Introduction:

Colour is not only a perceptual feature of the environment but also a contextual cue that can influence attention, emotion and memory. Studies in cognitive psychology suggest that colour may guide information processing through colour priming, a mechanism by which exposure to colours activates associated emotional and semantic networks that shape subsequent perception and encoding. Many authors have been interested in studying the relationship between psychology and colour. A lot of them have demonstrated that colour and memory are related in different ways.

Scientific evidence shows that sensitivity to colour as a meaningful cue appears early in development. Wilcox et al. (2014) found that infants exposed to consistent colour–object pairings later demonstrated improved recognition and increased neural activation in object-processing areas. In adults, colour effects are often explained through automatic affective associations. For instance, red is linked to alertness and urgency , while blue and green are associated with calmness and reduced emotional intensity (Bargh & Lian, 2020). These associations can modulate attentional engagement, which is a key factor in memory encoding.

Colour has also been shown to act as an attentional orienting cue. Lumpkin et al. (2023) demonstrated that chromatic priming before stimulus presentation improved visuospatial memory, suggesting that colour prepares attentional resources during encoding. Similarly, Au and Tang (2025) reported that when a priming colour matched task-relevant stimuli, memory performance improved, when mismatched colours impaired the performance. This might indicate that colour can enhance or interfere with encoding depending on its relevance to task demands.

Despite this evidence, fewer studies have examined how background colour during the encoding of verbal material affects recognition memory. Some emerging research suggests that warm colours may enhance focused memory performance, while cool colours may be less effective for memorization tasks (Cai & Wang, 2024).

Based on the reviewed literature, the study investigated the relationship of recognition memory and colour. To be more specific this particular study examines the colligation between background colour and semantic meaning of words influences, the recognition memory and reaction times

To achieve this objective the following hypotheses are proposed:

General hypothesis (H): Background colour influences recognition memory, regulating performance based on semantic coherence and colour

Alternative hypothesis:

H1 (semantic congruence): Congruence between semantic meaning and background colour will positively influence recognition memory. Words presented against a background colours related to their meaning will be better recognized and will have a faster reaction time.

H2 (colour type): Words presented against warm background colours (red, orange, yellow) will yield better results—both in correct responses and reaction times—than words presented against cool background colours (blue, purple).

Based on the literature reviewed, this study analyzes the relationship between recognition memory and color. Specifically, the objective of this study is to examine how the relationship between background color and the semantic meaning of words influences, firstly, recognition memory and, secondly, reaction times.

To achieve this objective, the following hypotheses are proposed:
General hypothesis (H): Background color influences recognition memory, regulating performance based on semantic coherence and color.

> H1 (semantic congruence): Congruence between semantic meaning and background color will positively influence recognition memory. Words presented against a background color related to their meaning will be better recognized and will have a faster reaction time.
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> H2 (color type): Words presented against warm background colors (red, orange, yellow) will yield better results—both in correct responses and reaction times—than words presented against cool background colors (blue, purple).

Participants:

A total of 18 participants took part in the study, including 7 men and 11 women, aged between 18 and 23 years. All participants volunteered to take part in the study and provided informed consent before starting.

Experimental procedure:

The experiment was conducted individually using PsychoPy software. Participants were seated in front of a computer screen in a quiet room. They were presented with a list of words, one at a time. Each word appeared on a colored background, with half of the words displayed on warm-colored backgrounds (e.g., red, yellow) and half on cool-colored backgrounds (e.g., blue, green).

The assignment of words to background colors was counterbalanced across participants to prevent order or color confounds.

After viewing all the words, a recognition test was administered, presenting a mix of previously seen words and new words. Participants were asked to indicate whether they had seen each word before. Accuracy in recognizing previously presented words was recorded as the dependent variable.

Once all participants had completed the experiment, their responses were systematically recorded in an Excel spreadsheet, with individual data organized for each participant. This included responses for words presented on warm and cool backgrounds, as well as neutral and non-neutral words, to allow detailed analysis. The collected data were then imported into Jamovi, where means and standard deviations were calculated for each condition, providing a summary of memory performance across participants.

This procedure allowed us to examine whether background color (warm vs. cool) influenced memory performance and whether semantic associations between words and colors (e.g., “sun” on a yellow background) affected recognition.

Results:

The participants’ data were analyzed using the JAMOVI statistical software. A paired-samples t-test was conducted to compare reaction times (RT) and accuracy (correctness) between neutral and non-neutral conditions (N=18). As shown in the Paired Samples T-Test table below, there was no significant difference in reaction times between the neutral and non-neutral conditions (t(17) = -0.616, p = .546). The mean reaction time for the neutral condition (M=1.495) was very similar to the non-neutral condition (M=1.550). Similarly, there was no significant difference in accuracy rates between the two conditions (t(17) = -0.667, p = .513).

Paired Samples T-Test

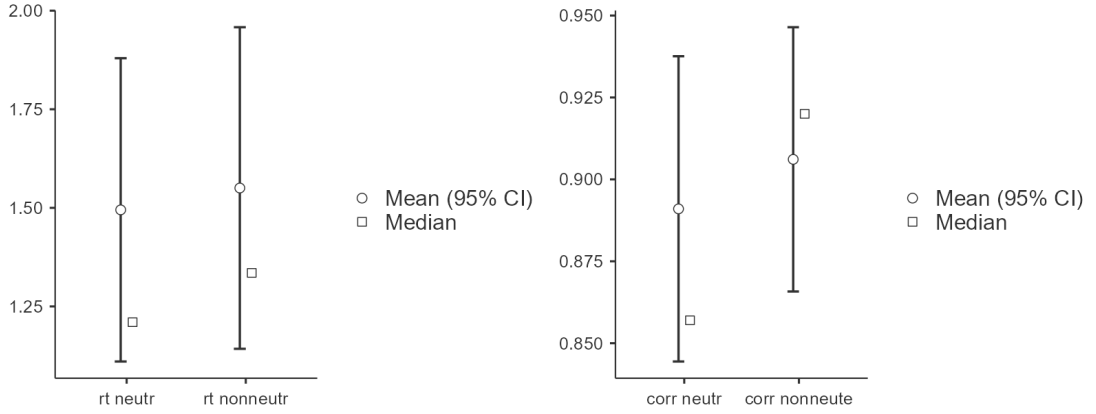
			statistic	df	p		Effect Size
rt neutr	rt nonneutr	Student's t	-0.616	17.0	0.546	Cohen's d	-0.145
corr neutr	corr nonneute	Student's t	-0.667	17.0	0.513	Cohen's d	-0.157

Note. $H_a\ \mu_{Measure\ 1 - Measure\ 2} \neq 0$

Descriptives

	N	Mean	Median	SD	SE
rt neutr	18	1.495	1.210	0.8324	0.1962
rt nonneutr	18	1.550	1.335	0.8827	0.2080
corr neutr	18	0.891	0.857	0.1008	0.0238
corr nonneute	18	0.906	0.920	0.0873	0.0206

Plots



Discussion and conclusion:

As we can see in the results shown in p, the result for the "rt neutral" and "rt nonneutral" variables is **0'546**. On the other hand, the result for the "corr neutr" and "corr nonneut" variables is **0'513**. As the experiment results could only be significant if they were <0'05, we can conclude that these experiment results are not significant to what we expected to align with our hypothesis.

Our hypothesis was that the words related to the background color we were showing, meaning non neutral words (for example, the word "fire" shown with a red background), were going to be remembered better or more easily than words that had nothing to do with the background color, meaning neutral words (for example, the word "map" shown with a purple background). Additionally, we thought that words were going to be remembered better if they were presented with a warm color background (for example, a red background) instead of being presented with a cold background (for example, a blue background).

As we can observe from the final results and analysis, we have obtained non significant results from any of the two hypotheses we imagined in the beginning . Our results, **p = 0'546** and **p = 0'513** prove that warm colors are not remembered any better than cold colors and that, even if the words are related to the background color, this does not make them more easily remembered.

This may be biased by several factors that intervened with the correct development of the experiment. For example, the sample size was not as large as it should have been to truly prove this effect, since we only had 30 participants and they were all of similar age. Ideally, we would need 100 participants of different genders and ages. Another factor that might have intervened are the inadequate conditions or environments where the experiment was conducted. We needed to present the experiment individually to three people each, so each participant had a different experience relating to the conditions where the study was conducted. It would have been best if we could have all gathered in a laboratory to conduct the experiment together in the same conditions. Lastly, there could have been some confusion and ambiguity when defining what background color we would put together with a word, meaning that maybe we associated this color and word together but, perhaps, some participants did not, as it is something subjective and does not follow any clear rule. All of these conditions should be improved in future studies to be able to truly discover if our results are indeed this way, since these factors may have affected the results.

To conclude our experiment, we can affirm that these were not the expected results. Our hypotheses were proven to be the opposite way; background colors do not affect the memory of the words associated with them, and words linked to warmer background colors are not remembered better than colder background colors. There were not any results of particular significance to prove that words associated with a specific color (for example: associating “fire” with the color red) were remembered better than words linked randomly with a color. This leaves an interesting space for future discoveries and exploring this relation in memory, which maybe could be changed and proven with a larger sample and different experimental conditions.