Age is associated with greater differentiation in brain response patterns between negative, neutral, and positive stimuli.

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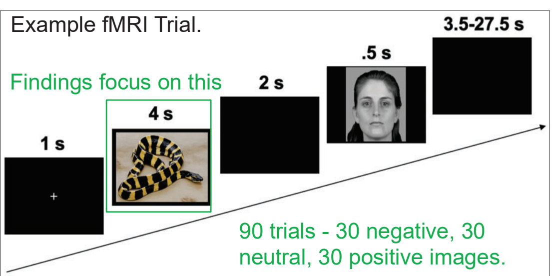
BACKGROUND

- Compared to younger adults, older adults:
  - Tend to be more positive and well-adjusted.[1]
  - Show changes in emotional regulation skills, including preferential attention and memory towards positive over negative events.[3,5]
  - But show greater provocation to negative stimuli.[4,7]
- Research show mixed findings regarding how how emotional processing in the brain changes with age.[2]
- We aim to better understand aging effects on emotional processes in the brain during mid to late adulthood with a focus on the amygdala.
- The amygdala is a subcortical region of the brain important for emotional processes.
- We compare patterns of amygdalar activation in response to positive, negative, and neutral images in a sample with a 45 year age range.

METHODS

- Data from the third wave of the Midlife in the United States (MIDUS3; https://midus.wisc.edu) Neuroscience Project (2017-2022).
- 136 participants, aged 48-95 years, 61% Female, 25% Black, Indigenous, and People of Color.
- Accounted for sex, education, and race effects.
- Functional magnetic resonance imaging data were collected during an emotional response task.

Example fMRI Trial.



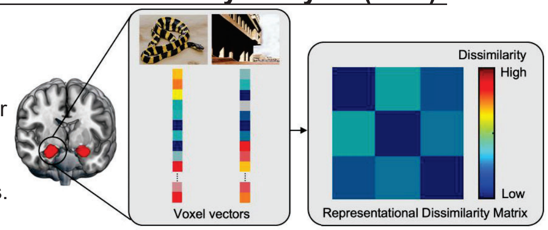
90 trials - 30 negative, 30 neutral, 30 positive images.

Each image was followed by a neutral face.

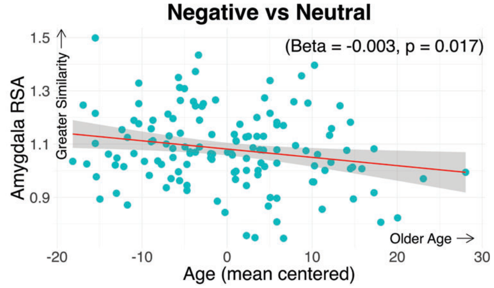
- Outside the scanner, participants rated the valence of each image (1-9).
  - 1 - most negative, 5 - neutral, 9 - most positive.

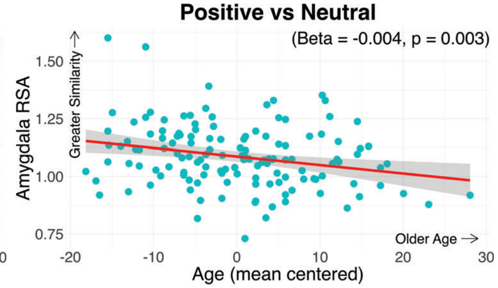
Representational Similarity Analysis (RSA)[6]

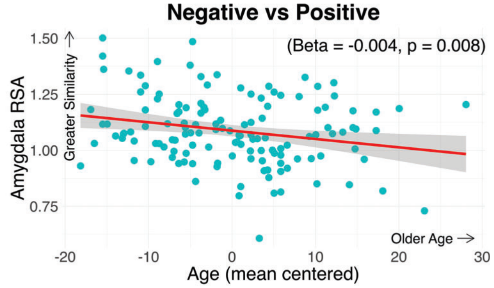
- How closely the amygdalar activation pattern to neutral images resembles that to emotional images (negative or positive images).
- Dissimilarity → stronger reactivity to emotional images.



Age associations with similarity in amygdala activation patterns

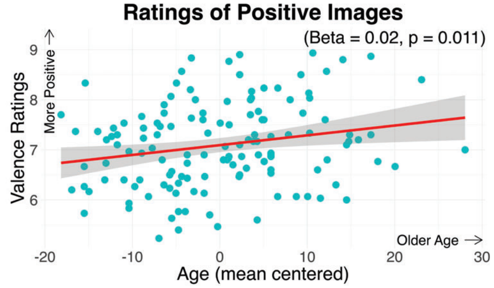


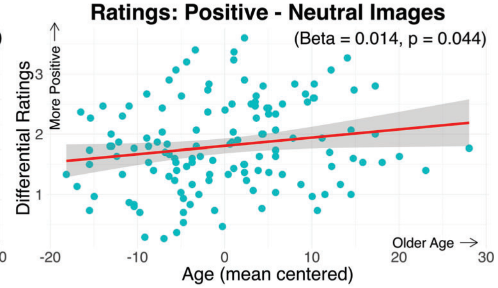




Older age is associated with lower similarity in bilateral amygdalar activation between negative and neutral images (top left), positive and neutral images (top right), and between negative and positive images (bottom left).

Age associations with valence ratings





- Older age is associated with higher valence ratings for positive images (left) and higher differences in valence ratings between positive and neutral images (right).
- Age was not associated with valence ratings for negative or neutral images.

FINDINGS

- Older age is associated with greater response differentiation between positive, negative, and neutral images.

DISCUSSION

- Older age is associated with:
  - Lower similarity in amygdala activation between positive, negative, and neutral stimuli.
  - Greater differentiation in valence ratings between positive and neutral images.
- Older adults show greater emotional reactivity to pleasant and unpleasant information.
- Findings are consistent with research literature suggesting a positivity bias in older age.[1,3]
  - Older adults prefer and respond more strongly to pleasant stimuli and experiences.[3,5]
- Findings also suggest older adults may be less prepared for coping with unpleasant stimuli and experiences, as shown in previous studies.[4,7]
  - Older adults may have greater difficulty in regulating negative emotion due to changes in cognitive functioning.[4,7]
- Future research should examine how aging increases in neural responses to emotional stimuli are associated with:
  - Daily reports of negative and positive affect.

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