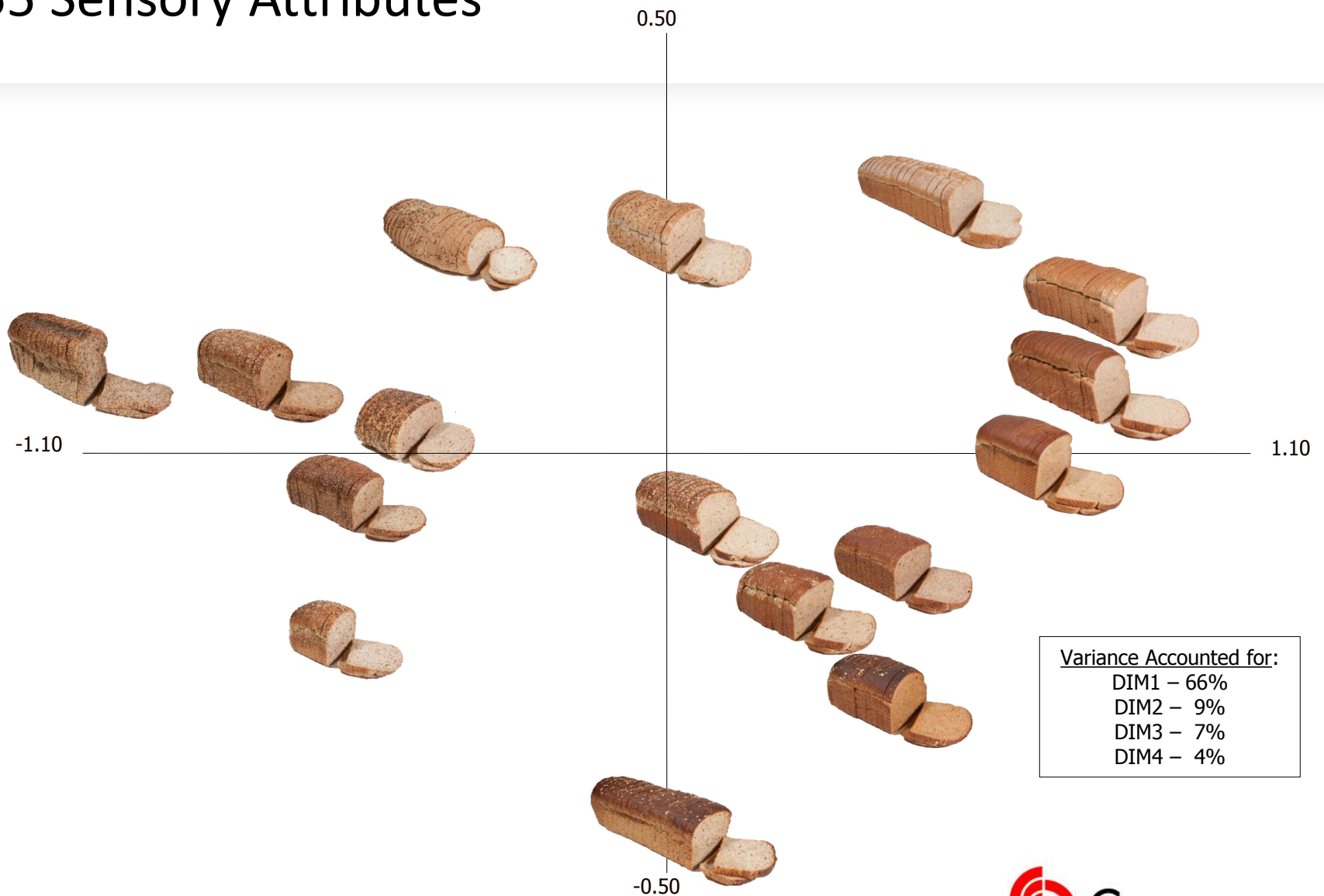


Cluster 4 – 17%



GPA of 16 Whole Grain Breads

55 Sensory Attributes



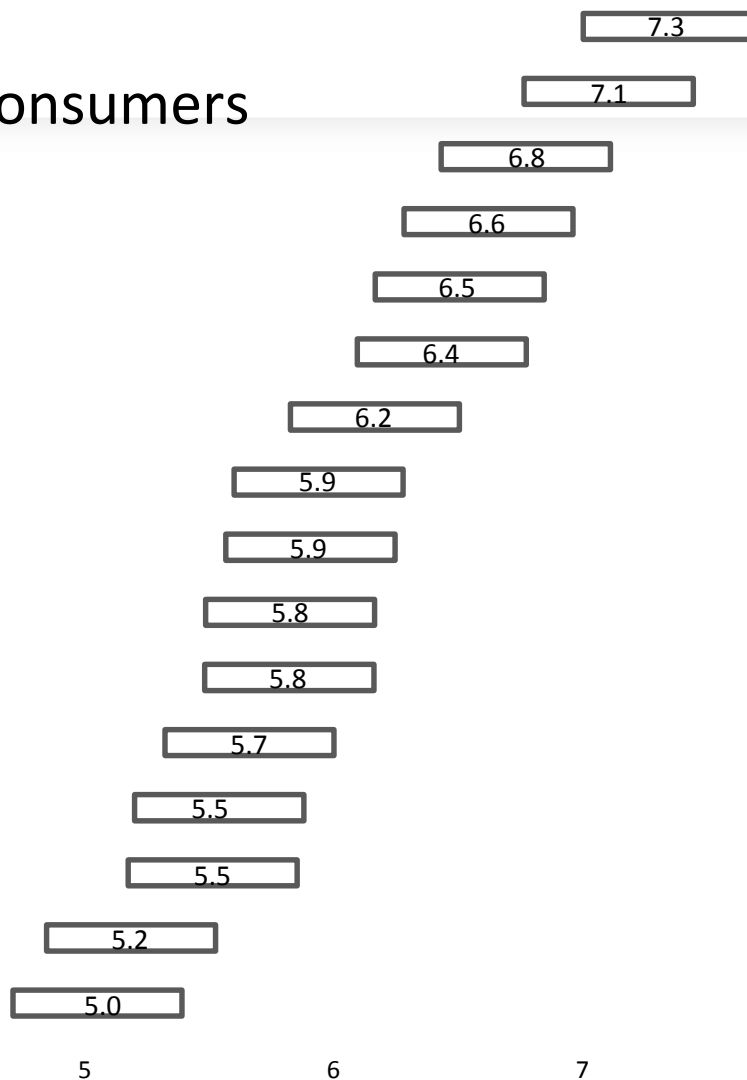
Overall Liking

All 570 Category Consumers



😊 LOVE IT!

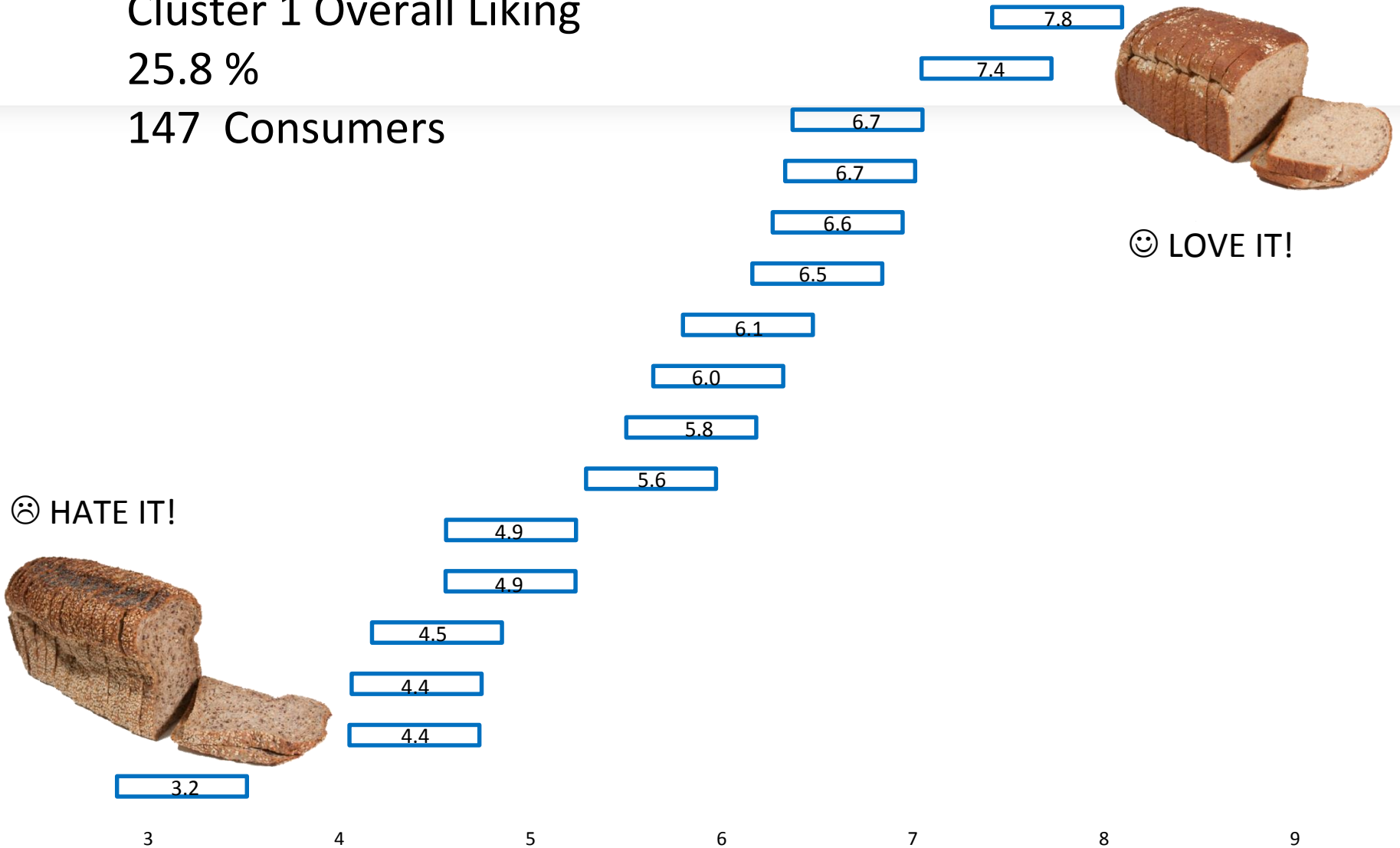
☹️ HATE IT!



Cluster 1 Overall Liking

25.8 %

147 Consumers



Cluster 2 Overall Liking

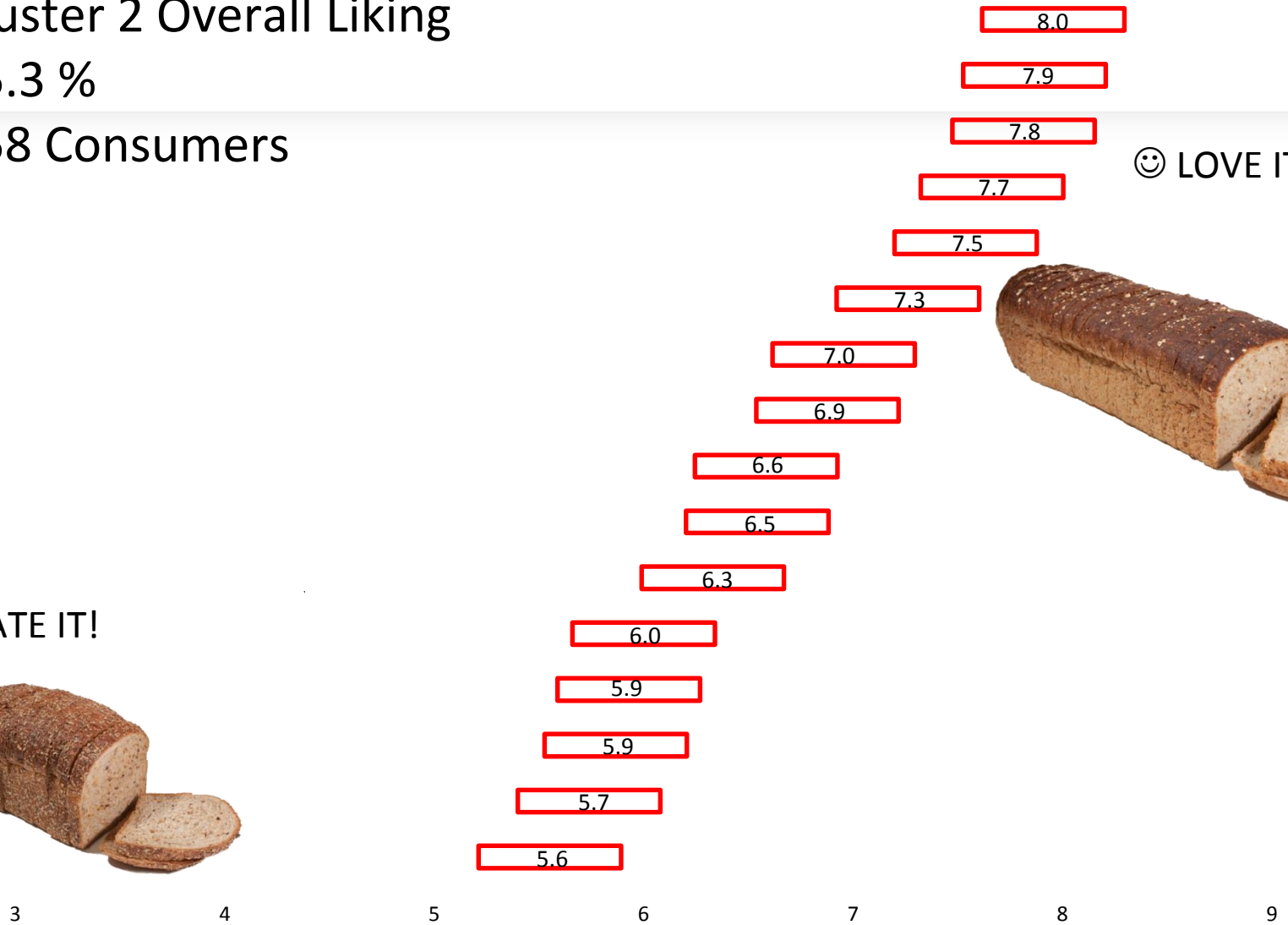
45.3 %

258 Consumers

☹️ HATE IT!



😊 LOVE IT!



Cluster 3 Overall Liking

28.9 %

165 Consumers

☹️ HATE IT!



😊 LOVE IT!

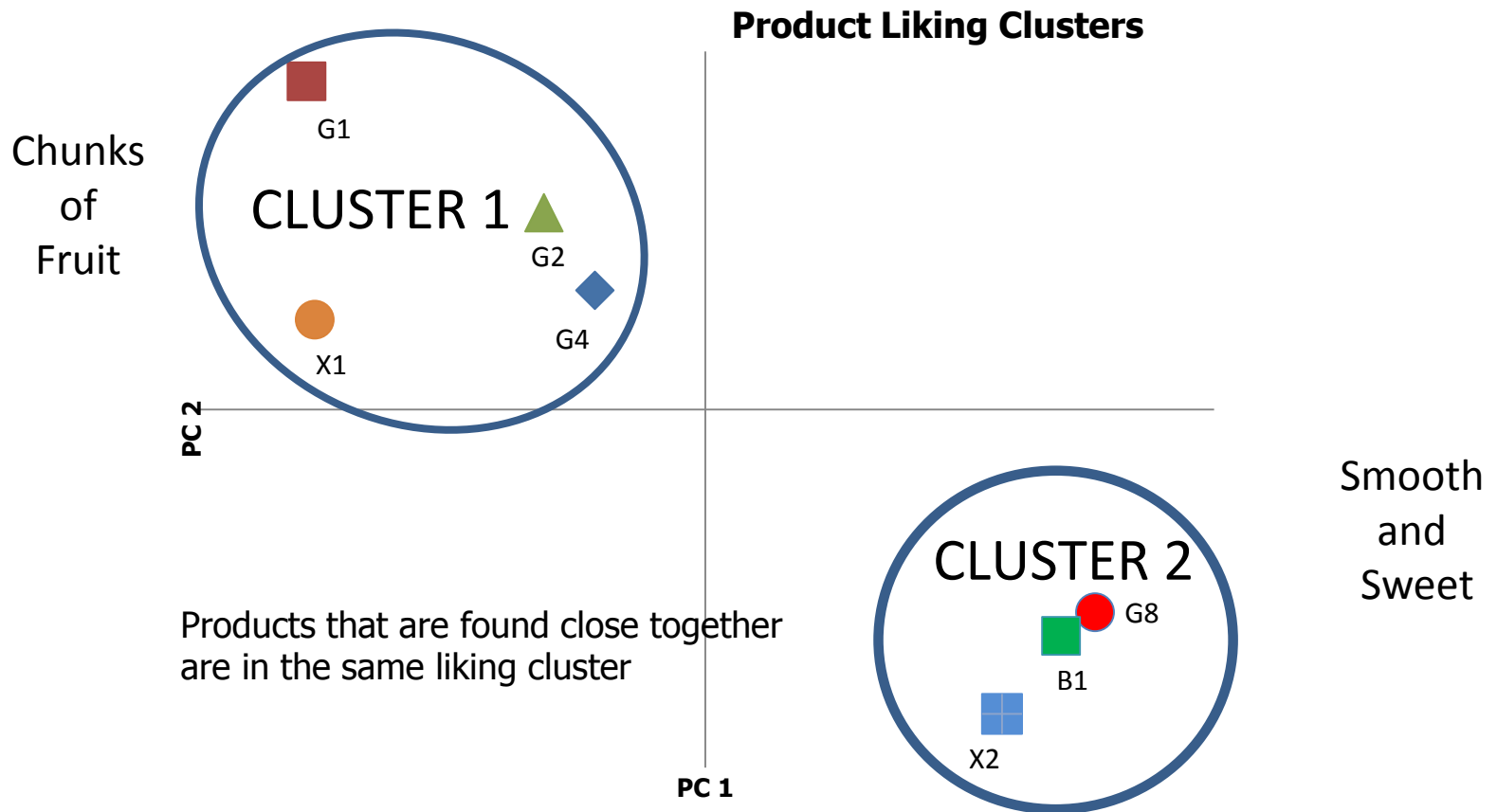


Understanding Consumers is important!

- Consumer segmentation is essential to understand liking
- This applies to all consumers
- Even little ones



Strawberry Jam Consumer Liking Clusters



Conclusions

- We must be aware of the increase in our understanding of perception and the methods for measuring the eating and drinking experience.
- Statistical tools allow the results we obtain to be interpreted with greater confidence.
- It's probably impractical to tailor products for individuals

Thank You