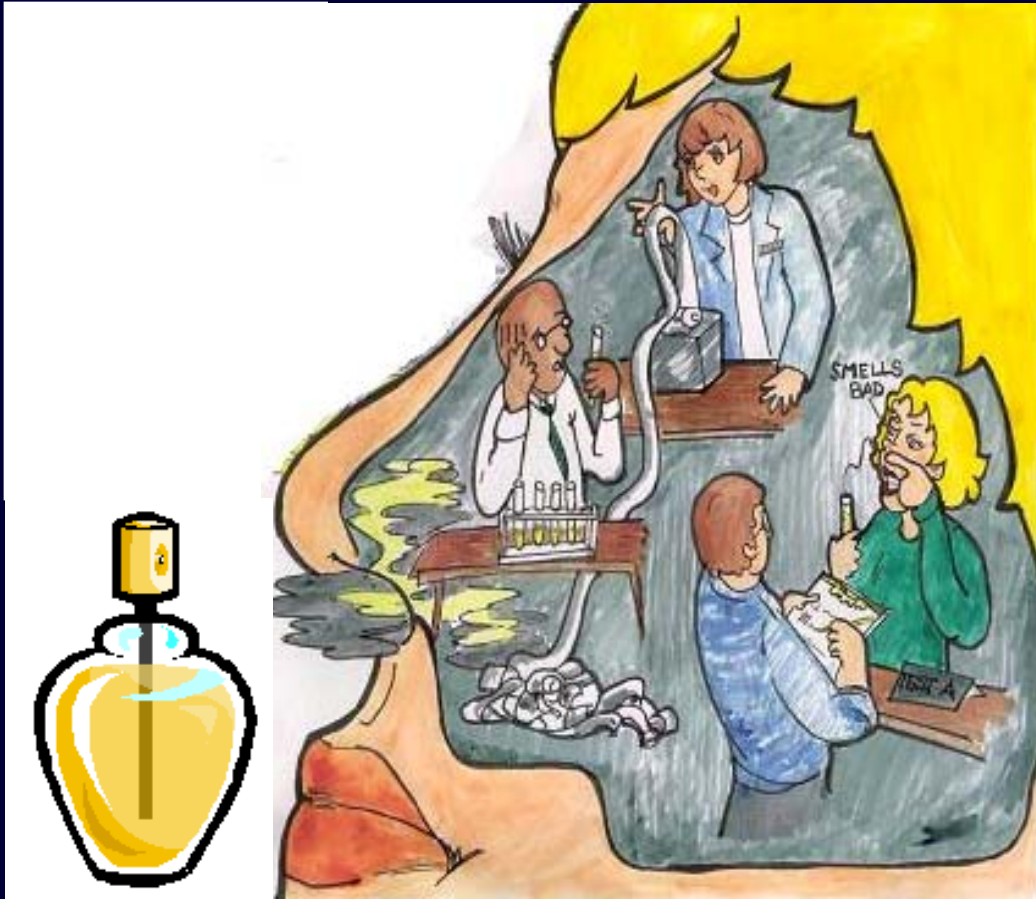


Olfaction: A Playground for Sensation, Emotion & Cognition

Pamela Dalton
Monell Chemical Senses Center

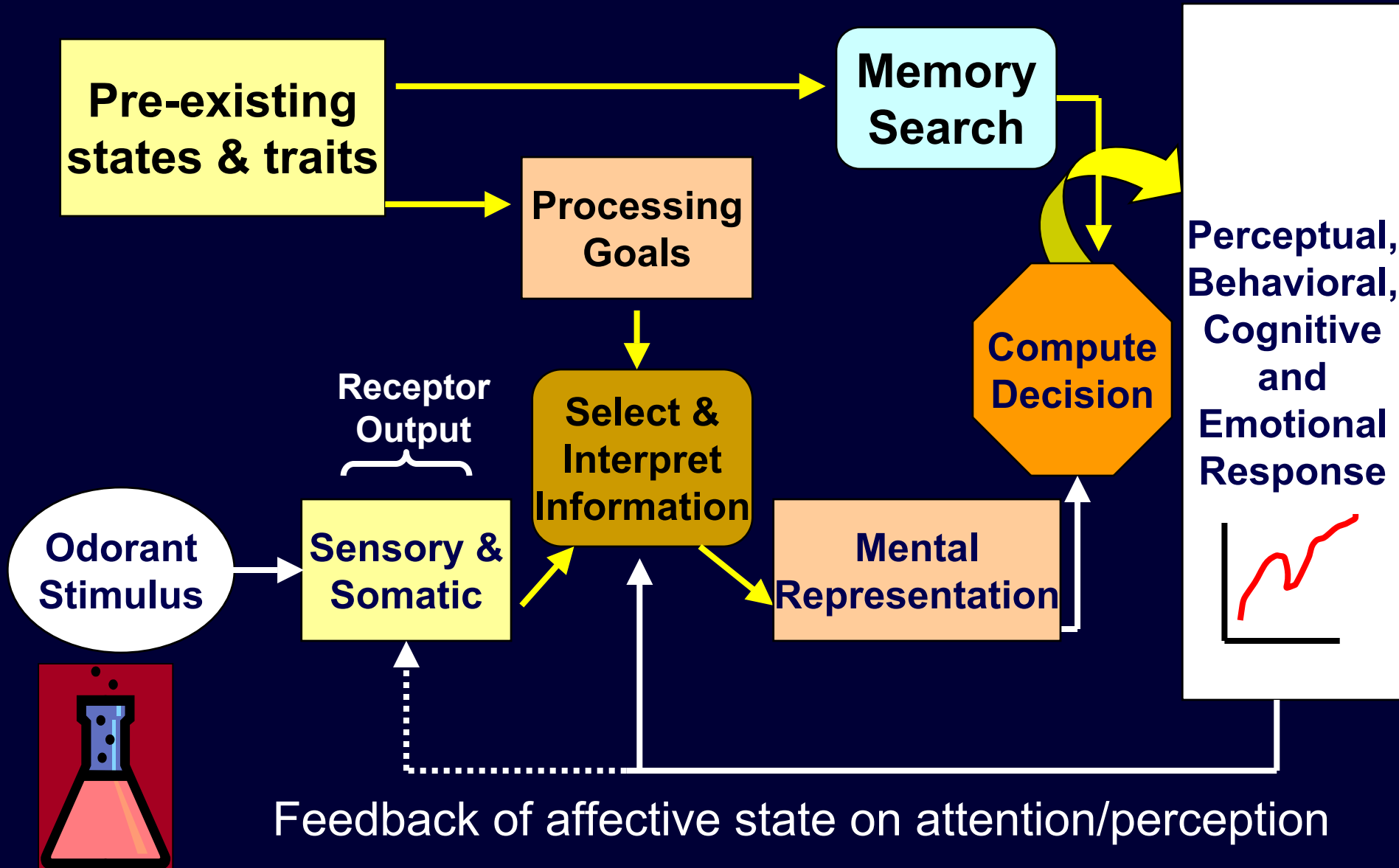


Cognitive and Emotional Interactions in Olfactory Experience



- ✓ Experience and Attention
- ✓ Expectations & Beliefs About Fragrance Effects
- ✓ Personality Traits
- ✓ Social Cues

Emotion can guide, influence or constrain cognition



The Affective Potency of Odor



- Odors as affective primes for judgment, behavior, memory
- Odors as conditioned reinforcers for positive or negative outcomes
- Odor perception as modulated by negative or positive affect
- **Possible limitations**

Affect as Prime for Cognition & Behavior



- Affective Induction Methods
 - Social behavior, rewards
 - Success/failure
 - Visual/auditory stimuli
 - Olfactory stimuli
- Effects on:
 - Evaluative judgments
 - Cognitive performance
 - Memory
 - Behavior

Affective Priming: Influence on Cognition & Behavior

- Positive affect increases:
 - verbal fluency
 - cognitive elaboration
 - perceived task richness
 - creativity and innovation
 - motivation
 - reported health and well-being
 - retrieval of positive memories

Positive affect interacts with type of stimuli, task complexity and other factors

Affective Priming: Influence on Cognition & Behavior

- Negative affect decreases:
 - Attentional resources
 - Cognitive elaboration
 - Motivation

And increases:

- Health symptom reporting
- Dispositional attributions
- Retrieval of negative memories

Negative affect interacts with appraisal, task complexity and other factors

Prevailing Assumptions:



Olfactory experience is inherently affective (positive or negative)

Therefore, olfactory experience will have effects on cognition & behavior similar to those produced by affective states



Ambient Odor: Effects on Evaluative Judgments



- Pleasant odor:
 - Increased judged attractiveness & personality under some circumstances (Baron, 1981)
- Malodor:
 - Decreased liking for people (Rotton, 1978)
 - Decreased liking and quality ratings for paintings/photographs (Rotton, 1988)
 - No effect of either odor on judged attractiveness of very attractive/unattractive faces (Cann & Ross, 1989)

In general, affect induction is most influential for evaluations of ambiguous stimuli

Ambient Odor: Effects on Cognitive Performance



- Pleasant odor:
 - Increased goals and efficiency (Baron, 1990)
 - Increased self-reported accuracy on verbal and math tasks (Knasko, 1992)
- Malodor:
 - Decreased perceived performance on verbal/math tasks (Knasko, 1992)

In general, affect influences on performance are modulated by task complexity

Ambient Odor: Miscellaneous Findings

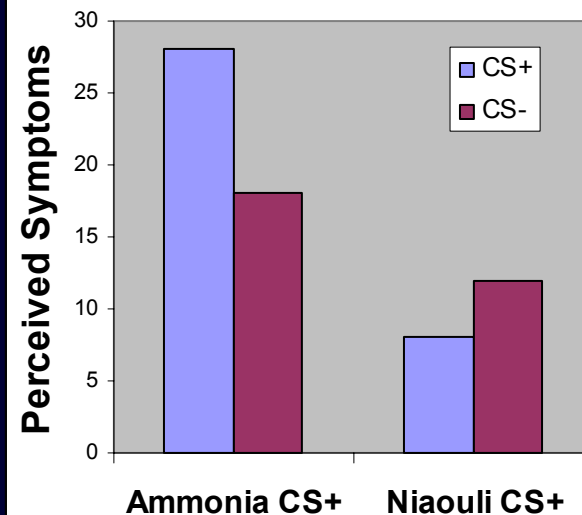
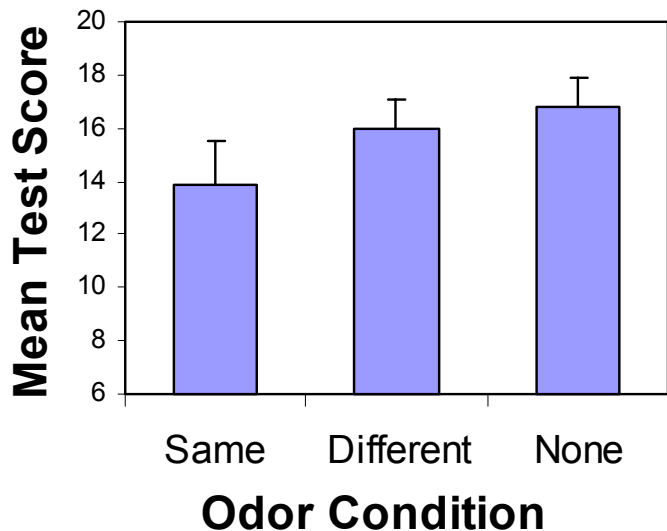


- Mood-Congruent Memory
 - Pleasant odors and malodors increased recall of congruently-valenced memories (Ehrlichman & Halpern, 1988)
- Health Symptoms
 - Pleasant odors decreased health symptom reports (Knasko, 1992), while malodors increased them (Dalton, 1999).

Odors Can Influence Behavior Through Associative Conditioning

Neutral odor associated with frustrating task decreased performance on subsequent task (Epple & Herz, 1999)

Neutral odor paired with CO₂ elicited higher symptom reports on subsequent exposure (Van den Bergh, 1995)

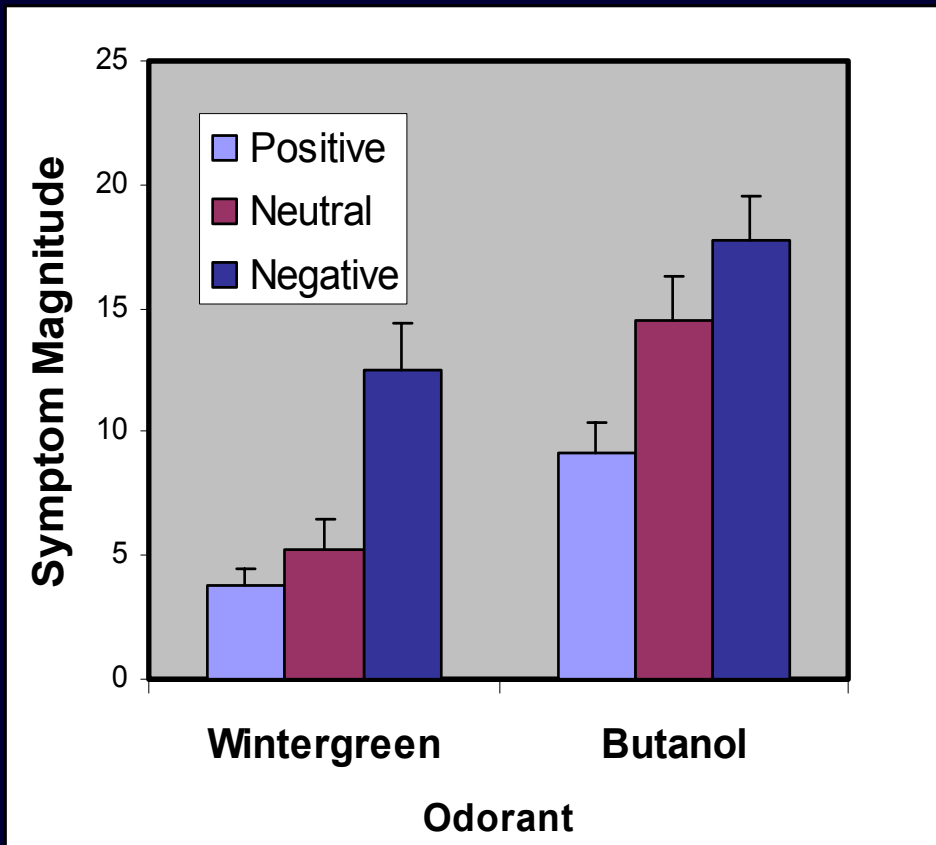


Affective Feedback on Fragrance Experience

Evaluation and response to an odor sensation also depends on the cognitive and emotional state of the perceiver



Positive and Negative Priming of Fragrance Experience: Health Symptoms



Information given about odorant source (positive, negative or neutral) is modulated by normative hedonic rating of odor

Possible Limitations on the Relationship Between Odor and Emotions

- Appraisal of novel odors is biased toward negativity

Possible Limitations on the Relationship Between Odor and Emotions

- Appraisal of novel odors is biased toward negativity
- Consistent with other hedonic stimuli (e.g., attractive faces) there is greater normative agreement on unpleasant than pleasant odors

Frequency distributions of hedonic ratings for 3 odorants

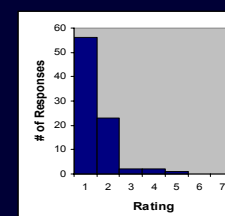
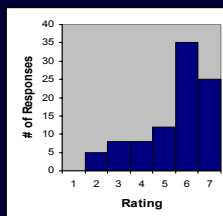
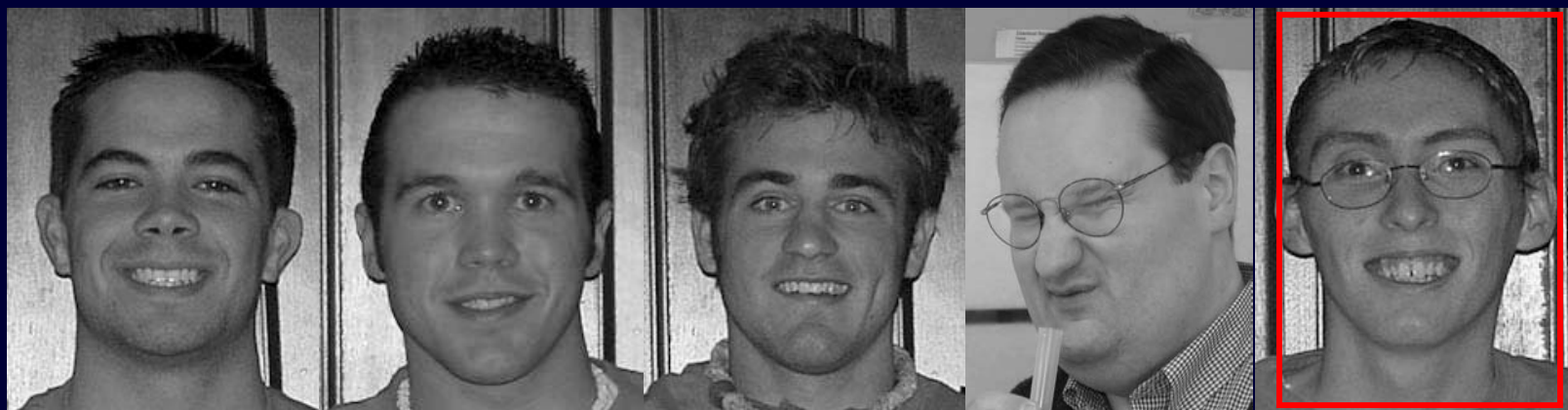
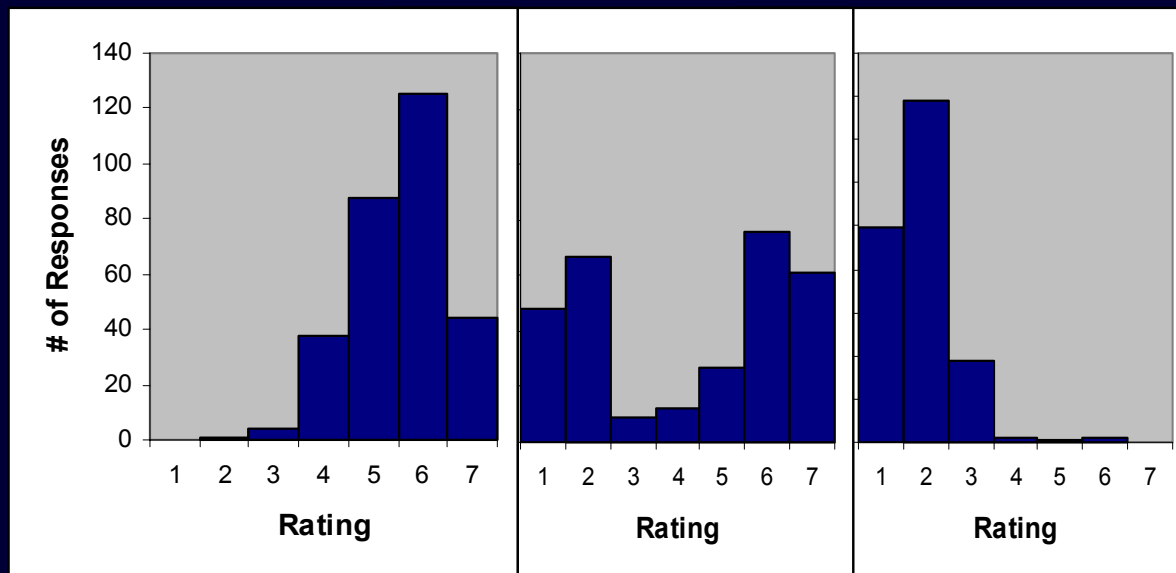
1 = Unpleasant

7 = Pleasant

Vanilla

Coconut

Sage

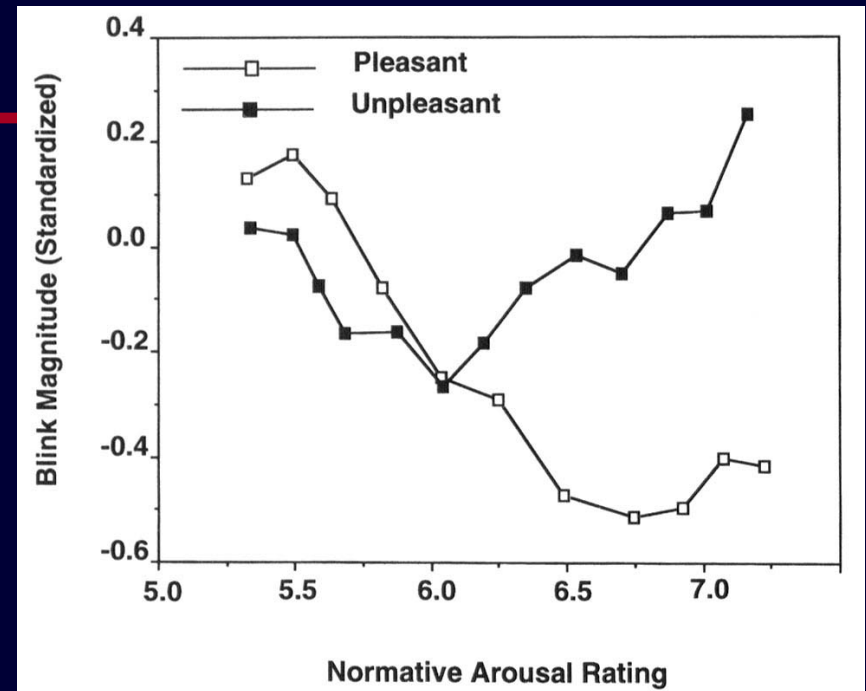
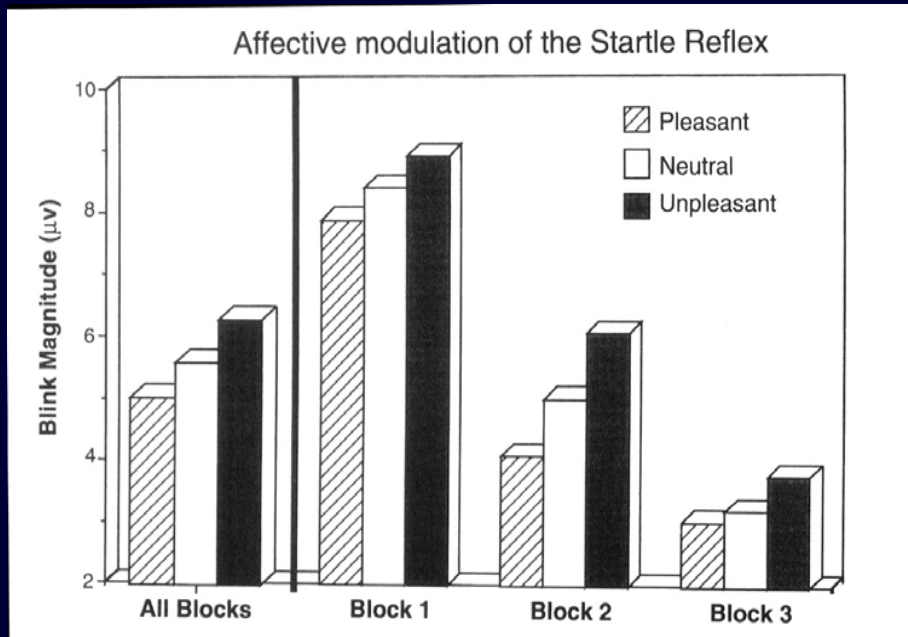


Limitations on the Use of Odors for Affect Induction

- Appraisal of novel odors is biased toward negativity
- Consistent with other hedonic stimuli (e.g., attractive faces) there is greater normative agreement on unpleasant than pleasant odors
- Arousal strength is an important component of affective potency

Affect, Arousal & Startle Modulation

Startle is potentiated by negative and inhibited by positive affective stimuli



Magnitude of potentiation or inhibition is due to arousal level of affective prime: Both potentiation and inhibition increase with arousal

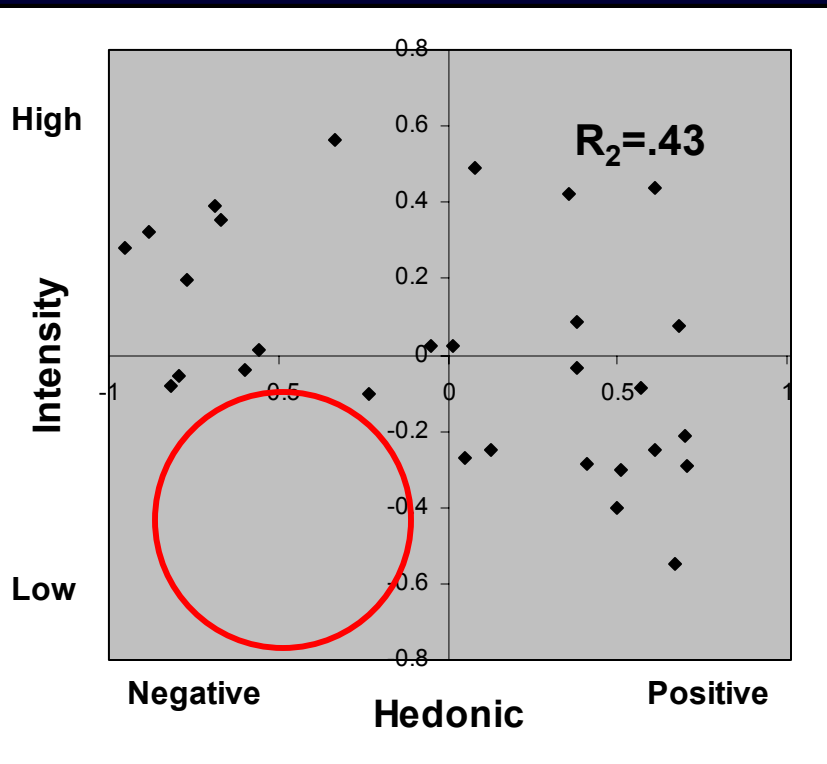
Data from Lang et al, 1993

Semantic Differential Scaling of Odors

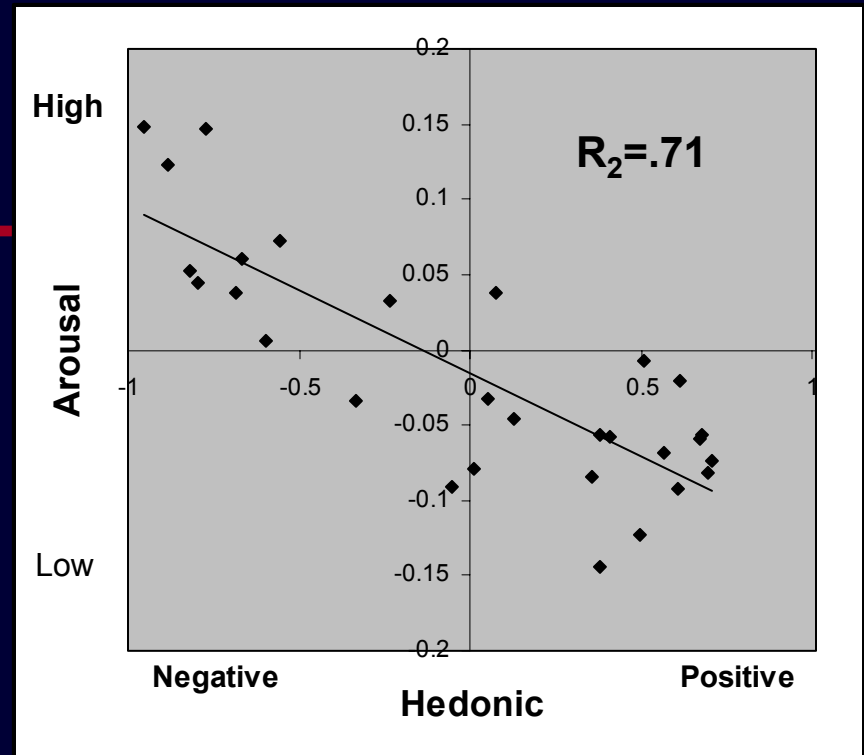
- 30 iso-intense odors were rated using 50 S-D adjective pairs (e.g., light-dark, noisy-quiet)
- Consistent with S-D results for words, pictures, etc. 3 factors emerged
 - Hedonic
 - Potency-Intensity
 - Activity-Arousal

Semantic Differential Scaling of Odors

SD Cross-Loadings for
Hedonic & Potency Factors
for 30 Odorants



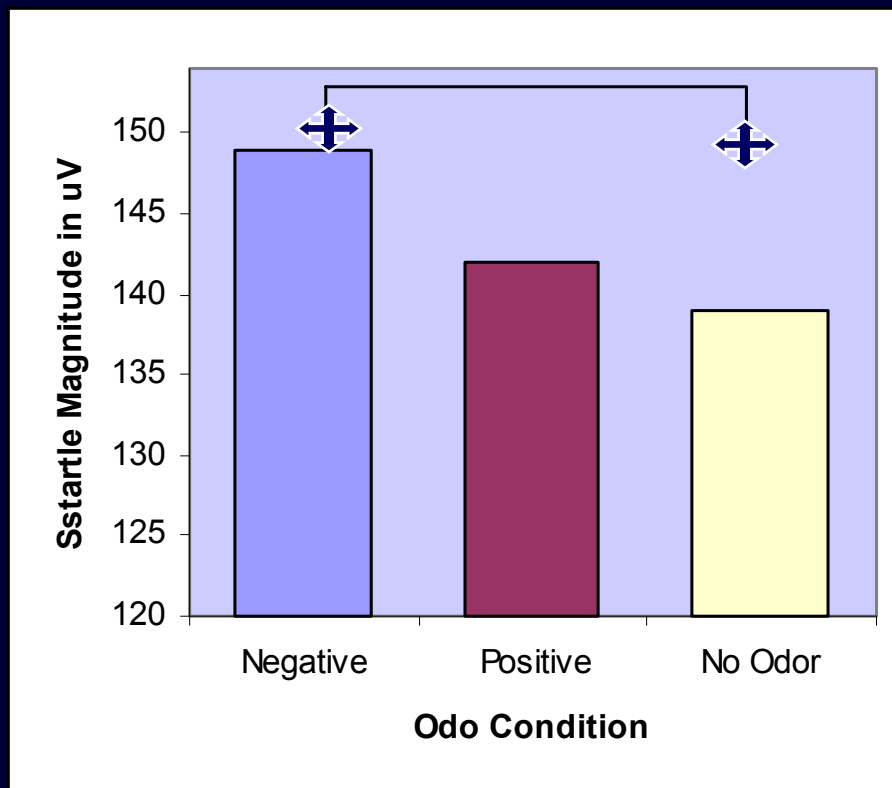
n=300



Cross-Loadings for
Hedonic & Arousal Factors

Weaker arousal loadings for
“normatively” positive odors
may lessen their impact as
affective stimuli

Odors as Affective Primes for Startle Modulation (Ehrlichman et al, 1995)



6 positive, 6 negative odors

Acoustic startle probe

Negative odors potentiated startle relative to no odor condition

Positive odors did not inhibit startle

Although magnitude of hedonic valence was equivalent, arousal level may have differed

The Interplay of Olfaction, Emotion & Cognition



General Issues

- The interplay of affect on motivation, cognition and behavior is complex and may differ as a function of perceiver's goals, the objects of evaluation or task complexity

Olfactory-Specific Issues

- Affect elicited by olfactory stimuli may be biased toward negative-neutral valence
- Less normative agreement on pleasant odors than unpleasant ones
- Arousal modulation may be asymmetric for positive/negative olfactory stimuli

