

The Impact of Coloured Alphanumeric Characters on Short-Term Memory

Ali-Reza Vaezi

Kwantlen Polytechnic University

Introduction

The impact of colour on our cognition can be used to enhance our ability to retain sensory information for a longer period of time (Wichmann et al., 2002).

Colour can arouse our attention which is needed for deeper processing of stimuli and longer retention rates (Farley & Grant, 1976; Pan, 2010).

Previous research shows a positive relationship between colour and retention of visual stimuli:

- Successful recall and recognition of images was 5% higher for individuals exposed to coloured images compared to those who were exposed to gray-scale images (Spence et al., 2006)
- Participants performed 5% - 10% better when recalling coloured images compared to the black-and-white condition (Wichmann et al., 2002).
- Participants performed significantly better when recognizing objects in colour compared to recalling objects in the non-coloured condition (Vernon & Lloyd-Jones, 2003).

Prior research focuses on the retention rates; however, limited research has been done to study the effect of unicoloured alphanumeric characters on memory performance. Similarly, there is limited investigation on the impact of gender and colour on short-term memory.

Hypotheses

- Participants who are exposed to the red-coloured alphanumeric characters will recall those characters more often during the memory span test when compared to individuals who will not have any exposure to coloured characters
- Participant's gender will not have an impact on their ability to recall and retain stimuli

Methodology

Participants

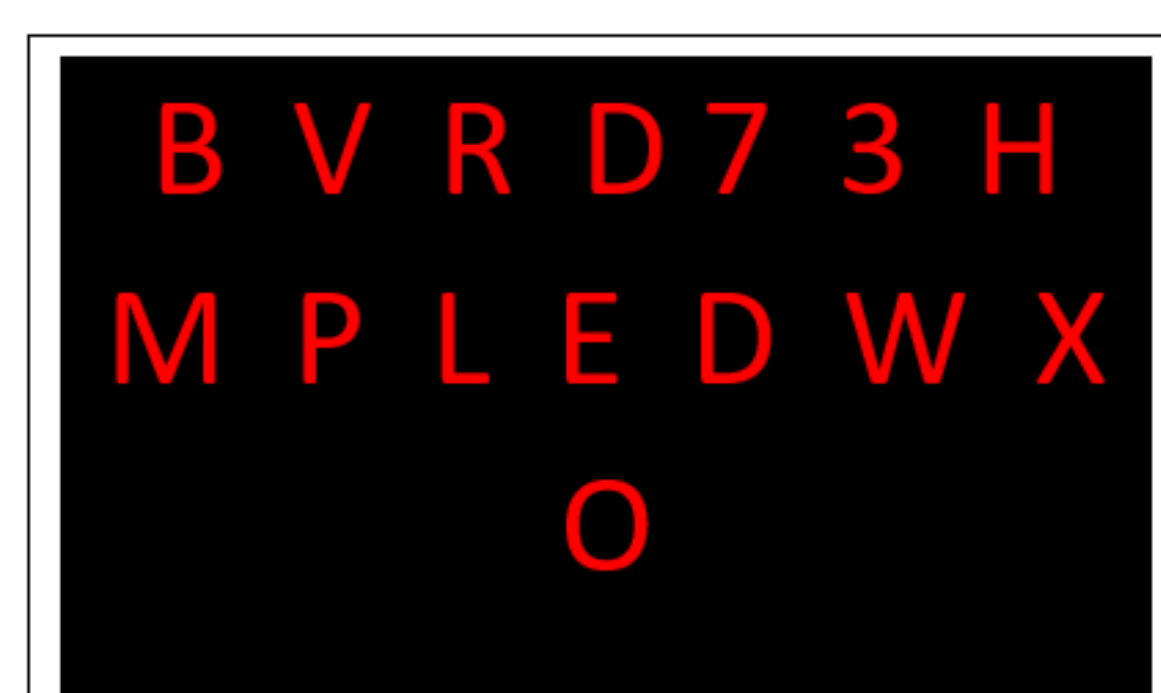
- 60 participants (14 male, 46 female) were recruited through the KPU research pool using convenience sampling
- 7 male and 23 female participants were assigned to each condition
- Experimental condition: mean age = 23.0, standard deviation = 5.52
- Control condition: mean age = 22.6, standard deviation = 3.48

Materials

- 5 videos were used in each condition (coloured/non-coloured)
- Each video contained a random mix of letters and numbers (total of 15 characters)
- The colour condition included videos with red characters on a black background (Figure 1)
- The non-coloured condition included videos with white characters on a black background
- A list containing letters from A-Z and numbers from 0-9 was used to test participant memory

Figure 1

An example of characters that were used in a trial in the experimental condition.



Procedures

- This study was conducted online through Qualtrics
- After providing consent and answering demographic questions, participants were randomly assigned to either the coloured or non-coloured condition
- Participants were presented one video at a time and could view each video only once
- After each trial, participants were asked to select the characters from a list of provided characters that they were able to successfully recall
- Participants were not required to remember the sequence in which the letters were presented

Results

- Each participant's score from all trials was totalled into a single dependent variable.
- Both assumptions of normality and equal variances were assessed to find that the former was met, and the latter was violated. In order to assess violation in assumptions, an alpha of .01 was utilized.
- Figure 2** shows the means and standard deviation of total scores for male and female participants in the experimental and control conditions
- Table 1** provides a summary of the two-way ANOVA results
 - No statistically significant main effects or interactions ($p > .01$).
 - Effect sizes indicate small effects across both variables and the interaction

Figure 2

Comparison of the mean scores for male and female participants in the coloured and non-coloured conditions. Bars represent the standard deviation.

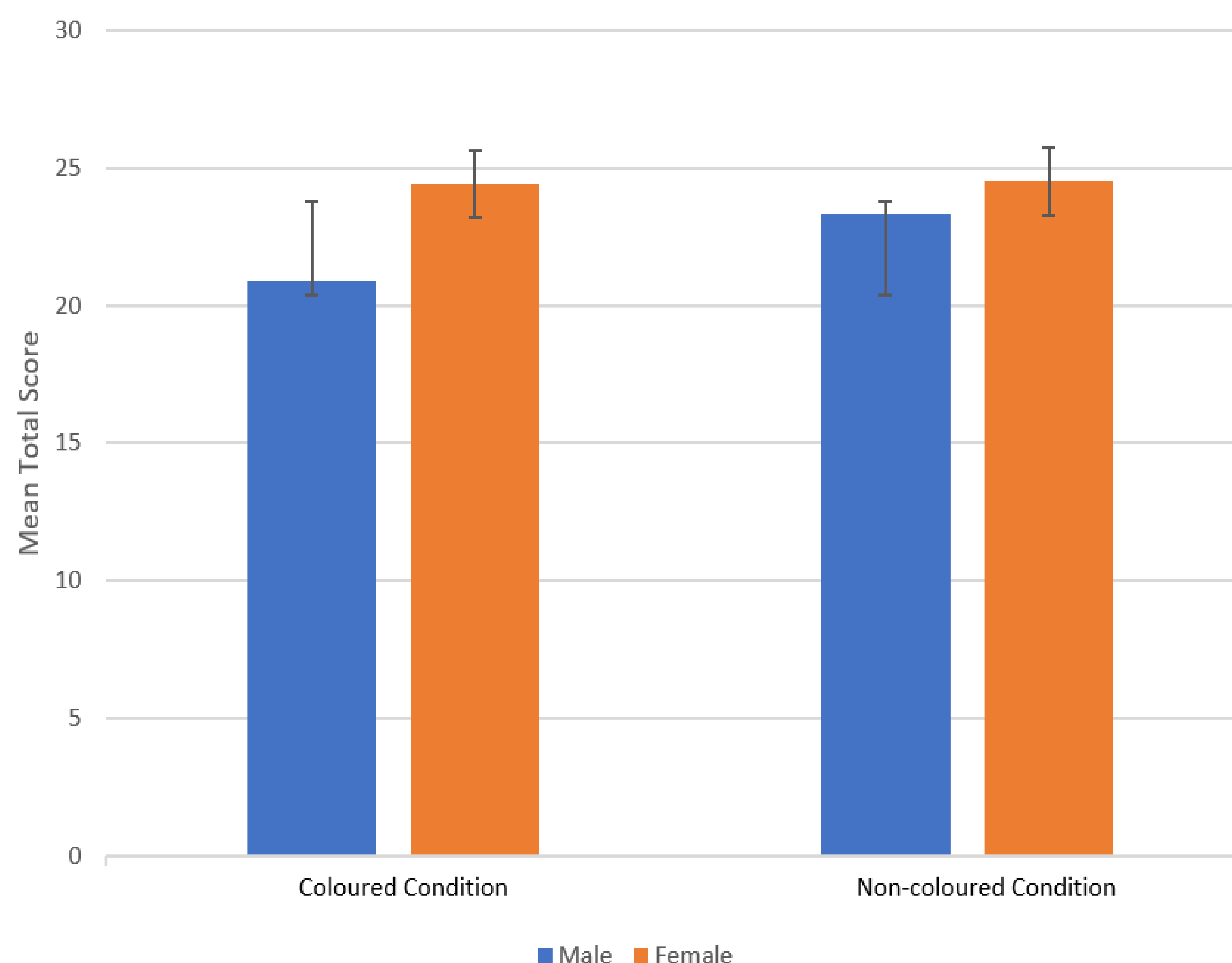


Table 1

Summary of the results of two-way ANOVA using total scores

	Sums of Squares	df	Mean Square	F	p	$\eta^2 P$
Condition	17.60	1	17.60	0.78	.382	.05
Gender	59.80	1	59.80	2.63	.111	.01
Condition * Gender	14.10	1	14.10	0.62	.434	.01
Residuals	1273.40	56	22.70			

Discussion

- Hypothesis 1 was **not** supported: The results suggest that color had no impact on retention and recall of stimuli.
- Hypothesis 2 was supported: The results suggest that gender did not influence short-term memory retention rates.
- Results are incongruent with the findings of Spence et al. (2006), which showed greater retention and recall of coloured images versus gray-scale images. This conclusion is made by analyzing the p values obtained which may suggest low statistical power.
- The difference in results could potentially be caused by a difference in perception of images versus letters and numbers.
- Notable limitations include:
 - Sample size:** The overall sample size for this study was small, which may have resulted in insufficient power. However, the small effect sizes do support the conclusions of no difference. Additionally, the greater number of females compared to males also resulted in unbalanced conditions in this study (which may explain the violation of homogeneity of variance).
 - Conducting the study online:** External factors such as participants' setting could not be controlled for due to the online nature of the study. Distractions and external stimuli such as noise may have also influenced the data obtained.
- If the study were repeated in the future, using a larger sample size would be beneficial to observe the impact of a variety of coloured alphanumeric characters on short-term memory. Future studies should also consider keeping test conditions (i.e., setting) consistent for all participants.

References

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