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Aroused and Impulsive Effects of Colour Stimuli on Lateral and Logical Abilities

Guobin Xia 1,* , Muzi Li 2, Philip Henry 1, Stephen Westland 1, Francisco Queiroz 1, Qiwei Peng 3 and Luwen Yu 1

Abstract: The purpose of this study was to explore the influence of environmental colour on people’s lateral and logical abilities. This was done by evaluating study participants’ response time and error rate when completing six types of psychometric tests that were performed in various hue backgrounds on a computer. To maximise the colour stimulation provided by the monitor, the experiment was carried out in a dark laboratory. Analysis of participants’ response time and error rate showed that different colours could significantly influence arousal and impulsiveness, which suggests that colour has indirect impacts on cognitive abilities. Further analysis revealed that different colours had various effects depending on the type of psychometric test given. These findings suggest that future research on environmental design should consider how to effectively use colour to impact people’s performance and behaviour.

Keywords: colour psychology; arousal; impulsiveness; cognitive abilities

1. Introduction

The study evaluated the influence of colour stimuli on people’s cognitive abilities with particular focus on logical and lateral abilities. The human brain divides into two distinct cerebral hemispheres, and each of them tends to lateralise and specialise in different cognitive abilities [1–3]. Notably, the right hemisphere is responsible for lateral abilities (i.e., creative thinking, imagination, holistic perception and emotional thought), while the left hemisphere is in charge of logical abilities (i.e., analytical thought, detail-oriented perception, ordered sequencing, rational thought, and math/science) [4–7]. Colour and light as a ubiquitous perceptual stimulus have been manifested in the previous studies in optimistically affecting people’s cognitive functions [8], human perceptions [9], psychological and emotional reactions and ultimately [10,11], behavioural intentions [12]. However, research investigating the influence of colour stimuli on people’s lateral and logical abilities is limited. Questions that this study deems significant and attempts to answer are (1) whether colours could influence people’s cognitive abilities, and (2) how?

There is a rich history of studies that relates to how environmental colours can affect people’s behaviours and performance. For instance, Elliot, et al. [13] investigated the connection between colour and human psychological reactions with particular focus on red and performance attainment. Results of their work found a clear link between colours and emotions through various observed behavioural (i.e., task choice) and psychophysiological (i.e., cortical activation) reactions. The study by Elliot, et al. [13] was impressive in its contribution to illustrate that colour can act as a subtle environmental cue that has essential impacts on people’s behaviours. Yildirim, et al. [14] studied the effects of three different colours (cream, blue, and pink) on the interior wall surfaces of classrooms on the perceived performance of male students. They observed that students felt more positive in spaces
with blue walls compared to cream and pink coloured spaces. It is suggested that the effective use of colours in the design of classrooms do have significant impacts on students’ perceptual performances. Interestingly, some studies carried out explored the intensity lighting impacts have on people’s electroencephalogram (EEG) power [15,16]. Results have demonstrated the stimulus of short and long wavelength light on people’s alpha, theta, and beta power, suggesting that coloured light can promote acute alertness and improve performance on tasks requiring sustained attention.

The impacts of colour inducements on cognitive performance can also be observed in textile design. Significant contributions have been made by Hill and Barton [17], Ilie, et al. [18] and Attrill, et al. [19] in several experiments demonstrating that red relative to blue clothes have significantly higher opportunities to win in competition or matches. Apart from findings regarding red effects, other researchers additionally reported judokas that wear blue might carry a better performance compared with those wearing white [20,21].

Other studies indicate that people’s emotions and performance can be induced by specific colours [11,22–26], and this indication parallels on the relationship between the impacts of colour on people’s arousal and impulsiveness (Figure 1).

![Figure 1](image)

**Figure 1.** The relationship between the impacts of colour on people’s arousal and impulsive level and cognitive performance.

Arousal refers to the physiological and psychological state of being awake. It is relatively crucial in regulating the psychological experience of attention, alertness, information processing (decision-making or judgments), emotions, memory and consciousness [27–29], that dimension ranges from deactivation (i.e., calm) to activation (i.e., stress or happiness) [30]. One crucial theory that attempts to explain the empirical relationship between emotional arousal and performance is the U-shaped relationship, initially established by Yerkes and Dodson, and was known as Yerkes–Dodson Law [31]. Specifically, Yerkes–Dodson Law states that raised levels of arousal can enhance performance up to a certain point; however, if beyond the optimum, increased level of arousal is followed by declines in performance [32]. For example, an optimal level of stress before an exam can increase people’s attention on the test and retain the knowledge that you have studied. In contrast, excessive test anxiety can weaken people’s ability to focus and make it more challenging to remember precise answers. Drawing on investigations of the core design elements of colour and light, generally, researchers posited that arousal difference effects could be observed and that the red end of the spectrum increased arousal and the blue reduced arousal [33,34]. Specifically, Greene, et al. [35] explored the connections among hue, arousal and boredom. In their study, a total of 140 undergraduate students (70 males, 70 females) were invited to sit in carrels and exposed to side panels painted either light blue, blue, pink, red, orange, white, brown, green, yellow, or grey. The experiment evaluates students’ aroused level by exploiting Russell and Mehrabian [32] Emotional Response Scale (ERS), Griffitt [36] Personal Feelings Scale (PFS), and Russell and Pratt [37] Affective Quality of Place Scale (AQPS). Their findings show that self-reported arousal and evaluations of the environment were higher with the yellow stimulus than in the other coloured stimulations. Collectively, the work carried out by Greene and colleagues illustrated the potential of colour stimulus as an aroused effect trigger even employing the coloured inducement in less immersive conditions.

Nevertheless, the experiment by Greene and colleagues has some problems. Firstly, they failed to manage the brightness of the colour stimulus when studying the hue influ-
ence. Moreover, when participants look at the painted side panels, they must not view a single colour, but a combination of the colour with a background colour, even though one consciously attempts to recognize only one of them. Furthermore, the results of the subjective measure are questionable, as people may mix their feelings before and after each experiment session. However, despite various methods applied in order to measure colour influence on arousal, previous insights into measuring approaches can be generally classified into three types: self-reporting methods (i.e., verbal scales), psychophysical methods (i.e., paper-folding, cognitive tasks), and psychophysiological methods (i.e., GSR, EEG, heart rate) [38–41].

Impulsiveness is defined as a behavioural ability to respond quickly and without mental reflection, which is essentially associated with the control of thoughts and behaviour [41]. It is well documented in the literature that colour can influence human perceptions and behaviours [17,21]. However, research into the measurement of colour on impulsivity is relatively limited but can be generally categorized into four categories: self-report measure, behavioural measure, psychophysiological measure, everyday life experiences measure. For instance, Zentall, et al. [42] used colour stimulation with psychophysical methods to test the impulsivity of attention-problem adolescents. They compared participants’ performance through the Matching Familiar Figures Test (MFFT) between “black and white” and “colourful” patterns. Their results showed that participants were less impulsive with colourful patterns in terms of the reduced error rate of MFFT. Wang, et al. [43] conducted two psychophysical experiments to investigate the effects of environmental colour on impulsive buying behaviour. Their results revealed that environmental colour (blue vs. red) could stimulate people’s impulsive buying behaviour. To be specific, they also observed that participants who were exposed to the blue environment had higher impulsive buying intent than those exposed to the red environment. Sevda, et al. [44] explored the relationship between colour preferences and impulsive behaviour by using Beck Anxiety (BAI), Beck Depression (BDI) and Barrat Impulsivity Scales (BIS). They found colour preference is related to impulsivity. Ciccone [45] used personality, behavioural and neurological methods to study the effect of coloured environments on impulsivity in his PhD thesis, and his results conflicted with conventional opinion that long wavelength (i.e., red light) lights are encouraging and short wavelength lights (i.e., blue light) are calming. A study by Duan, Rhodes and Cheung [26] used a behavioural measure method to examine hue and found that it can have distinct impacts on impulsiveness and arousal, in which the hue seemed to have a greater impact on arousal than impulsiveness. To be specific, their findings revealed that orange and purple can influence people to exhibit a high-aroused state, while yellow leads to the least aroused state. Interestingly, in Duan, Rhodes and Cheung [26], a theoretical framework developed from the Salkind and Wright [46] integrated model was proposed to illuminate both impulsiveness and arousal based on the error-speed theory, which also can be utilized to explain the colour influence on people’s cognitive abilities in this study.

Collectively, many studies have demonstrated that colour can affect performance and behaviours but how do the effects occur on the lateral and logical abilities? Studies reviewed above help to inform the hypothesis that colour can have aroused and impulsive effects on people’s lateral and logical abilities. For a better understanding, and proliferating the potential of colour, the originality of this work builds on previous insights but goes further to develop new knowledge regarding the effective use of the colour design in triggering people’s logical and lateral functions. Psychological experiments have been carried out to study the impacts of colour on people’s aroused and impulsive level to validate the hypothesis, which is an indirect approach to validate the colour impacts on people’s lateral and logical abilities.
2. Methods

2.1. Colour Conditions

The six colour patches and an equally luminous reference white colour (used as a control) were selected from an Adobe HSB colour system based on previous research by Eysenck [47], Yu, et al. [48], Singh [49], Yu, et al. [50], and Duan, Rhodes and Cheung [26]. These colours were used as the background colour for a series of questions and adjusted to have a similar lightness and chroma based on the CIELAB values displayed on the monitor measured by the X-rite i1 Pro in dark laboratory settings (see Table A1 in Appendix A).

2.2. Psychometric Tests

Six types of psychometric test were utilised for measuring the participants’ logical ability (logic rule test, mathematics sequence test), lateral ability (spatial structure test, rotation test) and detail ability (odd one out, same detail test) (see Table A2). For each type of test, there were seven questions and each of these seven questions was assigned a different coloured background. This led to there being 42 questions in total (6 types of test x 7 coloured backgrounds) and each participant was asked to answer all 42 questions. The colours of the backgrounds and the orders of presentation of the questions were randomised (for each participant). However, within each test, each participant was presented with a question with each of the seven coloured backgrounds. Note, however, that for different participants the coloured backgrounds assigned to the questions within a test were different. The purpose of this is to ensure that if one of the questions, for example, was slightly more difficult than another then it would be equally likely to have any of the backgrounds for a particular participant and would remove bias.

Response time and error rate were the two main data gathered from the experiment. In the Results section, these measurements will be used to estimate participants’ aroused and impulsive levels which will be used as an indirect approach to understanding how colour impacts on people’s lateral and logical abilities.

2.3. Participants

A total of 21 participants (aged 20–25 years old, 10 males and 11 females) were recruited for the psychological experiment. To avoid culture effects and the possibility that some participants might be more logical in their approach, all participants were Chinese undergraduate students from the School of Media with similar academic backgrounds (animation studies).

2.4. Experimental Procedure

The experiment was carried out in a dark room with each participant on their own. All participants were required to complete the Ishihara Colour Vision Test before entering the room to ensure that they had normal colour vision. After passing the test, they were asked to read the instructions concerning the entire experimental procedure. Next, a sample test including each type of psychometric test was introduced to familiarise participants with the tests before launching the formal experiment. Participants were asked to focus on the reference white background picture for five minutes to adapt to the experimental lighting conditions. The main experiment started five minutes after they had adapted to the experimental conditions. Each participant spent about 40 min to complete the main experiment. Individual participants were seated in front of a monitor and were asked to choose the right answer for each question as quickly and as accurately as possible by using a mouse (see Figure 2a,b). The monitor used in the experiment had an aspect ratio of 16:9.
3. Results

3.1. General Trend

Statistical analysis was performed using Statistical Product and Service Solutions (SPSS, Armonk, NU, USA) software. Figure 3 shows the mean scores for response time and error rate pooled over all six types of test in completing psychological tasks. The green background gave both the fastest response and lowest error rate. A multivariate analysis of variance (MANOVA) was conducted to show the statistical significance of
colour backgrounding, participants’ impulsiveness and arousal can be defined as High Arousal (HA), faster reactions and lower error rate; Low Arousal (LA), slower reactions and higher error rate; High Impulsiveness (HI), shorter response time and higher error rate; and Low Impulsiveness (LI) longer response time and lower error rate (all compared with the mean).

As for the response time (Figure 3a), participants performed faster with the reference white than the purple background ($p = 0.032$). In addition, their response time with the red ($p = 0.008$) and orange ($p = 0.017$) was shown to perform faster than the purple background. Furthermore, participants performed significantly faster with the green background than the purple ($p = 0.001$), and yellow ($p = 0.017$) backgrounds.

With regard to the error rate (Figure 3b), participants with the green background were shown to make significantly fewer errors compared with participants with the purple ($p = 0.000$), orange ($p = 0.000$), blue ($p = 0.000$) and also the reference white ($p = 0.000$) backgrounds. Meanwhile, participants with the yellow background made lower errors than the reference white ($p = 0.012$), red ($p = 0.002$), blue ($p = 0.002$), orange ($p = 0.001$), and purple ($p = 0.000$) backgrounds (Tables A3–A5).

Figure 3c visualises colour impacts on general performance in the Error-Speed space. Looking at error rate and response time together, participants were slower to respond, and their error rate was relatively higher with the purple and blue backgrounds, while participants reacted faster, and their error rate was significantly lower with the green background. These findings suggested that participants experienced a LA state when they completed questions with the purple and blue backgrounds and a HA state with the green background. Moreover, for the orange and red backgrounds, participants reacted significantly faster than with the purple, and they made slightly fewer errors than with the purple background. This suggested that participants experienced a HI state with the red and orange backgrounds. Regarding the yellow background, participants were shown to respond slower and made fewer errors, suggesting that participants experienced a LI state here.

![General trend](image-url)
Figure 3. (a) General trend of response time by background colours; (b) General trend of error rate by background colours; (c) Colour impacts on general performance visualised in the Error-Speed space. The bars represent mean changes, while the error bars are the standard error of the mean across individual participants.

3.2. Logical Abilities

Participants’ logical abilities were validated by a logical rule test and mathematics sequence test. Generally, participants responded slowly with the purple background, but faster with the green. However, no statistical significance was observed in their response
time with respect to colour influence on logical abilities (Figure 4a). Interestingly, we found participants’ logical abilities were significantly affected by colours with respect to their error rate (Figure 4b). Specifically, participants were shown to make significantly more errors with the orange background compared with the yellow \((p = 0.002)\) and green \((p = 0.000)\) backgrounds. Moreover, compared with the purple background, the participants’ error rate was significantly lower with the green \((p = 0.000)\) and yellow \((p = 0.002)\) backgrounds. Compared with the yellow, the participants’ error rate was shown to be higher than with the blue \((p = 0.042)\) and reference white \((p = 0.024)\) backgrounds. Furthermore, we observed that participants made fewer errors with the green \((p = 0.003)\) compared with the red background \((p = 0.024)\) and the reference white condition \((p = 0.007)\) (Tables A6–A8).

Together with both the error rate and response time (Figure 4c), our results suggested that participants’ logical abilities can be significantly influenced by green and red with an increasing aroused state and low aroused state with purple and orange. Meanwhile, blue and yellow were demonstrated to have low impulsive effects on participants’ logical abilities.
3.3. Lateral Abilities

Results of the participants’ performance in relation to spatial imagination ability tests were shown to be significantly affected by colours with respect to their response time and error rate. Specifically, in terms of their response time (Figure 5a), participants reacted slower with the purple background compared with the red ($p = 0.018$) and green ($p = 0.01$) backgrounds. In addition, a significant difference was also observed between the orange and purple ($p = 0.006$) backgrounds. With regard to the error rate (Figure 5b), participants
made fewer errors with the green background compared with the orange \((p = 0.000)\), red \((p = 0.001)\), purple \((p = 0.001)\), blue \((p = 0.000)\), and reference white condition \((p = 0.000)\). Moreover, participants with the yellow background were shown to make fewer errors in lateral ability tests than those with the orange \((p = 0.022)\), red \((p = 0.040)\), and blue \((p = 0.022)\) (Tables A6–A8). Results of both error rate and response time (Figure 5c) of the spatial imagination ability tests suggested that participants experienced a HI state with orange, red, and blue backgrounds. Meanwhile, those with the green background were shown to be in a HA state, and the yellow background rarely induced a LI state.
3.4. Detail Abilities

Colour influence on detail abilities was validated through an odd one test and same detail test. Statistical significances were found in participants error rate. As shown in Figure 6a, participants reacted slower with the purple background than the green. However, no significant difference between these two colours on response time was found. Moreover, Figure 6b indicates that participants with the purple background made more errors than the green ($p = 0.003$) and yellow ($p = 0.041$) backgrounds. Meanwhile, participants made fewer errors with the green backgrounds than the blue ($p = 0.041$) and red ($p = 0.031$) backgrounds. Together with response time and error rate (Figure 6c), we found purple, red, and blue have LA effects on detail abilities. In addition, participants experienced a HA state with the green background, and rarely LI with the yellow background. Orange is located on the border between the LI and LA quadrants, while it is not the colour having no effects on detail abilities.
Figure 6. Cont.
4. Discussion

This study explores the design potential of colour stimuli on cognitive abilities with a particular focus on people’s logical and lateral functions. Results from psychological experiments showed that colours can significantly influence people’s arousal and impulsiveness, suggesting that colour has indirect impacts on cognitive abilities. Specifically, findings concerning the colour impacts on general, logical, and spatial imagination, and detail abilities can be summarised as follows:

4.1. General Trend
- Purple leads to the lowest aroused state. It induced participants to make the most errors and had the longest reaction time.
- Green leads to the greatest aroused state. It induced participants to make the fewest errors and had the shortest reaction time.
- Yellow leads to the least impulsive state. Participants with yellow made the second most errors, while they reacted faster compared with green.
- Red and yellow are colours that influence people to be more impulsive.
- Blue seems to have a low aroused influence on participants’ performance. Participants with blue made more errors compared with orange, yellow, and green. Meanwhile, participants responded slower with blue compared with green.

4.2. Logical Abilities
- Colour seems to have no significant impact on participants’ reaction time on their logical performance.
- Yellow leads to the least impulsive state on participants’ logical performance.
• Yellow and green induced participants to make fewer errors in the logical ability test, suggesting green and yellow may have a positive impact on people’s logical abilities.
• Green and red are colours that influence people towards more arousal in logical performance.
• Red seems to have relatively high aroused effects on participants’ logical abilities.
• Purple and orange are colours that influence people towards low arousal in logical performance.
• Blue rarely has low impulsive impacts on logical abilities. It induced participants to make more errors in logical tests compared with yellow and green.

4.3. Spatial Imagination Abilities
• Green leads to the highest aroused state on spatial imagination abilities, suggesting green can positively stimulate people’s left cerebral hemisphere functions (lateral functions).
• Orange leads to the greatest impulsivity on lateral functions.
• Orange, red and blue seem to influence participants’ lateral functions with a high impulsivity state.
• Purple induced participants to make the most errors and had the longest reaction time in lateral ability tests.
• Red seems to have high impulsivity on participants’ lateral abilities, while it has relatively high aroused effects on participants’ logical abilities. Specifically, participants seem to make fewer errors in logical ability tests than lateral ability tests.
• Yellow has a low impulsive influence on participants’ lateral abilities.

4.4. Detail Abilities
• Purple leads to the lowest aroused state on participants’ detail abilities, suggesting purple has a relatively negative influence on people’s logical and lateral abilities.
• Green leads to the highest aroused influence on participants’ spatial imagination abilities. This also suggests that the colour green can positively influence people’s logical and lateral abilities.
• Purple, red, and blue are colours that have low aroused effects on detail abilities.
• Yellow and orange seem to have a relatively low impulsivity state on participants’ detail abilities. Specifically, participants made fewer errors with the orange background compared with the purple.

Above all, many studies have observed our findings and agreed that reddish colours (i.e., red, orange) can influence people with a high impulsivity state [11,33,43,44]. Moreover, we found green seems to have high aroused effects, which is consistent with Ciccone [45] whose results conflict with the conventional opinion that long wavelength (i.e., red light) lights are encouraging and short wavelength lights (i.e., blue light) are calming. In addition, our findings show that blue and yellow induced participants to make more errors, in agreement with Duan, Rhodes and Cheung [26]. However, our findings indicate that green seems to have high aroused effects and purple leads to the lowest aroused state, differing from Duan, Rhodes and Cheung [26] who found purple located in the high aroused quadrant and green seeming to have low aroused effects. A possible explanation for this could be that all participants involved in this study were animators (people good at lateral thinking), and this suggests that colours might have different impacts on lateral and logical thinkers. In that case, the participant selection criteria, although designed to ensure consistency, could be considered a study limitation.

5. Conclusions
The purpose of this study was to explore the influence of environmental colour on people’s logical and lateral abilities. This research used a psychological method to validate the impacts of colour on people’s response time and error rate in completing six types of psychometric tests (varied in hue backgrounds). Through the experiments, we
found people’s logical and lateral functions can be significantly influenced by colours. Deliverable potentials of this work would add value to ongoing environmental design research, suggesting that researchers and designers should consider using colour to prompt people’s lateral and logical abilities. These experiments also retain certain limitations. First, due to the practical difficulties in conducting the study (each participant spent about 40 min), we included 21 participants, which is a relatively small number but nevertheless sufficient to show some significant results. Second, all participants were aged from 20 to 25, and thus the findings might not be generalisable to children and the elderly. Further experiments will be performed in the future to expand our findings.

**Author Contributions:** Conceptualization, G.X.; methodology, G.X.; software, G.X., Q.P. and M.L.; validation, G.X. and M.L.; formal analysis, G.X. and L.Y.; data curation, G.X.; writing—original draft preparation, G.X.; writing—review and editing, G.X., S.W. and F.Q.; supervision, P.H., F.Q. and S.W.; All authors have read and agreed to the published version of the manuscript.

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**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** The data presented in this study are available on request from the corresponding author.

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**Conflicts of Interest:** The authors declare no conflict of interest.

### Appendix A

**Table A1.** The Characteristics of the Background Colours.

| Colours     | L *    | C *    | h      | a *    | b *    | R      | G      | B      |
|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| Visual      | 70.01  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |
| Reference   |        |        |        |        |        |        |        |        |
| White       | 70.01  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |
| Red         | 70.02  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |
| Yellow      | 70.03  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |
| Blue        | 70.04  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |
| Green       | 70.05  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |
| Orange      | 70.06  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |
| Purple      | 70.07  | 0.51   | 28.34  | 0.24   | 0.19   | 171.27 | 170.01 | 169.86 |

**Table A2.** Functions of Six Types of Psychometric Tests Used in the Experiments.

| Cerebral Hemisphere | Cognitive Functions | Tests |
|---------------------|---------------------|-------|
| Right cerebral hemisphere | Logical function | Logical abilities: Logical rule test |
|                      |                     | Mathematics sequence |
| Left cerebral hemisphere | Lateral function | Spatial imagination abilities: Spatial structure test |
|                      |                     | Rotation test |
| Right cerebral hemisphere: holistic perception;          | Logical & Lateral functions | Detail abilities: Odd one out |
| Left Right cerebral hemisphere: detail oriented perception |                     | Same detail test |
Table A3. MANOVO Analysis of People’s Responses to Colours—General Effects.

|                      | Coloured Backgrounds | Mean     | Std. Deviation | N  |
|----------------------|----------------------|----------|----------------|----|
| **Response_time**    | Reference white      | 42.1864  | 45.30772       | 126|
|                      | Red                  | 38.7156  | 37.01419       | 126|
|                      | Yellow               | 51.4849  | 84.10959       | 126|
|                      | Blue                 | 45.9029  | 49.64691       | 126|
|                      | Green                | 34.8059  | 30.16076       | 126|
|                      | Orange               | 40.4606  | 45.95477       | 126|
|                      | Purple               | 57.1974  | 73.77608       | 126|
|                      | Total                | 44.3934  | 55.60318       | 882|
| **Error_rate**       | Reference white      | 0.4206   | 0.49563        | 126|
|                      | Red                  | 0.4524   | 0.49971        | 126|
|                      | Yellow               | 0.2698   | 0.44565        | 126|
|                      | Blue                 | 0.4603   | 0.50041        | 126|
|                      | Green                | 0.1746   | 0.38114        | 126|
|                      | Orange               | 0.4683   | 0.50098        | 126|
|                      | Purple               | 0.4921   | 0.50193        | 126|
|                      | Total                | 0.3912   | 0.48829        | 882|
Table A4. Multivariate Tests of People’s Responses to Colours—General Effects.

| Effect                | Value  | F       | Hypothesis df | Error df | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Power |
|-----------------------|--------|---------|---------------|----------|------|---------------------|--------------------|-----------------|
| Intercept             | 0.556  | 547.626 | 2             | 874      | 0    | 0.556               | 1095.252           | 1               |
| Wilks' Lambda         | 0.444  | 547.626 | 2             | 874      | 0    | 0.556               | 1095.252           | 1               |
| Hotelling’s Trace     | 1.253  | 547.626 | 2             | 874      | 0    | 0.556               | 1095.252           | 1               |
| Roy’s Largest Root    | 1.253  | 547.626 | 2             | 874      | 0    | 0.556               | 1095.252           | 1               |
| Coloured_backgrounds  | 0.068  | 5.128   | 12            | 1750     | 0    | 0.034               | 61.537             | 1               |
| Wilks' Lambda         | 0.933  | 5.153   | 12            | 1748     | 0    | 0.034               | 61.833             | 1               |
| Hotelling’s Trace     | 0.071  | 5.177   | 12            | 1746     | 0    | 0.034               | 62.128             | 1               |
| Roy’s Largest Root    | 0.056  | 8.226   | 6             | 875      | 0    | 0.053               | 49.356             | 1               |

* Design: Intercept + Coloured_backgrounds.  
* Exact statistic.  
* The statistic is an upper bound on F that yields a lower bound on the significance level.  
* Computed using alpha = 0.05.

Table A5. Multiple Comparisons of People’s Responses to Colours—General Effects.

| LSD                  | Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval | Lower Bound | Upper Bound |
|----------------------|--------------------|--------------------------|--------------------------|-----------------------|------------|------|--------------------------|-------------|-------------|
| Response_time        | Reference white    | Red                      | 3.4708                   | 6.97038               | 0.619      | −10.2098 | 17.1514                  |             |             |
|                      |                    | Yellow                   | −9.2984                  | 6.97038               | 0.183      | −22.9791 | 4.3822                   |             |             |
|                      |                    | Blue                     | −3.7165                  | 6.97038               | 0.594      | −17.3971 | 9.9641                   |             |             |
|                      |                    | Green                    | 7.3806                   | 6.97038               | 0.29       | −6.3001  | 21.0612                  |             |             |
|                      |                    | Orange                   | 1.7258                   | 6.97038               | 0.805      | −11.9548 | 15.4064                  |             |             |
|                      |                    | Purple                   | −15.0110 *               | 6.97038               | 0.032      | −28.6916 | −1.3304                  |             |             |
|                      | Reference white    | Red                      | −3.4708                  | 6.97038               | 0.619      | −17.1514 | 10.2098                  |             |             |
|                      |                    | Yellow                   | −12.7693                 | 6.97038               | 0.067      | −26.4499 | 0.9113                   |             |             |
|                      |                    | Blue                     | −7.1874                  | 6.97038               | 0.303      | −20.868  | 6.4933                   |             |             |
|                      |                    | Green                    | 3.9097                   | 6.97038               | 0.575      | −9.7709  | 17.5903                  |             |             |
|                      |                    | Orange                   | −1.745                   | 6.97038               | 0.802      | −15.4256 | 11.9356                  |             |             |
|                      |                    | Purple                   | −18.4818 *               | 6.97038               | 0.008      | −32.1624 | −4.8012                  |             |             |
| Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval   |
|--------------------|--------------------------|--------------------------|-----------------------|-----------|-----|--------------------------|
|                    |                          |                          | Lower Bound           | Upper Bound|     |                          |
| Yellow             | Reference white          | 9.2984                   | 6.97038               | 0.183     | −4.3822 | 22.9791                  |
|                    | Red                      | 12.7693                  | 6.97038               | 0.067     | −0.9113 | 26.4499                  |
|                    | Blue                     | 5.5819                   | 6.97038               | 0.423     | −8.0987 | 19.2625                  |
|                    | Green                    | 16.6790 *                | 6.97038               | 0.017     | 2.9984  | 30.3596                  |
|                    | Orange                   | 11.0242                  | 6.97038               | 0.114     | −2.6564 | 24.7048                  |
|                    | Purple                   | −5.7125                  | 6.97038               | 0.413     | −19.3931 | 7.9681                   |
| Blue               | Reference white          | 3.7165                   | 6.97038               | 0.594     | −9.9641 | 17.3971                  |
|                    | Red                      | 7.1874                   | 6.97038               | 0.303     | −6.4933 | 20.868                   |
|                    | Yellow                   | −5.5819                  | 6.97038               | 0.423     | −19.2625 | 8.0987                   |
|                    | Green                    | 11.0971                  | 6.97038               | 0.112     | −2.5835 | 24.7777                  |
|                    | Orange                   | 5.4423                   | 6.97038               | 0.435     | −8.2383 | 19.1229                  |
|                    | Purple                   | −11.2944                 | 6.97038               | 0.106     | −24.9751 | 2.3862                   |
| Green              | Reference white          | −7.3806                  | 6.97038               | 0.29      | −21.0612 | 6.3001                   |
|                    | Red                      | −3.9097                  | 6.97038               | 0.575     | −17.5903 | 9.7709                   |
|                    | Yellow                   | −16.6790 *               | 6.97038               | 0.017     | −30.3596 | −2.9984                  |
|                    | Blue                     | −11.0971                 | 6.97038               | 0.112     | −24.7777 | 2.5835                   |
|                    | Orange                   | −5.6548                  | 6.97038               | 0.417     | −19.3354 | 8.0258                   |
|                    | Purple                   | −22.3915 *               | 6.97038               | 0.001     | −36.0721 | −8.7109                  |
| Orange             | Reference white          | −1.7258                  | 6.97038               | 0.805     | −15.4064 | 11.9548                  |
|                    | Red                      | 1.745                    | 6.97038               | 0.802     | −11.9356 | 15.4256                  |
|                    | Yellow                   | −11.0242                 | 6.97038               | 0.114     | −24.7048 | 2.6564                   |
|                    | Blue                     | −5.4423                  | 6.97038               | 0.435     | −19.1229 | 8.2383                   |
|                    | Green                    | 5.6548                   | 6.97038               | 0.417     | −8.0258 | 19.3354                  |
|                    | Purple                   | −16.7368 *               | 6.97038               | 0.017     | −30.4174 | −3.0561                  |
| Purple             | Reference white          | 15.0110 *                | 6.97038               | 0.032     | 1.3304  | 28.6916                  |
|                    | Red                      | 18.4818 *                | 6.97038               | 0.008     | 4.8012  | 32.1624                  |
|                    | Yellow                   | 5.7125                   | 6.97038               | 0.413     | −7.9681 | 19.3931                  |
|                    | Blue                     | 11.2944                  | 6.97038               | 0.106     | −2.3862 | 24.9751                  |
|                    | Green                    | 22.3915 *                | 6.97038               | 0.001     | 8.7109  | 36.0721                  |
|                    | Orange                   | 16.7368 *                | 6.97038               | 0.017     | 3.0561  | 30.4174                  |
Table A5. Cont.

Multiple Comparisons

| Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval |
|--------------------|--------------------------|--------------------------|-----------------------|------------|------|------------------------|
| Error_rate         | Reference white          | Red                      | −0.0317               | 0.06009    | 0.597| −0.1497                | 0.0862               |
|                    |                          | Yellow                   | 0.1508 *              | 0.06009    | 0.012| 0.0328                 | 0.2687               |
|                    |                          | Blue                     | −0.0397               | 0.06009    | 0.509| −0.1576                | 0.0783               |
|                    |                          | Green                    | 0.2460 *              | 0.06009    | 0    | 0.1281                 | 0.364                |
|                    |                          | Orange                   | −0.0476               | 0.06009    | 0.428| −0.1656                | 0.0703               |
|                    |                          | Purple                   | −0.0714               | 0.06009    | 0.235| −0.1894                | 0.0465               |
| Red                | Reference white          | Yellow                   | 0.0317               | 0.06009    | 0.597| −0.0862                | 0.1497               |
|                    |                          | Blue                     | −0.0079               | 0.06009    | 0.895| −0.1259                | 0.11                 |
|                    |                          | Green                    | 0.2778 *              | 0.06009    | 0    | 0.1598                 | 0.3957               |
|                    |                          | Orange                   | −0.0159               | 0.06009    | 0.792| −0.1338                | 0.1021               |
|                    |                          | Purple                   | −0.0397               | 0.06009    | 0.509| −0.1576                | 0.0783               |
| Yellow             | Reference white          | Red                      | −0.1508 *             | 0.06009    | 0.012| −0.2687                | −0.0328              |
|                    |                          | Yellow                   | −0.1825 *             | 0.06009    | 0.002| 0.0646                 | 0.3005               |
|                    |                          | Blue                     | −0.1905 *             | 0.06009    | 0.002| −0.3084                | −0.0725              |
|                    |                          | Green                    | 0.0952                | 0.06009    | 0.113| −0.0227                | 0.2132               |
|                    |                          | Orange                   | −0.1984 *             | 0.06009    | 0.001| −0.3164                | −0.0805              |
|                    |                          | Purple                   | −0.2222 *             | 0.06009    | 0    | −0.3402                | −0.1043              |
| Blue               | Reference white          | Yellow                   | −0.2460 *             | 0.06009    | 0    | −0.364                 | −0.1281              |
|                    |                          | Red                      | −0.2778 *             | 0.06009    | 0    | −0.3957                | −0.1598              |
|                    |                          | Yellow                   | −0.0952               | 0.06009    | 0.113| −0.2132                | 0.0227               |
|                    |                          | Blue                     | −0.2857 *             | 0.06009    | 0    | −0.4037                | −0.1678              |
|                    |                          | Orange                   | −0.2937 *             | 0.06009    | 0    | −0.4116                | −0.1757              |
|                    |                          | Purple                   | −0.3175 *             | 0.06009    | 0    | −0.4354                | −0.1995              |
Table A5. Cont.

Multiple Comparisons

| Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig.   | 95% Confidence Interval |
|--------------------|--------------------------|--------------------------|-----------------------|------------|--------|------------------------|
|                    |                          |                          | Lower Bound           | Upper Bound |
| Orange             | Reference white          | 0.0476                   | 0.06009               | 0.428      | 0.428  | (−0.0703, 0.1656)      |
|                    | Red                      | 0.0159                   | 0.06009               | 0.792      | 0.792  | (−0.1021, 0.1338)      |
|                    | Yellow                   | 0.1984 *                 | 0.06009               | 0.001      | 0.001  | (0.0805, 0.3164)       |
|                    | Blue                     | 0.0079                   | 0.06009               | 0.895      | 0.895  | (−0.11, 0.1259)        |
|                    | Green                    | 0.2937 *                 | 0.06009               | 0          | 0      | (0.1757, 0.4116)       |
|                    | Purple                   | −0.0238                  | 0.06009               | 0.692      | 0.692  | (−0.1418, 0.0941)      |
| Purple             | Reference white          | 0.0714                   | 0.06009               | 0.235      | 0.235  | (−0.0465, 0.1894)      |
|                    | Red                      | 0.0397                   | 0.06009               | 0.509      | 0.509  | (−0.0783, 0.1576)      |
|                    | Yellow                   | 0.2222 *                 | 0.06009               | 0          | 0      | (0.1043, 0.3402)       |
|                    | Blue                     | 0.0317                   | 0.06009               | 0.597      | 0.597  | (−0.0862, 0.1497)      |
|                    | Green                    | 0.3175 *                 | 0.06009               | 0          | 0      | (0.1995, 0.4354)       |
|                    | Orange                   | 0.0238                   | 0.06009               | 0.692      | 0.692  | (−0.0941, 0.1418)      |

Based on observed means. The error term is Mean Square (Error) = 0.228. * The mean difference is significant at the 0.05 level.
### Table A6. MANOVO Analysis of People’s Logical, Lateral, and Detail Abilities Affected by Colours.

| Descriptive Statistics | Coloured Backgrounds | Mean   | Std. Deviation | N  |
|------------------------|----------------------|--------|----------------|----|
| **Logical_Response_Time** | Reference white      | 43.462 | 36.98222       | 42 |
|                        | Yellow               | 61.7532| 129.30801      | 42 |
|                        | Green                | 39.5396| 37.95461       | 42 |
|                        | Blue                 | 54.4412| 56.83899       | 42 |
|                        | Purple               | 67.7787| 105.389        | 42 |
|                        | Red                  | 41.0226| 29.54236       | 42 |
|                        | Orange               | 48.5597| 54.56498       | 42 |
|                        | Total                | 50.9367| 73.33785       | 294|
| **Logical_Error_rate**  | Reference white      | 0.4762 | 0.50549        | 42 |
|                        | Yellow               | 0.2381 | 0.43108        | 42 |
|                        | Green                | 0.1905 | 0.39744        | 42 |
|                        | Blue                 | 0.4524 | 0.50376        | 42 |
|                        | Purple               | 0.5    | 0.50606        | 42 |
|                        | Red                  | 0.4286 | 0.50087        | 42 |
|                        | Orange               | 0.5714 | 0.50087        | 42 |
|                        | Total                | 0.4082 | 0.49233        | 294|
| **Lateral_Response_Time**| Reference white      | 46.6805| 58.013         | 42 |
|                        | Yellow               | 49.7937| 48.91309       | 42 |
|                        | Green                | 33.3861| 28.51248       | 42 |
|                        | Blue                 | 44.1349| 48.82134       | 42 |
|                        | Purple               | 58.4328| 57.48352       | 42 |
|                        | Red                  | 35.4139| 28.68746       | 42 |
|                        | Orange               | 31.5281| 28.2063        | 42 |
|                        | Total                | 42.7671| 45.0009        | 294|
| **Lateral_Error_rate**  | Reference white      | 0.4524 | 0.50376        | 42 |
|                        | Yellow               | 0.2619 | 0.445         | 42 |
|                        | Green                | 0.119  | 0.32777        | 42 |
|                        | Blue                 | 0.5    | 0.50606        | 42 |
|                        | Purple               | 0.4524 | 0.50376        | 42 |
|                        | Red                  | 0.4762 | 0.50549        | 42 |
|                        | Orange               | 0.5    | 0.50606        | 42 |
|                        | Total                | 0.3946 | 0.48959        | 294|
| **Detail_Response_Time**| Reference white      | 36.4168| 38.32565       | 42 |
|                        | Yellow               | 42.9077| 47.63413       | 42 |
|                        | Green                | 31.4918| 21.99098       | 42 |
|                        | Blue                 | 39.1327| 42.13849       | 42 |
|                        | Purple               | 45.3806| 43.86046       | 42 |
|                        | Red                  | 39.7102| 49.63497       | 42 |
|                        | Orange               | 41.294 | 50.15938       | 42 |
|                        | Total                | 39.4763| 42.69481       | 294|
| **Detail_Error_Rate**   | Reference white      | 0.3333 | 0.47712        | 42 |
|                        | Yellow               | 0.3095 | 0.4679         | 42 |
|                        | Green                | 0.2143 | 0.4153         | 42 |
|                        | Blue                 | 0.4286 | 0.50087        | 42 |
|                        | Purple               | 0.5238 | 0.50549        | 42 |
|                        | Red                  | 0.4524 | 0.50376        | 42 |
|                        | Orange               | 0.3333 | 0.47712        | 42 |
|                        | Total                | 0.3707 | 0.48383        | 294|
Table A7. Multivariate Tests of People’s Logical, Lateral, and Detail Abilities Affected by Colours.

| Effect                        | Value    | F          | Hypothesis df | Error df | Sig. | Partial Eta Squared | Noncent. Parameter | Observed Power |
|-------------------------------|----------|------------|---------------|----------|------|---------------------|--------------------|-----------------|
| Intercept                     | Pillai’s Trace | 0.801     | 189.496 b     | 6        | 282  | 0                   | 0.801              | 1136.976        | 1               |
|                               | Wilks’ Lambda     | 0.199     | 189.496 b     | 6        | 282  | 0                   | 0.801              | 1136.976        | 1               |
|                               | Hotelling’s Trace | 4.032     | 189.496 b     | 6        | 282  | 0                   | 0.801              | 1136.976        | 1               |
|                               | Roy’s Largest Root | 4.032     | 189.496 b     | 6        | 282  | 0                   | 0.801              | 1136.976        | 1               |
| Coloured_backgrounds          | Pillai’s Trace | 0.235     | 1.952         | 36       | 1722 | 0.001               | 0.039              | 70.262          | 1               |
|                               | Wilks’ Lambda     | 0.778     | 2.024         | 36       | 1241.11 | 0      | 0.041             | 52.907           | 0.994           |
|                               | Hotelling’s Trace | 0.267     | 2.082         | 36       | 1682 | 0                   | 0.043              | 74.967          | 1               |
|                               | Roy’s Largest Root | 0.185     | 8.851 c       | 6        | 287  | 0                   | 0.156              | 53.108          | 1               |

* Design: Intercept + Coloured_backgrounds. b Exact statistic. c The statistic is an upper bound on F that yields a lower bound on the significance level. d Computed using alpha = 0.05.

Table A8. Multiple Comparisons of People’s Logical, Lateral, and Detail Abilities Affected by Colours.

| LSD                          | Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval |
|------------------------------|--------------------|--------------------------|--------------------------|-----------------------|------------|------|-------------------------|
|                              | Logical_Response_Time | Reference white          | Yellow                   | −18.2911              | 16.01793   | 0.254| −49.8187                | 13.2364          |
|                              |                     |                          | Green                    | 3.9224                | 16.01793   | 0.807| −27.6051                | 35.4499          |
|                              |                     |                          | Blue                     | −10.9792              | 16.01793   | 0.494| −42.5067                | 20.5483          |
|                              |                     |                          | Purple                   | −24.3167              | 16.01793   | 0.13 | −55.8442                | 7.2108           |
|                              |                     |                          | Red                      | 2.4395                | 16.01793   | 0.879| −29.0881                | 33.967           |
|                              |                     |                          | Orange                   | −5.0977               | 16.01793   | 0.751| −36.6252                | 26.4298          |
|                              | Yellow              | Reference white          | Yellow                   | 18.2911               | 16.01793   | 0.254| −13.2364                | 49.8187          |
|                              |                     |                          | Green                    | 22.2136               | 16.01793   | 0.167| −9.314                  | 53.7411          |
|                              |                     |                          | Blue                     | 7.312                 | 16.01793   | 0.648| −24.2155                | 38.8395          |
|                              |                     |                          | Purple                   | −6.0256               | 16.01793   | 0.707| −37.5531                | 25.502           |
|                              |                     |                          | Red                      | 20.7306               | 16.01793   | 0.197| −10.7969                | 52.2581          |
|                              |                     |                          | Orange                   | 13.1934               | 16.01793   | 0.411| −18.3341                | 44.721           |
Table A8. Cont.

Multiple Comparisons

| LSD | Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval |
|-----|--------------------|--------------------------|--------------------------|------------------------|------------|------|------------------------|
|     |                    | Reference white          | Green                    | −3.9224                | 16.01793   | 0.807 | −35.4499               | 27.6051 |
|     |                    | Yellow                   | Yellow                   | −22.2136               | 16.01793   | 0.167 | −53.7411               | 9.314   |
|     |                    | Blue                     | Blue                     | −14.9016               | 16.01793   | 0.353 | −46.4291               | 16.6259 |
|     |                    | Purple                   | Purple                   | −28.2391               | 16.01793   | 0.079 | −59.7666               | 3.2884  |
|     |                    | Red                      | Red                      | −1.483                 | 16.01793   | 0.926 | −33.0105               | 30.0446 |
|     |                    | Orange                   | Orange                   | −9.0201                | 16.01793   | 0.574 | −40.5476               | 22.5074 |
|     |                    | Reference white          | Blue                     | 10.9792                | 16.01793   | 0.494 | −20.5483               | 42.5067 |
|     |                    | Yellow                   | Yellow                   | −7.312                 | 16.01793   | 0.648 | −38.8395               | 24.2155 |
|     |                    | Green                    | Green                    | 14.9016                | 16.01793   | 0.353 | −16.6259               | 46.4291 |
|     |                    | Purple                   | Purple                   | −13.3375               | 16.01793   | 0.406 | −44.8651               | 18.19   |
|     |                    | Red                      | Red                      | 13.4186                | 16.01793   | 0.403 | −18.1089               | 44.9461 |
|     |                    | Orange                   | Orange                   | 5.8815                 | 16.01793   | 0.714 | −25.6461               | 37.409  |
|     |                    | Reference white          | Purple                   | 24.3167                | 16.01793   | 0.13  | −7.2108                | 55.8442 |
|     |                    | Yellow                   | Yellow                   | −7.5372                | 16.01793   | 0.197 | −30.0446               | 10.7969 |
|     |                    | Green                    | Green                    | −20.7306               | 16.01793   | 0.231 | −52.2581               | 33.0105 |
|     |                    | Blue                     | Blue                     | −13.1934               | 16.01793   | 0.926 | −52.0461               | 18.1089 |
|     |                    | Purple                   | Purple                   | −26.7562               | 16.01793   | 0.403 | −58.2837               | 4.7713  |
|     |                    | Orange                   | Orange                   | −7.5372                | 16.01793   | 0.638 | −39.0647               | 23.9904 |
|     |                    | Reference white          | Red                      | −2.4395                | 16.01793   | 0.879 | −33.967                | 29.0881 |
|     |                    | Yellow                   | Yellow                   | −20.7306               | 16.01793   | 0.197 | −52.2581               | 10.7969 |
|     |                    | Green                    | Green                    | −13.1934               | 16.01793   | 0.926 | −52.0461               | 18.1089 |
|     |                    | Blue                     | Blue                     | −5.8815                | 16.01793   | 0.714 | −37.409                | 25.6461 |
|     |                    | Purple                   | Purple                   | −19.219                | 16.01793   | 0.231 | −50.7465               | 12.3085 |
|     |                    | Orange                   | Orange                   | 7.5372                 | 16.01793   | 0.638 | −23.9904               | 39.0647 |
### Multiple Comparisons

| Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval | Lower Bound | Upper Bound |
|--------------------|--------------------------|--------------------------|-----------------------|------------|-----|-------------------------|-------------|------------|
| Logical_Error_rate | Reference white           | Yellow                   | 0.2381 *              | 0.10468    | 0.024 | 0.0321                  | 0.4441      |            |
|                    |                          | Green                    | 0.2857 *              | 0.10468    | 0.007 | 0.0797                  | 0.4918      |            |
|                    |                          | Blue                     | 0.0238                | 0.10468    | 0.82  | −0.1822                 | 0.2299      |            |
|                    |                          | Purple                   | −0.0238               | 0.10468    | 0.82  | −0.2999                 | 0.1822      |            |
|                    |                          | Red                      | 0.0476                | 0.10468    | 0.65  | −0.1584                 | 0.2537      |            |
|                    |                          | Orange                   | −0.0952               | 0.10468    | 0.364 | −0.3013                 | 0.1108      |            |
| Yellow             | Reference white           | Yellow                   | −0.2381 *             | 0.10468    | 0.024 | −0.4441                 | −0.0321     |            |
|                    |                          | Green                    | 0.0476                | 0.10468    | 0.65  | −1.584                  | 0.2537      |            |
|                    |                          | Blue                     | −0.2143 *             | 0.10468    | 0.042 | −0.4203                 | −0.0082     |            |
|                    |                          | Purple                   | −0.2619 *             | 0.10468    | 0.013 | −0.4679                 | −0.0599     |            |
|                    |                          | Red                      | −0.1905               | 0.10468    | 0.07  | −0.3965                 | 0.0156      |            |
|                    |                          | Orange                   | −0.3333 *             | 0.10468    | 0.002 | −0.5394                 | −0.1273     |            |
| Green              | Reference white           | Yellow                   | −0.2857 *             | 0.10468    | 0.007 | −0.4918                 | −0.0797     |            |
|                    |                          | Yellow                   | −0.0476               | 0.10468    | 0.65  | −1.584                  | 0.1584      |            |
|                    |                          | Blue                     | −0.2143 *             | 0.10468    | 0.042 | −0.4203                 | −0.0082     |            |
|                    |                          | Purple                   | −0.3095 *             | 0.10468    | 0.003 | −0.5156                 | −0.1035     |            |
|                    |                          | Red                      | −0.2381 *             | 0.10468    | 0.024 | −0.4441                 | −0.0321     |            |
|                    |                          | Orange                   | −0.3810 *             | 0.10468    | 0.002 | −0.587                  | −0.1749     |            |
| Blue               | Reference white           | Yellow                   | −0.0238               | 0.10468    | 0.82  | −0.2299                 | 0.1822      |            |
|                    |                          | Yellow                   | 0.2143 *              | 0.10468    | 0.042 | 0.0082                  | 0.4203      |            |
|                    |                          | Green                    | 0.2619 *              | 0.10468    | 0.013 | 0.0559                  | 0.4679      |            |
|                    |                          | Purple                   | −0.0476               | 0.10468    | 0.65  | −0.2537                 | 0.1584      |            |
|                    |                          | Red                      | 0.0238                | 0.10468    | 0.82  | −0.1822                 | 0.2299      |            |
|                    |                          | Orange                   | −0.119                | 0.10468    | 0.256 | −0.3251                 | 0.087       |            |
| Purple             | Reference white           | Yellow                   | 0.0238                | 0.10468    | 0.82  | −0.1822                 | 0.2299      |            |
|                    |                          | Yellow                   | 0.2619 *              | 0.10468    | 0.013 | 0.0559                  | 0.4679      |            |
|                    |                          | Green                    | 0.3095 *              | 0.10468    | 0.003 | 0.1035                  | 0.5156      |            |
|                    |                          | Blue                     | 0.0476                | 0.10468    | 0.65  | −0.1584                 | 0.2537      |            |
|                    |                          | Red                      | 0.0714                | 0.10468    | 0.496 | −0.1346                 | 0.2775      |            |
|                    |                          | Orange                   | −0.0714               | 0.10468    | 0.496 | −0.2775                 | 0.1346      |            |
## Table A8. Cont.

### Multiple Comparisons

| Dependent Variable | (l) Coloured_Backgrounds | (j) Coloured_Backgrounds | Mean Difference (l–j) | Std. Error | Sig. | 95% Confidence Interval |
|--------------------|--------------------------|--------------------------|----------------------|------------|------|-------------------------|
|                    |                          |                          |                      |            |      | Lower Bound              |
|                    |                          |                          |                      |            |      | Upper Bound              |
| **LSD**            |                          |                          |                      |            |      |                         |
| Red                | Reference white          | 0.0476                   | 0.10468              | 0.65       | 0.65 | -0.2537                 |
|                    | Yellow                   | 0.1905                   | 0.10468              | 0.07       | 0.0156 | -0.0156          |
|                    | Green                    | 0.2381 *                 | 0.10468              | 0.024      | 0.0321 | 0.4441          |
|                    | Blue                     | -0.0238                  | 0.10468              | 0.82       | 0.2299 | 0.1822          |
|                    | Purple                   | -0.0714                  | 0.10468              | 0.496      | 0.2775 | 0.1346          |
|                    | Orange                   | -0.1429                  | 0.10468              | 0.173      | 0.3489 | 0.0632          |
| Orange             | Reference white          | 0.0952                   | 0.10468              | 0.364      | 0.1108 | 0.3013          |
|                    | Yellow                   | 0.3333 *                 | 0.10468              | 0.002      | 0.1273 | 0.5394          |
|                    | Green                    | 0.3810 *                 | 0.10468              | 0              | 0.1749 | 0.587  |
|                    | Blue                     | 0.119                    | 0.10468              | 0.256      | -0.087  | 0.3251          |
|                    | Purple                   | 0.0714                   | 0.10468              | 0.496      | -0.1346 | 0.2775          |
|                    | Red                      | 0.1429                   | 0.10468              | 0.173      | -0.0632 | 0.3489          |
| Lateral_Response_Time | Reference white          | -3.1132                  | 9.71618              | 0.749      | -22.2372 | 16.0108 |
|                    | Yellow                   | 13.2943                  | 9.71618              | 0.172      | -5.8297 | 32.4183          |
|                    | Green                    | 2.5455                   | 9.71618              | 0.794      | -16.5785 | 21.6695          |
|                    | Blue                     | -11.7523                 | 9.71618              | 0.227      | -30.8763 | 7.3717  |
|                    | Purple                   | 11.2665                  | 9.71618              | 0.247      | -7.8575 | 30.3905          |
|                    | Red                      | 15.1524                  | 9.71618              | 0.12       | -3.9716 | 34.2764          |
| Yellow             | Reference white          | 3.1132                   | 9.71618              | 0.749      | -16.0108 | 22.2372          |
|                    | Green                    | 16.4076                  | 9.71618              | 0.092      | -2.7165 | 35.5316          |
|                    | Blue                     | 5.6588                   | 9.71618              | 0.651      | -13.4652 | 24.7828          |
|                    | Purple                   | -8.6391                  | 9.71618              | 0.375      | -27.7631 | 10.4849          |
|                    | Red                      | 14.3797                  | 9.71618              | 0.14       | -4.7443 | 33.5037          |
|                    | Orange                   | 18.2656                  | 9.71618              | 0.061      | -0.8584 | 37.3896          |
| Green              | Reference white          | -13.2943                 | 9.71618              | 0.172      | -32.4183 | 5.8297  |
|                    | Yellow                   | -16.4076                 | 9.71618              | 0.092      | -35.5316 | 2.7165  |
|                    | Blue                     | -10.7488                 | 9.71618              | 0.27       | -29.8728 | 8.3752  |
|                    | Purple                   | -25.0466 *               | 9.71618              | 0.01       | -44.1707 | -5.9226          |
|                    | Red                      | -2.0278                  | 9.71618              | 0.835      | -21.1518 | 17.0962          |
|                    | Orange                   | 1.8581                   | 9.71618              | 0.848      | -17.2659 | 20.9821          |
Table A8. Cont.

| Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval | Lower Bound | Upper Bound |
|--------------------|--------------------------|--------------------------|-----------------------|------------|-----|-------------------------|-------------|-------------|
| Blue               | Reference white          | 2.5455                   | 9.71618               | 0.794      |     | -21.6695                | 16.5785     |
| Yellow             | Blue                     | -5.6588                  | 9.71618               | 0.561      |     | -24.7828                | 13.4652     |
| Green              | Blue                     | 10.7488                  | 9.71618               | 0.27       |     | -8.3752                 | 29.8728     |
| Purple             | Blue                     | -14.2979                 | 9.71618               | 0.142      |     | -33.4219                | 4.8261      |
| Red                | Blue                     | 8.721                    | 9.71618               | 0.37       |     | -10.403                 | 27.845      |
| Orange             | Blue                     | 12.6068                  | 9.71618               | 0.195      |     | -6.5172                 | 31.7308     |
| Blue               | Reference white          | 11.7523                  | 9.71618               | 0.227      |     | -7.3717                 | 30.8763     |
| Yellow             | Blue                     | 8.6391                   | 9.71618               | 0.375      |     | -10.4849                | 27.7631     |
| Green              | Blue                     | 25.0466 *                | 9.71618               | 0.01       |     | 5.9226                  | 44.1707     |
| Purple             | Blue                     | 14.2979                  | 9.71618               | 0.142      |     | -4.8261                 | 33.4219     |
| Red                | Blue                     | 23.0188 *                | 9.71618               | 0.018      |     | 3.8948                  | 42.1428     |
| Orange             | Blue                     | 26.9047 *                | 9.71618               | 0.006      |     | 7.7807                  | 46.0287     |
| Red                | Reference white          | -11.2665                 | 9.71618               | 0.247      |     | -30.3905                | 7.8575      |
| Yellow             | Blue                     | -14.3797                 | 9.71618               | 0.14       |     | -33.5037                | 4.7443      |
| Green              | Blue                     | 2.0278                   | 9.71618               | 0.835      |     | -17.0962                | 21.1518     |
| Purple             | Blue                     | -8.721                   | 9.71618               | 0.37       |     | -27.845                 | 10.403      |
| Red                | Blue                     | -23.0188 *               | 9.71618               | 0.018      |     | -42.1428                | -3.8948     |
| Orange             | Blue                     | 3.8859                   | 9.71618               | 0.69       |     | 15.2381                 | 23.0099     |
| Orange             | Reference white          | -15.1524                 | 9.71618               | 0.12       |     | -34.2764                | 3.9716      |
| Yellow             | Blue                     | -18.2656                 | 9.71618               | 0.061      |     | -37.3896                | 0.8584      |
| Green              | Blue                     | -1.8581                  | 9.71618               | 0.848      |     | -20.9821                | 17.2659     |
| Purple             | Blue                     | -12.6068                 | 9.71618               | 0.195      |     | -31.7308                | 6.5172      |
| Red                | Blue                     | -26.9047 *               | 9.71618               | 0.006      |     | -46.0287                | -7.7807     |
| Orange             | Reference white          | -3.8859                  | 9.71618               | 0.12       |     | -23.0099                | 15.2381     |
| Lateral_Error_rate| Reference white          | 0.1905                   | 0.1037                | 0.067      |     | -0.0136                 | 0.3946      |
| Yellow             | Blue                     | 0.3333 *                 | 0.1037                | 0.001      |     | 0.1292                  | 0.5374      |
| Green              | Blue                     | -0.0476                  | 0.1037                | 0.646      |     | -0.2517                 | 0.1565      |
| Purple             | Red                      | 0                        | 0.1037                | 1          |     | -0.2041                 | 0.2041      |
| Red                | Orange                   | -0.0238                  | 0.1037                | 0.819      |     | -0.2279                 | 0.1803      |
| Orange             | Lateral_Error_rate       | -0.0476                  | 0.1037                | 0.646      |     | -0.2517                 | 0.1565      |
Table A8. Cont.

Multiple Comparisons

| Dependent Variable | (I) Coloured Backgrounds | (J) Coloured Backgrounds | Mean Difference (I–J) | Std. Error | Sig.  | 95% Confidence Interval | Lower Bound | Upper Bound |
|--------------------|--------------------------|--------------------------|-----------------------|------------|------|-------------------------|-------------|-------------|
| Yellow             | Reference white          |                          | −0.1905               | 0.1037     | 0.067| −0.3946                 | 0.0136      |             |
| Green              |                          | Yellow                   | 0.1429                | 0.1037     | 0.169| −0.0612                 | 0.347       |             |
| Blue               | −0.2381 *                | Blue                     | 0.022                 | 0.1037     |      | −0.4422                 | −0.034      |             |
| Purple             | −0.1905                  | Purple                   | 0.067                 | 0.1037     |      | −0.3946                 | 0.0136      |             |
| Red                | −0.2143 *                | Red                      | 0.04                  | 0.1037     |      | −0.4184                 | −0.0102     |             |
| Orange             | −0.2381 *                | Orange                   | 0.022                 | 0.1037     |      | −0.4422                 | −0.034      |             |
| Green              | Reference white          |                          | −0.3333 *             | 0.1037     | 0.001| −0.5374                 | −0.1292     |             |
| Yellow             | −0.1429                  | Yellow                   | 0.169                 | 0.1037     |      | −0.347                  | 0.0612      |             |
| Blue               | −0.3810 *                | Blue                     | 0                     | 0.1037     |      | −0.5851                 | −0.1768     |             |
| Purple             | −0.3333 *                | Purple                   | 0.001                 | 0.1037     |      | −0.5374                 | −0.1292     |             |
| Red                | −0.3571 *                | Red                      | 0.001                 | 0.1037     |      | −0.5612                 | −0.153      |             |
| Orange             | −0.3810 *                | Orange                   | 0                     | 0.1037     |      | −0.5851                 | −0.1768     |             |
| Blue               | Reference white          |                          | 0.0476                | 0.1037     | 0.646| −0.1565                 | 0.2517      |             |
| Yellow             | 0.2381 *                 | Yellow                   | 0.022                 | 0.1037     |      | 0.034                   | 0.4422      |             |
| Green              | 0.3810 *                 | Green                    | 0                     | 0.1037     |      | 0.1768                  | 0.5851      |             |
| Purple             | 0.0476                   | Purple                   | 0.646                 | 0.1037     |      | −0.1565                 | 0.2517      |             |
| Red                | 0.0238                   | Red                      | 0.819                 | 0.1037     |      | −0.1803                 | 0.2279      |             |
| Orange             | 0                       | Orange                   | 1                     | 0.1037     |      | −0.2041                 | 0.2041      |             |
| Purple             | Reference white          |                          | 0                     | 0.1037     | 1    | −0.2041                 | 0.2041      |             |
| Yellow             | 0.1905                   | Yellow                   | 0.067                 | 0.1037     |      | −0.0136                 | 0.3946      |             |
| Green              | 0.3333 *                 | Green                    | 0.001                 | 0.1037     |      | 0.1292                  | 0.5374      |             |
| Blue               | −0.0476                  | Blue                     | 0.646                 | 0.1037     |      | −0.2517                 | 0.1565      |             |
| Red                | −0.0238                  | Red                      | 0.819                 | 0.1037     |      | −0.2279                 | 0.1803      |             |
| Orange             | −0.0476                  | Orange                   | 0.646                 | 0.1037     |      | −0.2517                 | 0.1565      |             |
| Red                | Reference white          |                          | 0.0238                | 0.1037     | 0.819| −0.1803                 | 0.2279      |             |
| Yellow             | 0.2143 *                 | Yellow                   | 0.04                  | 0.1037     |      | 0.0102                  | 0.4184      |             |
| Green              | 0.3571 *                 | Green                    | 0.001                 | 0.1037     |      | 0.153                   | 0.5612      |             |
| Blue               | −0.0238                  | Blue                     | 0.819                 | 0.1037     |      | −0.2279                 | 0.1803      |             |
| Purple             | 0.0238                   | Purple                   | 0.819                 | 0.1037     |      | −0.1803                 | 0.2279      |             |
| Orange             | −0.0238                  | Orange                   | 0.819                 | 0.1037     |      | −0.2279                 | 0.1803      |             |
Table A8. Cont.

Multiple Comparisons

| Dependent Variable | (l) Coloured_Backgrounds | (j) Coloured_Backgrounds | Mean Difference (l−j) | Std. Error | Sig.  | 95% Confidence Interval          |
|--------------------|--------------------------|--------------------------|-----------------------|-----------|------|----------------------------------|
|                    |                          |                          |                       |           |      | Lower Bound                      |
| Orange             | Reference white          | 0.0476                   | 0.1037                | 0.646     | 0.646| −0.1565                          |
|                    | Yellow                   | 0.2381 *                 | 0.1037                | 0.022     | 0.022| 0.034                            |
|                    | Green                    | 0.3810 *                 | 0.1037                | 0          | 0    | 0.1768                           |
|                    | Blue                     | 0                        | 0.1037                | 1         | 1    | −0.2041                          |
|                    | Purple                   | 0.0476                   | 0.1037                | 0.646     | 0.646| −0.1565                          |
|                    | Red                      | 0.0238                   | 0.1037                | 0.819     | 0.819| −0.1803                          |
| Detail_Response_Time | Reference white          | −6.491                   | 9.36793               | 0.489     | 0.489| −24.9295                         |
|                    | Green                    | 4.925                    | 9.36793               | 0.599     | 0.599| −13.5136                         |
|                    | Blue                     | −2.716                   | 9.36793               | 0.772     | 0.772| −21.1545                         |
|                    | Purple                   | −8.9639                  | 9.36793               | 0.339     | 0.339| −27.4024                         |
|                    | Red                      | −3.2935                  | 9.36793               | 0.725     | 0.725| −21.7321                         |
|                    | Orange                   | −4.8773                  | 9.36793               | 0.603     | 0.603| −23.3159                         |
| Yellow             | Reference white          | 6.491                    | 9.36793               | 0.489     | 0.489| −11.9476                         |
|                    | Green                    | 11.4159                  | 9.36793               | 0.224     | 0.224| −7.0227                          |
|                    | Blue                     | 3.775                    | 9.36793               | 0.687     | 0.687| −14.6636                         |
|                    | Purple                   | −2.4729                  | 9.36793               | 0.792     | 0.792| −20.9115                         |
|                    | Red                      | 3.1975                   | 9.36793               | 0.733     | 0.733| −15.2411                         |
|                    | Orange                   | 1.6137                   | 9.36793               | 0.863     | 0.863| −16.8249                         |
| Green              | Reference white          | −4.925                   | 9.36793               | 0.599     | 0.599| −23.3635                         |
|                    | Yellow                   | −11.4159                 | 9.36793               | 0.224     | 0.224| −29.8545                         |
|                    | Blue                     | −7.6409                  | 9.36793               | 0.415     | 0.415| −26.0795                         |
|                    | Purple                   | −13.8888                 | 9.36793               | 0.139     | 0.139| −32.3274                         |
|                    | Red                      | −8.2185                  | 9.36793               | 0.381     | 0.381| −26.657                          |
|                    | Orange                   | −9.8023                  | 9.36793               | 0.296     | 0.296| −28.2408                         |
| Blue               | Reference white          | 2.716                    | 9.36793               | 0.772     | 0.772| −15.7226                         |
|                    | Yellow                   | −3.775                   | 9.36793               | 0.687     | 0.687| −22.2136                         |
|                    | Green                    | 7.6409                   | 9.36793               | 0.415     | 0.415| −10.7977                         |
|                    | Purple                   | −6.2479                  | 9.36793               | 0.505     | 0.505| −24.6865                         |
|                    | Red                      | −0.5775                  | 9.36793               | 0.951     | 0.951| −19.0161                         |
|                    | Orange                   | −2.1613                  | 9.36793               | 0.818     | 0.818| −20.5999                         |
**Table A8. Cont.**

**Multiple Comparisons**

| LSD       | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig.   | 95% Confidence Interval     |
|-----------|--------------------------|--------------------------|-----------------------|------------|--------|-----------------------------|
|           |                          |                          |                       |            |        | Lower Bound | Upper Bound |
| Purple    | Reference white          | 8.9639                   | 9.36793               | 0.339      | −9.4747| −27.402        | 20.4637     |
| Yellow    |                          | 2.4729                   | 9.36793               | 0.792      | −15.9657| 20.9115       |              |
| Green     | 13.8888                  | 9.36793                  | 0.139                 | 0.047      | −15.368 | −4.5498       | 32.3274     |
| Blue      | 6.2479                   | 9.36793                  | 0.505                 | 0.155      | −12.1907| 24.6865       |              |
| Red       | 5.6704                   | 9.36793                  | 0.545                 | 0.033      | −12.7682| 24.1089       |              |
| Orange    | 4.0866                   | 9.36793                  | 0.663                 | 0.028      | −14.352 | 22.5251       |              |
| Red       | Reference white          | 3.2935                   | 9.36793               | 0.725      | −15.1451| 21.7321       |              |
| Yellow    | −3.1975                  | 9.36793                  | 0.733                 | 0.047      | −12.636 | 15.2411       |              |
| Green     | 8.2185                   | 9.36793                  | 0.381                 | 0.149      | −12.221 | 26.657        |              |
| Blue      | 0.5775                   | 9.36793                  | 0.951                 | 0.346      | −13.861 | 20.0161       |              |
| Purple    | −5.6704                  | 9.36793                  | 0.545                 | 0.033      | −24.1089| 12.7682       |              |
| Orange    | −1.5838                  | 9.36793                  | 0.866                 | 0.056      | −20.0224| 16.8548       |              |
| Orange    | Reference white          | 4.8773                   | 9.36793               | 0.603      | −13.5613| 23.3159       |              |
| Yellow    | −1.6137                  | 9.36793                  | 0.863                 | 0.056      | −12.0522| 16.8249       |              |
| Green     | 9.8023                   | 9.36793                  | 0.296                 | 0.111      | −8.6363 | 28.2408       |              |
| Blue      | 2.1613                   | 9.36793                  | 0.818                 | 0.346      | −16.2772| 20.5999       |              |
| Purple    | −4.0866                  | 9.36793                  | 0.663                 | 0.056      | −22.5251| 14.352        |              |
| Red       | 1.5838                   | 9.36793                  | 0.866                 | 0.056      | −16.8548| 16.8548       |              |
| Detail_Error_Rate | Reference white        | Yellow                   | 0.0238                | 0.010455   | 0.82   | −0.182        | 0.2296      |
|           |                          | Green                    | 0.119                 | 0.010455   | 0.82   | −0.0867       | 0.3248      |
|           |                          | Blue                     | −0.0952               | 0.010455   | 0.363  | −0.301        | 0.1105      |
|           |                          | Purple                   | −0.1905               | 0.010455   | 0.07   | −0.3963       | 0.0153      |
|           |                          | Red                      | −0.119                | 0.010455   | 0.256  | −0.3248       | 0.0867      |
|           |                          | Orange                   | 0                     | 0.010455   | 1      | −0.2058       | 0.2058      |
| Yellow    | Reference white          | −0.0238                 | 0.010455              | 0.82       | −0.2296 | 0.182         |              |
|           |                          | Green                    | 0.0952                | 0.010455   | 0.363  | −0.1105       | 0.301       |
|           |                          | Blue                     | −0.119                | 0.010455   | 0.256  | −0.3248       | 0.0867      |
|           |                          | Purple                   | −0.2143 *             | 0.010455   | 0.041  | −0.4201       | −0.0085     |
|           |                          | Red                      | −0.1429               | 0.010455   | 0.173  | −0.3486       | 0.0629      |
|           |                          | Orange                   | −0.0238               | 0.010455   | 0.82   | −0.2296       | 0.182       |
| Dependent Variable | (I) Coloured_Backgrounds | (J) Coloured_Backgrounds | Mean Difference (I–J) | Std. Error | Sig. | 95% Confidence Interval | Lower Bound | Upper Bound |
|--------------------|--------------------------|--------------------------|-----------------------|------------|-----|-------------------------|-------------|-------------|
| Green              | Reference white          | –0.119                   | 0.10455               | 0.256      |     | –0.3248                 | –0.0867     |             |
| Yellow             | –0.0952                  | 0.10455                  | 0.363                 |            |     | –0.301                 |             |             |
| Blue               | –0.2143 *                | 0.10455                  | 0.041                 |            |     | –0.4201                |             |             |
| Purple             | –0.3095 *                | 0.10455                  | 0.003                 |            |     | –0.5153                |             |             |
| Red                | –0.2381 *                | 0.10455                  | 0.024                 |            |     | –0.4439                |             |             |
| Orange             | –0.119                   | 0.10455                  | 0.256                 |            |     | –0.3248                |             |             |
| Blue               | Reference white          | 0.0952                   | 0.10455               | 0.363      |     | –0.1105                | 0.301       |             |
| Yellow             | 0.119                    | 0.10455                  | 0.256                 |            |     | –0.0867                | 0.3248      |             |
| Green              | 0.2143 *                 | 0.10455                  | 0.041                 |            |     | 0.0085                 | 0.4201      |             |
| Purple             | –0.0952                  | 0.10455                  | 0.363                 |            |     | –0.301                 |             |             |
| Red                | –0.0238                  | 0.10455                  | 0.82                  |            |     | –0.2296                | 0.182       |             |
| Orange             | 0.0952                   | 0.10455                  | 0.363                 |            |     | –0.1105                |             |             |
| Purple             | Reference white          | 0.1905                   | 0.10455               | 0.07       |     | –0.0153                | 0.3963      |             |
| Yellow             | 0.2143 *                 | 0.10455                  | 0.041                 |            |     | 0.0085                 | 0.4201      |             |
| Green              | 0.3095 *                 | 0.10455                  | 0.003                 |            |     | 0.1037                 | 0.5153      |             |
| Blue               | 0.0952                   | 0.10455                  | 0.363                 |            |     | –0.3105                |             |             |
| Red                | 0.0714                   | 0.10455                  | 0.495                 |            |     | –0.1344                | 0.2772      |             |
| Orange             | 0.1905                   | 0.10455                  | 0.07                  |            |     | –0.0153                | 0.3963      |             |
| Red                | Reference white          | 0.119                    | 0.10455               | 0.256      |     | –0.0867                | 0.3248      |             |
| Yellow             | 0.1429                   | 0.10455                  | 0.173                 |            |     | –0.0629                | 0.3486      |             |
| Green              | 0.2381 *                 | 0.10455                  | 0.024                 |            |     | 0.0323                 | 0.4439      |             |
| Blue               | 0.0238                   | 0.10455                  | 0.82                  |            |     | –0.182                 | 0.2296      |             |
| Purple             | –0.0714                  | 0.10455                  | 0.495                 |            |     | –0.2772                | 0.1344      |             |
| Orange             | 0.119                    | 0.10455                  | 0.256                 |            |     | –0.0867                | 0.3248      |             |
| Orange             | Reference white          | 0                      | 0.10455               | 1          |     | –0.2058                | 0.2058      |             |
| Yellow             | 0.0238                   | 0.10455                  | 0.82                  |            |     | –0.182                 | 0.2296      |             |
| Green              | 0.119                    | 0.10455                  | 0.256                 |            |     | –0.0867                | 0.3248      |             |
| Blue               | –0.0952                  | 0.10455                  | 0.363                 |            |     | –0.301                 | 0.1105      |             |
| Purple             | –0.1905                  | 0.10455                  | 0.07                  |            |     | –0.3963                | 0.0153      |             |
| Red                | –0.119                   | 0.10455                  | 0.256                 |            |     | –0.3248                | 0.0867      |             |

Based on observed means. The error term is Mean Square (Error) = 0.230. * The mean difference is significant at the 0.05 level.
References

1. Bibost, A.-L.; Brown, C. Laterality influences cognitive performance in rainbowfish Melanotaenia duboulayi. Anim. Cogn. 2014, 17, 1045–1051. [CrossRef] [PubMed]
2. Chen, Q.; Beaty, R.E.; Cui, Z.; Sun, J.; He, H.; Zhuang, K.; Ren, Z.; Liu, G.; Qiu, J. Brain hemispheric involvement in visuospatial and verbal divergent thinking. Neuroimage 2019, 202, 116065. [CrossRef]
3. Pflug, A.; Compf, F.; Muthuraman, M.; Groppe, S.; Kell, C.A. Differential contributions of the two human cerebral hemispheres to action timing. elife 2019, 8, 48404. [CrossRef]
4. Mihov, K.M.; Denzler, M.; Förster, J. Hemispheric specialization and creative thinking: A meta-analytic review of lateralization of creativity. Brain Cognit. 2010, 72, 442–448. [CrossRef]
5. Brown, R.J.; Oakley, D. Hypnotic susceptibility and holistic/sequential styles of thinking. Contemp. Hypn. 1998, 15, 76–83. [CrossRef]
6. Ramachandran, V.S.; Hubbard, E.M. Synaesthesia—A window into perception, thought and language. J. Conscious. Stud. 2001, 8, 3–34.
7. Henry, J.P. Psychological and physiological responses to stress: The right hemisphere and the hypothalamo-pituitary-adrenal axis, an inquiry into problems of human bonding. Integr. Physiol. Behav. Sci. 1993, 28, 369–387. [CrossRef]
8. Elliot, A.J.; Maier, M.A. Color and psychological functioning. Curr. Dir. Psychol. Sci. 2004, 13, 525–547. [CrossRef] [PubMed]
9. Henry, J.P. Psychological and physiological responses to stress: The right hemisphere and the hypothalamo-pituitary-adrenal axis, an inquiry into problems of human bonding. Integr. Physiol. Behav. Sci. 1993, 28, 369–387. [CrossRef]
10. Elliot, A.J.; Maier, M.A.; Moller, A.C.; Friedman, R.; Meinhardt, J.J. Color and psychological functioning: The effect of red on performance attainment. J. Exp. Psychol. Gen. 2007, 136, 154. [CrossRef] [PubMed]
11. Xia, G.; Henry, P.; Queiroz, F.; Westland, S. Effects of object colour stimuli on human brain activities and subjective feelings in physical environment and virtual reality. In Proceedings of the International Colour Association (AIC) Conference, Buenos Aires, Argentina, 15–17 October 2019.
12. Jang, S.C.S.; Namkung, Y. Perceived quality, emotions, and behavioral intentions: Application of an extended Mehrabian–Russell model to restaurants. J. Bus. Res. 2009, 62, 451–460. [CrossRef]
13. Elliot, A.J.; Maier, M.A.; Moller, A.C.; Friedman, R.; Meinhardt, J.J. Color and psychological functioning: The effect of red on performance attainment. J. Exp. Psychol. Gen. 2007, 136, 154. [CrossRef] [PubMed]
14. Yildirim, K.; Cagatay, K.; Ayalp, N. Effect of wall colour on the perception of classrooms. Indoor Built Environ. 2014, 24, 607–616. [CrossRef]
15. Lin, J.; Westland, S.; Cheung, V. Effect of intensity of short-wavelength light on electroencephalogram and subjective alertness. Light. Res. Technol. 2019, 52, 413–422. [CrossRef]
16. Lin, J.; Westland, S. Effect of long-wavelength light on electroencephalogram and subjective alertness. Light. Res. Technol. 2020, 52, 763–774. [CrossRef]
17. Hill, R.A.; Barton, R.A. Red enhances human performance in contests. Nat. Cell Biol. 2005, 435, 293. [CrossRef] [PubMed]
18. Ilie, A.; Ioan, S.; Zagrean, L.; Moldovan, M. Better to Be Red than Blue in Virtual Competition. Cyberpsychol. Behav. 2008, 11, 375–377. [CrossRef]
19. Attrill, M.J.; Greesty, K.A.; Hill, R.A.; Barton, R.A. Red shirt colour is associated with long-term team success in English football. J. Sports Sci. 2008, 26, 577–582. [CrossRef]
20. Matsumoto, D.; Konno, J.; Hata, S.; Takeuchi, M. Blue judogi may bias competition outcomes. Percept. Motor Skills 2007, 95, 386–389. [CrossRef]
21. Rowe, C.; Harris, J.M.; Roberts, S.C. Seeing red? Putting sportswear in context. Nat. Cell Biol. 2005, 435, e10. [CrossRef]
22. Al-Ayash, A.; Kane, R.T.; Smith, D.; Green-Armytage, P. The influence of color on student emotion, heart rate, and performance in learning environments. Color Res. Appl. 2016, 41, 196–205. [CrossRef]
23. Ou, L.-C.; Luo, M.R.; Woodcock, A.; Wright, A. A study of colour emotion and colour preference. Part I: Colour emotions for single colours. Color Res. Appl. 2004, 29, 232–240. [CrossRef]
24. Xin, J.; Cheng, K.M.; Taylor, G.; Sato, T.; Hansuebsai, A. Cross-regional comparison of colour emotions Part II: Qualitative analysis. Color Res. Appl. 2004, 29, 458–466. [CrossRef]
25. Soriano, C.; Valenzuela, J. Emotion and colour across languages: Implicit associations in Spanish colour terms. Soc. Sci. Inf. 2009, 48, 421–445. [CrossRef]
26. Duan, Y.; Rhodes, P.A.; Cheung, V. The influence of color on impulsiveness and arousal: Part 1—Hue. Color Res. Appl. 2018, 43, 396–404. [CrossRef]
27. Pribram, K.H.; McGuinness, D.J. Arousal, activation, and effort in the control of attention. Psychol. Rev. 1975, 82, 116–149. [CrossRef]
28. Waid, W.M.; Orne, E.C.; Orne, M.T. Selective memory for social information, alertness, and physiological arousal in the detection of deception. J. Appl. Psychol. 1981, 66, 224–232. [CrossRef]
29. Hackfort, D.; Schinke, R.J.; Straus, B. Dictionary of Sport Psychology: Sport, Exercise, and Performing Arts; Elsevier Science & Technology: San Diego, CA, USA, 2019.
30. Galentino, A.; Bonini, N.; Savadori, L. Positive Arousal Increases Individuals’ Preferences for Risk. Front. Psychol. 2017, 8, 2142. [CrossRef] [PubMed]
31. Teigen, K.H. Yerkes-Dodson: A Law for all Seasons. Theory Psychol. 1994, 4, 525–547. [CrossRef]
32. Russell, J.A.; Mehrabian, A. Distinguishing anger and anxiety in terms of emotional response factors. J. Consult. Clin. Psychol. 1974, 42, 79. [CrossRef]
33. Jacobs, K.W.; Suess, J.F. Effects of Four Psychological Primary Colors on Anxiety State. Percept. Mot. Skills 1975, 41, 207–210. [CrossRef]
34. Wilson, G.D. Arousal properties of red versus green. Percept. Mot. Skills 1966. [CrossRef]
35. Greene, T.C.; Bell, P.A.; Boyer, W.N. Coloring the environment: Hue, arousal, and boredom. Bull. Psychon. Soc. 1983, 21, 253–254. [CrossRef]
36. Griffitt, W. Environmental effects on interpersonal affective behavior: Ambient effective temperature and attraction. J. Personal. Soc. Psychol. 1970, 15, 240. [CrossRef] [PubMed]
37. Russell, J.A.; Pratt, G. A description of the affective quality attributed to environments. J. Personal. Soc. Psychol. 1980, 38, 311. [CrossRef]
38. Beck, J.; Egger, R. Emotionalise Me: Self-reporting and Arousal Measurements in Virtual Tourism Environments. In Information and Communication Technologies in Tourism; Springer: Berlin/Heidelberg, Germany, 2018; pp. 3–15.
39. Groeppel-Klein, A. Arousal and consumer in-store behavior. Brain Res. Bull. 2005, 67, 428–437. [CrossRef] [PubMed]
40. Korff, J.; Geer, J.H. The Relationship Between Sexual Arousal Experience and Genital Response. Psychophysiology 1983, 20, 121–127. [CrossRef]
41. Barratt, E.S. Anxiety and impulsiveness: Toward a neuropsychological model. In Anxiety; Elsevier: Amsterdam, The Netherlands, 1972; pp. 195–222.
42. Zentall, S.S.; Falkenberg, S.D.; Smith, L.B. Effects of color stimulation and information on the copying performance of attention-problem adolescents. J. Abnorm. Child Psychol. 1985, 13, 501–511. [CrossRef] [PubMed]
43. Wang, L.; Pirouz, D.; Zhang, X. Should Santa Still Wear Red?: Investigating the Effects of Color on Impulsive Buying Behavior. Assoc. Consum. Res. 2011, 39, 730.
44. Sevda, K.; Özer, Ö.; Kaya, Ş.; Kazgan, A.; Atmaca, M. The correlation between color choices and impulsivity, anxiety and depression. Eur. J. Gen. Med. 2016, 13, 47–50. [CrossRef]
45. Ciccone, N.W. A Multifaceted Approach into the Effect of Coloured Environment on Impulsivity Using Personality, Behavioural and Neurological Methods; University of Leeds: Leeds, UK, 2018.
46. Salkind, N.J.; Wright, J. The development of reflection-impulsivity and cognitive efficiency. Hum. Dev. 1977, 20, 377–387. [CrossRef]
47. Eysenck, H.J. A Critical and Experimental Study of Colour Preferences. Am. J. Psychol. 1941, 54, 385. [CrossRef]
48. Yu, L.; Westland, S.; Li, Z.; Pan, Q.; Shin, M.J.; Won, S. The role of individual colour preferences in consumer purchase decisions. Color Res. Appl. 2018, 43, 258–267. [CrossRef]
49. Singh, S. Impact of color on marketing. Manag. Decis. 2006, 44, 783–789. [CrossRef]
50. Yu, L.; Westland, S.; Li, Z. Analysis of experiments to determine individual colour preference. Color Res. Appl. 2021, 46, 155–167. [CrossRef]