WHY CAN'T WE LIVE WITHOUT SWEETNESS?

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Why low calories count: The effective use of low calorie sweeteners in today's diet and lifestyle choices

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Background of food preferences

Most preferences are learned via

- Mere **exposure**
- **Social** pressure, modeling and conditioning
- Flavor-pharmacological **conditioning**
- Flavor-flavor conditiong (where sweetness can be a crucial factor)
- **Cognitive** influences

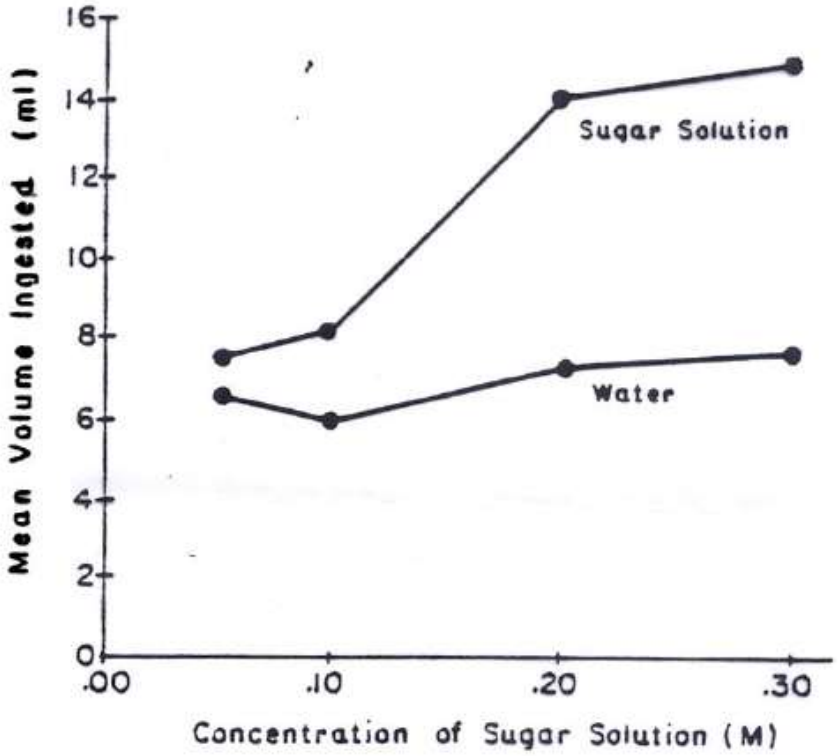
Very few innate (biological) responses

- Reluctance to try new foods
- Rejection based on negative consequences
- Basic tastes (**sweet+,** salty+, sour-, bitter-, umami+)
- Impact of **genes**?

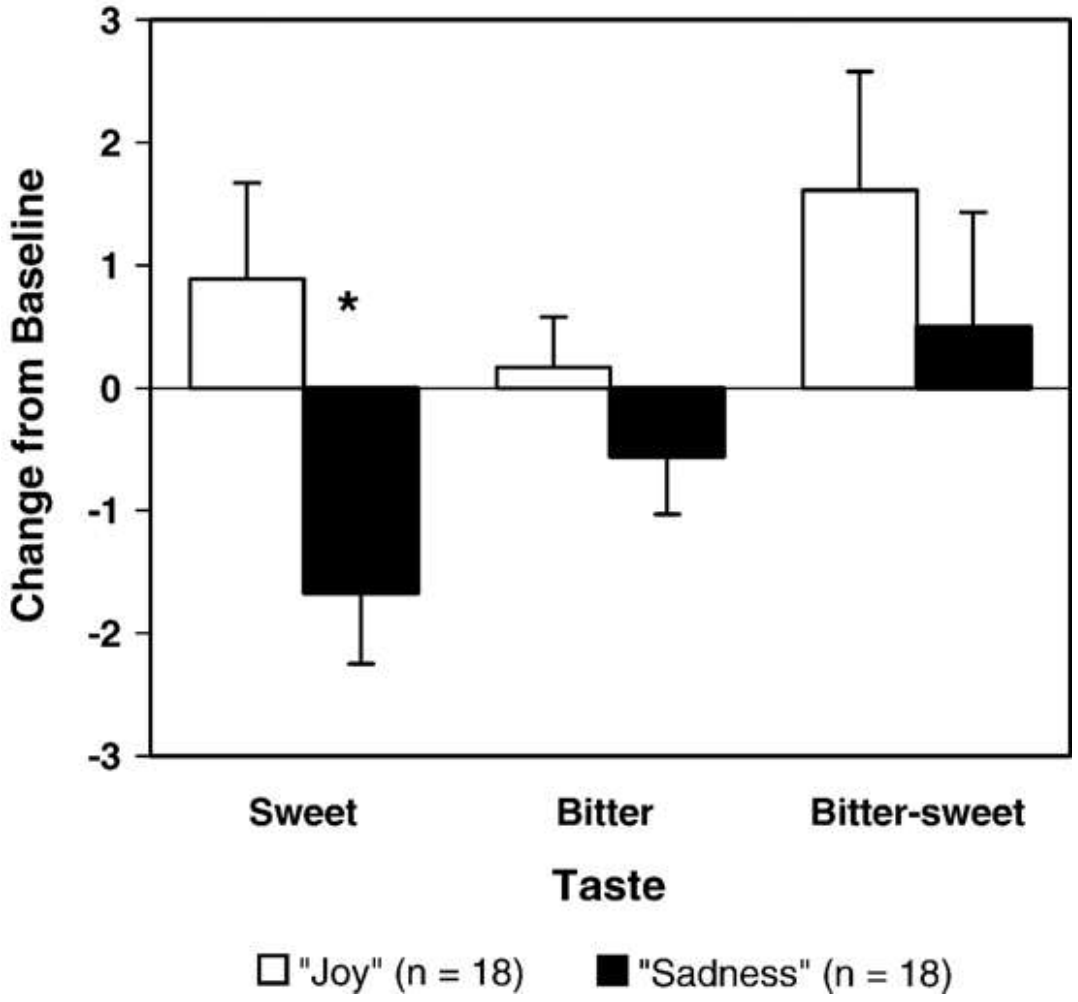
Responses of newborn babies

Drop of 12% sucrose solution on the tongue (Steiner 1977)

Consumption (sucking) of water vs 1.7-10% sucrose (Desor et al.1973)



Pleasantness of taste after joyful or sad film
Emotional status is displayed in responses to sweetness



Greimel, Macht, Krumhuber & Ellgring, 2006

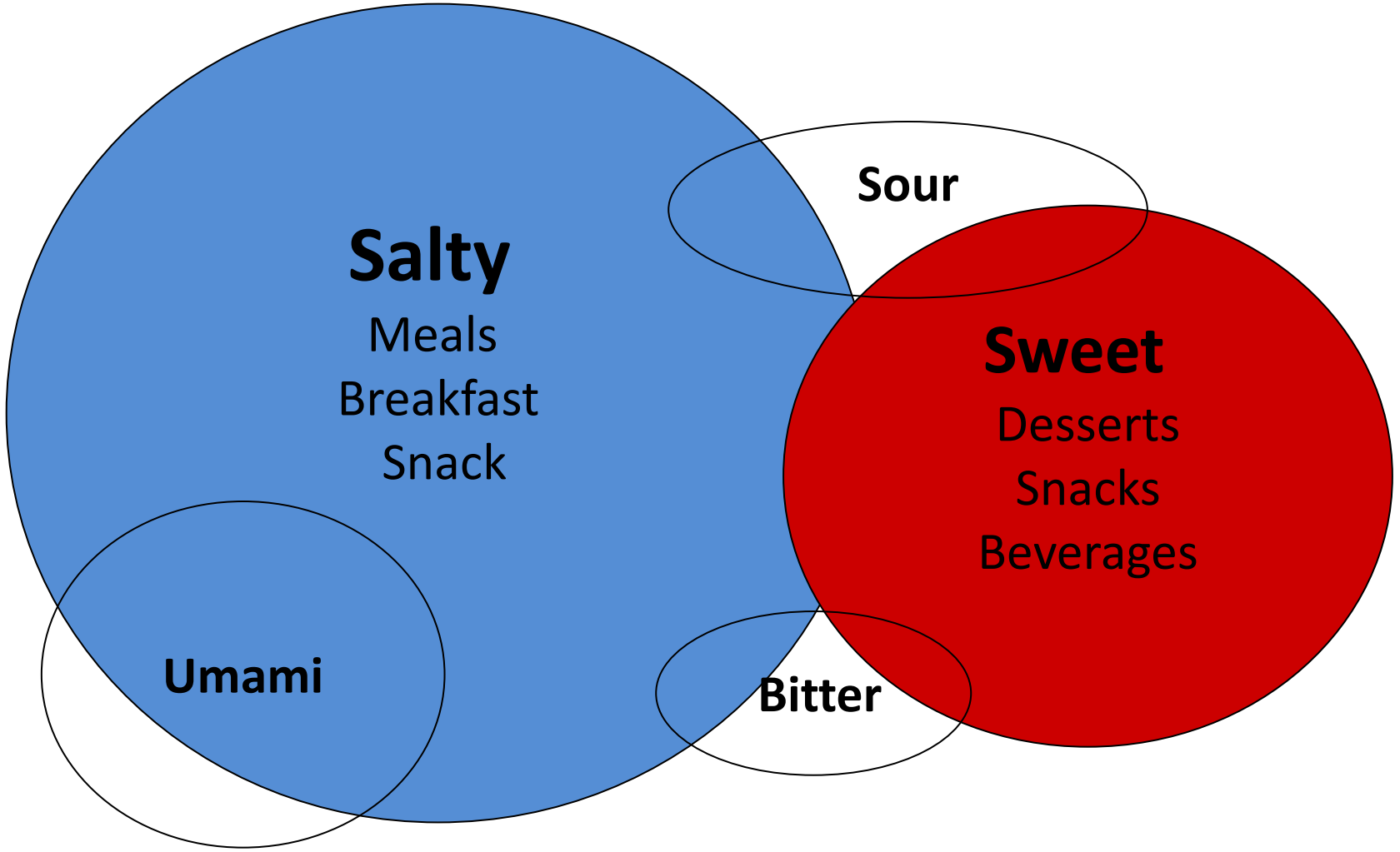
Formation of cultural food preferences

Two examples from Rozin (1982)

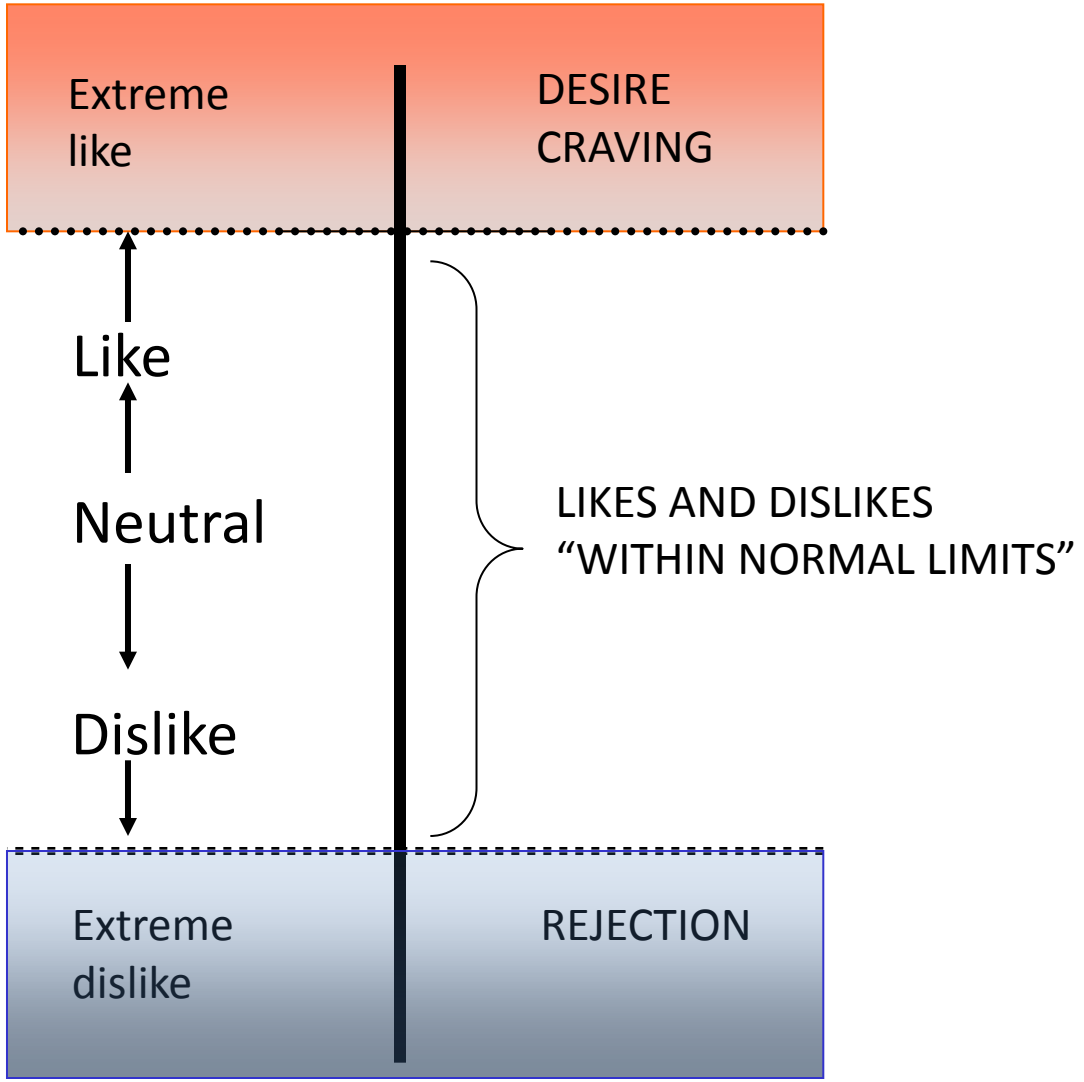
	SUGAR	CHILI PEPPER
BIOLOGY	Innate preference	Innate aversion (irritant)
INDIVIDUAL	Discovery of sweetness in the surroundings	• Use for medicinal effects? • Substitute for black pepper?
FOOD CULTURE	Sweet foods into cuisine • Availability of sugar through agriculture • Product technologies • Artificial sweeteners	Chili pepper into cuisine as flavor principle
INDIVIDUAL	Exposure leads immediately to liking	Exposure leads gradually to habitual use and liking. Two stages: • Socially mediated exposure • Internalization of preference

Taste is the core of sensory quality of foods

- and salty and sweet tastes are the very core



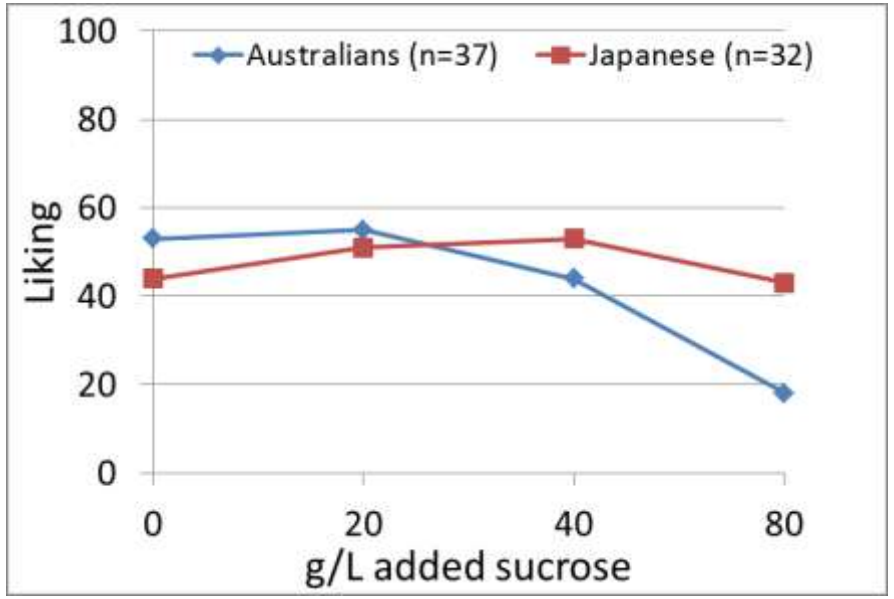
Affective continuum



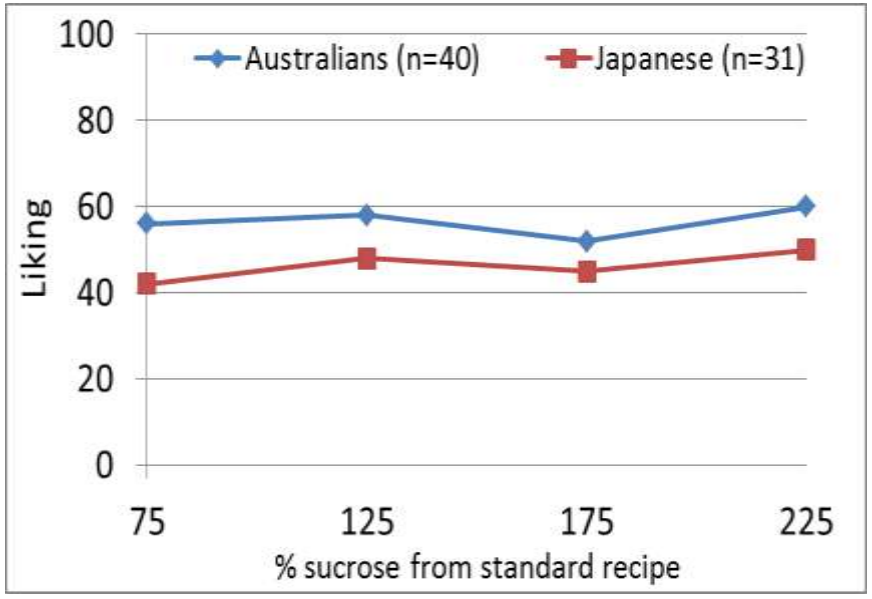
Liking for sweetness in products varies by culture

Australians vs Japanese

Orange juice



Breakfast cereals

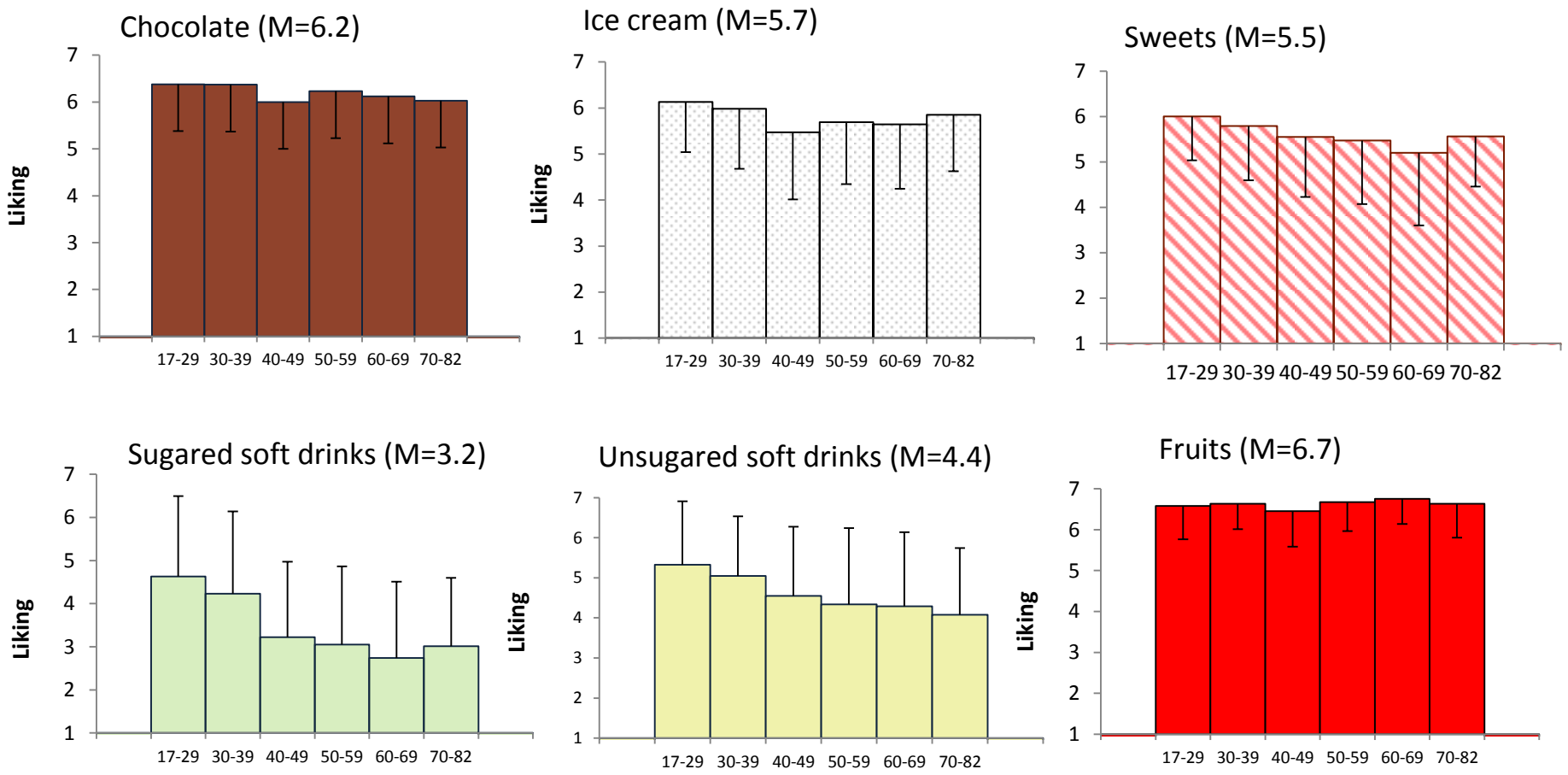


Prescott, Bell, Gillmore, Yoshida, O'Sullivan, Korac, Allen & Yamazaki 1997

Liking for sweet products varies by product and by age

Female British twins, 17-82 yrs (n=884)

1 =dislike very much, 4 =neither like nor dislike, 7= like very much



Unpublished data from: Keskitalo, Tuorila, Spector, Cherkas, Knaapila, Kaprio, Silventoinen & Perola, 2008

Liking for sweet products by gender

1=dislike very much, 4=neither like nor dislike, 7=like very much

	Finnish twins 20-25yrs, n=1175		British twins 17-82yrs, n=1018	
Product	**Males (FI) n= 532**	**Females (FI) n=643**	**Males (UK) n= 106**	**Females (UK) n=912**
Chocolate	5.8	6.3***	6.1	6.2 .
Ice cream	5.8	6.0***	6.0**	5.7
Sweets	5.7	6.0***	5.2	5.5
Sugared soft drinks	5.6***	5.0	3.7***	3.2
Unsugared/sugar-free soft drinks	5.2	5.4**	4.3	4.4
Fruits	6.0	6.6***	6.5	6.7

**** or **significantly higher ratings within a data set*

Unpublished data from: Knaapila, Silventoinen, Broms, Rose, Perola, Kaprio & Tuorila 2011; *and* Keskitalo et al. 2008

Craving for sweet foods (CSF)

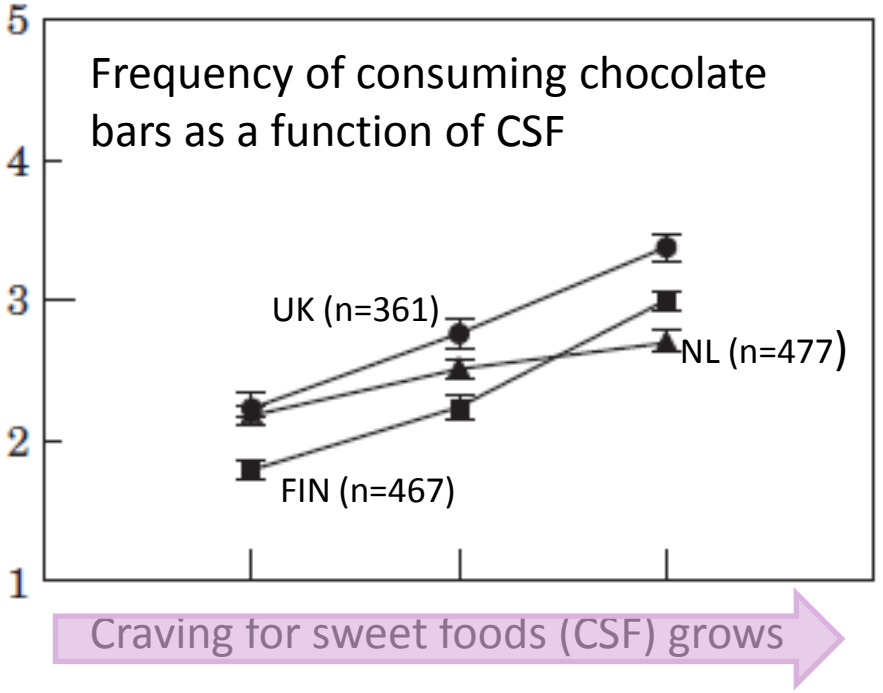
The instrument CSF consists of 6 statements, e.g.;

”I often have cravings for chocolate”

Ratings between 1 and 7:

1= strongly disagree

7= strongly agree



Roininen, Tuorila, Zandstra, De Graaf, Vehkalahti, Stubenitsky, & Mela, 2001

Craving for sweet foods (CSF1=low, CSF2=high) drives liking for sugary products, but this does not generalize to naturally sweet products

Female British twins, 17-82 yrs (n=884)

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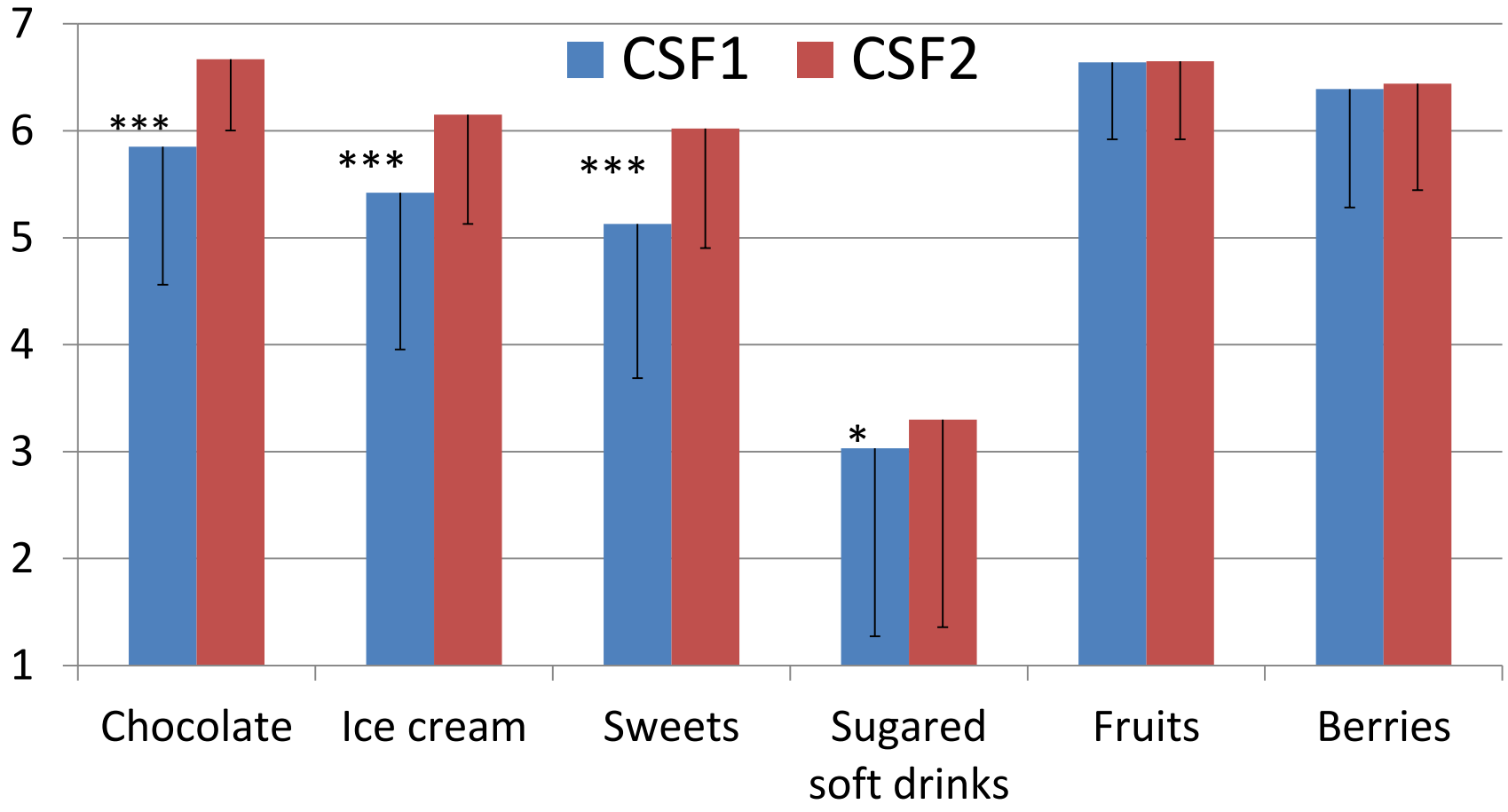
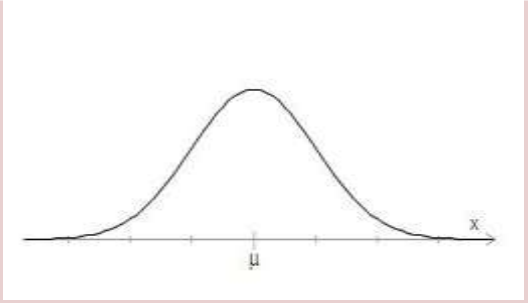


Unpublished data from: Keskitalo et al. 2008

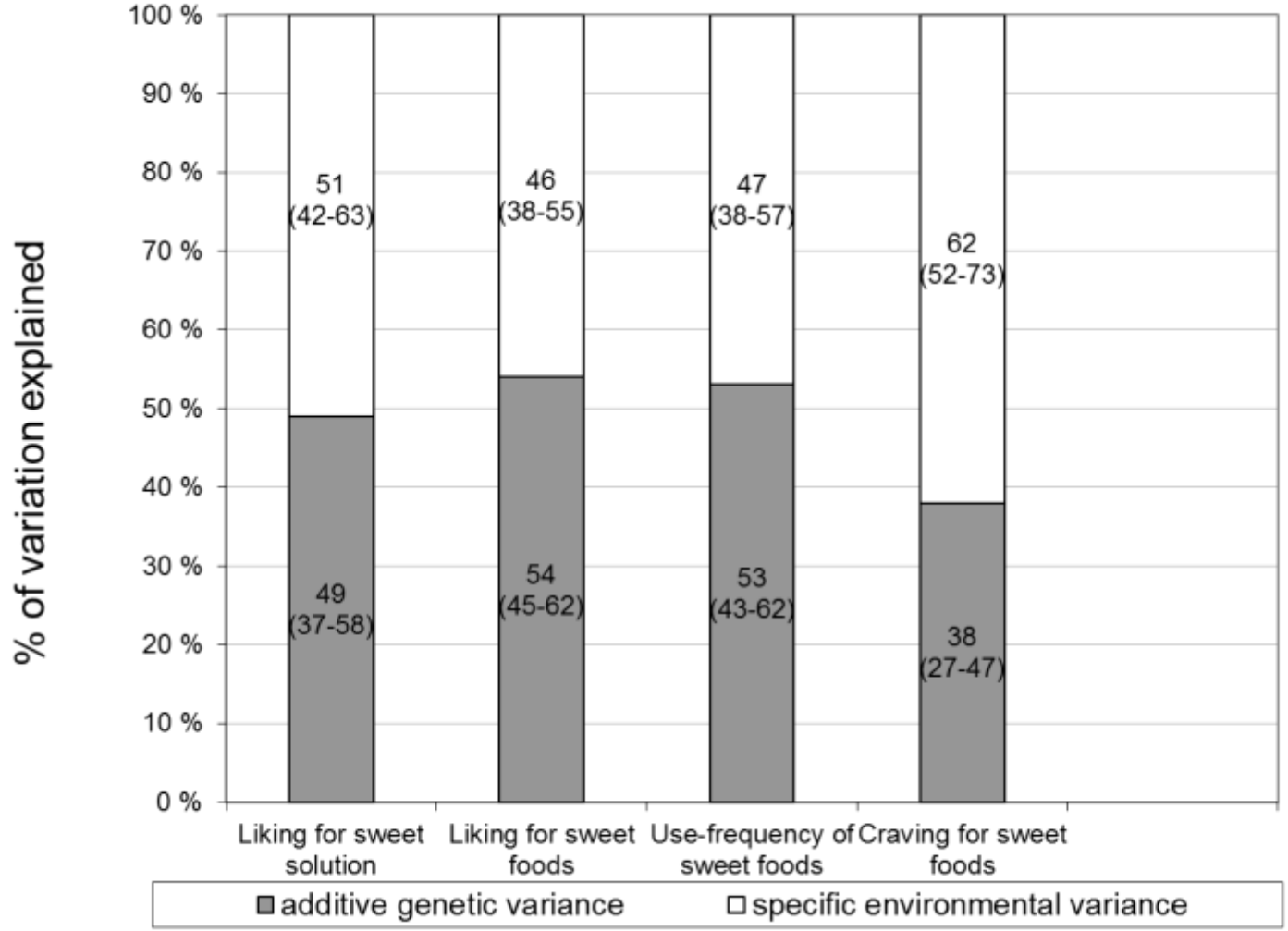
Heritability of sweetness responses
Starting point and design

Point of departure	Populations	Methods
 • Liking for sweet is innate and universal • However, some individuals appear to like sweet more than others -> does ”sweet tooth” have a genetic background?	• Finnish twins • British twins Classical twin studies: • Comparison of mono- and dizygotic twin pairs • Resulting models are based on differences between these groups	• Liking for a very sweet (20% sucrose) liquid • Questionnaire on liking and use frequency of a range of sweet foods • Ratings of CSF (craving for sweet foods) • Other ratings and questionnaires • Intensity of PROP filter paper (control, known to be heritable)

Heritability of traits related to preference for sweetness

Variation explained by genetic and specific environmental effects

Female British twins (n=648)



Keskitalo, Tuorila, Spector, Cherkas, Knaapila, Silventoinen & Perola, 2007

Take home messages

- We can live without sweetness! but it may be difficult because of its biological, psychological, and social role in our lives
- ”Sweet tooth” has a genetic background: for some people, living without sweetness may be easier than for others
- Food culture shapes the role of sweetness and the preferred sweetness intensities