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THE PERCEPTUAL EXPERIENCE OF SYNESTHESIA IN ROMANIAN CULTURE

Case Study

Keywords
Personality,
Synesthesia,
Perception,
Culture,
Group

Abstract

The article presents an experimental analysis of perceptual experiences related to the music –color synesthesia and grapheme – color synesthesia in Romanian culture. The data have showed significant differences in the occurrence of the synaesthetic perceptions experienced by participants depending on group'size, gender and the two forms of synesthesia. The experimental sample consisted of 67 Romanian participants. Further, limits and implications of the research were discussed.

OVERVIEW OF STUDIES

Synesthesia has been described as a "merging of the senses", with more than 100 different manifestations reported depending on what is "merged": sound with color; taste with shape; touch with smell, sound with touch, color with smell, and so on.

Each manifestation of synesthesia unites a different pair of modalities. It is well known that many of us have had the experience of unusual associations between our senses and our memories since childhood. For example, in literature, we remember the sensory experiences of the main character in the novel "In Search of Lost Time," namely the taste of a cake and the profoundly emotional associations in his emotional memory, which expressed the memories of his childhood.

Synesthesia is characterized as a condition in which a sensory or cognitive input gives rise to atypical output. For example, you see a cake, and this gives rise to a sensation of sunshine. Or you see a black letter and you taste an orange fruit. Associations between memories and sensory experience are normal, but about 6-7 % of the population experiences a condition called synesthesia in which normal sensory experiences – like reading, talking, or listening to music – cause them to experience additional unusual and unrelated sensations.

Because of the automatic nature of synesthesia and its test-retest reliability, color synesthesia is not to be confused with memory associations or stereotypical colors of objects. For example, there is no evidence that color synesthetes simply remember the colors of entities or images they were exposed to earlier in their lives or associate stimuli with their stereotypical colors.

According with Hubbard and Ramachandran (2005, p. 509) "Synesthesia is a condition in which stimulation of one sensory modality causes unusual experiences in asecond, unstimulated modality".

One of the best-known forms of color synesthesia is grapheme-color synesthesia, in which numbers or letters are seen as colored. But a lots of other forms of color synesthesia have been identified, including temperature- color, week-color synesthesia, sound-color synesthesia, taste-color synesthesia, fear-color synesthesia, etc.

In the emergence of perceptual experiences involving synesthesia, a very important role is played by genetic factors.

The inheritance of synesthesia initially appeared to be linked to the X chromosome because more females seemed to be affected than males. So, in 1996, Baron and his colleagues argued that there were six times more female synesthetes than male synesthetes (Baron-Cohen et al., 1996).

Asher et al. (2009) have conducted the first whole – genome scan for susceptibility genes linked to synesthesia. This study was conducted in a sample of 196 individuals who experience color synesthesia triggered by sounds and / or by spoken words (auditory-visual synesthesia) from 43 multiplex families. The research sample included two families reporting male-to-male transmission of synesthesia. Before starting the genome scan, the authors confirmed the power of this sample to detect a major gene effect via computer simulations. The results showed evidence of linkage to chromosomes 2, 5, 6, and 12: 2q24, 5q33, 6p12 and 12p12).

From a neurological point of view synesthesia is a neurodevelopmental condition characterized by anomalous sensory perception and associated alterations in cognitive function due to interference from synesthetic percepts. For synesthetic person, a stimulus in one modality triggers an automatic, consistent sensation in another modality. For example, sound triggers the perception of color (Baron-Cohen, 1996; Ward et al., 2006; Simner, 2012). For many synesthetic people, the synesthetic experience crosses modalities (e.g. temperature-to-color) while for others, the inducer and synesthetic concurrent occur in different facets of the same modality (Asher & Carmichael, 2013).

Studies also show that anomalous activation occurs in brain regions involved in color processing when color- experiences synesthetes are exposed to synesthetic triggers. For example, in 'colored-hearing' synesthesia, individuals report color experiences when they hear spoken words (Nunn et. al, 2002). If the synesthetic color experience resembles that of normal color perception, one would predict activation of parts of the visual system specialized for such perception, namely the human 'color center', referred to as either V4 or V8 (idem). Using functional magnetic resonance imaging (fMRI), the authors located here the region activated by speech in synesthetes to area V4/V8 in the left hemisphere, and demonstrate overlap with V4/V8 activation in normal controls in response to color. Also, "no activity was detected in areas V1 or V2, suggesting that activity in primary visual cortex is not necessary for such experience. Control subjects showed no activity in V4/V8 when imagining colors in response to spoken words, despite overtraining on word-color associations similar to those spontaneously reported by synesthetes" (Nunn et. al, 2002, p. 371). According to the authors, hearing words compared with tones showed in the experiment no. 1, in both synesthetes and controls, activation of language areas of the perisylvian regions: superior temporal gyrus bilaterally, and left inferior frontal gyrus (idem). Synesthetes showed additional activation in the color-selective region. The authors have compared this to that elicited by color (colored versus monochromatic 'Mondrians') previously reported in normal subjects. The only significant overlap was found by the authors in the left fusiform gyrus, with

coordinates closely similar to those reported as V4 or V8 (idem) .
Although many synesthetes report their synesthesia to be neutral or even pleasant, there are studies which indicates that the simultaneous perception of normal and synesthetic percepts can result in perceptual and cognitive dysfuntion, with particulary strong effects on linguistic processing (Mattingley et. al., 2001) and numerical processing (Green and Goswami, 2007).
Every synesthete is unique. One synesthete would, for example, describe the days of the week in colors; another synesthete would experience orange color for specific musical chords or even some synesthetes will experience orange color when they are feeling certain body pains.
A very good example of this is the artist, writer, and synesthete Carol Steen (2001). She has experienced synesthesia for as long as she can remember, perceiving colors in numbers, or letters when hearing certain sounds. In a lecture held about one of her paintings (Runs Off in Front, Gold, 2003, oil on paper, 105 x 70cm), she said: "This is based on an especially colourful photism that occurred while I listened to Santana's version of a song called Adouma.The colours I see are the colours of light, not the colours of pigment, and I played this song over and over again as I painted the moving colours. The advantage of sound visions, or photisms as the researchers call what we synesthetes see, is that I don't have to rely on my memory. I can replay the song as often as I want to watch the colours" (McDonald, 2006, p.77).
For grapheme-color synesthesia, synesthetes are very particular about their letter-color combinations, and will firmly disagree with one another about which color a letter should be (Cytowic, 1995; Ramachandran & Hubbard, 2001; Day, 2011; Simner et. al, 2005).

PURPOSE

The current study aimed to advance our understanding on the relationship between the music-color synesthesia, grapheme-color synesthesia, characteristics of the experimental group and personal characteristics of the participants such as their gender .

Hypothesis

1. The author assumed that there are significant differences between grapheme-color synesthesia, considering the gender of the participants.
2. The author assumed that there is a significant positive correlation between the frequency of expression for grapheme- color synesthesia and music- color synesthesia.
3. The author assumed that the group' size influences the frequency of occurrence for the two forms of synesthesia.

MATERIALS AND METHODS

The experimental sample consisted of 67 adult Romanian subjects (33 male, 34 female). For choosing a valid experimental sample in pretest situation, the researcher gathered participants who experienced at least two forms of synesthesia. The experiment was conducted according to the ethical and deontological rules presented in Deontological Code of the Psychologist, from Romanian Psychologists Association. Prior to conducting the experiment, participants were informed about the purpose of the study and also they have agreed to participate in the experiment.
The author has used a between-subject design - under three conditions of the independent variable: the participants were asked to describe their sensory experiences of synesthesia in a group of 30 participants who have interacted each other (the first level of the independent variable); in a group of 10 participants (the second level of the independent variable); the participants were alone in the laboratory room (the third level of the independent variable). As an auditory stimulus, the participants have listened for 20 minutes to the piano song "Winter" by American singer Tori Amos. For the first 10 minutes, the participants have listened to the audio track, then in the next 10 minutes the participants have watched the video of the song. Subsequently, they were asked to describe the experiences which they had during the experiment, using response sheets that measured the frequency of color-music synesthesia and grapheme- color synesthesia. Also, the participants were asked to describe other possible forms of synesthesia they have felt listening the audio / video song.
For testing the research' assumptions we have used several statistical methods (MANOVA) processed in SPSS 23 program.

RESULTS AND DISCUSSIONS

Regarding the two first dimensions of synesthesia, (music-color synesthesia and grapheme-color synesthesia) the author hypothesized that there are significant differences between them, considering the gender of the participants. (Hypothesis no. 1). The data have showed no significant differences between participants considering the influence of gender ($F = 0{,}007$; sig. = 0.093; partial eta squared = 0.000) on music- color synesthesia and grapheme-color synesthesia ($F = 0{,}385$; sig. = 0.537; partial eta squared = 0.006). Also, the correlation between the two dependent variables was significant at $p<.001$,

the correlation is medium (r = 0.499; p<.001). This results invalidated Hypothesis no 1. The author had assumed that the null hypothesis according to that the error variance of the dependent variable is equal across groups through Levene's Test of Equality of Error Variances (see table no. 2); so, for Music-Color synesthesia values (F = 0.294; sig. = 0. 746) and Grapheme-Color synesthesia (F = 4.026; sig. = 0. 023), the values are insignificant, which allowed to interpret the data from an experimental perspective.

For the assumption no. 2, the results have showed a significant correlation between the expression of grapheme- color synesthesia and music- color synesthesia (r = 0.499; p<.001). So, it is very likely that the most participants of the experiment have expressed both forms of synesthesia; also, the data from descriptive statistics (table no. 1) showed a much higher mean of music-color synesthesia, (mean= 5,46) compared to grapheme-color synesthesia (mean = 1,79).

Referring to the assumption no. 3, the data have showed that the size of the group do not influences the frequency of occurrence for one form of synesthesia, namely the color – music synesthesia (F = 0,911; sig. = 0.407; partial eta squared = 0.028); so, there is an insignificant influence of the group' size (as independent variable) on the frequency of color-music synesthesia. Regarding the relationship between the group size (as independent variable) and the frequency of grapheme-color synesthesia, the data have showed a significant result, but the effect size partial squared eta) is very poor (F = 3,346; sig. = 0.4042; partial eta squared = 0.096). So, hypothesis no. 3 has been partially confirmed. Figure 1 shows an increased frequency of music-color synesthesia, where the participants have experienced their synesthesia in a group of 10 subjects.

LIMITATIONS AND FUTURE CONSIDERATIONS

As for the limits of this study, the author identified the following issue: the group' size of the experimental sample was small; in order to increase the validity of the obtained results, the author believes that more studies are needed in the future, having similar research objectives on the relationship between the two forms of synesthesia and other particularities, such as the size of the group in which the experience of synesthesia is verbalized by the participants.

CONCLUSION

Synesthesia and its forms require a more in-depth study in the future. From the results we have obtained, it seems that this cognitive phenomenon can be influenced to a small extent by social factors such as the size of the group in which synesthesia is verbalized, especially for a rare forms such as grapheme-color synesthesia.

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APPENDICES

Table no 1. Descriptive statistics for the two forms of synesthesia

	Mean	Std. Deviation	N
Music-color synesthesia	5.46	2.464	67
Grapheme-color synesthesia	1.79	1.213	67

Table no. 2. Levene's Test of Equality of Error Variances

Levene's Test of Equality of Error Variances

	F	df1	df2	Sig.
Music-color synesthesia	.294	2	64	.746
Grapheme-color synesthesia	4.026	2	64	.023

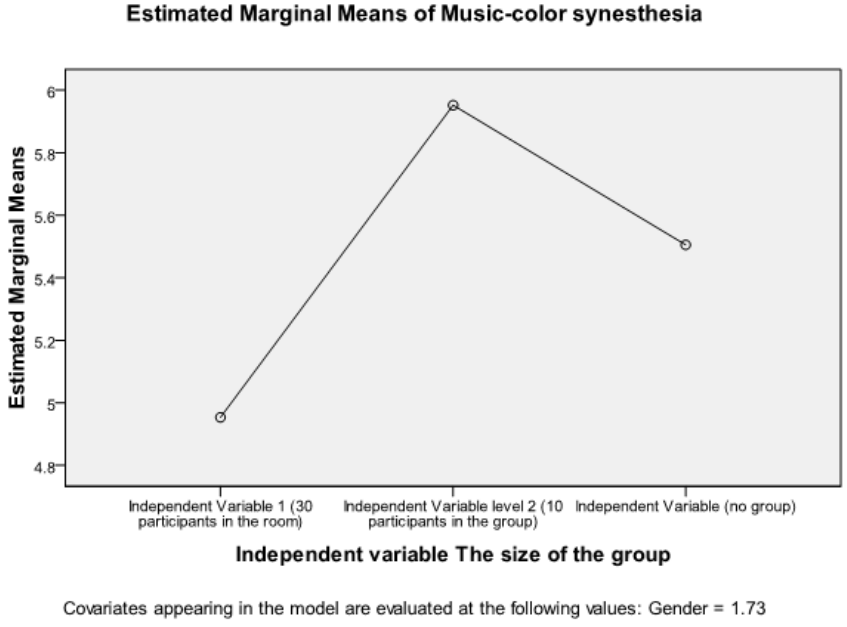

Figure no 1. Music- color synesthesia across the three values of independent variable (the siye of the group)