

## The Effect of Culture on Colour Emotion and Preference

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### ABSTRACT

This study investigates how cultures influence viewers' emotional responses and preference to single colours and to colour pairs. To achieve this, a psychophysical experiment was carried out in six countries: Britain, France, Germany, Spain, Sweden and Taiwan. A total of 20 single colours and 190 colour pairs were used as the stimuli, presented individually on a calibrated cathode-ray-tube (CRT) monitor in a darkened room at each experimental site. Four scales, "warm-cool", "heavy-light", "active-passive" and "like-dislike", were used in the experiment to measure colour emotion and preference using the method of categorical judgement. The experimental results show that for single colours there was little cultural effect on all the scales except "like-dislike". For colour pairs, on the other hand, little cultural effect was found on all the four scales, while the Spanish data were found to disagree with the other five observer groups on "like-dislike". The Spanish observers tended to prefer colour pairs with small lightness difference between constituent colours in each pair, while the other five observer groups tended to prefer colour pairs with large lightness difference.

### 1. INTRODUCTION

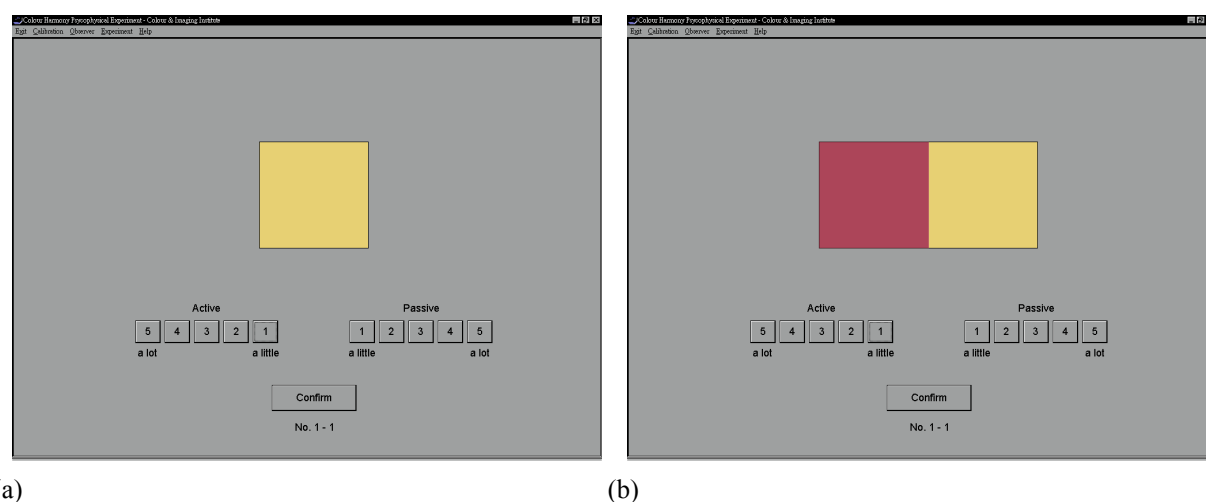
Colour emotion, also called *colour image*,<sup>1-4</sup> *colour meaning*<sup>5-9</sup> and *colour association*<sup>10</sup> in the literature, is defined in the present study as the relation between colour stimuli and reactive-level emotional responses which are determined by the configurations of these stimuli in an entire visual experience.<sup>11</sup> Colour preference is defined as "one colour being liked more than another".<sup>12</sup> The literature suggested that colour emotion and preference can be affected by cultures.<sup>13-14</sup> A widely accepted reason is that different cultures have different associations in colour and accordingly people of different cultural backgrounds have different emotional responses to colours.<sup>15</sup> To see how the effect of culture influences colour emotion and preference, the present study conducted a psychophysical experiment in six countries, Britain, France, Germany, Spain, Sweden and Taiwan, where 123 observers took part to assess colour emotion and preference. Four scales, including three colour-emotion scales "warm-cool", "heavy-light" and "active-passive", and a colour-preference scale "like-dislike", were used in the experiment to measure observers' psychophysical responses. The experimental data were analysed using the CIELAB colour system.

### 2. METHOD

In this experiment, 20 single colours and 190 colour pairs were used as the stimuli. The 20 single colours were selected from the CIELAB colour space in order to reasonably cover the entire range of colours in terms of hue, lightness and chroma. These colours were also used in our previous colour-emotion studies.<sup>16-18</sup> The 190 colour pairs included all possible two-colour combinations generated by these 20 colours. Each colour stimulus was presented individually on a calibrated CRT monitor in a darkened room. Four scales, "warm-cool", "heavy-light", "active-passive" and "like-dislike", were used to measure colour emotion and preference for each colour stimulus.

The screen layouts of the experiment are shown in Figures 1 (a) and (b) for single colours and colour pairs, respectively. Each colour stimulus was presented at the centre of the screen, under which 10 numbered buttons were lined. These buttons represent a 10-categorie scale. Taking “active-passive” as an example, the 10 categories ranged from “extremely active” (labelled 5 on the “active” side, as shown in the figures), “very active” (4), “moderately active” (3), “quite active” (2) and “just perceptibly active” (1), to “just perceptibly passive” (1 on the “passive” side), “quite passive” (2), “moderately passive” (3), “very passive” (4) and “extremely passive” (5). This scale was designed on a “forced choice” basis, i.e. each observer must choose from one side (e.g. the “active” side) or the other (e.g. the “passive” side) where there was no “neutral answer” (i.e. there was no category representing “neither active nor passive”). Each observer assessed colour emotion and preference by clicking one of the 10 buttons. The experiment was divided into two sessions, one for single colours and the other for colour pairs.

A total of 123 observers, including 12 British, 30 Chinese, 21 French, 20 German, 20 Spanish and 20 Swedish, participated in the experiment. The four scales “warm-cool”, “heavy-light”, “active-passive” and “like-dislike” were translated into six languages so that the observers could perform the assessment using their own languages. While the British and the Chinese observers took part in both single-colour and colour-pair sessions, the other four observer groups participated in only the session for colour pairs. Therefore, the cultural effect for single colours was examined by comparing only British and Chinese data. For colour pairs, on the other hand, the cultural effect was investigated using the data of all the six countries.

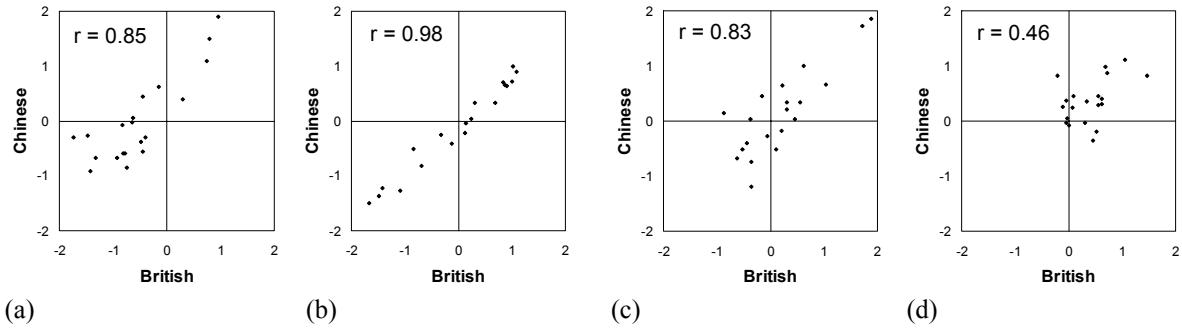


**Figure 1:** Screen Layout of the experiment for (a) single colours and (b) colour pairs

### 3. RESULTS

The colour-emotion scores of the four scales were calculated from the experimental data using the method of categorical judgement.<sup>19</sup> The scores of each colour emotion were determined on an interval scale, ranging from approximately -2 to 2. A positive score means that more than half of the observers associated a given colour stimulus with “warm”, “heavy”, “active”, or “like”; a negative score means that “cool”, “light”, “passive”, or “dislike” was associated.

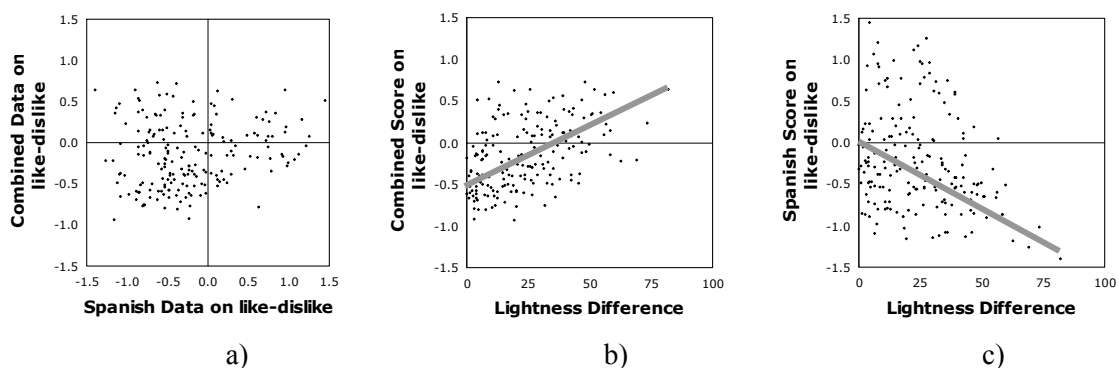
For single colours, the cultural effect was investigated by comparing the colour-emotion scores for British and Chinese groups. The comparison results are shown in Figures 2 (a) to (d) for scales “warm-cool”, “heavy-light”, “active-passive” and “like-dislike”, respectively. In these diagrams, the two observer groups appear to agree well for all the scales except “like-dislike”, which had a correlation coefficient of 0.46 between the data sets from the two countries. This suggests that there was little cultural difference in scales “warm-cool”, “heavy-light” and “active-passive” between the British and the Chinese data, while the two data sets do not seem to agree on “like-dislike”, as shown in Figure 2 (d). A further comparison between the two data sets shows that among the 20 colour samples, greyish colours had the largest differences in scores of “like-dislike” between the two countries.



**Figure 2:** Comparisons of single-colour emotion between British and Chinese data on (a) warm-cool, (b) heavy-light, (c) active-passive and (d) like-dislike

For colour pairs, on the other hand, the experimental results showed little cultural difference in scales “heavy-light”, “warm-cool” and “active-passive” between all the six countries, while there were significant differences in “like-dislike” between Spanish and each of the other five observer groups. To clarify these differences, the experimental data were further analysed, as will be described in the following. Note that the five observer groups (i.e. British, Chinese, French, German and Swedish) were found to correlate closely with each other. Therefore, to simplify the analysis, the scores on “like-dislike” of the five observer groups were averaged to produce a combined data set, which was then compared with the Spanish data. As a result, the combined data were found to have little correlation with the Spanish data, as shown in Figure 3 (a).

The two data sets were further compared using a colour harmony model developed in our recent studies.<sup>11,20-22</sup> According to this model, two-colour harmony can be determined by the following properties: *lightness sum*, *lightness difference* and *chromatic difference* between constituent colours in a given colour pair, as well as the *hue angle* of each constituent colour. This harmony model was used here because in our previous study we found a close correlation between colour preference and colour harmony.<sup>18</sup> Each of the two data sets, the combined data and the Spanish data, was plotted against these harmony properties. The results suggest a major difference between the two data sets to be the lightness difference, i.e. the Spanish observers were found to prefer colour pairs with small lightness difference to those with large lightness difference, while the observers of the other five countries preferred colour pairs with large lightness difference to those with little lightness difference. These are depicted in Figures 3 (b) and (c).



**Figure 3:** The comparison between the Spanish data and the combined data on “like-dislike”: (a) the two data sets plotted against each other, (b) the combined data plotted against lightness difference, and (c) the Spanish data plotted against lightness difference.

#### 4. CONCLUSIONS

For single colours, there was little cultural difference between British and Chinese data in all the scales except “like-dislike”. The experimental results show that greyish colours had the largest differences in “like-dislike”. For colour pairs, while the five observer groups, British, Chinese,

French, German and Swedish, were found to agree well for all the scales, the Spanish data were found to disagree with all the other groups on “like-dislike”. The experimental results indicate that the Spanish observers tended to prefer colour pairs with small lightness difference between constituent colours. This tendency was different from that of the other five observer groups, who tended to prefer colour pairs with large lightness difference instead.

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