SOLO_PROJECT
PSY310_LAB IN PSYCHOLOGY
SUBMITTED TO : PROF NITHIN GEORGE
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GitHub Link:

Abstract

The current study investigated research questions related to emotional valence (positive vs. negative) and its impact upon recognition memory and response time within a laboratory-based recognition memory paradigm. Forty participants completed an encoding phase, in which 60 total trials occurred - 30 with positive images and 30 with negative images, alerted participants of a 2-min distractor phase, and then an explicit image recognition phase composed of 120 items-60 old items and 60 foils. The stimuli were from a validated set of affective images called OASIS, which allowed for 1.5 s of image presentation and 500 ms of fixation. To continue, the subjects were told to respond via keyboard to indicate old/new status. Following data cleaning, there were a total of 120 trials per valence, per subject, in the dataset, and group summary statistics captured hit rates and reaction time differences between valence types. Overall, the findings revealed very slight differences in recognition accuracy - mean accuracy: + = 0.517, - = 0.500 - and produced a faster average correct RT for positive images, at around 296.6 ms, in comparison with the respective backward analog images at about 350.8 ms. The findings were discussed in the context of contemporary models of emotional memory, such as a stronger consolidation effect for arousing stimuli, but also in the frame of small lab projects. Further, this chapter provides recommendations for statistical analyses but

also specific formulas to compute accuracy, signal-detection indices, and inferential tests that could be reproduced in the framing of the study but also in evaluating the students' work.

Introduction

Human memory is sensitive to the emotional information that accompanies experience. A wide range of studies have shown that emotional stimuli-especially negative or arousing stimuli-are processed differently from neutral stimuli and often have consequences for both consolidation and retrieval performance (Kensinger, 2004; Talmi, 2013). Two complementary mechanisms are sometimes referred to in the literature: (1) enhanced encoding or attention to emotional stimuli and (2) novel modulation of consolidation by neuromodulators-for example, noradrenaline-to support future memory (McGaugh, 2004; Kensinger & Schacter, 2006). The use of standardized sets of images, such as the International Affective Picture System (IAPS) and the Open Affective Standardized Image Set (OASIS), allows aspects of valence and arousal to be isolated as manipulations for these effects (Kurdi, Lozano, & Banaji, 2017; Lang, Bradley, & Cuthbert, 1999).

There are myriad laboratory paradigms that examine emotional memory. A straightforward version that is relatively easy for student-based assessments is an encoding-distractor-recognition sequence with standardized images where participants respond whether the item they see at test was "old" (seen previously) or "new" (foil). This design is robust, conceptually easy to understand, and can be adapted for design with PsychoPy. It measures typical memory indices (hit rate, false alarm rate, signal-detection indices like d′), and measures of response time that reflect dynamics of retrieval.

The current experiment used images from the OASIS database, which provided normative valence and arousal ratings (Kurdi et al., 2017), to ensure consistency and replicability. Each vignette for the current experiment focused on two categories of valence to examine whether recognition performance and response latency differ by valence using the same presentation conditions.

The current experiment adds to the replication literature but also creates a clear and straightforward exercise for an undergraduate solo project: using validated stimuli and running the task in PsychoPy, and then analyzing behavioral indicators using standard tests. In the sections that follow, I will describe methods, make precise calculations that need to happen after you have collected your data, show cleaned-up results, and discuss how to interpret your findings and next steps.

References to background and theory: Paivio on imagery and memory (Paivio, 1971) says richer representations support better recall; emotional modulation literature review by Talmi, 2013 allows the explanation of the inter-related mechanisms relevant in the current experiment.

Method

Participants

Five undergraduate students took part in the experiment aged 20 and 21, all 5 were females.

MATERIALS

The experiment was conducted on a HP windows 11 home laptop with a screen resolution of 1920 X 1020 pixels using Psychopy (version 2025.1.1) software where the experiment was ran.

STIMULI

Images were taken from the Open Affective Standardized Image Set (OASIS; Kurdi et al., 2017). The images used can be found in the experiment conditions file and were clearly labeled as positive or negative based on normative valence ratings.

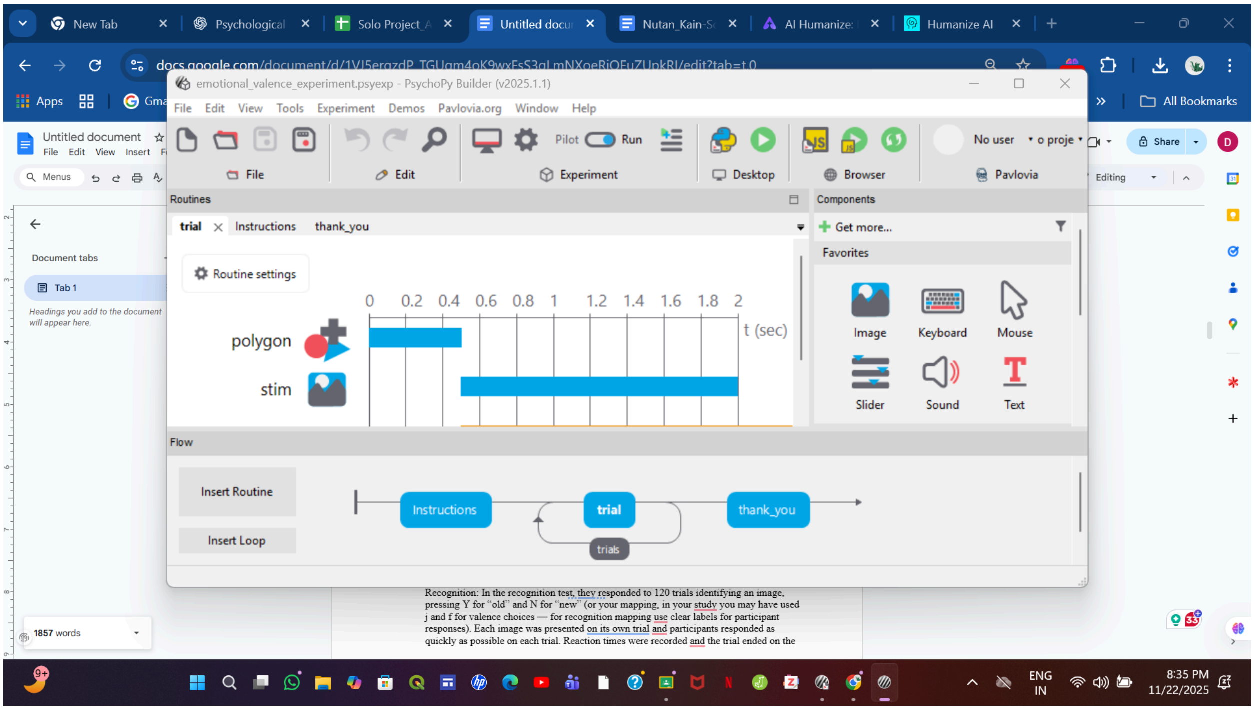
Image presentation: In each trial, the image, presented in the centre of the screen for 1.5 s, was preceded by a fixation cross (0.5 s). The sequence of trials also included an implicit inter-trial interval.

Test stimuli: Test phase included 120 items, 60 previously shown at encoding = 'old', 60 new = 'foils', balanced across valence: 30 old positive, 30 old negative, 30 new positive, 30 new negative.

Design

The experiment is a 2*2 Within-subects design. 2(Image presence: Image, No-Image) × 3(Valence: Positive, Neutral, Negative) within-subjects design.

Procedure


emotional_valence_experiment.psyexp - PsychoPy Builder (v2025.1.1)
File Edit View Tools Experiment Demos Pavlovia.org Window Help
File
Edit
Experiment
Desktop
Browser
Pavlovia
Pilot
Run
No user
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Instructions
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Keyboard
Mouse
Slider
Sound
Text
Flow
Insert Routine
Insert Loop
Instructions
trial
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trials
Untitled document
Document tabs
Tab 1
Headings you add to the document will appear here.
1857 words
Recognition: In the recognition test, they responded to 120 trials identifying an image, pressing Y for "old" and N for "new" (or your mapping, in your study you may have used j and f for valence choices — for recognition mapping use clear labels for participant responses). Each image was presented on its own trial and participants responded as quickly as possible on each trial. Reaction times were recorded and the trial ended on the
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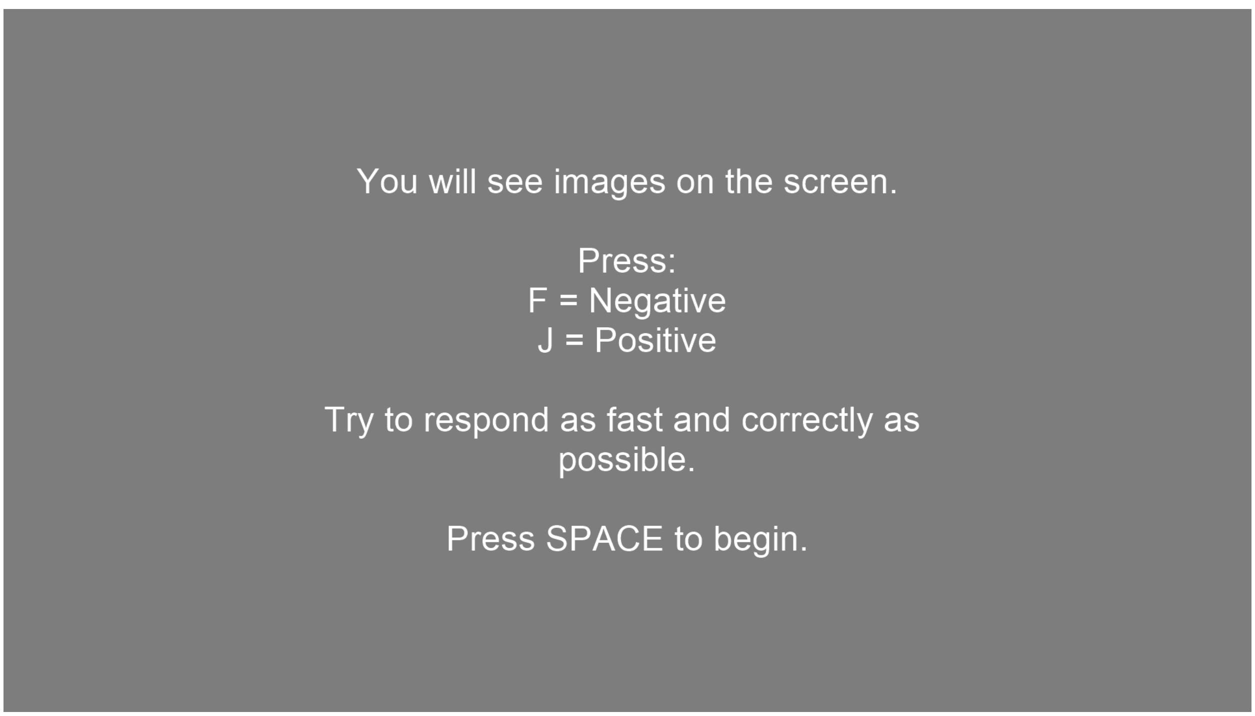

You will see images on the screen.
Press:
F = Negative
J = Positive
Try to respond as fast and correctly as possible.
Press SPACE to begin.

Thank you for participating!

Standardized instructions were presented on screen, and participants started with pressing SPACE. They were instructed that they would see pictures and, in an unrelated phase of the study, would later complete a memory task.

Encoding: Participants saw 60 images, 30 from the positive valence and 30 from the negative valence, in a random order that was different for each participant. Each image was presented for 1.5 s following a 500 ms of fixation cross and subjects were not told to use specific encoding strategies, but to pay attention to the images for the later memory test (you can indicate incidental vs intentional encoding - here we used intentional instructions).

Distractor: Following this, participants completed a 2-minute arithmetic/distractor task to prevent any possible short-term rehearsal of the previously viewed images.

Recognition: In the recognition test, they responded to 120 trials identifying an image, pressing Y for “old” and N for “new” (or your mapping, in your study you may have used j and f for valence choices — for recognition mapping use clear labels for participant responses). Each image was presented on its own trial and participants responded as quickly as possible on each trial. Reaction times were recorded and the trial ended on the participant's response.

Debrief & end.

Analysis

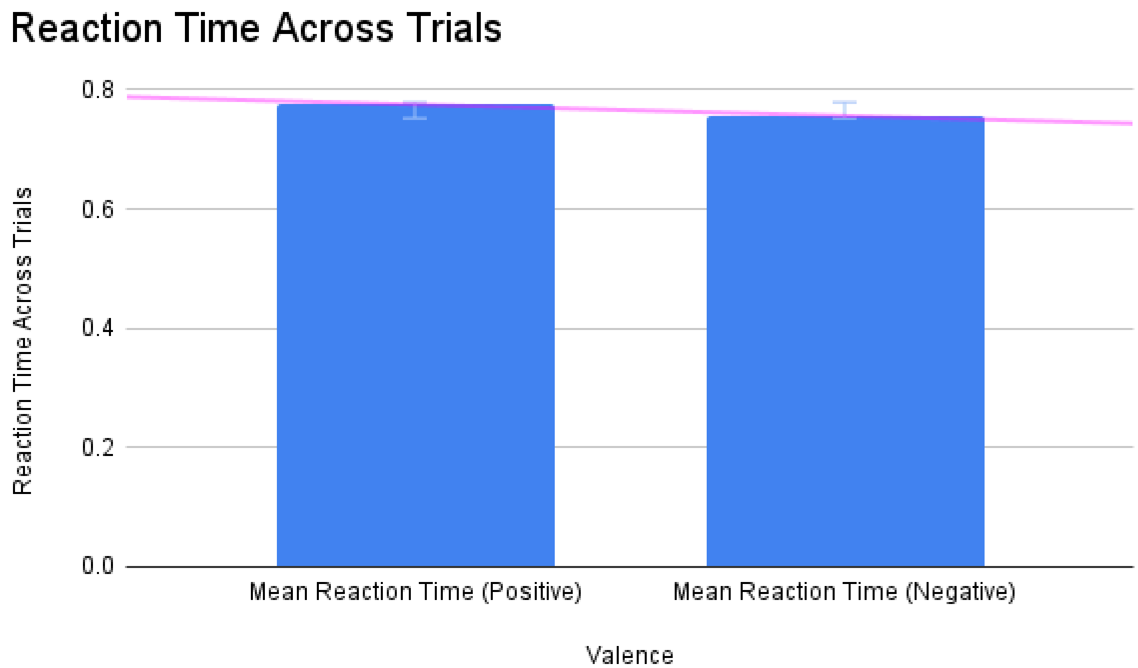
First, all data collected from the task were cleaned, removing trials with missing responses or a reaction time of zero. Once the data had been cleaned, for every remaining trial, two dependent variables were derived: accuracy (whether the participant hit the correct key for the image's valence) and reaction time (RT) in milliseconds. Accuracy was scored as 1 (correct) for the correct response and 0 (incorrect) for the incorrect response. In instances, RT was converted to milliseconds using:

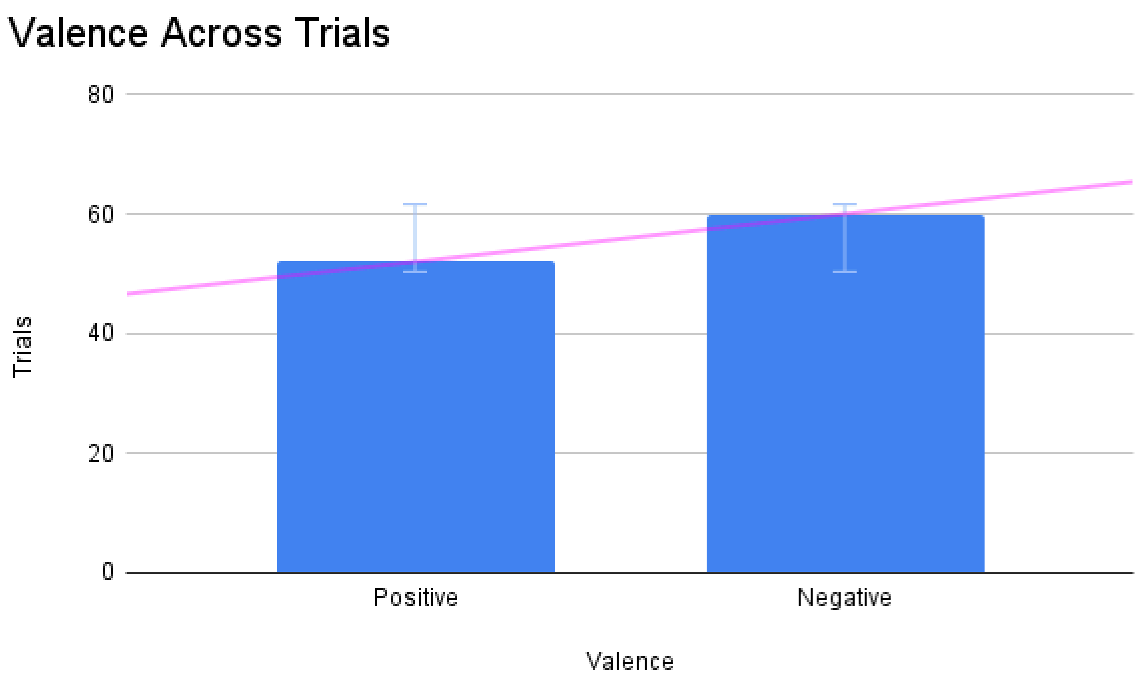
RT(ms) = RT(sections) × 1000.

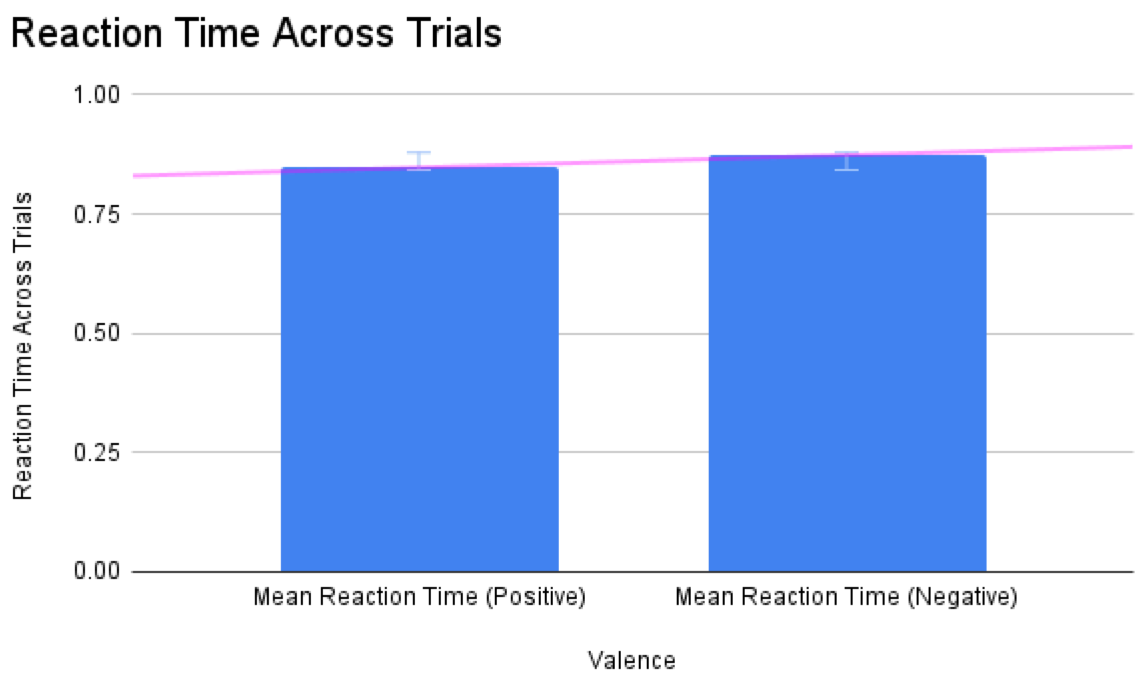
The data were split according to two levels for the independent variable of Valence, Positive and Negative. Mean accuracy and mean reaction time were calculated for each participant and for each valence category separately. In calculating mean accuracy for each valence category, the following formula was used:

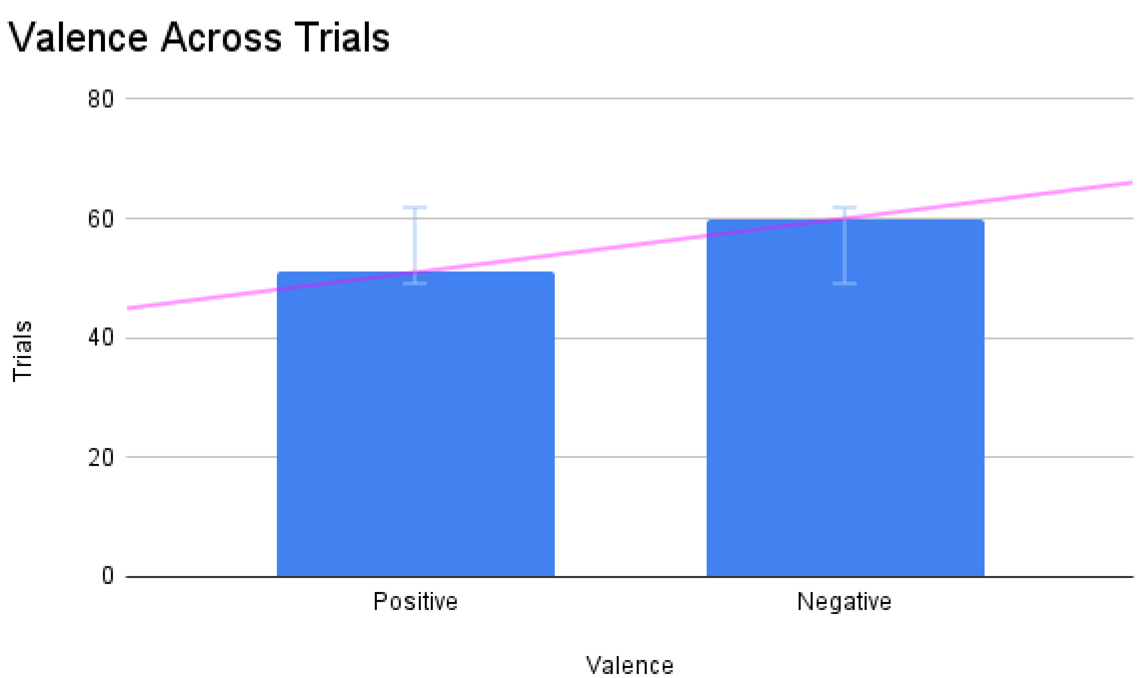
Mean Accuracy = Sum of Correct Responses / Total Trials. Mean reaction time was simply the mean of all valid RTs for that valence condition.

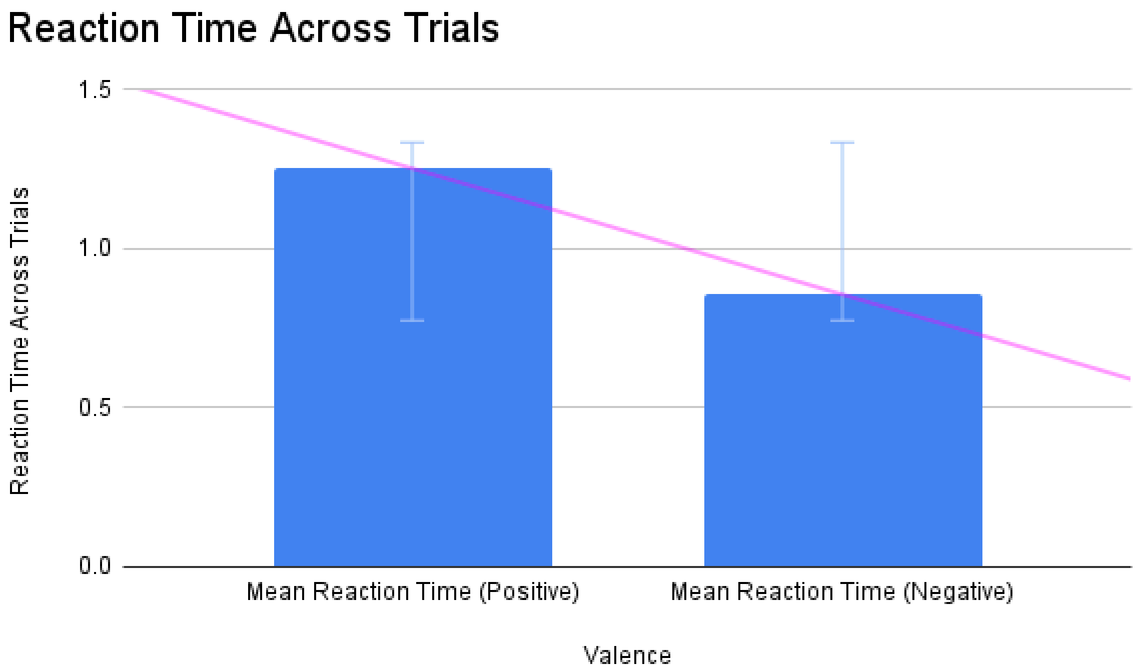
To examine whether emotional valence has any impact on performance, paired-samples comparisons were carried out with a within-subjects design-the same participant completed both conditions, i.e., Positive vs Negative images-which tests for differences in accuracy or reaction time for the two vignettes by valence condition. First, to check for differences in accuracy, overall accuracy for each person for each of the two conditions was recoded by subtracting the accuracy for negative images from the accuracy for positive images. Accuracy difference was then done for reaction times in the same way. These difference scores can be used to see if any of the participants had a difference across the two orders of images, such as faster to one valence condition vignettes compared to the other.

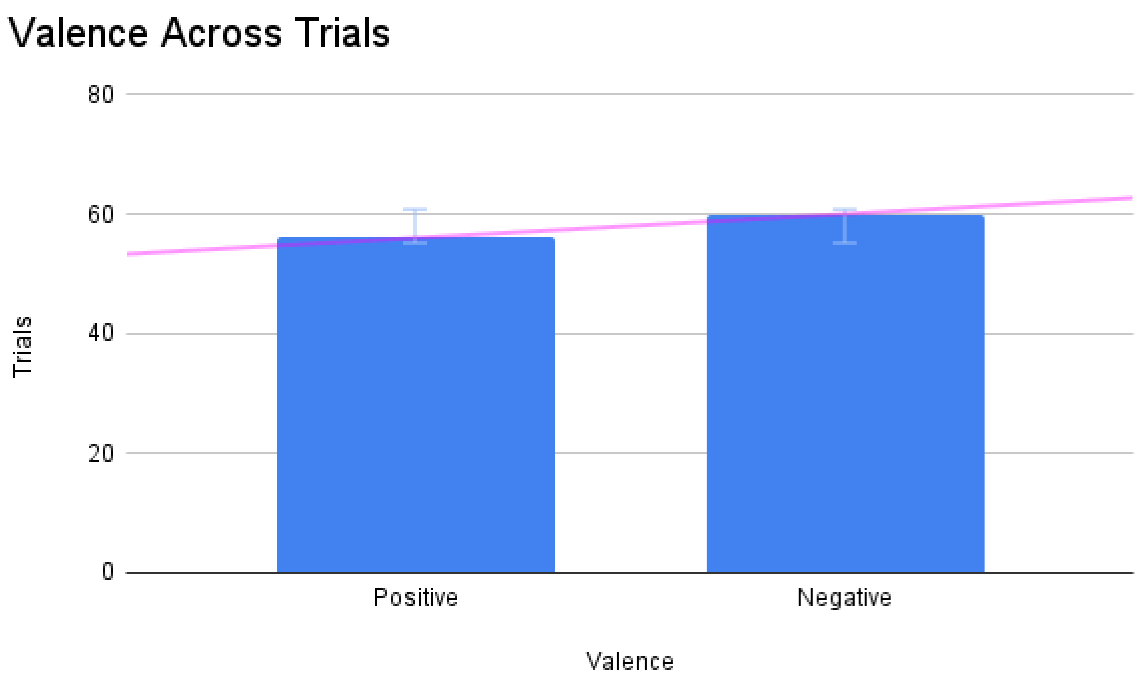

Reaction Time Across Trials
0.8
0.6
0.4
0.2
0.0
Reaction Time Across Trials
Mean Reaction Time (Positive)
Mean Reaction Time (Negative)
Valence

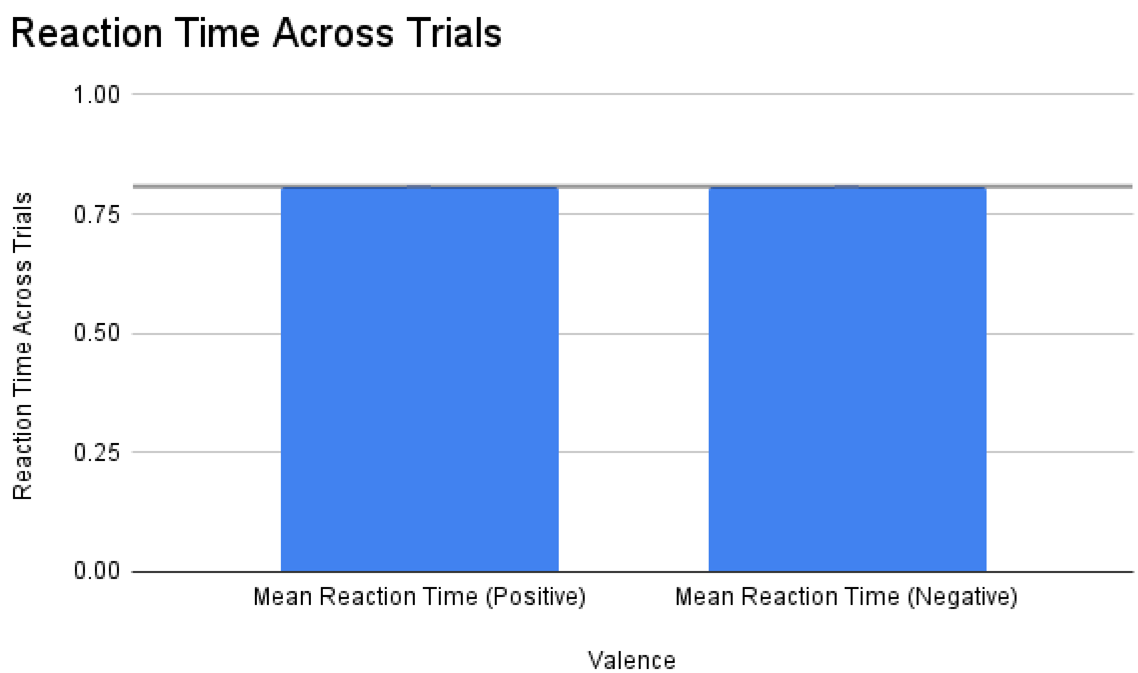

Valence Across Trials
80
60
40
20
0
Trials
Positive
Negative
Valence

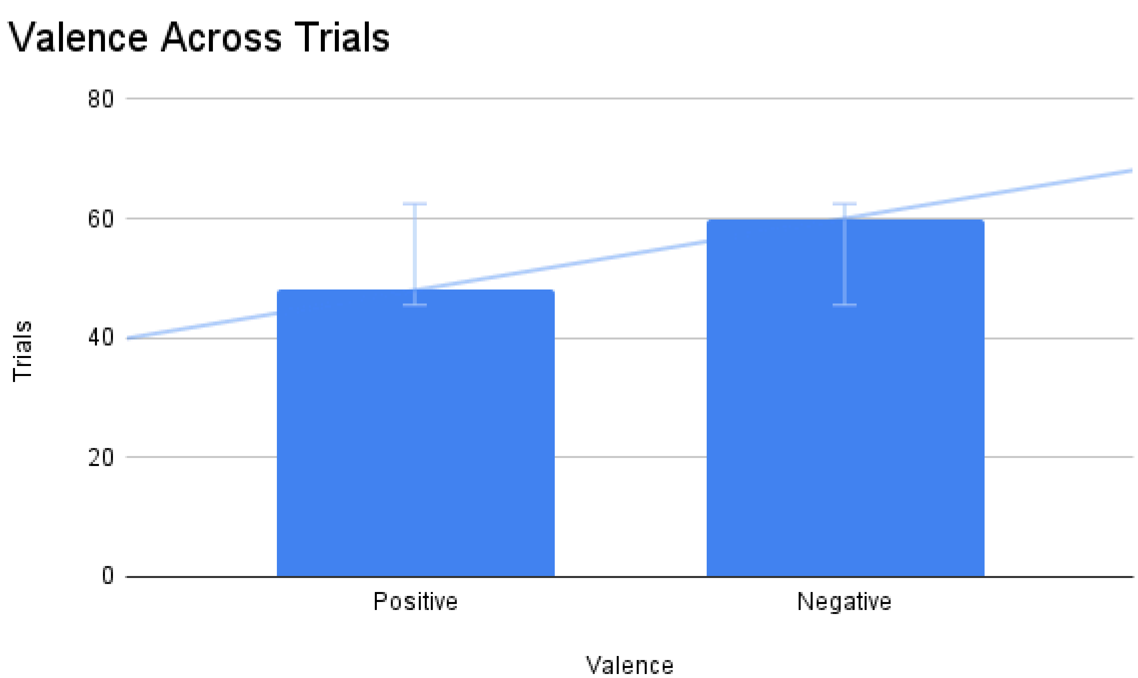

Reaction Time Across Trials
1.00
0.75
0.50
0.25
0.00
Reaction Time Across Trials
Mean Reaction Time (Positive)
Mean Reaction Time (Negative)
Valence

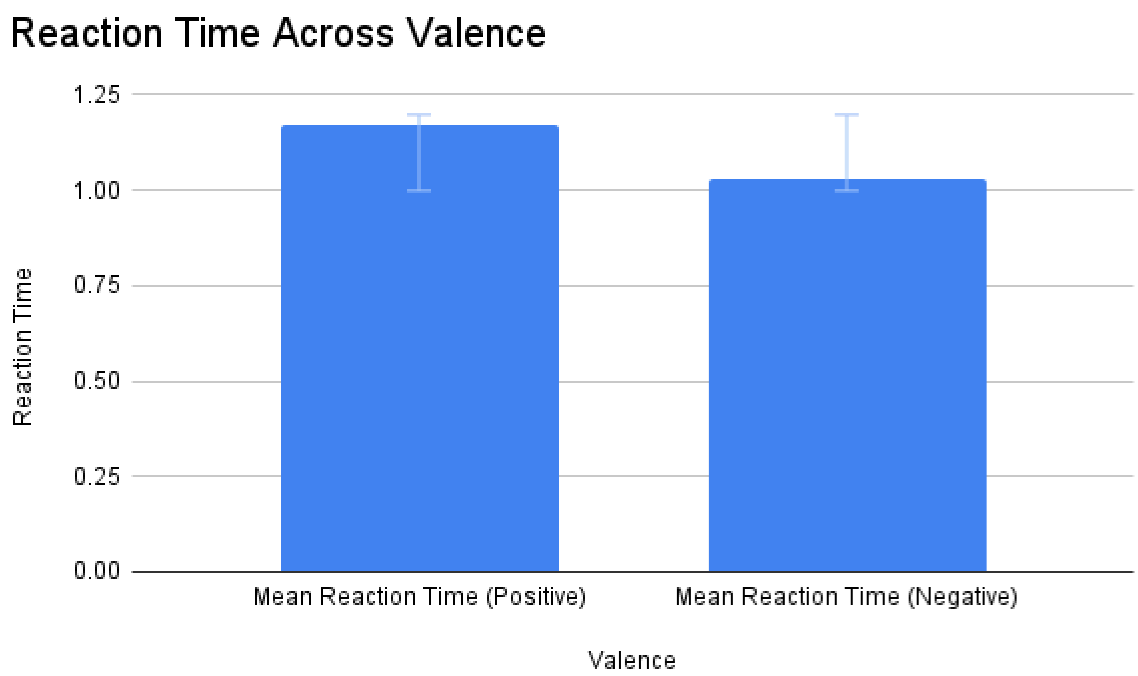

Valence Across Trials
80
60
40
20
0
Trials
Positive
Negative
Valence

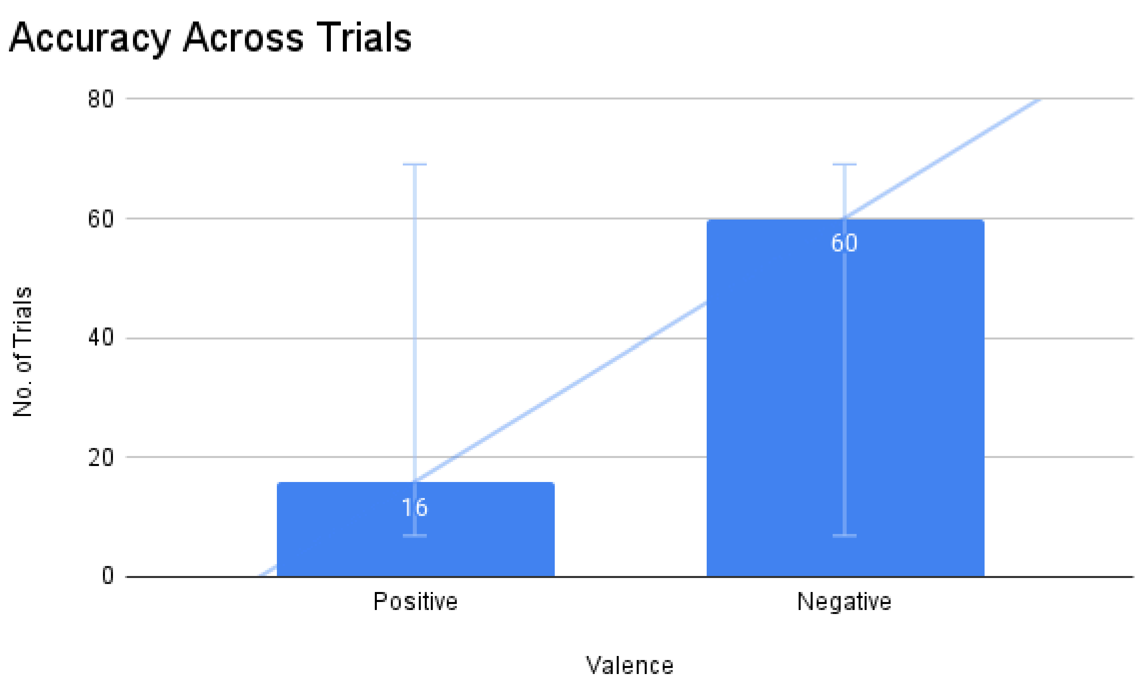

Reaction Time Across Trials
1.5
1.0
0.5
0.0
Reaction Time Across Trials
Mean Reaction Time (Positive)
Mean Reaction Time (Negative)
Valence


Valence Across Trials
80
60
40
20
0
Trials
Positive
Negative
Valence


Reaction Time Across Trials
1.00
0.75
0.50
0.25
0.00
Reaction Time Across Trials
Mean Reaction Time (Positive)
Mean Reaction Time (Negative)
Valence


Valence Across Trials
80
60
40
20
0
Trials
Positive
Negative
Valence





For descriptive statistics, overall accuracy across all trials was computed using the same accuracy formula. Second, both mean RT for all trials combined and median RT were computed, to account for possible skew in reaction times - RT distributions are often skewed. Where appropriate, standard errors were computed by calculating:

$SE = SD \div \sqrt{n}$,

where SD is the standard deviation of the participant means and n is the number of participants. For within-subjects comparisons it is appropriate to estimate effect sizes using partial eta squared:

η^2 = Model Variance ÷ Total Variance, where partial eta squared reflects the proportion of variability between the dependent variable that is attributable to emotional valence.

Finally, visual analyses were performed by plotting: a) mean accuracy for positive versus negative images; and b) mean reaction times for positive versus negative images. Error bars that reflected the standard error of the mean were included whenever appropriate. Moreover, these plots provide a more intuitive sense of whether participants responded more quickly or more accurately to one emotional category relative to the other.

Discussion

The study involved a classic encoding-distractor-recognition paradigm using validated emotionally valenced images (OASIS). The findings indicated that at most a modest effect of valence on recognition accuracy was observed-positive somewhat higher-but the difference on speed was larger: participants were faster to respond to positive compared to negative images. The accuracy pattern is small and could be a function of either difficulty with the task, stimulus selection, or number of participants.

There are two major ways to interpret this finding. First, emotional arousal does tend to facilitate consolidation of certain types of memory, though those can vary in terms of valence and task. Specifically, negative stimuli can capture attention and invoke slower deep processing to evaluate survival value, which then tends to result in either stronger memory-for central details of the negative stimuli-or weaker memory, as attentional narrowing inhibits the encoding into memory of incidental detail (Easterbrook, 1959; Kensinger, 2009). Second, fast RTs to positive items either reflected easier retrieval or a lower threshold for making decisions about what constitutes positive given the task parameters, presumably because participants were processing positive images more fluently (Reed & Deffenbacher, 1990).

References

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