CORTEX 45 (2009) 721–729

available at www.sciencedirect.com

ScienceDirect

journal homepage: www.elsevier.com/locate/cortex

Research report

A novel, illustrated questionnaire to distinguish projector and associator synaesthetes

*Richard Skelton**, *Casimir Ludwig and Christine Mohr*

Department of Experimental Psychology, University of Bristol, Bristol, UK

ARTICLE INFO

Article history:
Received 1 June 2007
Reviewed 20 August 2007
Revised 27 November 2007
Accepted 2 February 2008
Action editor Sergio Della Sala
Published online 5 June 2008

Keywords:
Synaesthesia
Individual differences
Self-report questionnaire
Projector
Associator

ABSTRACT

Individual differences in synaesthesic experiences have recently received much interest, with synaesthetes typically being classified as either projectors (seeing colours projected externally in space) or associators (experiencing colours in their ''minds eye''). However, the current standard method of ascertaining these differences through self-reported ratings of statements has been found to be unreliable. Here, we report a test–retest comparison of two sequentially presented questionnaires, asking participants to rate how well the depictions reflect their own experiences. The first questionnaire used standard rating statements, while the second presented the synaesthetic experience in a visual, illustrated format. Results from 12 female synaesthetes highlighted the test–retest consistency with the illustrated questionnaire to be significantly higher than statements alone, suggesting that the visual presentation more approximates and reflects the synaesthetic experience. Through doing so, the illustrated questionnaire is considered to enable an accurate and reliable partition of synaesthetes into projectors and associators.

1. Introduction

Synaesthesia is a phenomenon wherein an atypical dual perception arises from a single stimulus input. The additional percept may belong to the same or different sensory modality. Reported phenomena include the simultaneous activation of smells, taste and colour induced by pain, or viewing words or shapes (Cytowic, 2002; Tyler, 2005; Ward and Simner, 2003). One of the most common forms of synaesthesia, and that is currently under study, is grapheme–colour synaesthesia (Simner et al., 2006) whereby viewing an achromatic grapheme elicits a specific, idiosyncratic, yet stable colour experience to each synaesthete (e.g., Day, 2005; Rich et al., 2005).

Despite grapheme–colour synaesthesia having been typically considered as a homogenous entity, recent studies have observed at least two distinct types of synaesthesic experiences when viewing graphemes; those of *projectors* and *associators* (Dixon et al., 2004; Dixon and Smilek, 2005; Ramachandran and Hubbard, 2001; Ward et al., 2007; see also Duffy, 2001; Tyler, 2005 for synaesthetes perspectives). Projectors perceive the synaesthesic colours in external space (Dixon et al., 2004; Dixon and Smilek, 2005; Ward and Mattingley, 2006), appearing as a transient mist, a transparent coloured overlay or as saturating the printed letter (Cytowic, 1993, 2005; Tyler, 2005). Accordingly, when synaesthetes are presented with physically coloured letters, they simultaneously experience both the physical colour and the synaesthetic colour. These dual perceptions of real and synaesthetic colours do not mix or occlude each other (Kim and Blake, 2005). Alternatively, associators experience

* *Corresponding author*. Department of Experimental Psychology, University of Bristol, Bristol, UK.
E-mail address: richardskelton1@gmail.com (R. Skelton).
0010-9452/$ – see front matter © 2008 Elsevier Srl. All rights reserved.
doi:10.1016/j.cortex.2008.02.006

synaesthetic colours internally, in their 'minds eye' (Dixon et al., 2004; Dixon and Smilek, 2005), an experience potentially likened to our associated knowledge of consistently coloured objects (Dixon et al., 2004). Given the substantial increase in interest as to how this division of experiences differentially influences behavioural performance (e.g., Dixon et al., 2004; Dixon and Smilek, 2005; Edquist et al., 2006; Hubbard et al., 2005; Ward et al., 2007), a reliable measurement to distinguish between projector and associator synaesthetes is imperatively necessary. Despite this, self-report measures have, to date, demonstrated such experiential separation to be undesirably complex, typically being contradictory and unreliable upon retest (Edquist et al., 2006). While regarded by some as a potentially accurate reflection of changeable synaesthesic experiences (e.g., Edquist et al., 2006), this is inconsistent with concurrent self-reported stability of the idiosyncratic experience over a relatively long period of time.

The primary purpose of the present study was to assess the reliability of standard rating questions typically employed, and to overcome the short-comings of such techniques through formulating a new standard. Crucially, at each stage, synaesthetes were unaware that a retest or additional questionnaire would be administered. Here we present the results obtained from two Synaesthesic Experience Questionnaires (SEQs). The first assessed associated and projected synaesthetic experiences by rating standard descriptive statements (Descriptive Synaesthesic Experience Questionnaires – DSEQs, see Table 1), but demonstrated low test–retest reliability. Post-hoc, to consider the synaesthetes' self-reported problems that the terminology used in the DSEQ was inherently ambiguous, we utilised illustrations to clarify text comprehension (e.g., Brookshire et al., 2002; Larkin and Simon, 1987). Specifically, we devised a second rating questionnaire in which the respective associated and projected synaesthetic experiences were illustrated (Illustrated Synaesthesic Experience Questionnaires – ISEQs, see Fig. 1). This questionnaire revealed a significant test–retest reliability, to the extent that it was significantly more consistent between test and retest sessions than the standard DSEQ.

Table 1 – Questions endeavouring to dissociate projectors and associators

Question no	Question
1	The colour has the same shape as the letter or number
2	The colour looks like it is on the page
3	You see a coloured copy of it in your 'minds eye' and black and white on the page
4	The figure[a] is not coloured, but you are aware that it has a specific associated colour
5	How would you best describe your synaesthesic colours? (a) Solid/transparent (b) Over the letter/around the letter (c) On the page/in front of the page

The questions were provided in the given order. Of note, is that there were three dimensional sub-questions for question 5.
a Please note that here, the term 'figure' was used to denote a letter or number.

2. Method

2.1. Synaesthetes

Twelve female synaesthetes (mean = 28.2 ± 14 years) were recruited through various local and national media advertisements. With these advertisements presenting letters and numbers and explicitly asking if persons experienced colours when viewing these, all those who replied were indicative of possessing synaesthesia. Synaesthetes consisted of five University of Bristol students, two University administration staff, two students attending local schools, a draughtsman, an accountant, and an artist. All participants received detailed information prior to study inclusion about synaesthesia in general, and the present study in particular. The local ethics committee approved the study, and all participants provided written informed consent prior to study commencement.

2.2. Test of genuineness

Measures of synaesthesic colour consistency have conventionally been used to establish the genuineness of synaesthetes experiences (Baron-Cohen et al., 1987, 1996; Mattingley et al., 2001). To affirm an established synaesthesic sample, grapheme–colour consistency was assessed through presenting synaesthetes with a self-programmed, computerised colour–grapheme matching task.[1] For each synaesthete, between 10–15 letters and numbers were pre-selected on the basis of these eliciting their strongest self-rated synaesthesic colour. Each letter or number was presented, and synaesthetes carefully selected a corresponding colour to their synaesthesic experience from a display of 30 randomly ordered coloured patches. Subsequently, a new display of 30 coloured patches was presented, with half the range of colours, based around the previously selected colour. This was consecutively repeated three times to arrive at the closest representation of the colour. Each grapheme was presented three times within a session and, without warning, synaesthetes were later invited to undertake a second session (mean = 3.4, range = 1–6 weeks). Of note, this test was independent of questionnaire administration, and was performed in the laboratory.

A sample of 12 individually age- and gender-matched random controls (mean = 24.4 ± 4 years) were contrasted with synaesthetes specific letter and number set. To establish a conservative measure on which to base comparisons (see Ward and Simner, 2003), control participants were asked to explicitly associate a specific colour to each presented grapheme and to remember this, as the same graphemes would be presented again within the same session. Furthermore, they were informed that a retest would occur within 5–7 days, and that they should endeavour to remember the previously selected colours.

The specific colour selected for each grapheme was recorded in the form of RGB vector triplets, ranging from 0–255 on each dimension. To establish within-session colour–grapheme matching consistency, the RGB distance

[1] Details of the task, as well as the programme, can be obtained from CL (C.Ludwig@bris.ac.uk).