

The blue GOOSE and the yellow FLEECE: a study into vowel/colour associations

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Background

Research into phoneme/colour perceptual relationships is not new, even in non-synaesthetes (e.g. Moos et al 2010; Wrembel & Grzybowski 2011). However, previous research has always been carried out with selected participants in laboratory settings. This poster reports on an attempt to measure vowel/colour relationships in the wider population by using an online survey.

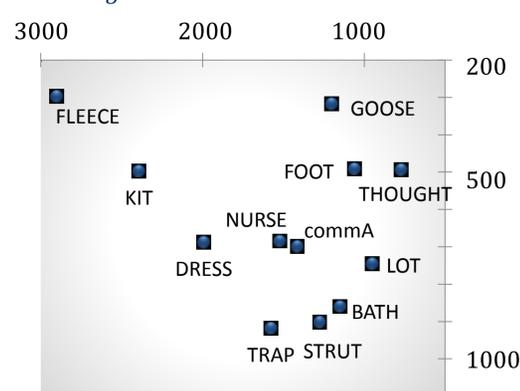
Research questions

1. Is there a measurable association between vowel sounds and colours in uncontrolled experimental conditions?
2. Do the patterns of association reflect previous findings?
3. Do individual accent features affect the association?

Method

12 monophthongs were recorded in isolation by a professional voice-over artist (Alison - www.thephonevoice.com), aiming for Standard Southern British English.

Figure 1. Formant measurements of the vowel recordings



The experiment itself was freely available online for 43 days from 31st Aug 2011. It was publicised on Twitter, Facebook, and John Wells' blog. In total there were 1498 complete responses in that time.

Participants were asked a series of questions about their language background, their accent (based on questions used in Maguire 2009), gender and age, before completing the task. The task itself involved a vowel sound being played, with participants being asked to click on a coloured rectangle from a series of 30 samples. The sounds were played in a random order, but the colour display remained constant. After each selection, participants used a slider to indicate how sure they were of their choice.

Figure 2. Screenshot of the colour selection process.

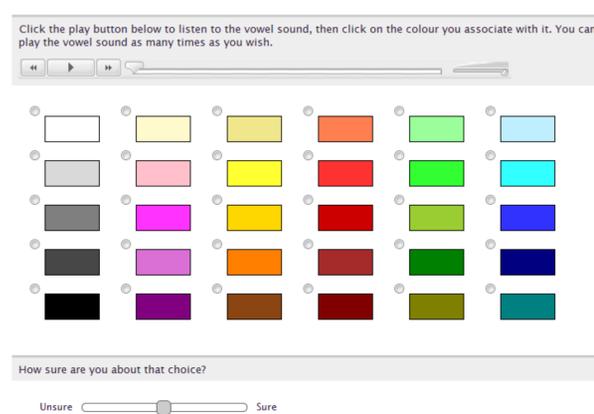
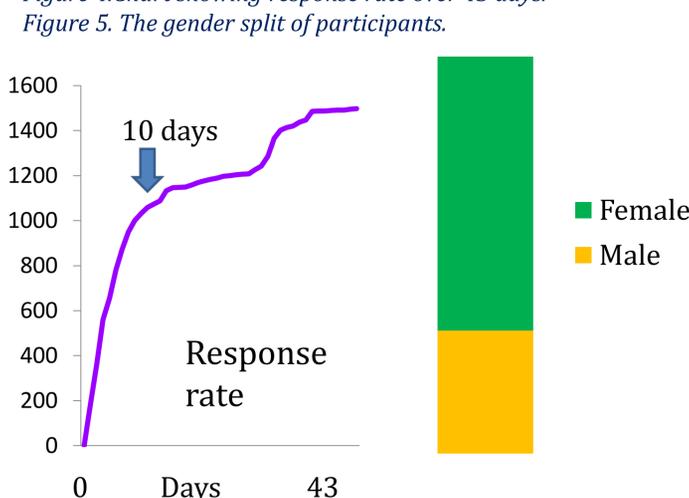


Figure 4. Chart showing response rate over 43 days.

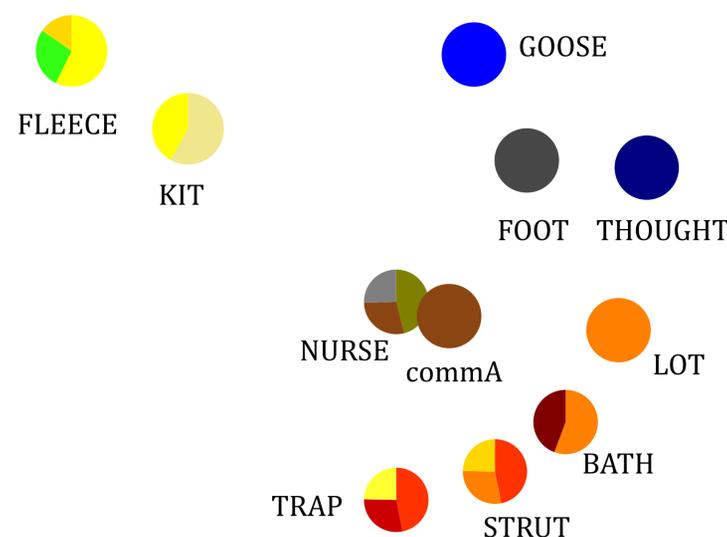


Results

These results come from the 189 participants who were more than 50% sure on all 12 vowels (the default certainty was 50, so 51+ shows an element of engagement and confidence).

Chi-square goodness of fit tests were carried out in order to ascertain if the frequency distribution of colours for each vowel was random or not. 11 of the 12 vowels showed statistically significant non-random distribution patterns. For each vowel, those colours which were selected with a frequency of more than twice their expected frequency ($>N/30$) are displayed below.

Figure 6. Dominant colours for each vowel.

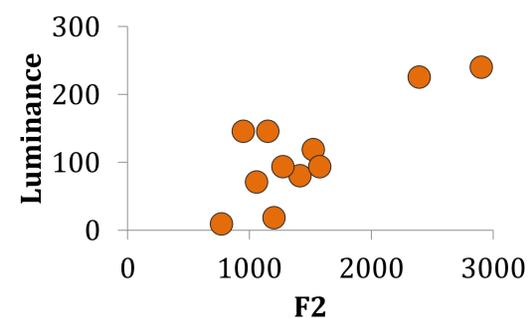


FLEECE, TRAP, NURSE, LOT, FOOT and GOOSE all show colours comparable to Wrembel & Grzybowski (2011)

Luminance

The luminance value of each colour was calculated from their RGB values - $(0.2126 * R) + (0.7152 * G) + (0.0722 * B)$. The luminance of the dominant colour for each vowel was then compared to its f2 value. There was found to be a strong correlation between the two ($r=0.8$; $p<0.01$) with front vowels being perceived as brighter colours, as in Marks (1975).

Figure 7. Relationship between F2 and Luminance.



Accent

Preliminary investigations into different associations by speakers with different accents show mixed results. Speakers with no TRAP/BATH split associated BATH with orange, whereas those with a split chose red or blue. This perhaps explains why the overall association of BATH was orange. However, the dominant colours for STRUT were red, orange and yellow, regardless of a FOOT/STRUT split.

Certainty

Vowels/colours were associated with significantly different degrees of certainty overall. From most to least certain, these were: FLEECE, GOOSE, STRUT, TRAP, BATH, THOUGHT, NURSE, DRESS, LOT, commA, KIT, FOOT. Men were more certain than women in their choices (60.8 vs 52.8 $p<0.01$)

Conclusion

Even in an uncontrolled environment, there is still a consistency in the association between vowels and colours. Moreover, there is considerable consistency between studies both in terms of individual colour choice and the relationship between front/back and luminance. The influence of accent on the patterns of association is as yet unclear, although there is still potential for this to be a real effect.

References

- Maguire (2009) *Investigating phonological variation in contemporary English in the British Isles*. [presentation] UKLVC7, University of Newcastle, 1st-3rd Sep.
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- Moos, A., Simmons, D. & Smith, R. 2010. *Colour and luminance associations with vowel sounds in synaesthetes and non-synaesthetes*. Paper presented at BAAP 2010.
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