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English 1010

Period 5

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Synthesis Chart

- Article 1: Survival of the Synesthesia Gene: Why Do People Hear Colors and Taste Words?
    - “Synesthesia is a condition present in 2%–4% of the population [1] in which a sensory stimulus presented to one modality elicits concurrent sensations in additional modalities [2].”
    - Previous studies examining the prevalence of synesthesia found a significant gender gap with a 6∶1 ratio of female synesthetes to males, leading to the suggestion that synesthesia was an X-linked condition [23]. However, prevalence studies conducted using random sampling have shown an even distribution of synesthesia among the genders, suggesting the discrepancy was based on methodological flaws and self-report biases in earlier studies. Subsequent research on the genetics of synesthesia has unfortunately not clarified which genes underlie the phenomenon.
    - Long-standing evidence has also demonstrated that hallucinogenic drugs can cause synesthesia-like experiences (for a review see [30]), suggesting

the neural mechanism is present in all or many individuals but is merely suppressed.

    - Daniel Tammet used his synesthesia to memorize pi to 22,514 digits and Luria [33] described an individual ("S") with a prodigious memory based largely on using synesthetic associations evoked by the items to be memorized.

- Article 2: Geminate consonant grapheme-colour synaesthesia (ideaesthesia)
    - Thus, grapheme-colour synaesthesia is a neurological condition comprising a sensation of colour which occurs simultaneously with viewing graphemes (letters or numbers); the association between a grapheme and a colour is specific, with graphemes corresponding to a specific colour that is largely unchanged throughout the synaesthete's life [6–8].
    - A 55 year old right-handed male presented with a lifelong history of grapheme-colour synaesthesia in which the double letters "ll" (e.g. in the words "will", "silly") are both equally perceived in a vivid blue colour. When the letter "l" is presented singly (e.g. "colour"), it is not seen as blue; when a word contains two "l" letters separated by another letter (e.g. lily), neither "l" is seen as blue. He describes the colour blue as being on the page, rather than existing "in his mind's eye".
    - The patient reports a font-specific influence upon his synaesthesia, as has been previously described by Ramachandran and Hubbard [2]. For sans-serif fonts (Arial, Calibri, Helvetica) the "ll" grapheme is seen with

light blue shadows; for serif fonts (Garamond, Georgia, Times New Roman) both of the “l”s are seen entirely in a more vivid darker blue colour.

    - To assess the dynamic limits of his grapheme-colour synaesthetic phenomenon, we exposed the patient to presentations in which the “ll” grapheme rotated smoothly, or morphed into other characters, or disappeared abruptly. Rotating the letters and morphing them into another character both caused an abrupt change in colour due to the change or failure in letter identification.

- Article 3: What is synesthesia?
    - Synesthesia is an anomalous blending of the senses in which the stimulation of one modality simultaneously produces sensation in a different modality.
    - The estimated occurrence of synesthesia ranges from rarer than one in 20,000 to as prevalent as one in 200.
    - Synesthetes report having unusually good memory for things such as phone numbers, security codes and polysyllabic anatomical terminology because digits, letters and syllables take on such a unique panoply of colors.
    - For lexical synesthetes, these words take on unique colors. When the synesthetic color matches the ink color, responses are fast. But when the synesthetic color mismatches the ink color, responses are slow,

presumably because subjects need to resolve the conflict over which color name to respond with.

- Article 4: Synaesthesia, Color Terms, and Color Space
    - . In this article, we show that grapheme-color synaesthetes make nonrandom associations that are best described by an understanding of color language, and that different measures of such associations converge to illustrate a nonarbitrary relationship for all people between color names and color space.
    - We showed that high-frequency graphemes tend to be paired with high-frequency color names (e.g., ared) in verbal reports of synaesthetic associations. Beeli et al. measured the hue, saturation, and luminance (HSL) of synaesthetic colors and showed (inter alia) that grapheme frequency was correlated with the colors' saturation.
    - We converted the synaesthetic color choices from the graphemecolor synaesthetes tested by Beeli et al. (their Fig. 1) into the 11 irreducible color terms from Berlin and Kay (1969; i.e., black, white, red, yellow, green, blue, brown, orange, purple, pink, and gray).
    - However, the precise relationship remains unclear because the precise function of saturation for the synaesthetes Beeli et al. tested is itself uncertain. Beeli et al. reported a strong negative correlation between grapheme frequency and saturation for digits (consistent with the negative

correlation we found between color-term frequency and saturation), but a slight positive correlation for letters.

- Article 5: Components of Attention in Grapheme-Color
    - A small minority of people report a consistent and automatic experience of non-physical color when presented with a grapheme. These people are called grapheme-color synesthetes, and the experience of synesthesia is described as concurrent (the subjective colors) to inducing stimuli (the graphemes).
    - Less is known about the processing of stimuli, colored either congruently or incongruently, with synesthesia. Studies of grapheme congruence/incongruence effects using physically colored letters have primarily used synesthetic versions of the Stroop-task [20]. In such tasks observers are presented with a grapheme, which is colored either congruently or incongruently with regard to their synesthetic experience, and they name the color of each grapheme as quickly as possible (e.g. [21–25]).
    - To return to the terminology introduced at the beginning of the article, the presented TVAparameters may be placed into three categories of cognitive processing. The period from stimulus presentation to t0 is determined by the pre-processing stage, where the physically determined sensory imprint is being integrated by spatiotemporal filtering.

    - In case of faster processing of synesthesia congruent graphemes, it is important to be able to discriminate between an absolute increase or decrease in processing, and a more selective allocation of resources. Under the assumption that processing capacity is a finite resource [33, 60], there are various ways of of selectively allocating resources via attentional filtering. Unique features; such as color, orientation, size and motion are filtered very efficiently [66].
- Article 6: Grapheme-Color Synesthesia Influences Overt Visual Attention
    - A 20-year-old man with grapheme–color synesthesia (D. E.) participated in the approximately 1-hr free-viewing task. As well, a 23-year-old woman with grapheme–color synesthesia (K. S.) participated in the same 1-hr freeviewing session. Six nonsynesthetic students from the University of Waterloo served as yoked controls for each synesthete (i.e., they were presented with exactly the same letter displays in the same order, and were required to perform the same task as the synesthete to whom they were yoked).
    - For the free-viewing task, participants were instructed to view each display until they believed they had seen everything on the display, and that they could view the displays for as long as they wished. Participants were further instructed to press a button when they were finished viewing a display and ready to proceed to the next display. In order to ensure a similar mean viewing time to that of D. E. and K. S., nonsynesthete

participants were also instructed to attempt to view the displays for at least 8 sec, on average, but to do so without counting the time in their heads

- On trials in which the target was present, the congruity bias was predicted to influence response times. That is, when searching through a display of congruent and incongruent stimuli, synesthetes should be biased to respond more quickly to congruently colored targets relative to incongruently colored ones.
- Namely, the synesthetes could have employed a simple color search strategy. Recall that prior to search trials, participants were shown an achromatic target letter that indicated the goal of the upcoming search. Synesthetes could have noted the color of their photism for the target and simply looked through the display for the video color that best matched the color of their photism for the target item