

Color-Grapheme Associations in Non-Synesthetes: Evidence of Emotional Mediation

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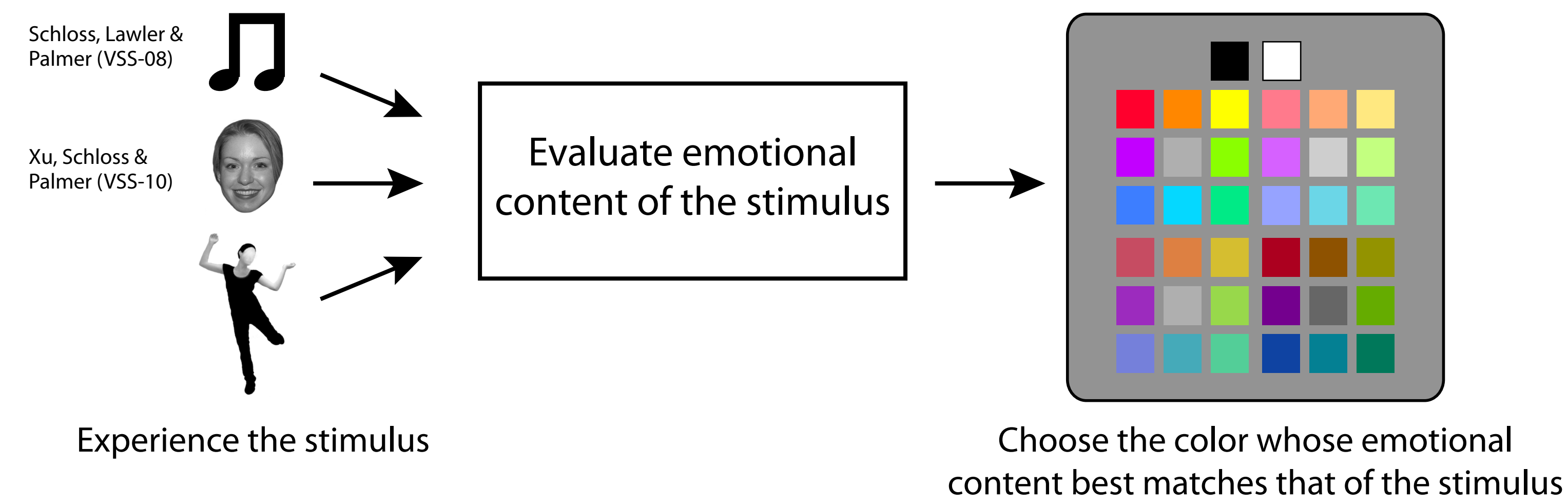
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Background

Schloss, Lawler, and Palmer (VSS-08): When choosing the colors that “go best” with orchestral music, participants choose the colors that best matched the emotional content of the music.

The Emotional Mediation Hypothesis:

When choosing colors to go with an emotional stimulus in a different modality, people choose the colors that best match the emotional content of that stimulus.



Does the emotional mediation hypothesis hold for less emotionally expressive stimuli, such as graphemes?

Prior research on verbal color-grapheme associations in non-synesthetes:

Non-synesthetes tend to have similar associations between graphemes and colors, as tested using color name association tasks (e.g., Rich, Bradshaw, & Mattingley, 2005; Simner et al., 2005).

A G Y B X □

Linguistic explanation:

The first letter of a color name is paired with its color (e.g., ‘G’ for green).

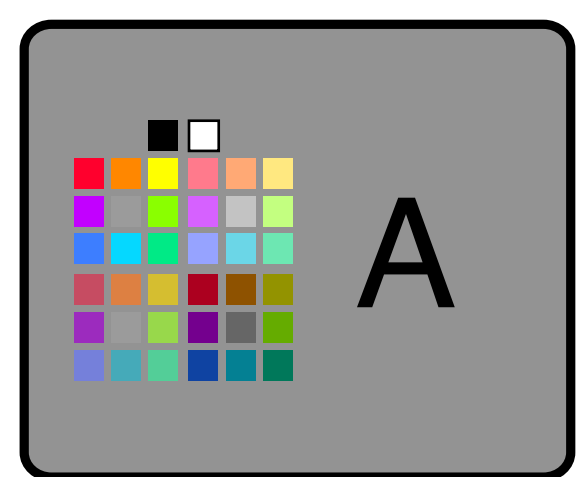
The first letter of a strongly associated colored object is paired with the objects’ color (e.g., ‘A’ is red because of associations with apples).

Will such associations hold for a non-verbal color-association task?

General Methods

Participants: 42 non-synesthetes, as determined by the www.synesthete.org initial questionnaire.

Color-Grapheme Associations

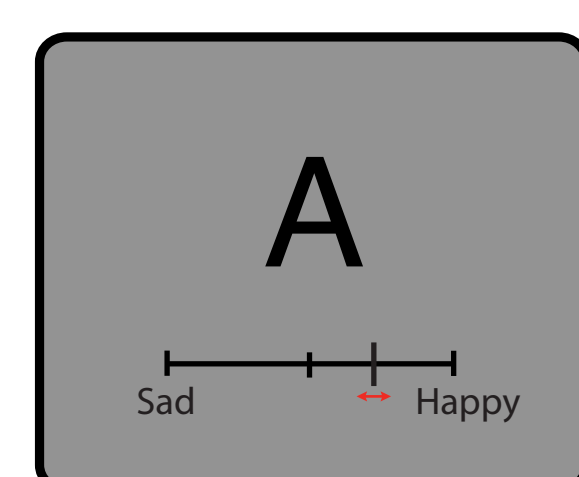


Berkeley Color Project (BCP) 37 colors presented beside each grapheme (26 letters, 9 numbers).

Tasks:

- Click the 5 most consistent colors with the grapheme starting with the most consistent
- Click the 5 most inconsistent colors with the grapheme starting with the most inconsistent

Grapheme-Emotion Associations

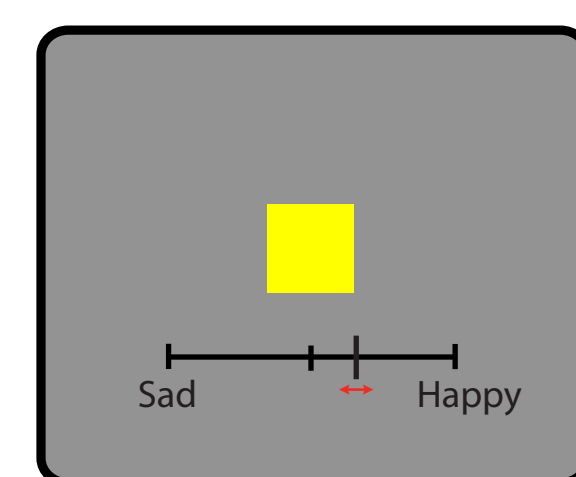


Graphemes presented one at a time with a bipolar emotional scale.

Tasks:

- Rate emotional content of each grapheme (blocked by emotional dimension):
- happy-sad
 - active-passive
 - angry-calm
 - strong-weak
 - good-evil

Color-Emotion Associations

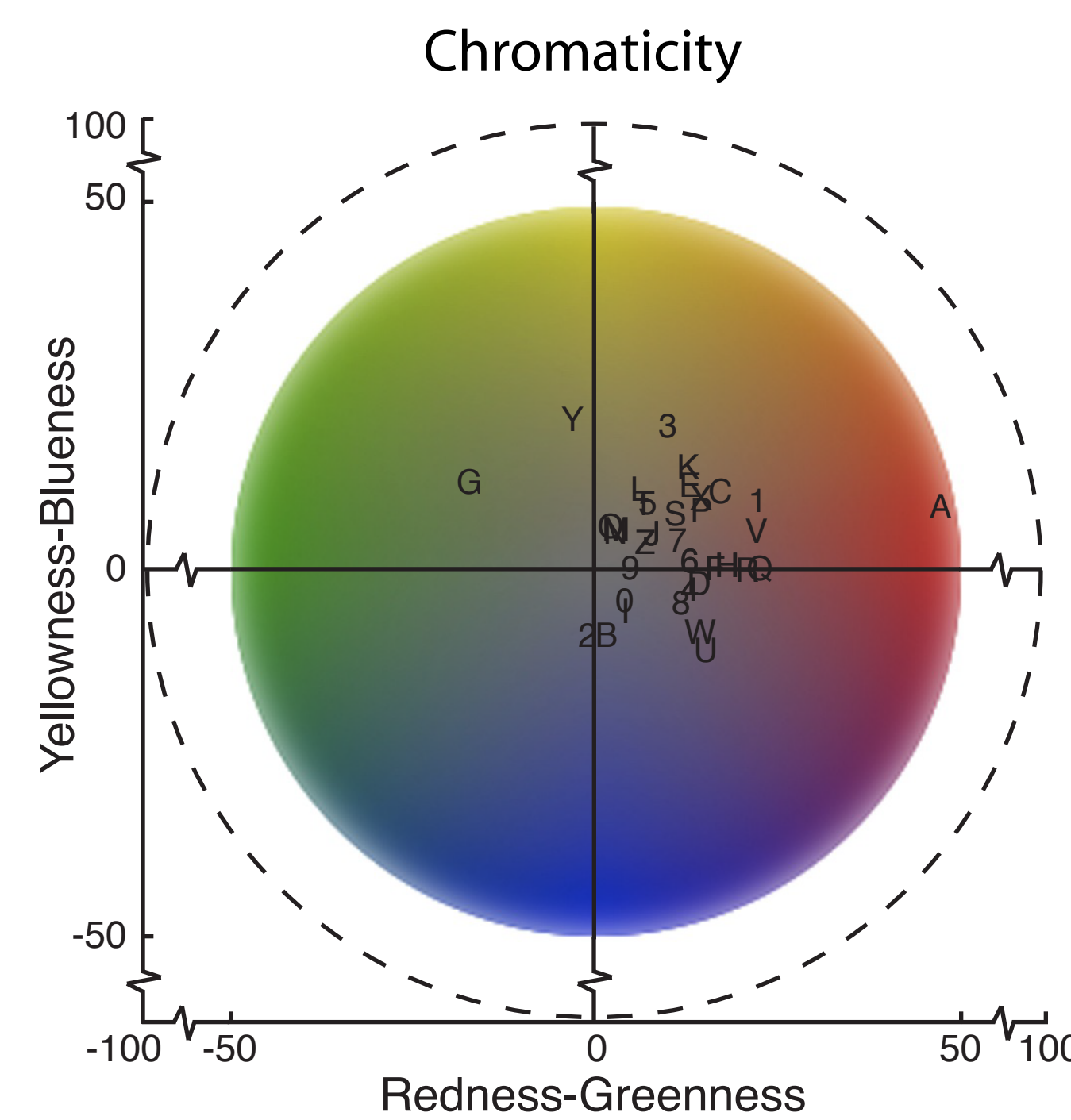


BCP-37 colors presented one at a time with a bipolar emotional scale

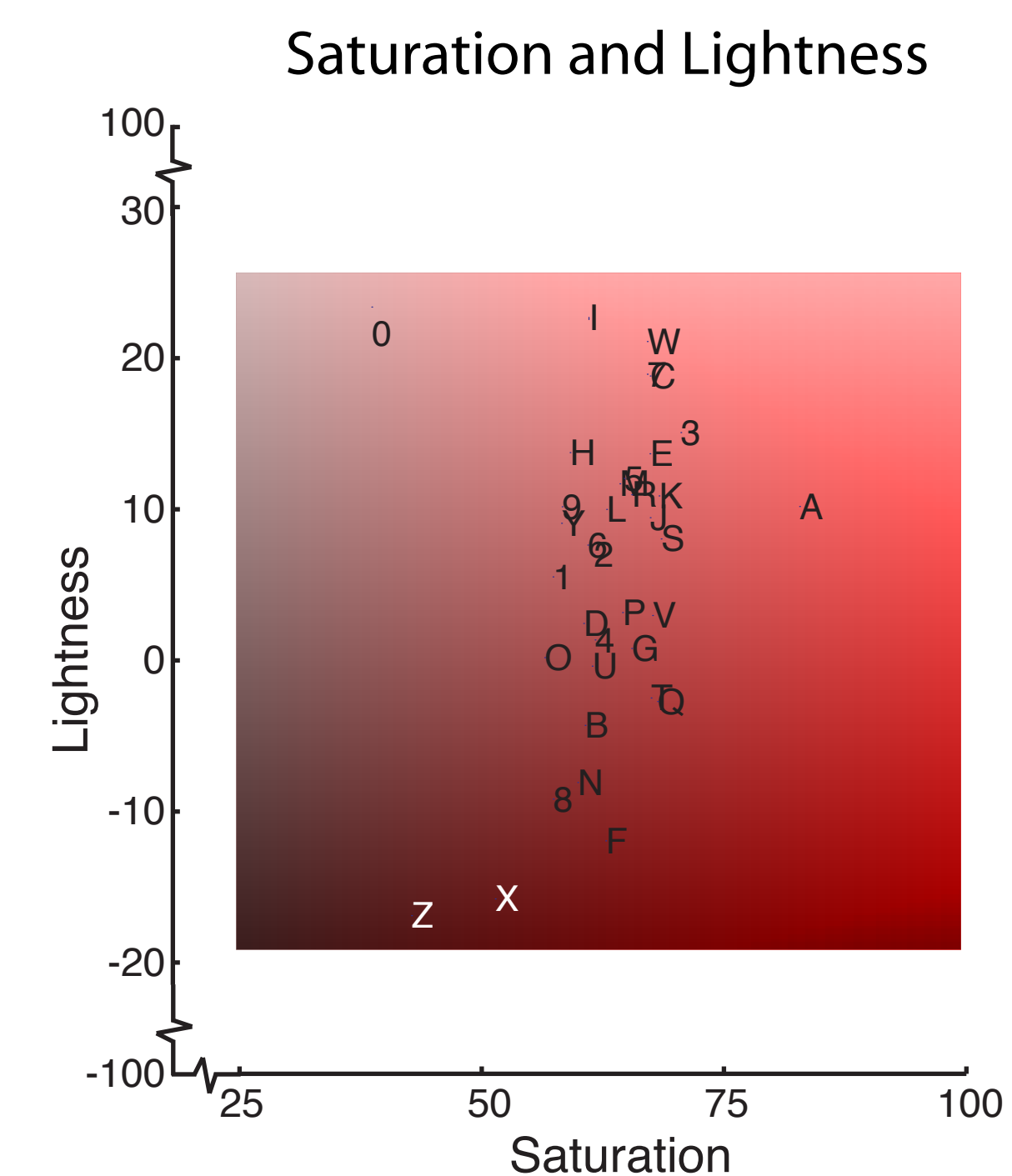
Tasks:

- Rate emotional content of each color (blocked by emotional dimension):
- happy-sad
 - active-passive
 - angry-calm
 - strong-weak
 - good-evil

Colors of Graphemes



As in verbal descriptions of colors (Rich et al., 2005; Simner et al., 2005), ‘G’ was greenish, ‘A’ was reddish ‘Y’ was yellowish, and ‘B’ was bluish, although there were large individual differences.



‘X’ and ‘Z’ were desaturated and dark. ‘O’ (zero) was desaturated and light. Note that ‘O’ was more saturated ($p < .01$) and darker than ‘0’ ($p = .07$), even though they have similar shapes.

Do Emotions Mediate Color-Grapheme Associations?

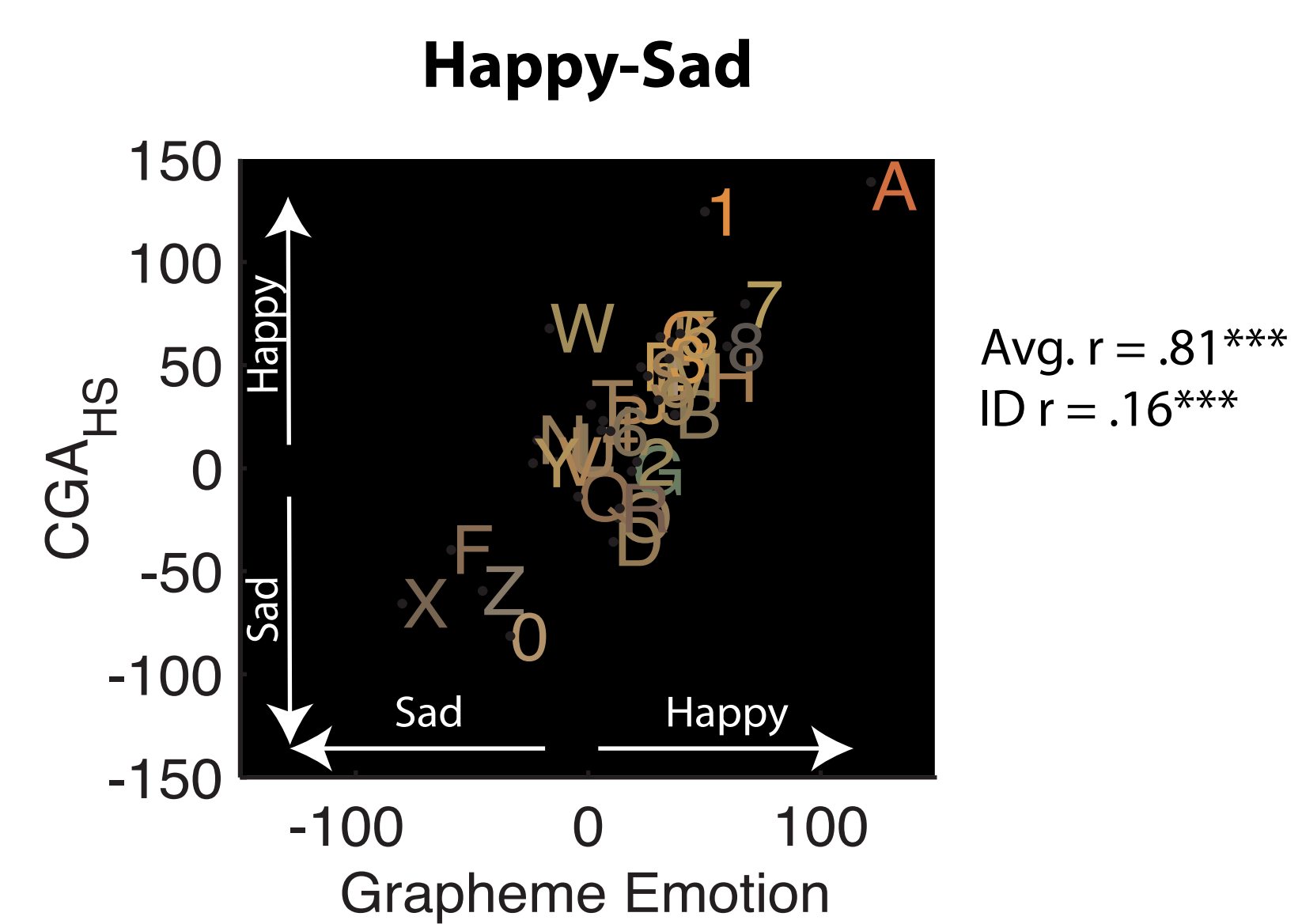
Color-Grapheme Associations (CGA) were calculated for each grapheme in terms of the emotional dimensions (D) of the five colors that were **most consistent** with the grapheme (C) and the five that were **most inconsistent** with the grapheme (I).

Computing CGAs

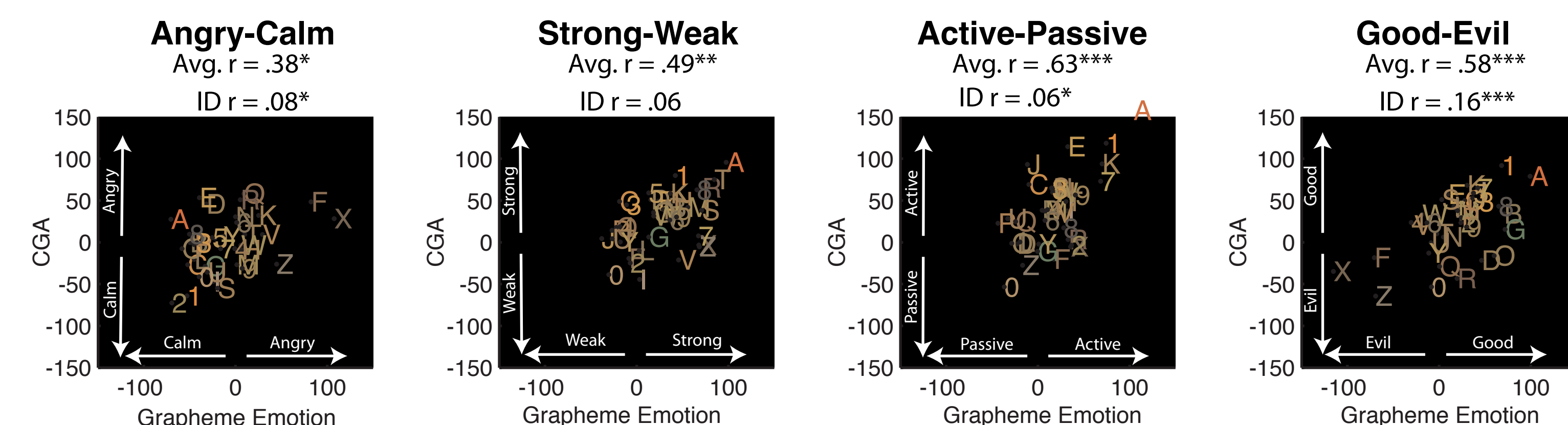
$$C_D = (5c_{1,D} + 4c_{2,D} + 3c_{3,D} + 2c_{4,D} + c_{5,D})/5$$

$$I_D = (5i_{1,D} + 4i_{2,D} + 3i_{3,D} + 2i_{4,D} + i_{5,D})/5$$

$$CGA_D = C_D - I_D$$



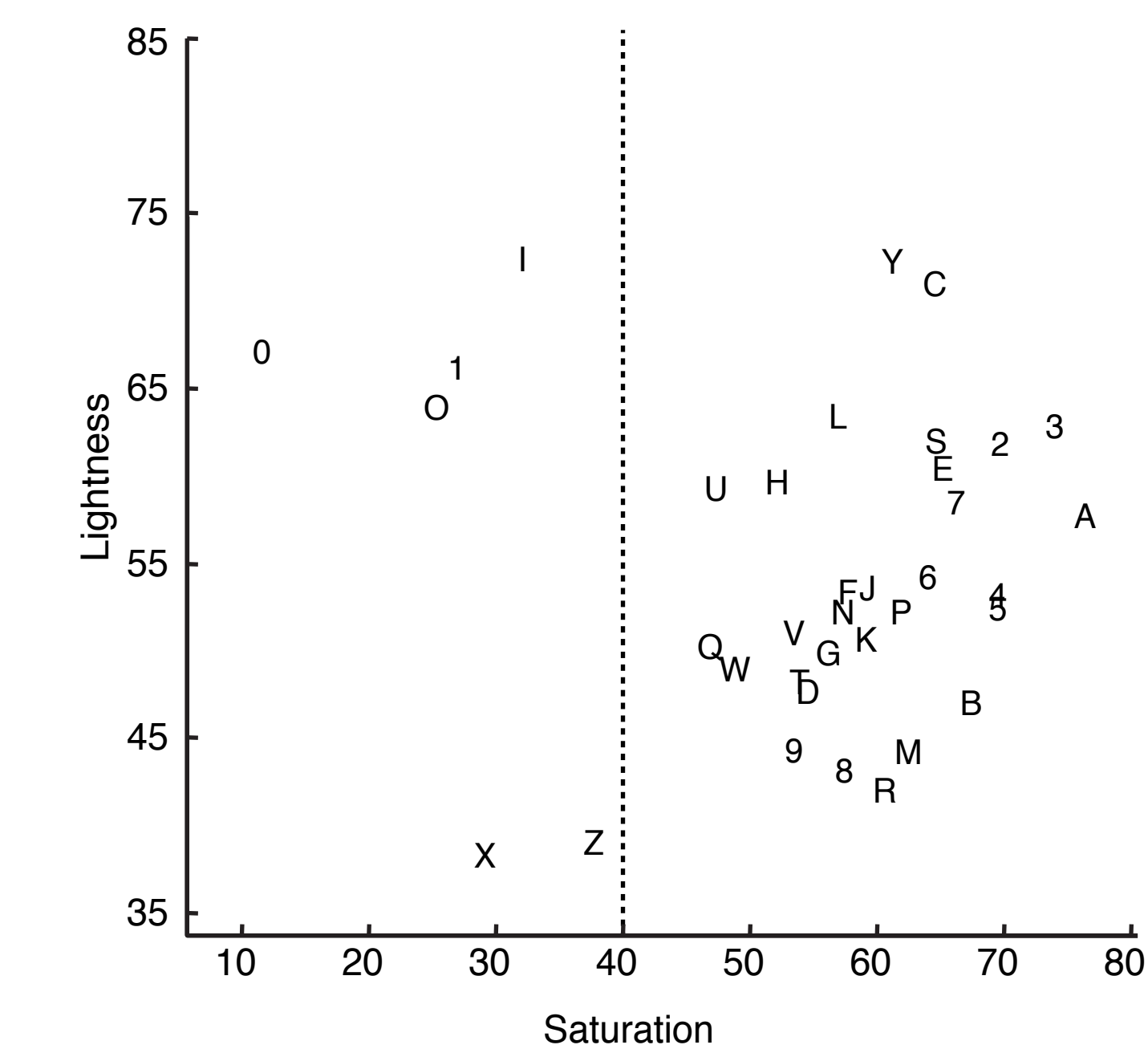
In non-synesthetes, colors are associated with graphemes that share similar emotional content (e.g., happy graphemes are associated with happy colors).



Similarities Among Non-synesthetes and Synesthetes

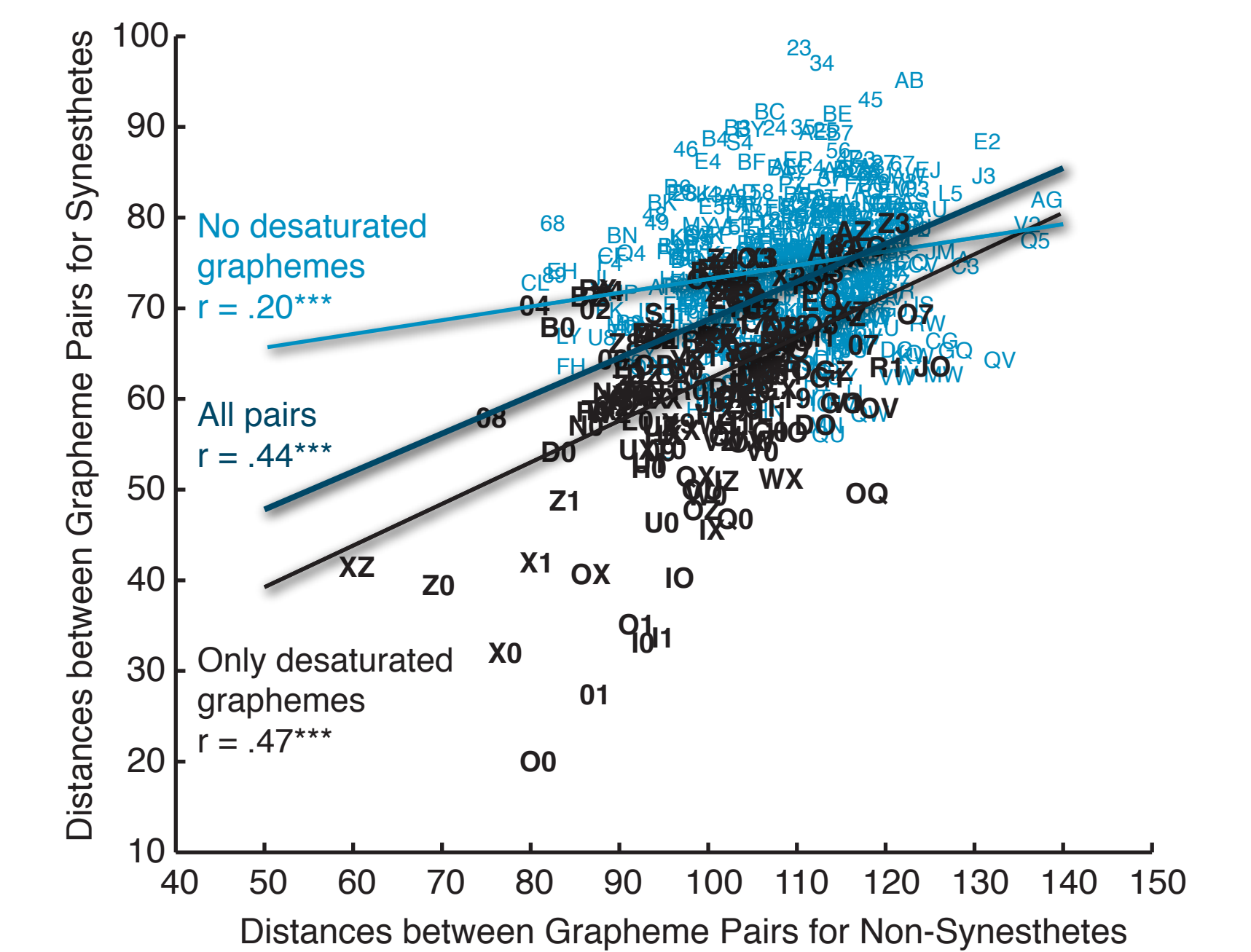
Eagleman (in preparation) showed that, although synesthetes have idiosyncratic color-grapheme pairings, the distance between pairs of graphemes is correlated across subjects. Do non-synesthetes show similar effects (i.e., correlated distances for grapheme pairs)?

Saturation and Lightness of Graphemes Among Synesthetes (Eagleman, in prep)



For synesthetes and non-synesthetes, graphemes have similar saturations ($r = .58***$) and lightnesses ($r = .49***$).

Average Distance (CIELAB) between Each Pair of Graphemes for Synesthetes vs. Non-synesthetes

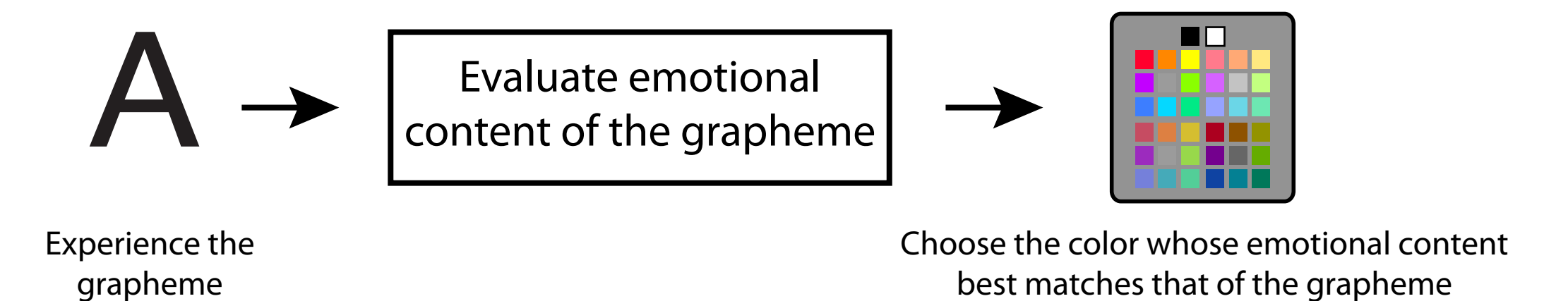


Graphemes that are associated with similar colors among synesthetes and non-synesthetes tend to be the “desaturated” (grayish) graphemes

Conclusions

As predicted by the Emotional Mediation Hypothesis:

There is a clear mapping between the emotional content of graphemes and the emotional content of the colors chosen to go with those graphemes in non-synesthetes.



Although there are large individual differences in color grapheme associations among both synesthetes and non-synesthetes, there are shared systematic effects of saturation and lightness among both groups.

Future research: Does the emotional mediation hypothesis hold for synesthetes?

References and Acknowledgements

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