Predicting Image Memorability from Evoked Affect

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With funding from NSF

Background

Memorability is an intrinsic image property which indicates how well an image is remembered across the general population. It is related to both the high and low-level features of an image[1].

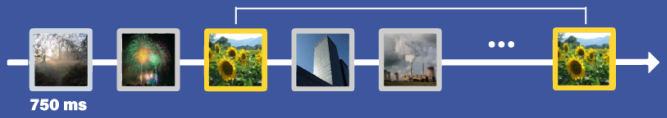
The majority of memorability work has not explored the influence of the affect elicited by an image[2].

How does the affect associated with an image influence its memorability?

Methods

For a set of 906 scene images, we collected independent measurements of image memorability and the feeling evoked by each image, measured on the valence and arousal affective dimensions. Images within this set were sourced from four existing scene image sets: COMPASS[3], NAPS[4], OASIS[5], and Places[6].

Experiment 1: Memorability Task (N= 640)



Participants viewed a stream of images and were instructed to respond when they encountered a previously shown target image (yellow). We then calculated corrected recognition (CR) for each image, which acted as a proxy for memorability.

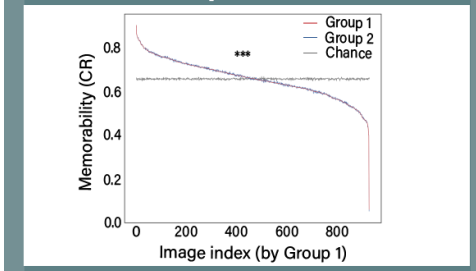
Memorability (CR) = Hit Rate - False Alarm Rate

Experiment 2: Affect Rating Task (N= 528)

Participants provided valence and arousal ratings using a nine-point Likert scale.

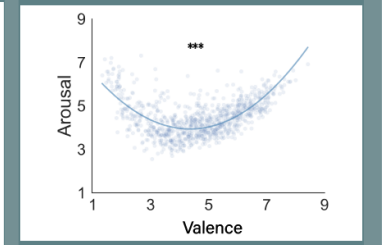
Results

Experiment 1

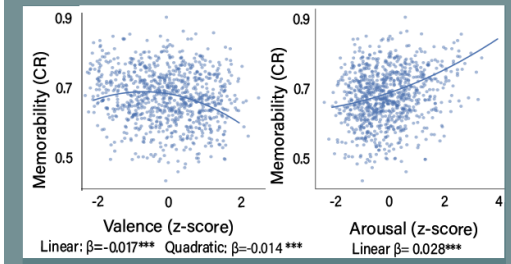


Memorability remains consistent for images that evoke a wide range of valence and arousal

Experiment 2



There was a positive quadratic relationship between averaged valence and arousal scores



Valence predicts memorability with both negative linear and negative quadratic relationships. Arousal was positively and linearly related to memorability.

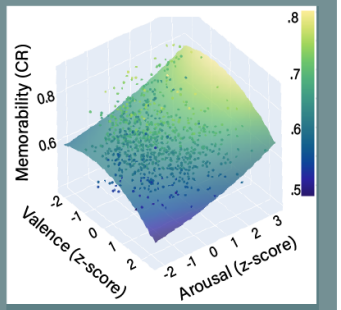


Image Memorability ~ ***Valence + Valence² + Arousal + Arousal²***

McFadden's R-squared=0.095

Visualizing the simultaneous influence of valence and arousal shows that the most memorable images are generally those that are moderately negatively valenced and more arousing.

Valence, Arousal, and Memorability of Scenes (VAMOS) Set

see Wakeland-Hart, C., & Aly, M. (2023). Predicting image memorability from evoked feelings.
https://doi.org/10.31234/osf.io/grxdz

Conclusions

Valence and arousal independently contribute to memorability

Moderately negative, highly arousing images are generally best remembered

Valence and arousal dimensions of affect explain less than 10% of variance in memorability

Future Directions

Image Memory ~ ***Attentional State * Memorability * Valence***

Experiment 3: Sustained Attention Task

Attentional state will be indexed by participant RTs during a continuous performance task.

References

1. Dubey, R., Peterson, J., Khosla, A., Yang, M.-H., & Ghanem, B. (2015). What Makes an Object Memorable? 2015 IEEE International Conference on Computer Vision (ICCV), 1089–1097.
2. Isola, P., Xiao, J., Parikh, D., Torralba, A., & Oliva, A. (2014). What Makes a Photograph Memorable? IEEE Transactions on Pattern Analysis and Machine Intelligence, 36(7), 1469–1482.
3. Weierich, M. R., Kleshchova, O., Rieder, J. K., & Reilly, D. M. (2019). The Complex Affective Scene Set (COMPASS): Solving the Social Content Problem in Affective Visual Stimulus Sets. Collabra: Psychology, 5(1), 53.
4. Marchewka, A., Żurawski, Ł., Jednoróg, K., & Grabowska, A. (2014). The Nencki Affective Picture System (NAPS): Introduction to a novel, standardized, wide-range, high-quality, realistic picture database. Behavior Research Methods, 46(2), 596–610.
5. Kurdi, B., Lozano, S., & Banaji, M. R. (2017). Introducing the Open Affective Standardized Image Set (OASIS). Behavior Research Methods, 49(2), 457–470.
6. Zhou, B., Lapedriza, A., Khosla, A., Oliva, A., & Torralba, A. (2018). Places: A 10 Million Image Database for Scene Recognition. IEEE Transactions on Pattern Analysis and Machine Intelligence, 40(6), 1452–1464.