Cross-cultural comparison of colour evaluation using semantic differential

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Introduction

Simultaneous presentation of the image of a train in different colour can influence the perceived loudness of the train sound despite identical sound stimuli. It was found that at same SPL, red trains are perceived as louder than trains with light green colour (e.g. Fastl, [1]).

Since these effects are of importance for sound quality engineering, in a global market it is of vital interest, whether there exist cross-cultural differences. Therefore, a basic study was performed both in Germany and Japan, using the method of semantic differential. Two sets of experiments were performed: in one experiment, subjects imagined the colours and rated them from their memory. In the other experiment, rating was performed with "real" colours, displayed on colour cards. The results of both experiments are discussed in view of two main aspects:

1) Differences between ratings for imagined versus "real" colours.

2) Differences in the rating of Japanese versus German subjects.

For practical purposes of sound engineering it is most important to know, whether German and Japanese subjects rate the same colours e.g. as pleasant.

Experiments

Twenty Japanese subjects (10 female, 10 male) aged between 19 and 56 years (median 23) and 14 German subjects (1 female, 13 male) aged between 23 and 57 years (median 24) took part in the experiments. The method of semantic differential (SD) was used to evaluate 10 different colours by 14 bipolar adjective pairs like beautiful/ugly, dark/bright, hot/cool, pleasant/unpleasant etc, arranged in seven point category scales. In one experiment, the name of a colour, e.g. "red", was written on top of the questionnaire and the subjects had to answer the semantic differential from their memory of the colour "red". In the second experiment, subjects were shown colour cards printed on a colour-jet printer. Care was taken that the colour cards were identical in Germany and Japan.

Results and Discussion

Figure 1 shows the results of the experiments with semantic differential. For 10 different colours, the rating by Japanese subjects is given in the respective left panels, for the German subjects in the respective right panels. For many colours, there is not much difference between imagined colours (colour words, solid) and real colours (colour cards, dashed). For example for the colour „red", the average difference is 0.38 points for Japanese and 0.31 points for German subjects. However, for the colour „brown", imagined and real colours differ by 0.76 points for Japanese and 1.73 points for German subjects. In particular for the German subjects, their imagination of "brown" differed substantially from the brown colour presented on the colour card.

When ranking colours displayed on colour cards according to the adjective "pleasant", we obtain for Japanese subjects the following sequence:

white, green, light blue, blue, yellow, purple, orange, red, grey, brown,

and for German subjects

blue, brown, white, yellow, green, light blue, purple, red, grey, orange.

This means that the blue, green, and white colours used on the colour cards are pleasant for both Japanese and German subjects. On the other hand, red, grey, and orange are rated as more "unpleasant". Interestingly, for German subjects, brown gets the second best rating, whereas for Japanese subjects the worst rating.

As concerns the ranking of "loud", Japanese subjects rate red, yellow, purple, orange, blue, white, green, light blue, brown, grey, and German subjects red, brown, orange, purple, yellow, blue, grey, green, white, light blue.

For sound quality design, the results can be interpreted as follows: For both Japanese and German subjects, the colours red, orange, purple of the colour cards convey feelings of "loud" and "unpleasant" whereas green, blue and white are perceived as "soft" and "pleasant".

This ranking of the colours is perfectly in line with the observation from psychoacoustic experiments (e.g. Fastl [1], Rader et al. [2], Menzel [3]) that – at same SPL – red products are perceived as louder than green products.

References

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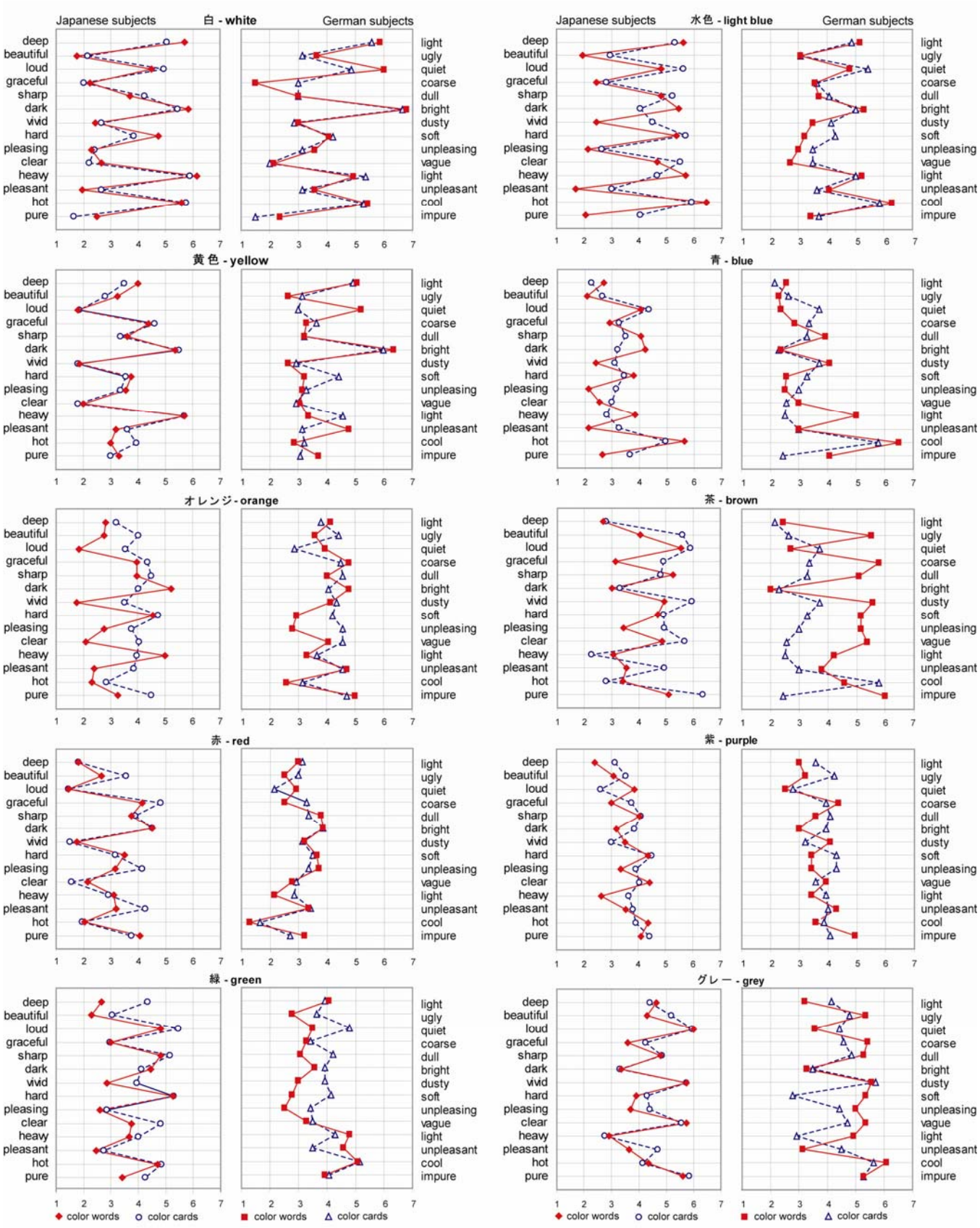

Fig. 1 Comparison of profiles for colours white, yellow, orange, red, green, light blue, blue, brown, purple, and grey for Japanese subjects (respective left panels) and German subjects (respective right panels). Filled symbols connected by red solid lines represent data for evaluations with imagined colours (colour words), unfilled symbols connected by blue dashed lines represent data for real colours (colour cards).