Adaptive Memory in Contamination Context: Emotionality is a Proximate Mechanism

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Background

Contamination-related cues are recalled better than neutral ones.

Infectious Disease Threat → Enhanced Episodic Memory

Contamination Effect
(Fernandes et al., 2017)

likely because

Behavioral Immune System's defense mechanism, which is connected to disgust to avoid disease and promote survival.
(e.g., Murray & Schaller, 2016)

\+

Memory is specialized to process fitness-relevant information and is particularly sensitive to disgust, more so than to fear.
(Moeck et al., 2021; Nairne et al., 2007; Schienle et al., 2021)

But how?

But how is this memory tuning achieved?

Emotions related to threats?

Some evidence suggest that **emotionality cannot explain** this tuning...

- but those studies only used self-reported scales
- or manipulated emotions that were unrelated to threats.

(e.g., Bel et al., 2013; Fernandes et al., 2021; Gretz & Huff, 2019; Kroneisen & Erdfelder, 2011; Nairne et al., 2017; Thiebaut et al., 2022; Yang et al., 2014)

vs.

In a similar paradigm involving the threat of predators and food deprivation, evidence has shown that....

! a deeper cardiac deceleration occurs in survival conditions, and the mnemonic advantage in survival conditions only occurs in the individual's native language and not in a secondary language, likely due to the weaker emotional associations in the latter.

(Fiacconi et al., 2015; Garrido & Prada, 2018; Kazanas et al., 2021; Saraiva et al., 2021)

Assessing the Role of Disgust

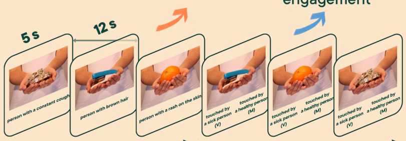
Replication of Contamination Effect with Psychophysiological Index Extension.

80 participants (55 females)
M_{age} = 22.60, SD_{age} = 8.06

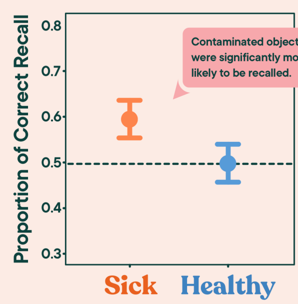
Participants were asked to recall and identify (24) objects that have been **touched by people infected with a deadly disease or who were healthy**, based on clues provided in (12) short descriptions.

Heart Rate's Area of Interest

Measure participant's engagement

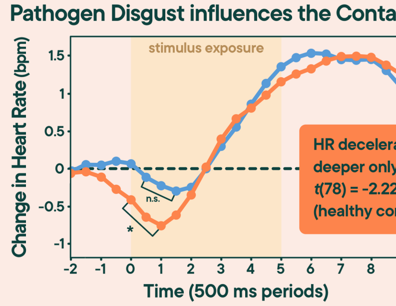


(3 Encoding Trials + 3 Immediate Memory Trials) x 8 + Distractor Task + Surprise Recall Task (5 min)



Contamination Effect was replicated, $b = 0.47$, $p < .001$, OR = 1.59. (Fernandes et al., 2017, 2021)

Pathogen Disgust influences the Contamination Effect:



(1) HR deceleration significantly deeper only in the sick condition, $t(78) = -2.22$, $p = .015$, $d = -0.25$. (healthy condition, $p = .132$).

(2) **Participants who manifested the contamination effect** showed a significant bradycardia while recalling objects from the sick condition (vs. healthy condition), $t(42) = -1.86$, $p = .035$, $d = -0.28$.

Participants **who did not manifest** the contamination effect (n=36) showed no significant difference, $p = .170$. (in line with Fiacconi et al., 2015)

Memory advantage arises from the activation of autonomic disgust responses to pathogenic threats, which trigger the defensive motivational system. (Bradley et al., 2001; Lang et al., 2000)

Limitations: The COVID-19 pandemic may have increased susceptibility to experiencing pathogen disgust.

Future research: Eye-tracking and fMRI can be used to further understand the interaction between cognitive and emotional systems in threatening contexts.

References

Bell, R., Röer, J. P., & Buchner, A. (2013). Adaptive memory: The survival-processing memory advantage is not due to negativity or mortality salience. *Memory & Cognition, 41*(4), 490–502.
Bradley, M. M., Codispoti, M., Cuthbert, B. N., & Lang, P. J. (2001). Emotion and motivation I: Defensive and appetitive reactions in picture processing. *Emotion, 1*(3), 276–298.
Fernandes, N. L., Pandeirada, J. N. S., & Nairne, J. S. (2021). The mnemonic tuning for contamination: A replication and extension study using more ecologically valid stimuli. *Evolutionary Psychology, 19*(1), 147470492094623.
Fernandes, N. L., Pandeirada, J. N. S., Soares, S. C., & Nairne, J. S. (2017). Adaptive memory: The mnemonic value of contamination. *Evolution and Human Behavior, 38*(4), 451–460.
Fiacconi, C. M., Dekraker, J., & Köhler, S. (2015). Psychophysiological evidence for the role of emotion in adaptive memory. *Journal of Experimental Psychology: General, 144*(5), 925–933.
Garrido, M. V., & Prada, M. (2018). Comparing the valence, emotionality and subjective familiarity of words in a first and a second language. *International Journal of Bilingual Education and Bilingualism, 24*(2), 275–291.
Gretz, M. R., & Huff, M. J. (2019). Did you wash your hands? Evaluating memory for objects touched by healthy individuals and individuals with contagious and noncontagious diseases. *Applied Cognitive Psychology, 33*(6), 1271–1278.
Kazanas, S. A., Wilck, A. M., & Altarriba, J. (2021). Adaptive memory: Greater memory advantages in bilinguals' first language. *International Journal of Bilingualism, 26*(1), 49–64.
Kroneisen, M., & Erdfelder, E. (2011). On the plasticity of the survival processing effect. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 37*(6), 1553–1562.
Lang, P. J., Davis, M., & Öhman, A. (2000). Fear and anxiety: animal models and human cognitive psychophysiology. *Journal of Affective Disorders, 61*(3), 137–159.
Makhanova, A., & Shepherd, M. A. (2020). Behavioral immune system linked to responses to the threat of COVID-19. *Personality and Individual Differences, 167*, 110221.
Moeck, E. K., Matson, L. A., & Takarangi, M. K. T. (2021). Mechanisms underlying memory enhancement for disgust over fear. *Cognition and Emotion, 35*(6), 1231–1237.
Murray, D. R., & Schaller, M. (2016). The behavioral immune system: Implications for social cognition, social interaction, and social influence. In J. M. Olson & M. P. Zanna (Eds.), *Advances in experimental social psychology* (Vol. 53, pp. 75–129). Elsevier Academic Press.
Nairne, J. S., Pandeirada, J. N. S., & Fernandes, N. L. (2017). Adaptive memory. In J. H. Byrne (Ed.), *Learning and memory: A comprehensive reference* (2nd ed., Vol. 2, pp. 279–293). Elsevier.
Nairne, J. S., Thompson, S. R., & Pandeirada, J. N. S. (2007). Adaptive memory: Survival processing enhances retention. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33*(2), 263–273.
Saraiva, M., Garrido, M. V., & Pandeirada, J. N. S. (2021). Surviving in a second language: Survival processing effect in memory of bilinguals. *Cognition and Emotion, 35*(2), 417–424.
Schienle, A., Potthoff, J., Schönthaler, E., & Schlintl, C. (2021). Disgust-Related memory bias in children and adults. *Evolutionary Psychology, 19*(2), 147470492199658.
Thiebaut, G., Méot, A., Witt, A., Prokop, P., & Bonin, P. (2022). COVID-19 and memory: A novel contamination effect in memory. *Evolutionary Psychology, 20*(2), 1–10.
Yang, L., Lau, K. P. L., & Truong, L. (2014). The survival effect in memory: Does it hold into old age and Non-Ancestral scenarios? *PLoS ONE, 9*(5), e95792.

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