

# Effect of repeated exposure on consumer preferences for sports drinks containing different acidulants

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Sensory Evaluation*

**DEPARTMENT OF  
FOOD SCIENCE**

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# Introduction

- It is often necessary to make small changes to a formulation of a well-known food product



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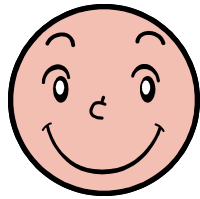
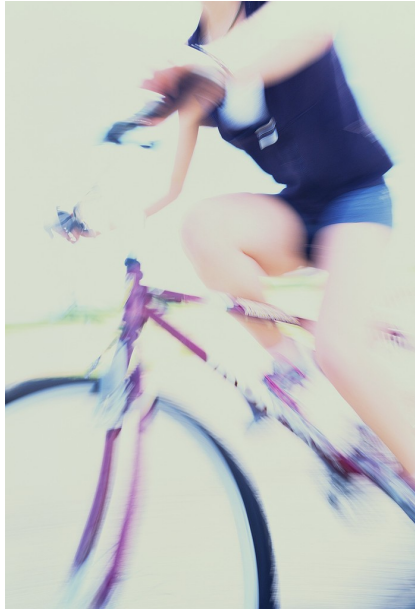
# Repeated consumption



- Repeated consumption of food and beverage products often changes consumers' acceptance or preferences for these products

Porcherot & Issanchou (1998); Lévy & Köster (1999); Köster *et al.* (2002); Stein *et al.*, (2003)

# Repeated exposure to food stimuli may lead to...

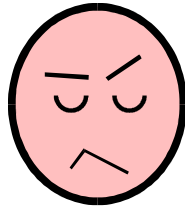


## – Mere exposure

- Experience with stimulus leads to increase liking (Zajonc, 1968)

## – Pacer theory

- People learn to appreciate more complex stimuli in life (Dember, 1970)



## – Food boredom/monotony

- A neural/physiological response with a decrease in actual liking caused by satiation with specific attributes of the consumed food (Zandstra *et al.*, 2004)

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# Hedonic Adjustment Potential HAP

- the change in like/dislike perceptions of consumers to the sensory properties of food stimuli after extended consumption or use

(De Kock & Kinnear, 2003)

# Repeated exposure testing

- Advantage
  - an improved reflection of a real-life situation in which consumers repeatedly consume a product over a period of time.
- Disadvantage
  - time consuming and expensive to conduct
  - experimental design

# Objective



- To determine the effect of repeated exposure on consumers' preferences for sports drinks containing different acidulants

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# Hypothesis



- We predicted that several exposures to sports drinks with different acidulants will change consumer preferences.
  - subtle differences in taste profiles became more evident after repeated exposure and therefore influenced liking  
(Stein *et al.*, 2003)



# Product samples



Citric  
Acid

Malic  
Acid

Tartaric  
Acid

Fumaric  
Acid

Fruitaric  
Acid

n = 128

**Pre exposure**

**Preference ranking**

**Sensory lab**

**Citric Acid**

**Malic Acid**

**Tartaric Acid**

**Fumaric Acid**

**Fruitaric Acid**

**Control Group**



**Mid exposure**

**Preference ranking**

**Sensory lab**



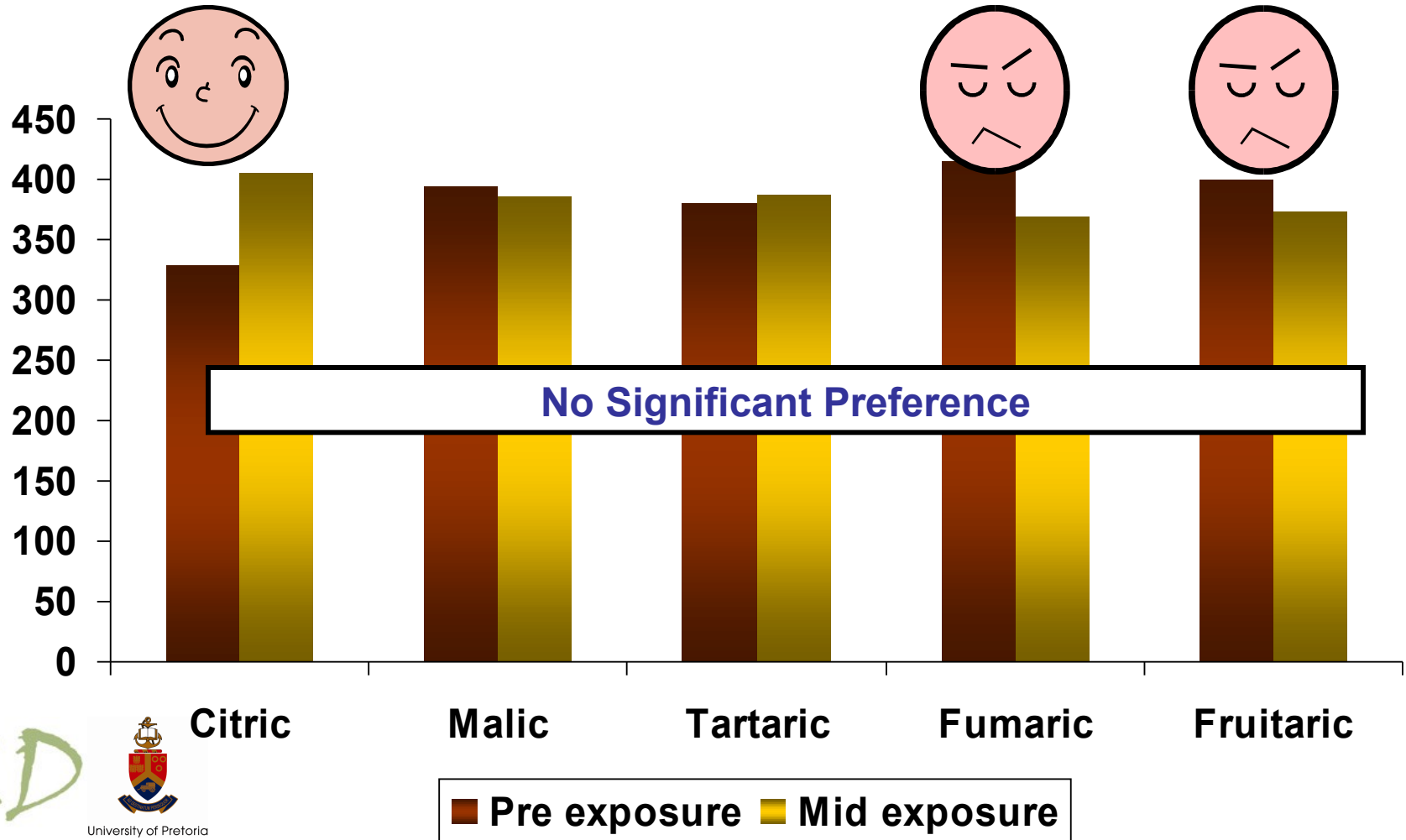
**Post exposure**

**Preference ranking**

**Sensory lab**

# Preference rank sum totals (n=128)

(1=Like the most, 5=Like the least)



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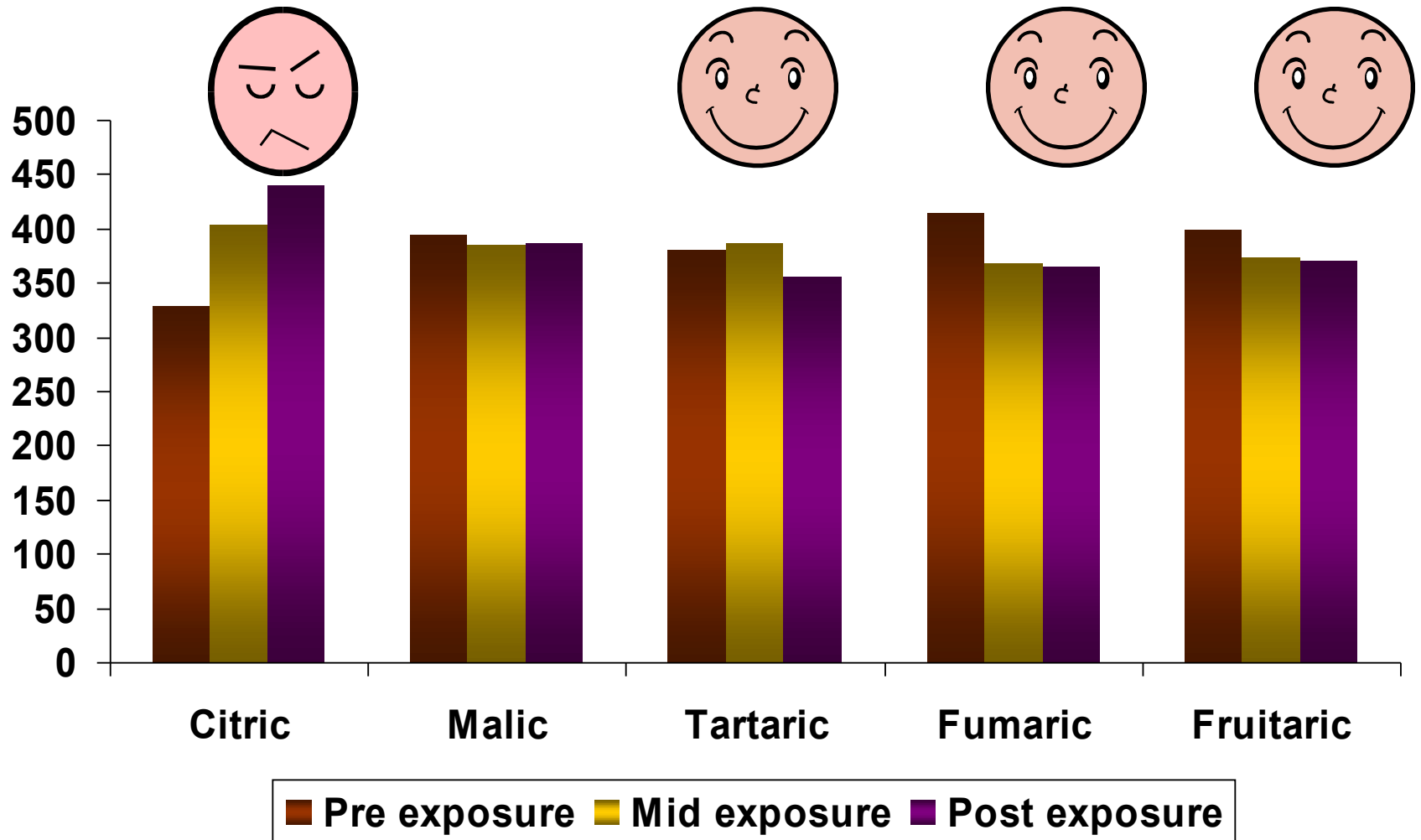
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■ Pre exposure ■ Mid exposure

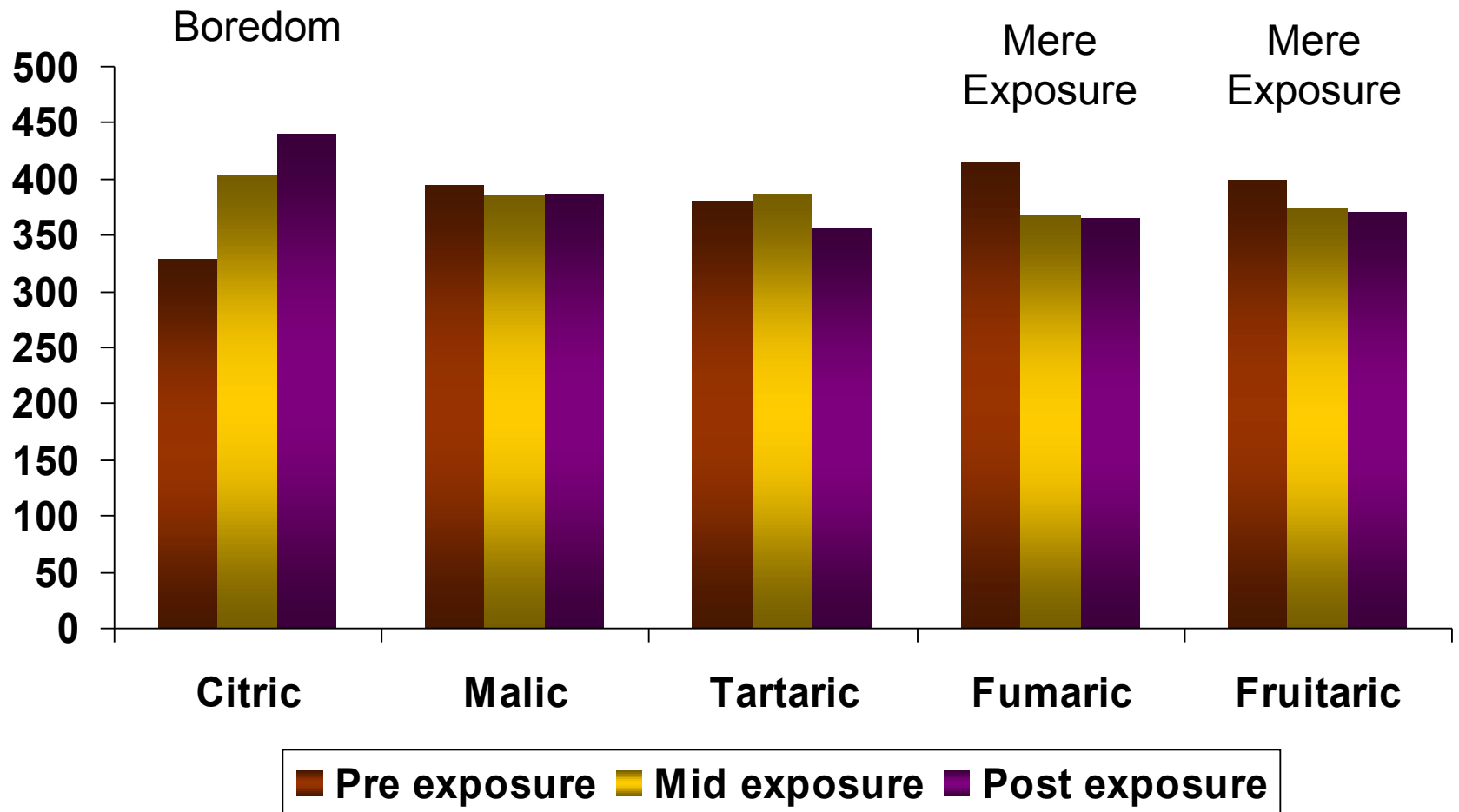
# Preference rank sum totals (n=128)

(1=Like the most, 5=Like the least)



# Preference rank sum totals (n=128)

(1=Like the most, 5=Like the least)



# Exposure to citric acid (n=20)

Rank sum totals (1=Like the most, 5=Like the least)

Exposure	Citric	Malic	Tartaric	Fumaric	Fruitaric
Pre	60	51	70	64	55
No Significant Preference					
Mid	60	57	65	56	62
No Significant Preference					
Post	71 <sup>b</sup> ↓	71 <sup>b</sup> ↓	63 <sup>ab</sup>	46 <sup>a</sup> ↑	49 <sup>a</sup> ↑

Boredom

Mere Exposure

# Exposure to fumaric acid (n=22)

Rank sum totals (1=Like the most, 5=Like the least)

Exposure	Citric	Malic	Tartaric	Fumaric	Fruitaric
Pre	56 <sup>a</sup> ↑	59 <sup>a</sup> ↑	54 <sup>a</sup> ↑	72 <sup>ab</sup>	89 <sup>b</sup> ↓
Mid	74	69	61	63	63
No Significant Preference					
Post	76 <sup>b</sup> ↓	45 <sup>a</sup> ↑	68 <sup>b</sup> ↓	73 <sup>b</sup> ↓	68 <sup>b</sup> ↓

Boredom



# Exposure to fumaric acid (n=22)

Rank sum totals (1=Like the most, 5=Like the least)

Exposure	Citric	Malic	Tartaric	Fumaric	Fruitaric
Pre	56a	Smooth Flat	54a ↑	Strong Metallic Lingering	89b ↓
Mid	74		61		63
Post	76b ↓		68b ↓	73b ↓	68b ↓

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Irritation

# Exposure to malic acid (n=24)

Rank sum totals (1=Like the most, 5=Like the least)

Exposure	Citric	Malic	Tartaric	Fumaric	Fruitaric
Pre	63	84	69	79	65
No Significant Preference					
Mid	62	71	76	76	75
No Significant Preference					
Post	77	86	59	69	69
No Significant Preference					

# Exposure to tartaric acid (n=22)

Rank sum totals (1=Like the most, 5=Like the least)

Exposure	Citric	Malic	Tartaric	Fumaric	Fruitaric
Pre	56 <sup>a</sup> ↑	90 <sup>b</sup> ↓	58 <sup>a</sup> ↑	73 <sup>ab</sup>	56 <sup>a</sup> ↑
Mid	74	64	65	64	65
No Significant Preference					
Post	63	65	66	66	70
No Significant Preference					

# Exposure to frutaric acid (n=21)

Rank sum totals (1=Like the most, 5=Like the least)

Exposure	Citric	Malic	Tartaric	Fumaric	Fruitaric
Pre	52	62	75	67	59
No Significant Preference					
Mid	71	66	53	61	64
No Significant Preference					
Post	79 <sup>b</sup> ↓	66 <sup>ab</sup>	48 <sup>a</sup> ↑	59 <sup>ab</sup>	63 <sup>ab</sup>

Pacer theory

# Control group (no exposure) (n=19)

Rank sum totals (1=Like the most, 5=Like the least)

Exposure	Citric	Malic	Tartaric	Fumaric	Fruitaric
Pre	45 <sup>a</sup> ↑	49 <sup>a</sup> ↑	55 <sup>a</sup> ↑	60 <sup>ab</sup>	76 <sup>b</sup> ↓
Mid	64	59	69	49	44
	No Significant Preference				
Post	74	55	52	53	51
	No Significant Preference				

# Conclusions

- Repeated exposure to sports drinks with different acidulants changed consumer preferences
- Home use exposure to specific sports drink did not always result in shifts in preferences according to predictable theories.

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# Conclusions

- As sensory scientists we need to critically evaluate the validity of our standard single exposure small sip consumer tests to predict long term consumer perception