

CORE STUDY #1: CANLI ET AL. 2000 (AMYGDALA ACTIVATION & MEMORY)

Aim:

- To investigate whether the amygdala is sensitive to varying degrees of emotional intensity to external stimuli and whether the level of intensity enhances memory.

Hypotheses:

There were 2 main hypotheses for this study:

- 1) Images that have a higher emotional intensity will lead to greater amygdala activation and thus greater memory recall later on
- 2) Higher amygdala activation will enhance memory

Background:

Previous studies used fMRI scans to identify areas of the brain that have specific functions. A previous study, also conducted by Canli (1999), showed that participants who had strong amygdala activation in response to a set of emotional stimuli showed superior memory for that stimuli later on. However, Canli (2000) suggested that since the previous study was an independent measures design, there may have been other explanations for the findings.

Method:

Participants

- 10 right-handed, healthy women
 - ↳ Women were chosen because it was thought that they would be more likely to report intense emotional experiences and show more physiological reactions to stimuli.
 - ↳ They were all right-handed because that meant that they all mainly used the left side of their brain (their left hemisphere) → this was done to standardise the sample

Design

- A laboratory experiment
- A repeated measures design
- The IV was the intensity of emotional arousal and rating given on the scale
- The DV was the degree of amygdala activation and subsequent memory recall

Procedure

- The participants were presented with 96 scenes while in the fMRI scanner.
 - ↳ All 96 scenes were from the 'International Affective Picture System' stimuli set.
 - ↳ For the scenes used the valence ratings ranged from 1.17 (highly negative) to 5.44 (neutral). The order of scenes was randomised (to help overcome order effects).
- Each picture was presented for 2.88 seconds and there was an interval of 12.96 seconds where they viewed a fixation cross.
 - ↳ During this, participants had to indicate their emotional arousal by pressing a button with their right hand.
 - ↳ They had to choose from 4 buttons on a scale of 0 (not emotionally intense at all) - 3 (extremely emotionally intense).
- To measure activity in the brain, fMRI data was collected by an fMRI scanner, which is used to measure blood-oxygen-level-dependent contrast.
- Contrast imaging observes the different areas of the brain which are found active at any given time.
- 3 weeks later, participants were tested in an unexpected recognition test.
 - ↳ They viewed the 96 scenes from the previous test as well as 48 foils (newly added).
 - ↳ The foils were selected to match the previous scenes' valence ratings.
 - ↳ Participants were asked to judge whether they had remembered it, felt it was familiar, or forgotten it.

Results

- The correlation between participants' intensity rating and valence: -0.66.
- The correlation between participants' intensity rating and arousal: +0.68.
 - ↳ Participants' ratings of emotional intensity reflected the valence and arousal of the stimuli.
- Amygdala activation was significantly correlated with higher ratings of individually experienced emotional intensity.
 - ↳ The follow-up memory task showed that memory performance was better for scenes rated "highly emotionally intense" than for scenes rated less emotionally intense.
- Left amygdala activation predicted whether the stimuli would be forgotten, appear familiar, or would be remembered.

Conclusion

- The amygdala is sensitive to individuals' experienced emotional intensity of visual stimuli, and the activity of the left amygdala during memory encoding is predictive of memory.

Evaluation

A strength of this study is that it is highly replicable. This is because it was conducted in a controlled laboratory environment with standardized procedures such as using the same 96 images for each participant and using the same fMRI machine for each participant. This means another researcher can simply get another group of participants and repeat the procedure exactly and compare and test the results for accuracy. This allows the findings of the study to be tested, therefore increasing the validity of the study.

Another strength of this study is that it is highly reliable. This is because the study collected quantitative, objective data through scientific methods like fMRI scans and numerical scales. This means that the results were not subject to interpretation and thus free from researcher bias. This increases the validity of the results of the study.

A weakness of this study is that it used a very small sample size. This is because it used a small sample size of only 10 right-handed women, and so the results cannot be generalised to a larger population of people of different genders. The small sample size also increases the chances that the results may have been impacted by participant variables. This reduces the results of the study because they cannot be applied to a wide variety of people.

Another weakness of this study is that it lacks ecological validity and mundane realism. This is because it was done in a controlled laboratory environment with standardised procedures and the participants had to rate their levels of arousal on a scale while looking at scenes inside an fMRI machine, which are not normal circumstances for people to feel and report emotion. Because of this, the results cannot be applied to reality which reduces their validity.

Issues and Debates

- **Nature vs. Nurture:** The findings of this study support the nature side of this debate because they investigate the underlying biological processes that go into experiencing emotions.
- **Individual vs. Situational:** the scores varied between participants showing that individual factors play a role in experiencing emotions e.g. one participant may have rated a scene 2 out of 3 while another may have rated it 0.