THE OLFACTORY THREATSCAPE

Using Breaking Continuous Flash Suppression to Understand the Influence of Odours on the Unconscious Perception of Threat

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BACKGROUND

- Odours have the unique ability to evoke emotional and cognitive responses, with certain smells often eliciting positive or negative affective states (Herz, 2002).
- The link between olfaction and threat perception lies in the evolutionary role of scent for survival. Olfactory cues have been fundamental in enabling humans to detect and respond to environmental threats (Stevenson, 2010).
- It is well-established that emotional experiences can significantly impact our perception and interpretation of threat-related stimuli (Bar-Haim et al., 2007; Jacobs et al., 2023). However, the specific effects of odours with threat-associated valence on threat perception remain largely unexplored.
- By employing breaking continuous flash suppression (b-CFS), a method where a stimulus is suppressed from awareness until it "breaks through" to consciousness, allows us to quantify the impact of olfactory stimuli on the unconscious processing of visual threats, contributing to a more comprehensive understanding of the sensory interplay in human perception.

AIM To investigate how pleasant and unpleasant odors can modulate the time it takes for threat-related stimuli to reach awareness.

RESEARCH QUESTIONS

1. Can unpleasant odours facilitate quicker detection of threat-related stimuli, reflecting an evolutionary-conserved alertness mechanism?
2. Can pleasant odours delay the perception of threat-related stimuli, indicating a potential soothing effect on the threat alert system?
3. Is this moderated by emotional state?

STUDY DESIGN

<u>Participants</u>

- 90 participants (30 per condition)
- Aged 18+ with normal functioning sense of smell

<u>Pre-Experiment Questions</u>

- Consent Form
- Participant Information
- Demographic Information

<u>Pleasant Odour Condition</u>

- Lavender (Koulivand et al., 2013; Louis & Kowalski, 2002)
- Bergamot (Watanabe et al., 2015)
- Sweet Orange (Lehrner et al., 2005)

(One will be selected after pilot study)

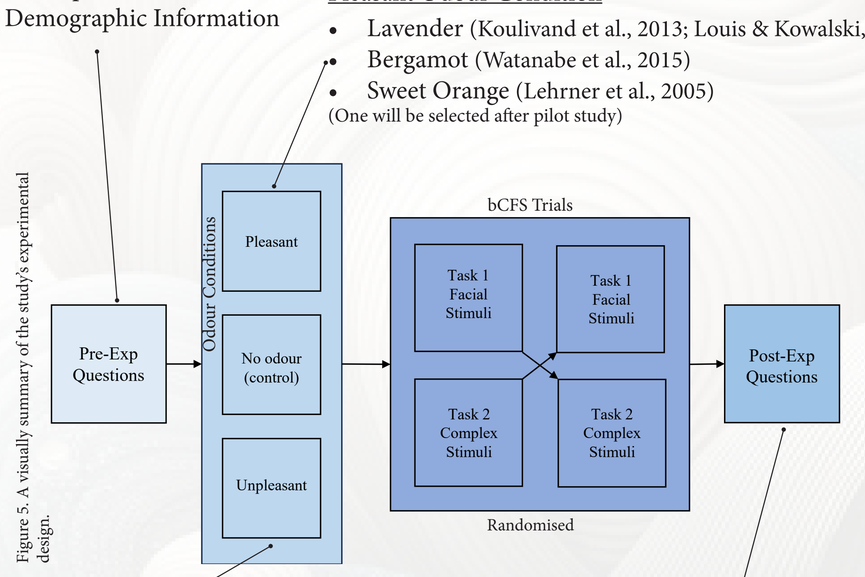


Figure 5. A visually summary of the study's experimental design.

<u>Unpleasant Odour Condition</u>

- Rotting Flesh (Wisman & Shrira, 2015; Barnett et al., 2022)
- Blood (Moran et al., 2015)
- Flatulence (Unpublished Pilot Data)

(One will be selected after pilot study)

<u>Post-Experiment Questions</u>

- Positive and Negative Affect Scale (PANAS)
- Debrief

MATERIALS

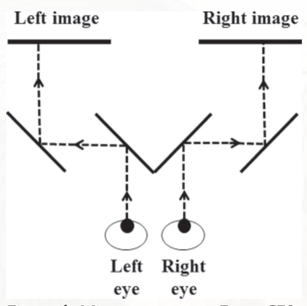
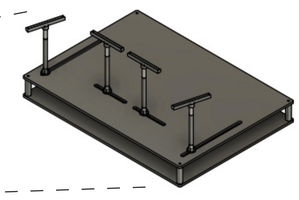


Figure 1b. Mirror stereoscope. From: CFS MATLAB toolbox

Figure 1a. Technical drawing of Stereoscope (Robinson, 2023)



<u>Basic Structure and Function:</u>

- The stereoscope will consist of two adjustable mirrors placed at a 45-degree angle to the participant's eyes.
- These mirrors are used to reflect two different images (one to each eye) from a computer screen, which will be positioned at 90 degrees to the left and right of the participant.

<u>Stimuli</u>

<u>Task 1</u>

- 4 faces (2 females) displaying anger, fear, happy and neutral expressions from the Radboud Faces Database (RaFD) (Langner et al., 2010).
- Images will be cropped to remove features outside of the face and contrast balanced.

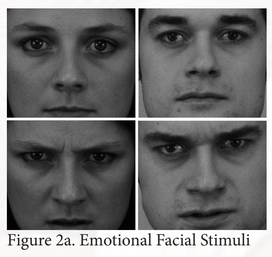


Figure 2a. Emotional Facial Stimuli

<u>Task 2</u>

- 4 scenes (2 threatening, 2 neutral) from The International Affective Picture System (IAPS) database (Lang et al., 2005).
- Images will be contrast balanced.

Figure 2b. Complex Stimuli

- All stimuli will be presented on the left and right sides of a computer monitor (800×600 resolution; 120 Hz frame rate) and viewed against a gray uniform background.
- A fusion contour frame will be used to aim with stable binocular eye alignment (Yang et al., 2007).

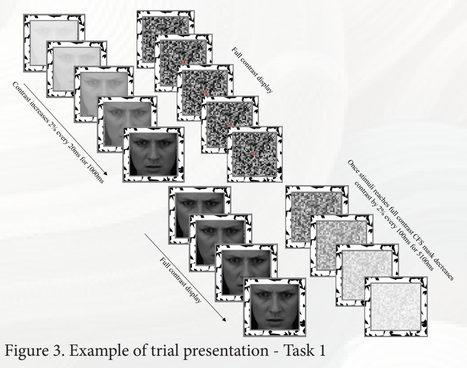


Figure 3. Example of trial presentation - Task 1

<u>Stimuli Presentation Steps</u>
Replicating Yang et al. (2007)

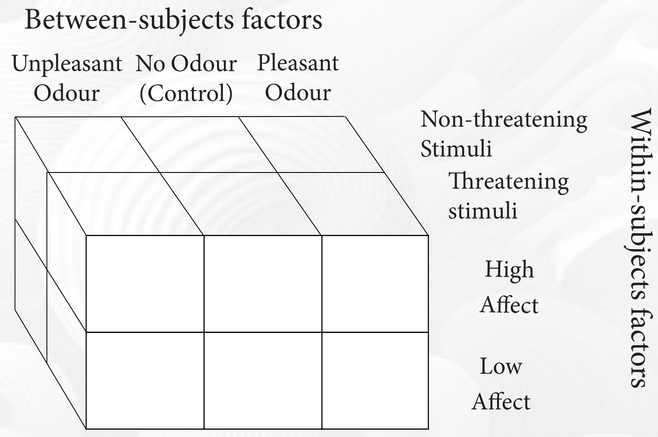
Figure 4. Example of trial presentation - Task 2

ANALYSIS

<u>Mixed-Design ANOVA (Split-Plot ANOVA)</u>

<u>Measures</u>

- Reaction Times (RT)
- PANAS Scores (HA/LA)



ISSUES → MIGITATION

<u>Processing</u>

- Individual differences

→ Use robust statistical methods to account for potential confounds.

<u>Odours</u>

- Impact on mood and cognitive state
- Subjective nature of odour perception

→ Using 'Scratch and sniff' odour strip to screen participants.

<u>Reaction Times</u>

- Response Bias/Error

→ % of trials with no stimuli (Yang et al., 2007)

THESIS TIMELINE

Effects of odour on threat related attentional bias (On-going) — 1

2 — Effects of odour valance of self-reported perception of threat (Ethics Approved)

Effects of odour of unconscious perception of threat (Design Phase) — 3

4 — TBC

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