Vowel-colour associations in non-synesthetes: A study with Spanish and Arabic participants

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Abstract

The present paper aims at contributing to the field of sound symbolism and, more specifically, to the association between sounds and colours as established by non-synesthetes. A study based on a forced-choice task performed by Spanish and Arabic speakers is presented. The study asks participants to listen to primary cardinal vowels and choose from a range of colours the one considered most suitable for the sound. The data gathered reinforce previous results that non-synesthetic participants are able to significantly associate vowel sounds and colours at a better than chance degree. However, results seem to go against the general idea that the associations are cross-linguistic, although the phenomenon itself seems to be.

Key words: cardinal vowels, colours, synesthesia, synesthetic symbolism

Introduction

Research on synesthetic sound symbolism has shown that participants from the normal population associate sounds and properties of objects at a better than chance degree (Sapir 1929; Westbury 2005). On the other hand, research on synesthesia has shown that synesthetes are able to automatically associate two senses, namely hearing and vision (Simner 2006; Ward & Mattingley 2006).

Taking into account the results obtained in the aforementioned areas, the question that emerges is: Will non-synesthetes be able to establish significant connections between two domains typically attributed to the synesthetic population, i.e. between sounds and colours? The research carried out in this respect (Miyahara *et al.* 2006; Wrembel 2007; Wrembel & Rataj 2008) shows that Japanese, Polish and English speakers are able to significantly relate vowel sounds and colours.

In an attempt to provide more evidence for this field and expand the range of languages studied, an experiment was designed. Native speakers of Spanish and Arabic had to listen to vowel sounds and choose the colour suitable for the sound listened to. Results show that participants significantly associated sounds and colours, although differences were also found between the two languages studied, probably due to linguistic and cultural factors.

Experiment

The present study contributes to the field of the association between sounds and colours by non-synesthetes. Two research questions were proposed: a) Will non-synesthete participants significantly associate sounds and colours?; b) Will the associations established be common to the two languages? Based on the results obtained in previous research, it was hypothesized that: i) Participants would be able to establish significant associations between sounds and colours; ii) The associations would be different for the two languages studied, although some common elements could be found. These differences would be basically due to two types of factors: linguistic and cultural.

Participants

For the experiment with Spanish participants, the data of 52 native speakers were taken into account. For the experiment with Arabic participants, the data of 48 native speakers of Darija were considered.

Stimuli

Two types of stimuli were used, auditory and visual, and these were the same for the two languages studied, so that, differences were found, these were due to the different stimuli used.

Auditory stimuli were the eight primary cardinal vowels (Jones [1918]1967). Cardinal vowels are not real vowels, but reference points for all the languages of the world. The following cardinal vowels were used: 1 /i/, 2 /e/, 3 /ɛ/, 4 /a/, 5 /ɑ/, 6 /ɔ/, 7 /o/, 8 /u/.

Visual stimuli were 12 coloured squares situated against a light grey background. Eleven squares were designed following Berlin & Kay's (1969) findings of the basic colour terms for all the languages of the world (white, brown, purple, red, grey, yellow, pink, green, orange, black and blue). A twelfth square was added that participants could use in case they felt that none of the colours corresponded to the sound listened to.

Materials

For Spanish speakers, the materials used were a desktop computer with a 15-inch screen, headphones and a dimmed quiet room. For Arabic speakers, a laptop computer was used, since the experiment had to be carried out in different places. In any case, the environment was always dimmed and quiet.

Procedure

The procedure followed was the same for both languages and the experiment was run by means of a computer programme designed for the purpose of the study. First participants were given an informed consent form and the experiment was explained orally. Then they sat in front of a computer and the programme asked them to choose their native language and provided

them with written explanations. Once they had read the explanations, they were asked about some personal data and required to do a colour-blindness test. If they passed this test, the experiment started automatically. Participants heard one sound and after that a screen with the 12 squares appeared. They had to click on the colour they associated the sound with. The position of the colours changed, so that findings would not be due to location of the colour squares.

Results and discussion

The results obtained in the two experiments were organized and chi-square tests were run in order to check the degree of significance of the associations (see Table 1).

Spanish participants provided significant results. Cardinal vowel 1 was significantly associated with yellow, cardinal vowels 2 and 3 were related to green, cardinal vowels 4 and 5 were connected with red, cardinal vowel 6 was related to pink, cardinal vowel 7 with black, and cardinal vowel 8 was connected with grey and purple.

The results provided by Arabic participants were not as strong as those of Spanish, though still significant. Cardinal vowel 1 was related to grey, cardinal vowel 2 with green and pink, cardinal vowel 3 with green, cardinal vowel 4 with blue and green. Following the tendency of the Spanish, cardinal vowel 5 was related with red, whereas cardinal vowel 6 was associated with black, cardinal vowel 7 with brown and orange, and 8 with pink and red.

Therefore, the results obtained in the three experiments seem to confirm hypothesis 1, that participants would be able to associate sounds and colours at a better than chance degree. These results seem to follow the line of the findings obtained in other works such as Miyahara *et al.* (2006), Wrembel (2007) and Wrembel and Rataj (2008).

Hypothesis 2 is also confirmed, since there are common choices between the languages, but mostly these tend to be language-specific. The differences observed can be due to linguistic and cultural factors. In the case of Spanish, pronunciation and spelling may have conditioned participants' choices; whereas Arabic choices might have been influenced by the small vowel inventory of this language. Culturally speaking, colours may be associated with positive or negative connotations, and this may have conditioned participants' choices. For example, green seems to be of paramount importance for the Arabic culture. This would explain why, at a higher or lower degree depending on the vowel, green is always chosen in Arabic, even for vowels for which in Spanish the choice of green is almost imperceptible.

Table 1. Chi-square results for Spanish and Arabic participants.

Vowels	Spanish	Arabic
/i/	Yellow ($X^2(1)=59.130$, $p<0.005$)	Grey ($X^2(1)=9.824$, $p<0.005$)
/e/	Green ($X^2(1)=42.391$, $p<0.005$)	Green ($X^2(1)=4.888$, $p<0.05$) Pink ($X^2(1)=4.324$, $p<0.05$)
/ɛ/	Green ($X^2(1)=12.057$, $p<0.005$)	Green ($X^2(1)=9.321$, $p<0.005$)
/a/	Red ($X^2(1)=13.684$, $p<0.005$)	Blue ($X^2(1)=4.047$, $p<0.05$) Green ($X^2(1)=4.001$, $p<0.05$)
/a/	Red ($X^2(1)=10.278$, $p<0.005$)	Red ($X^2(1)=8.871$, $p<0.005$)
/ɔ/	Pink ($X^2(1)=9.750$, $p<0.005$)	Black ($X^2(1)=4.047$, $p<0.05$)
/o/	Black ($X^2(1)=15.260$, $p<0.005$)	Brown ($X^2(1)=5.301$, $p<0.025$) Orange ($X^2(1)=5.873$, $p<0.025$)
/u/	Grey ($X^2(1)=8.091$, $p<0.005$) Purple ($X^2(1)=10.582$, $p<0.005$)	Pink ($X^2(1)=4.324$, $p<0.05$) Red ($X^2(1)=6.352$, $p<0.025$)

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