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Lynn K. Goode
Synesthesia: A Sixth Sense or
a Sensation?

ABSTRACT

Synesthesia is a peculiar neurological phenomenon that occurs when two senses combine. For example, seeing the colors of words, letters, and music or feeling the shapes of tastes and smells are types of synesthesia. Persons who experience these sensations are called “synesthetes.” I am one of a small percentage of the population who “see” language in color. Although writers, poets, and artists have historically intertwined color and language in a metaphoric way, letters and words literally appear in my mind in a color-coded sequence. While synesthesia is an involuntary, sometimes disruptive process for those who experience it, most synesthetes cannot imagine living without the phenomena.

My research was undertaken by means of a constructed survey of persons with synesthesia to examine how the condition has impacted each subject’s life in terms of aversion to different colors related to traumatic incidents, physical and/or mental illness, psychotropic interventions (such as SSRI drugs), prevalence within gender, and color coded-memories. The paper discusses how medical and mental health professions can better understand the association between colors and the emotional effects pertaining to a particular color if it is associated with an unpleasant memory or traumatic event.

Lastly, because Synesthesia is defined as a cross-firing in the nervous system, a small portion of the survey asked participants to disclose if he or she had any neurological conditions that were prevalent within synesthesia population.

SYNESTHESIA: A SIXTH SENSE OR A SENSATION?

A research project based upon interviewing persons with color synesthesia, submitted in partial fulfillment of the requirements for the degree of Master of Social Work.

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2010

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CHAPTER I

INTRODUCTION

The word "synesthesia," sometimes spelled "synaesthesia," is a hybrid of Latin and Greek: the Latin syn- (together) combined with -esthesia, from the Greek aisthesis (sensation or perception). An individual with synesthesia experiences a neurological sensation in which some of the normal senses are not separate but seem to be cross-wired (Hanlon, R.E, 1991). Sight may commingle with sound, for example, or taste with touch. When a digit-color synesthete sees or merely thinks of a number, the number will appear with an overlay of color. The color of a particular number never changes and invariably appears involuntarily. Further, synesthesia can take many forms. A synesthete may perceive the taste of chicken as a pointed object. Other synesthetes "hear" colors, and a small number of synesthetes may have several senses cross-wired.

In her memoir *Blue Cats and Chartreuse Kittens*, Patricia Duffy writes of living with color-infused letters. She recounts an afternoon when she and her father were reminiscing about the day she learned to write the alphabet; she spontaneously described to him her realization,

To make an R, all I had to do was first write a P and then draw a line down from its loop. And I was surprised that I could turn a yellow letter into an orange letter just by adding a line. (Duffy, 2001, p. 1)

Duffy revealed to her dismayed father that she had involuntarily seen and heard color throughout her entire life. Her memoir addresses many curiosities that most synesthetes yearn to uncover: why everyone doesn't have the same sensual experience

and what happens to the small percentage of the population who has been either blessed or cursed with this commingling of the senses.

Like Duffy, I recall the day I became aware that the majority of mankind did not experience a technicolor world of the senses. I was in my early teens, sitting with a group of friends, when I naively asked one friend if he thought it was odd that his last name (White) was not the color white, but instead a grayish-brown. The group laughed derisively, believing that I was joking. In defense, I told each of them what color his or her name appeared, but was astonished to discover that no one else combined the alphabet with colors.

I learned of Patricia Duffy's book thirty years later from my writing professor when I wrote a narrative about my mother's death. I immediately ordered it, needing a name, an explanation or causation for seeing colors in my head.

Certain colors represent joy in my mind, others represent anxiousness, but merely all emotions are coded with a color. Curiously, from seeing or hearing a particular color of sea-foam green, I used to feel mild distress. Fortunately, only one letter combination of the alphabet is sea-foam green in my mind's eye, the letters "th". Oddly, it is also the color of "therapy" (and "thesis"). In my synesthesia lexicon, all other words that begin with only a "t" are more a greenish-blue color in my head, not sea-foam green.

Some years ago I was sitting in my therapist's office working through the grief I experienced after my mother's death. The therapist was wearing a sea-foam green top that triggered a memory of my mother. I painfully recalled that, along with my older sister, I had been awakened from a deep sleep to assume the responsibility of talking my mother out of an attempted suicide. The memory was sea-foam green because it was the

color of the bathroom in which she had locked herself. My father's cries for help in "saving" Mom from taking a handful of Valium were intertwined with the memory. In reality, my mother did not die until I was nearly fifty years old. I was at her bedside in a sea-foam green room while she lay dying, but it was not her bathroom described above. Instead, she died in a hospice room painted that very same color that led me to believe that some palliative decorator must have believed sea-foam green to be a soothing color.

I spent nearly a year in therapy unraveling the color-coded trauma. My therapist was intrigued by my synesthesia and we discussed the memory until sea-foam green was no longer painful or disturbing. To add to the irony of the color-coded memories, my kaleidoscopic world of colors was muted by the anti-depressant Prozac the therapist had prescribed after my mother died. In a gothic twist of fate, I learned Prozac, a two-toned capsule, is sea-foam green at one end and goldenrod yellow at the other. My name (Lynn) is goldenrod yellow.

After returning to graduate school to study clinical social work, it became evident that synesthesia was not mentioned in any course of study. I was not anticipating that synesthesia would be a disorder listed in the DSM IV, but I was scanning references for research that actually clarifies the difference between a neurological and/or psychological sensation with a disorder. I found no distinction in the literature I reviewed. However, in one alarming article, another form of synesthesia known as spatial –sequence synesthesia, was referred to as a form of autism. Vieru (2009) refers to those that have the phenomena as "sufferers", and that the medical community in general is still largely unaware of Synesthesia. In his on-line article for the Science Monitor, Vieru (2009, ¶ 1) wrote:

Synesthesia, as a medical condition, tends to split people right down the middle. Some of those who have this form of autism say that they wouldn't get rid of it even if they could, while others would gladly do so if given the chance. Those suffering from spatial-sequence synesthesia (SSS) have one more reason to appreciate their condition – a new study has revealed that SSS allows for superior memory formation and storage inside the brains of people who have it.

In certain cultural settings, some clinicians believe that having synesthesia is grounds for a commitment to a mental institution. Sadly, in countries such as Japan, psychiatric specialists will probably diagnose a self-disclosing adolescent as schizophrenic, although in most regions of the world today – including the United States and Canada – even though the AMA and APA both proclaim synesthesia to be totally benign (Day, 1998).

If synesthesia is, as some reports indicate, believed to be present in 1 out every 200 people, the awareness and education of synesthesia should be brought to the attention of clinicians.

CHAPTER II

LITERATURE REVIEW

Historical Overview

Interest in synesthesia has been enormously revived over the last twenty years. It is not a novel topic --- scientists were aware of it as a “disorder” as far back as three centuries ago (Coriat, 1913). Richard Cytowic, a researcher who has written numerous articles on the subject, believes medicine keeps forgetting what it already knows (Cytowic, 2002). In other words, after decades of setting synesthesia research aside, neuroscience has now become interested in what synesthesia can tell it about the relationship between reason and emotion.

Cytowic’s research is partly due to his singular interest; he is also a synesthete.

He writes,

It is aphorismic that nature reveals herself by her exceptions. Since our intellectual baggage includes deeply-ingrained historical ideas about normative concepts of mind, synesthesia not only flaunts conventional laws of neuroanatomy and psychology, but even seems to grate against common sense. (Cytowic & Wood, 1982, p.38)

Experience and Emotions

He further argues that synesthesia, by definition, cannot be put into words but is instead a lived experience. However, if synesthetes intertwine reason and emotion as he suggests, then perhaps it is possible to delve into the emotional aspects of the sensation by surveying a number of people with regard to traumatic memories and whether they are coded or triggered by chromatic variables. In joining the bandwagon that synesthesia has

extra-sensory components, Cytowic (1995) also cites a high frequency of unusual experiences such as déjà-vu, clairvoyance, and premonitions attributed to synesthetes. Further, Cytowic's research has led him to believe that the limbic system is primarily responsible for synesthetic experiences. The limbic system includes several brain structures primarily responsible for regulating our emotional responses.

Maladaptive or a Gift?

Dr. Simon Baron-Cohen, a researcher at the University of Cambridge, U.K., posits that synesthesia could be a breakdown of modularity and questions why senses could be modular (Baron-Cohen, Harrison & Goldstein 1993, p.423). He uses a single case model as an example, but substantiates his findings by stating that he has tested the patient over a number of years and that her findings are consistent over time. By virtue of examining a single subject, Baron-Cohen explores a possible maladaptive aspect of synesthesia because his subject not only experienced seeing colors with sound but “suffers from the reverse” of hearing sounds when seeing a color. (Baron-Cohen, Wyke, & Binnie 1987, p. 4). He concludes that the genuineness of his patient’s synesthesia has led to a massive interference of stimuli, inclining her to social withdrawal. Baron-Cohen does not describe whether any therapeutic or medical interventions were administered to his subject, but his conclusion suggests that there are possible emotional impacts of the synesthiac mind, especially if the emotion is triggered by a certain color or colors.

The renaissance of research into synesthesia has produced numerous articles, studies, and recordable physical evidence that grapheme, the color form of synesthesia, once regarded as a rare neurological deviation, is now thought to be present in 1 out of every 100 persons. Dr. Isodar Coriat, who wrote an early 20th century article about

abnormal psychology, posited that synesthesia was not an emotional state, instead a physiological condition (Coriat, 1913, p.42). His conclusion, as was Baron-Cohen's, is based on studying a single subject, a woman, who he diagnosed as having a neurotic condition after she described her synesthesia to him.

Recently, Dutch scientist Cretien Van Campen's fascination with synesthesia led him to conclude that synesthesia does, in fact, produce discernible activation on MRI imaging. Van Campen (2008) writes, "Although brain scan studies have shown that synesthesia is the result of a neurological aberration, few synesthetes find their experiences to be disabilities in their daily functioning" (p.156).

Van Campen, a non-synesthete, was further interested in learning what the significance of having synesthesia is in the daily life of a synesthete. His enduring curiosity propelled him to meet with a number of synesthetes to understand what, if any value, synesthesia has in the daily functioning. He concluded that synesthesia was a "hidden sense".

In the *article Tangled Wires: Conceptualizing Neurological and Cultural Explanations of Synesthesia* (McGrath, 1998), explains several traits found in synesthetes indicate that they may have one cerebral hemisphere which dominates. Synesthetes are more often non-right-handed than non-synesthetes. They also exhibit tendencies toward being very neat and organized and also have particularly good memories. Many researchers attribute this skill to the manner in which synesthetes perceive senses combined. However, synesthetes often have noted deficiencies in mathematical skills and in with a sense of direction.

In an article written in 2006, Christine Cadena wrote a generalized description of synesthesia in which she refers to synesthetes as “suffering”. Cadena is obviously not a synesthete, yet she believes that individuals who have the trait are stricken with a suffering condition. Her article reinforces that identifying with synesthesia can create stigmas and misperceptions of the population who experience the sensation. Cadena (2006, ¶ 1) writes:

For patients suffering from a condition known as synesthesia, these sensory experiences are very real. Defined as a condition in which the senses are undifferentiated, synesthesia is more common among females with a 6:1 ration when compared to males. Additionally, the condition is believed to strike as many as 1 in 2,000 people and is believed to be genetic with left-handed individuals more commonly impacted than right-handed. What is important to note is that synesthesia is not considered a disease and most individuals with the condition carry an above average intelligence level and do not demonstrate any greater level of mental disorders. Of interesting note is the common thread that most synesthesia individuals are highly creative and generally pursue careers in the arts.

Sifting through past research, the statistics of synesthesia vary from 1 in 100 to 1 in 10,000. The actual number appears to climb each year as Synesthesia becomes more recognized and discussed within the media. According to Dr. Sean Day, Director of the American Synesthesia Society, the incidence of synesthesia is thought to be more prevalent within the general population than previous studies have revealed.

Implications of the Sensation

Standing on the shoulders of the pioneering research, my research primarily concentrated on the emotional aspects in the life of a synesthete. If synesthesia is indeed a hidden sense, it seemed plausible to explore whether or not color synesthetes are more inclined to be sensitive to a particular color or colors. And conversely, if colors are emblematic of emotions, how might the synesthete respond to colors that are disturbing?

And if the colors are unconsciously disturbing because of a traumatic event---how would a synesthete respond to therapeutic treatment in a room that is emotionally repulsive?

Dr. John Harrison, a principal consultant with the Cambridge Psychometric Consultants and an honorary research psychologist at the Radcliffe Infirmary at Hartford, discusses what he refers to as the BBC (brain, behavior and cognition) in his book *Synaesthesia: the Strangest Thing*. Harrison (2001) states that “mental processes are collectively referred to as cognition. Because they are unobservable, but resonate with our intuition, we infer their existence” (p. 10). From Harrison’s understanding of cognition, a synesthete’s behavior would be processed differently than an individual who does not process color cognitively.

One popular theory is that there are extra neural pathways in the brain of a synesthesiac that cause a removal of inhibition. Most theories include some kinds of cross connectivity in the nervous system, but research has been inconclusive. Muiris Houston wrote a very recent article for the Irish Times on the subject of connectivity and the inhibition of senses. Houston (2010, ¶ 5) states:

Aristotle formulated the idea that each of the five senses – smell, taste, touch, hearing and sight – had its own proper and distinct sphere of activity. And while synaesthesia was first described in the journal *Nature* 126 years ago, its study was hindered for almost a century by the absence of tests to verify the phenomenon.

Now the authenticity of synaesthesia has been confirmed by functional magnetic resonance imaging of the brain. It seems to reflect crosstalk between normally separated brain areas, so that activity in one area triggers activity in another. Whether this crosstalk results from increased physical connectivity between areas or a slight imbalance of inhibition and excitation is unclear. The results of one study suggest that parts of the brain normally used to process colour derived from vision are used instead to process colour derived from speech.

Neurological Causes

Whatever the cause, synesthesia has experiential components that remain intriguing and under-investigated. For example, if synesthesia is a neurological cross-firing prevalent in a larger sector of the population than previously believed, clinicians should be alerted to any implications that might incite traumatic responses in the synesthete. For example, if a person with synesthesia associates the name of a perpetrator of a crime with the color orange, would a therapist who wore an orange shirt or a clinic room with painted orange walls create an uncomfortable setting in which to receive treatment?

Grossenbacher and Lovelace, two prominent synesthesia researchers, wrote one of the few articles that delved into the psychological aspects of synesthesia by citing another researcher, Larry Marks. Grossenbacher proposes that in the brains of synesthetes, "feed-backward" connections that carry information from high-level multisensory areas of the brain back to single-sense areas are not properly inhibited. Ordinarily, information processed in such multisensory areas is allowed to return only to its appropriate single-sense area. But in synesthetes' brains, Grossenbacher (2001) argues, "that inhibition is disrupted somehow, allowing the different senses to become jumbled" (p. 39).

Grossenbacher and Lovelace were impressed by Yale University psychologist Larry Marks, PhD, who authored a 1975 review of the early history of synesthesia research in the journal *Psychological Bulletin*, the first serious investigation into the psychological implications of synesthesia, after having been ignored as a research topic for nearly a century. Marks (1975) commented (p.306),

Synesthesia taps into a lot of other domains that are more familiar to many psychologists. It tells us something about the nature of perception and what makes things perceptually similar to one another. Synesthesia may help us to understand how the concept of similarity is embedded within the nervous system.

Drug Interactions

Further, the conclusion that synesthesia is maladaptive should be explored further if most synesthetes report pleasure from the phenomenon and cannot imagine living without this extra sense. If SSRI drugs mute the sensation, what effects will the loss of it have on the emotional well-being of persons with synesthesia? While past research has not included clinical testing of larger groups of individuals with synesthesia; most of the existing research has focused on formulating and explaining the cause of the sensation. Recently, Dr. David Eagleman, who along with Dr. Richard Cytowic, co-authored the book *Wednesday is Indigo Blue: Discovering the Brain of Synesthesia* (Cytowic & Eagleman, 2009) began research on the conscious experience of synesthesia at Baylor College of Medicine in Houston. The pinnacle of his study is to determine if certain drugs (recreational and/or prescribed), alcohol, caffeine, cigarettes, emotions (such as sexual excitement), and fatigue affect synesthesia by either enhancement or suppression of the experience. Although their book suggests that Dr. Eagleman's survey of 1,279 verified grapheme-colored synesthetes can only be considered "informal", I met with Dr. Eagleman and his research assistant, Steffie Nelson, in their office at Baylor. Their research team has been collecting MRI data as well as testing synesthetes to learn more about the inter-relatedness of synesthesiac experiences. By virtue of the amount of collected data, their research, while on-going, is better substantiated than the earlier version mentioned in the book.

White Woman's Phenomena?

While sifting through the statistics of individuals who self-identify as synesthetes, the majority of literature suggests that synesthesia is mostly prevalent in white women. Jamie Ward, who has conducted research and wrote the book *The Frog Who Croaked Blue*, conducted a generalized survey that provided an insight into the population of synesthetes. Ward (2008) writes:

In order to find out how common synesthesia is, we conducted an experiment on passers-by at London's Science Museum, and my colleague Julia Simner conducted a similar study on the undergraduate population in Edinburgh, Scotland. As well as asking people whether they experienced color when they saw, heard or thought about letters and numbers, we also devised a computer test in which black letters and numbers were flashed on the screen and people had to choose a color as quickly as possible. Most people chose randomly but those with synesthesia were very reliable in their choice of colors. This enabled us to estimate that this type of synesthesia occurred in one to two percent of the population. A similar result was found in Edinburgh, and the Edinburgh study was also able to consider other types of synesthesia. Colored days of the week were more common than we had originally expected, but we were able to observe less common types such as tasting shapes, and colored music. In total, we were able to identify 22 synesthetes out of 500 students who were initially screened. (p.23)

Art and Synesthesia

There appears to be an abundance of literature on synesthesia that might lead one to assume that most synesthetes are artistic in nature. In 2008, the McMaster Museum of Art in Ontario held an exhibit in which the artworks were made by artists who are self-identified synesthetes. Daphne Maurer (2008), in her essay for the exhibition catalog, posits that "all synesthetes are visual learners, but not all visual learners are synesthetes" (p. 13). She describes artists such as Wassily Kandinsky and Paul Klee and the writer Vladimir Nabokov as known color-coded synesthetes, supporting earlier notions that

color synesthesia is an artistic phenomenon and that the larger populations of humans who are not artistic do not experience synesthesia.

Van Goethe (1810), in his book *The Theory of Colours*, does relate emotional impact with the theory of color, yet he doesn't explore the consequences of any emotional impact. It is fascinating that two centuries ago, the impact of color within emotions was explored, however Van Goethe investigated color theory from an artistic point of view, not a clinical perspective and his statements did not include any human studies.

Still a Mystery

While conventional thinking allows for artists to be eccentric (or a different view of the world), it is premature to believe that a topic that has only recently been of public interest could generate sweeping assumptions that most of the population who self-report as synesthetes are artistic in nature. Instead, it could be an inherent bias inasmuch as the artistic community, through exhibitions and art-related articles, has been exposed to the sensation more often than the rest of the population.

Although synesthesia continues to remain a mystery as to causation, perhaps greater importance and attention should be directed towards determining what clinical interventions or treatment models can be adapted for working with synesthetes who have experienced emotional trauma or who are undergoing emotional distress.

CHAPTER III

METHODOLOGY

Sample

When the survey was completed, the demographic results were startling. All but one participant was white/Caucasian. The one person who was not, identified as Hispanic. No other representatives from any other ethnic backgrounds responded.

Further, of the 51 participants who completed the survey, 46 were female, and the largest segment (39%) was between the ages of 45-65. The disparity in the female to male ratio, as well as the abundance of white/Caucasian participants compounded with the age range is perhaps indicative that this population is the most willing and the most accessible to complete on-line surveys. It was not feasible to survey an entire population in person based on the small percentage of persons who have synesthesia, Further, it was not possible to reach persons who are unaware that they may have the sensation. This was an unfortunate aspect of the survey as it does not reveal actual percentages of the entire sample of synesthetes within the general population. However, as the research was specifically directed at the clinical aspects of synesthesia, I believe that the persons who completed the survey were a reliable segment to survey. Biases were inevitable inasmuch as previous research has revealed that most persons who self-identify with synesthesia are artists who have access to the resources and websites that are intrinsically designed to attract artists, thereby educating that sector of the mass population about synesthesia. It is also plausible that persons who were not fluent with using the internet did not have

access to the survey and that a population who are not necessarily artistic or who are not educated about synesthesia had no guidance to find the survey.

Anonymity was completely assured to the participants by SurveyMonkey.com. The individuals who participated in the qualitative narrative section were asked five innocuous questions asking whether any certain color induces emotional trauma. The narrative section was voluntary and not a requirement for participation in the quantitative section.

There was no existing model or instrument for collecting the data being sought by the SurveyMonkey.com research. Instead, the survey was designed as an exploratory/descriptive research survey to ask about any emotional distress, medically muted synesthesia, and co-presenting neurological disorders or conditions.

The construction of the anonymous survey method was designed to cast into a larger pool of individuals who have synesthesia. For the quantitative section of the survey, at least 50 participants completed the entire survey over a two-month period. Sixty-eight participants entered the site and answered a portion of the questions.

The qualitative narrative questions were specifically formulated to allow the participant to further elaborate on any of the questions that are posted in the quantitative section. This allowed for a deeper understanding of the research materials, and provided an arena for personal accounts should the participant desire to expand the information being gathered.

The coding of the qualitative identified similar and different themes in the narratives using content and theme analysis. The quotations used in the thesis and any

later publications or presentations are carefully disguised so that the identities of the individuals who participated are kept confidential.

The formulated survey was designed in a manner to insure that there were not any unwarranted or gratuitous interpretations of causality obtained. Diversity selections were random and unable to predict, although the survey was constructed of a series of questions that pertain to race, gender, age, socio-economic status, and finally, the age at which the participant became aware of having synesthesia. Because there were limitations with regard to reaching populations who are not aware of what synesthesia is, it is reasonable to assume that possible candidates were excluded who may have synesthesia, but have not found resources to direct them to either the American Synesthesia Association website, the United Kingdom Website and the Face Book Synesthesia website.

Further, since the link to SurveyMonkey.com was posted on an American and United Kingdom sites, the participants were believed to be mostly North Americans and Europeans, although the Face Book site could have tapped into a larger population than those discussed above.

Procedures

My three essential research questions are: (1) what are the emotional effects and clinical implications of seeing a certain color if it is attached to a traumatic event; (2) what is the emotional effect of losing synesthesia perception if it is muted by anti-depressants or other drugs; and (3) is synesthesia related to other neurological conditions or illnesses? These three questions had a series of sub-questions that delved into more specifics and addressed gender, race, age, level of education obtained, occupation, as well

as other questions needed to specify what emotions, if any, colors incite in the synesthete. An optional set of narrative questions followed the questionnaire pertained to the clinical aspects of synesthesia and therapy, as well as questions formulated to ask the synesthete what would be helpful for others to know about individuals with synesthesia. Finally, the last question addressed whether or not the participant believed synesthesia could be affected by trauma. It appears, in retrospect, a number of participants confused “affect” with causation.

As the survey was comprised of both quantitative measures and qualitative narratives, the study was comprised as a mixed-method approach. I contacted the directors of the American Synesthesia Association and the United Kingdom Synesthesia Association, both of whom posted links to SurveyMonkey.com, the internet site used to conduct my research. The success of the survey in reaching persons who self-identify with synesthesia was addressed by virtue of the referral site. The survey was posted for two months and the data received was retrieved from SurveyMonkey.com and in turn, my thesis advisor, the Smith College Statistician, and I reviewed the material and formulated readable graphs of the responses.

My hypotheses were rooted in the belief that a majority of the surveyed population would report one or more color(s) which are related to a traumatic event, and that the use of anti-depressants has a muting effect that is unsettling to the population. Further, I propose that synesthesia, a neurological sensation, may co-exist with other neurological conditions or illnesses such as Multiple Sclerosis, Optic Neuritis, Parkinson’s disease, and so forth.

Data Analysis

Past research has demonstrated very similar statistics. It is still unclear if the sampling of the general population is accurate based on the need to provide education about the population of synesthesia in general.

The project compared findings at a single point in time to assess the factors that cause or create emotional distress in synesthetes. A case-control design was employed using both reliability and intensity sampling approaches of synesthetes for both the quantitative section of the study and the open-ended discussion on the qualitative section.

For each narrative question, the participants own words were used to identify or label each participant answer. Once this was done for each participant, major themes were developed using the content. For example, a major theme that emerged throughout the survey was the adverse emotional effects that certain colors incite.

The responses were categorized into themes that correlated with each of the three hypotheses.

Hypothesis I: In determining the emotional effects and clinical implications of seeing a certain color if it is attached to a traumatic event, the series of responses were grouped into similar themes of trauma/color aversion. This hypothesis was developed because some of the previous literature and research lightly touched on the subject, but usually, single subjects were used as opposed to a larger group of participants.

Hypothesis II: The purpose of the question “what is the emotional effect of losing synesthesia perception if it is muted by anti-depressants or other drugs” was derived from past literature and blog posts that indicated that certain individuals were reporting a loss

or enhancement of synesthesia when taking certain drugs. If a synesthete has relied on his or her synesthesia to activate memory, the emotional or mental effects could be devastating.

Hypothesis III: Lastly, the belief that synesthesia could be related to other neurological conditions or illnesses was tested to determine if synesthesia, a neurological mis-firing, could co-present with other neurological disorders, such as seizure disorder.

Summary

In the future, I am hopeful that scientists and sociologists will find a broader spectrum of racial and gender diversity by sampling the population in general. For example, according to the National Multiple Sclerosis Society, the rates of individuals with multiple sclerosis are overwhelmingly Caucasian females between the ages of 24 and 40 years old when the onset is diagnosed. In the early stages of assembling a population of persons diagnosed with Multiple Sclerosis, the primary afflicted population was as stated above: white, female and within an age range of 22 to 40 years old at onset of diagnosis. However, as education and better diagnostic tools evolved, the population has become more diversified. What was once thought to be a white woman's disease has proved to transcend across all races and the gap between the male to female patients is narrowing.

It's reasonable to believe that the chasm in diversity amongst synesthetes will taper as the sensation becomes more broadly recognized.

CHAPTER IV

FINDINGS

Explanation

Admittedly, researching this thesis was akin to a scavenger hunt as there is a myriad of different types of synesthesia and the available research literature was scattered and spotty. Moreover, the findings were broader than I anticipated, and in retrospect, the survey questionnaire was confusing to a few of the participants with regard to semantics. However, the survey was structured in such a manner that if a participant misunderstood a pinnacle question, the question was reframed in another fashion. For example, question number 15 asked “does a particular color(s) provide an adverse emotional reaction for you”. As N=52, the answers were divided equally down the middle with 26 person responding yes, while the other 26 persons replied no. Conversely, question number 23 asked “are you negatively affected by a certain color of a room, of clothing, or of an item”. The number of persons who replied yes to this question, which bares resemblance to question 15, indicated that 62.7% replied were negatively affected (N=51).

The last narrative question “do you think Synesthesia can be affected by trauma” supplied a variety of answers, some of which suggested that several of the participants confused “affected by” with “caused by”. The result of this interpretation produced rather interesting responses, including the following:” I don't believe synesthesia can be affected by traumas. Maybe a little percentage of cerebral tumors or physical brain

traumas could lead to an induced pseudo-synesthesia, but I think genetics has the main origin”.

One participant succinctly wrote about the correlation between trauma and synesthesia by stating:

I'm not sure. I haven't had any extremely traumatic experiences. I've had several miscarriages, though, and while when I think specifically about them, I feel a color. Thinking about that color from the other end does not invoke the feelings surrounding the miscarriages. There are colors that make me uncomfortable, in a room, for example, but I am unable to associate those colors with an event or experience. Very interesting work and questions!

There were several questions that could have been omitted as the answers did not provide any insight into any of the issues stated in the hypothesis. For example, question number eight “at what age did you begin to read in your native language” was fruitless unless it could be implied that the average age of four suggests an overall precociousness in synesthetes.

Finally, this research project addressed the significance of identifying synesthetes as a *distinct* population who deserve to be examined for ways in which to understand what medications and clinical interventions would be helpful or harmful, as well as demystifying the stigma of identifying with synesthesia.

Restatement of Hypothesis

The essential research hypothesis was divided into three questions: 1) what are the emotional effects and clinical implications of seeing a certain color if it is attached to a traumatic event? 2) What is the emotional effect of losing synesthesia perception if it is muted by anti-depressants or other drugs? 3) Is synesthesia related to other neurological conditions or illnesses?

In the course of the survey, it became apparent that the most honest dialogue of these issues takes place on the discussion forum of the American Synesthesia Society. After I posted my survey, many members began to trade comments about the myriad of colors evoked by their emotions. For example, one member posted the following comment “If you go into a room and that room has colors which are unpleasant to you, for whatever reason, what sort of compensation (for instance, imagination) do you use to ignore the colors and stay in the room?” The replies were varied, but it occurred to me that if nothing else, my survey questionnaire incited many of the participants to probe the survey questions on a deeper level, particularly with regard to the first hypothesis. Finally, the survey supported the first hypothesis, that is, that there *are* detrimental emotional affects connected to particular colors if that color is attached to a traumatic event.

The deficits in the manner in which I structured the second hypothesis were illuminated after meeting with Dr. David Eagleman and Steffie Nelson at Baylor College of Medicine. I learned that they had similar generalizations about medications in the early stages of their research. While I was aware that serotonin may have some interaction with either muting or enhancing the affects of synesthesia, I had not accounted for hormonal changes and the use of hormone replacement therapy, birth control, non-prescription drug changes, alcohol or caffeine induced alterations, and finally, marijuana as altering the chemical changes of synesthesia. Therefore, attempting to consider the emotional implications of losing synesthesia traits was not feasible in my study. Participant

responses in relationship to my second hypothesis are represented in Figure 1.

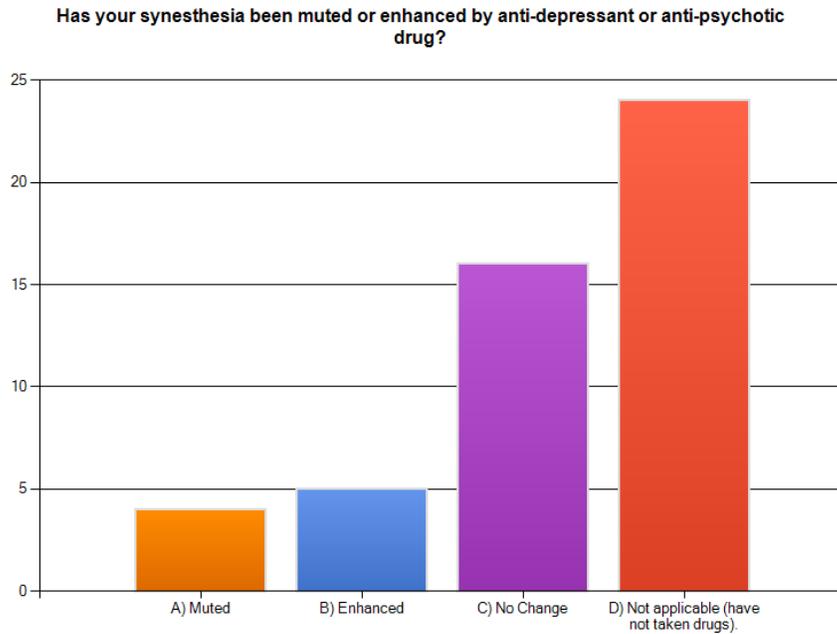


Figure 1. Has your synesthesia been muted or enhanced by an anti-depressant or anti-psychotic drug?

Recently, a discussion occurred on the American Synesthesia Association blog over “flashes of light” occurring during sleep or whenever certain synesthetes heard a loud noise. Several medical explanations were offered which experienced this optical sensation could perhaps be a form of seizure disorder. If this explanation is accurate, it would confirm my final question about the co-presence of other neurological conditions.

However, the survey that I posted did not *confirm* a high incidence of neurological disorders. Instead, of the 51 persons who responded to the question: “Have you ever suffered from depression?” a whopping 62% responded that they had indeed

suffered from this form of mood disorder. Yet these statistics are nearly triple to that of the general population. According to the National Institute of Mental Health (2009), 24% of people living in the United States suffer from any form of mental illness, and only 6% of the population suffers from a serious mental health problem.

The high incidence of depression rates among synesthetes established the clinical value of understanding the importance of decoding color-related trauma, and how best to work with individuals with synesthesia when color is such a vital component of their treatment. From the walls of the clinician's office, to the color of the clinician's apparel, the clinician's color choices will have an impact on the synesthete sitting across the room.

Major Consequences

Researching this topic has illuminated the need to think about how clinicians understand and identify *what* triggers a synesthetic individual who is reliving a painful experience. Clinicians can do so by educating the population of synesthetes to become aware of what it is that triggers these aversions to certain colors. Is it a name, a venue, or a day of the week? The determining causes of color associated traumatic memories need to be addressed through a rise in consciousness about the subject, particularly if it is more common than previously thought.

As stated earlier in this paper, Dr. Sean Day, who oversees the American Synesthesia Association, believes that 1 in 50 persons have color synesthesia. Even if only 1 out of 100 persons identify with synesthesia, it is likely that the incidents of synesthesia will emulate other medical or mental health discoveries inasmuch as the

population increases in accordance to the condition becoming better known within the general public.

And because trauma victims often employ defenses to protect their traumatic memories to help them survive, it is plausible that ego defenses and behavior adaptations prevent access to the triggers that cause emotional distress. Etta Goldstein, who wrote extensively about object relations within the Social Work Practice, believes traumatized individuals need “special sensitivity and skill” in the therapeutic relationship (Goldstein, 2001). Further, as it is conceivable that synesthetes are by nature, a more sensitive population and therefore would be prone to experiencing emotions at a more intense level than those who do not share the sensation, it is important to educate clinicians who work with this population about the volatile effects that color can incite.

As recent research has indicated that there is a higher level of activity in the limbic section of the synesthetic brain, it can also be argued that synesthetes are a population that *should* be researched more extensively in order to determine what levels of consciousness the synesthetes are able to achieve.

By example, when the participants were asked what he or she would believe is helpful in educating non-synesthetes in understanding how he or she is affected by the sensation, one participant thoughtfully responded by writing,

I would like to try to explain to people what it is like for me to experience sound: I see it, and I physically feel it in various parts of my body. Then they might understand why I need quiet so much more than others, especially when trying to sleep.

Another synesthete wrote “. . . maybe that I/we have a different perception of reality. Not better or worse --just different.” And finally, perhaps the most fitting of all responses was the following,

I suppose if it were more widely known and understood, it wouldn't be so strange to say something in normal conversation such as ‘excuse me, I'm having this strange green sensation on my feet.’ A statement like that would be normalized, such as saying something as ‘that made me nervous’.

To become a compassionate clinician, one must begin to recognize and allow for differences in perception and learning. The conclusions drawn from the survey strongly indicate that synesthetes perceive the world differently than those who do not share the phenomenon. If clinicians can begin to understand that synesthesia is not a disorder, but instead, a rare perception and gift, synesthetes might feel more comfortable explaining the emotional consequences and complications of attaching color to feeling and memory.

Who Was Studied and Who Was Not

The demographics for each answered question varied because although 68 persons visited the survey site, only 51 persons actually completed the entire qualitative section by answering every question. In several instances, more than 51 participants answered some of the questions, and in those cases, the responses will be larger than N=51.

As no one under eighteen was studied, the population who completed the survey is demonstrated in the Figure 2, the majority of individuals were between the ages of 45-65.

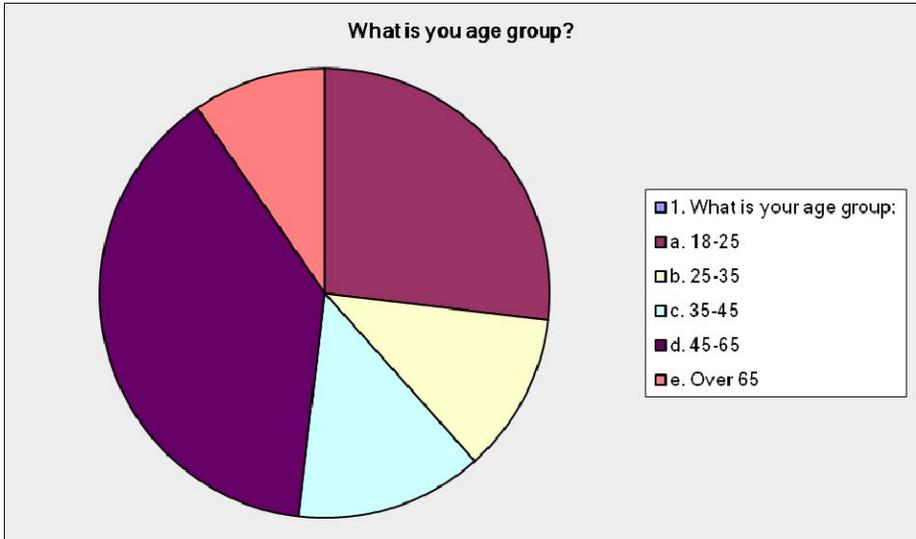


Figure 2. What is your age group?

With regard to gender, the census was overwhelmingly female (N=51, 88.7%). This was not unexpected as previous studies have produced similar results. In the figure 3, the responses are tabulated:

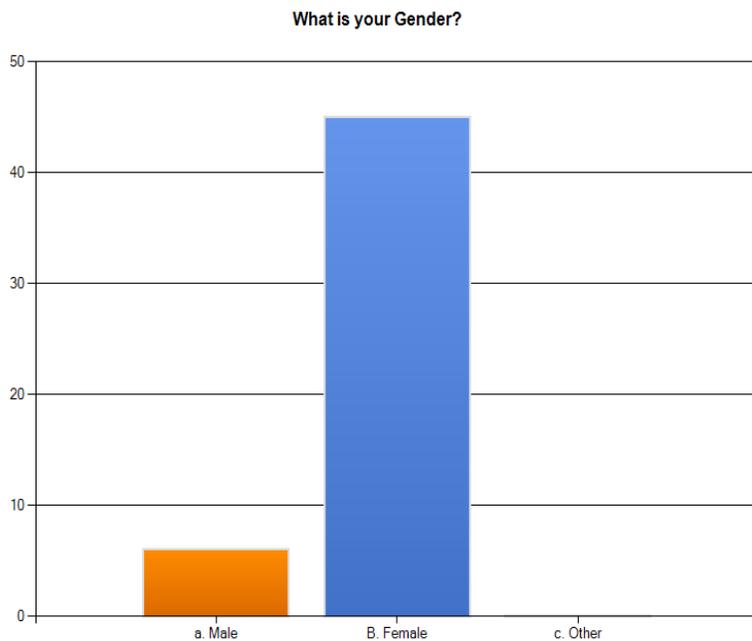
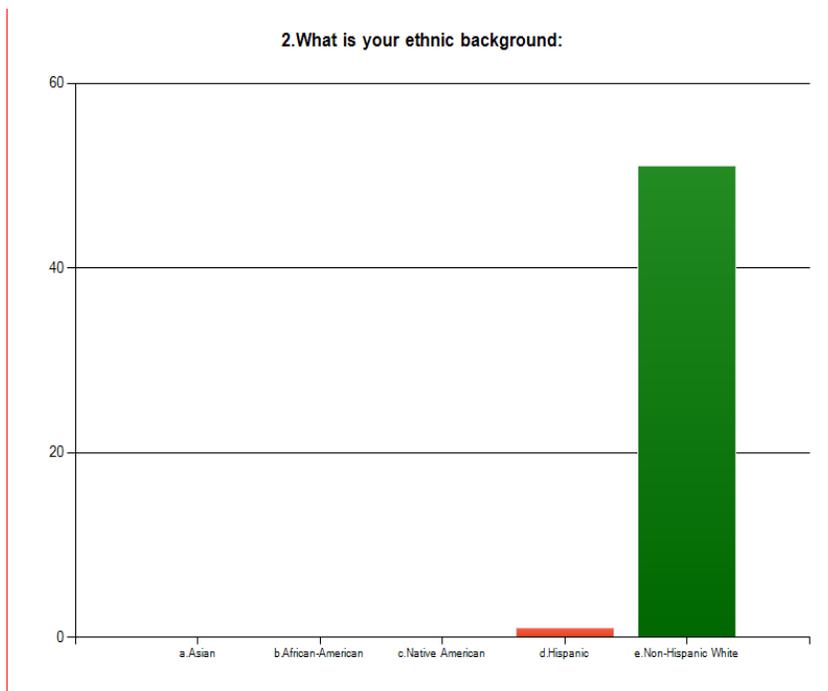


Figure 3. What is your gender?

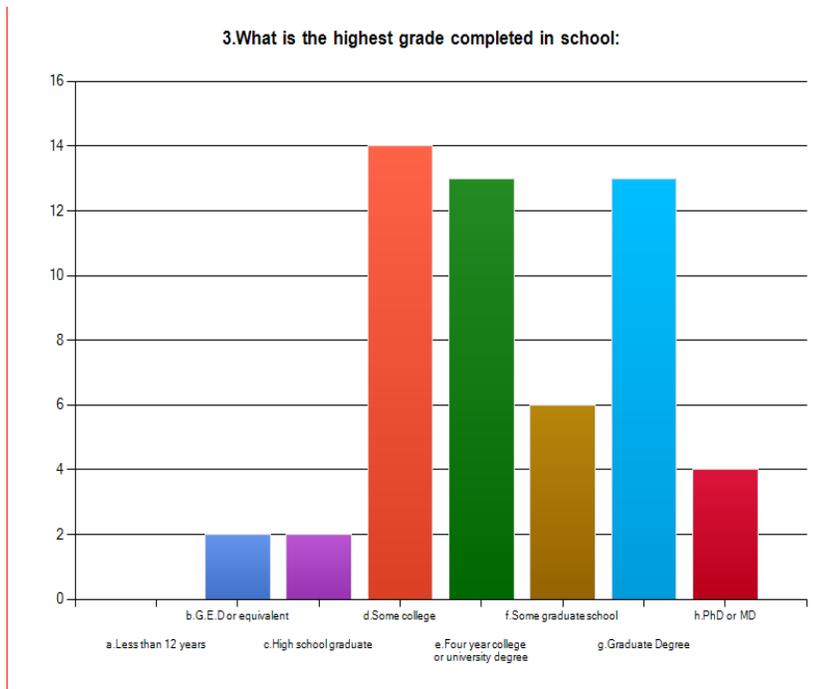
Perhaps the most astonishing result, even disappointing, was the lack of racial diversity amongst self-identifying synesthetes. Although the American Synesthesia Association represents 750 members from over 50 countries, white (non-Hispanic/Caucasian) was the overwhelming response to the question of race. Only one person identified as Hispanic, and out of 52 participants, the remaining 51 were white. Although this has been discussed in earlier chapters, it is conceivable that the population surveyed reflects more of the type of person who would complete an on-line survey, as opposed to the actual race.



Comment [J1]: Cannot edit table to get rid of heading – is this okay?

Figure 4. What is your ethnic background?

The level of education the participants achieved appears to be in keeping with that of the general population as depicted in Figure 5. There were no outstanding findings in this area, although the listed occupations of the individuals did suggest that most of the participants come from the field of academia, research, and largely, the arts. This finding substantiated past research that suggested synesthetes are more artistic in nature. However, it is important to consider that many artistic individuals do not necessarily work in art careers due to economic factors, and unfortunately, the study did not quantify this distinction.



Comment [J2]: I cannot change the heading on this table to get rid of the 3. – is that okay or do you want me to make this again somehow?

Figure 5. What is the highest grade completed in school?

Descriptive/Relational

The survey results indicated that there is an emotional link between certain colors, and that some of the synesthetes reported a traumatic link between the identifying event and color(s) (see Figures 6 and 7). If a clinician has the awareness to treat the synesthete as if one was treating a population different from his or her own cultural or social context, it would be helpful to treat a synesthete’s traumatic emotional memory in a similar way as one would work with individuals diagnosed with Post Traumatic Stress Disorder. Understanding the significance of colored emotions is crucial while working with a synesthete in a therapeutic setting. Further, if a synesthete tells you, for example that a certain color causes pain in his feet, that his perception is not abnormal for him, but

rather, a more descriptive way of conveying the pain itself. The two figures below reflect the correlation between trauma and color.

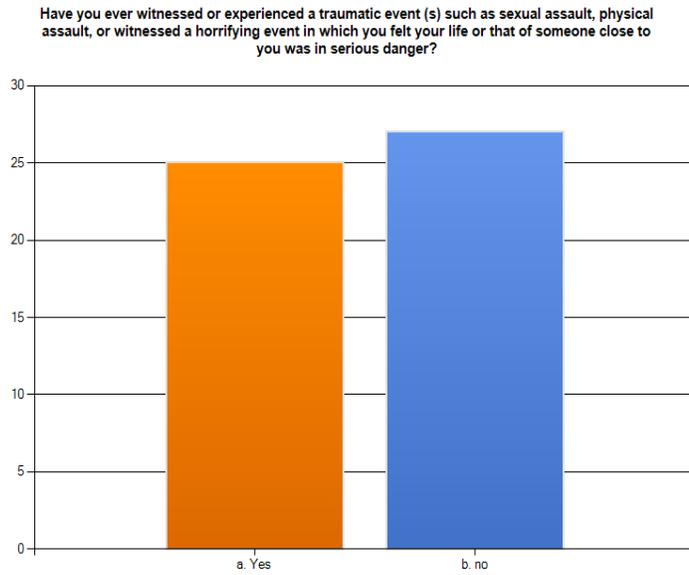


Figure 6. Have you ever witnessed or experienced a traumatic event?

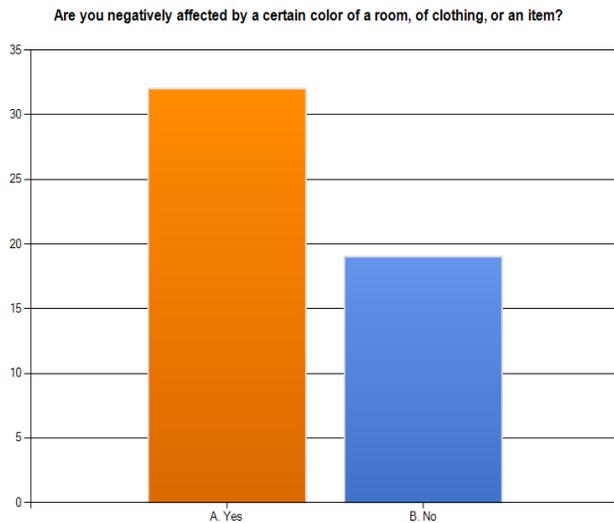


Figure 7. Are you negatively affected by a certain color of a room, clothing or other item?

To explicate, one participant replied that “green/grey, purple/grey, and especially colors saturated with black (or Fiesta-ware colors- there are no auditory overtones and they are dull, clunky, and oppressive,” with regard to color aversion. A therapist should be able to reflect and process what that would mean to a synesthete and how to untangle the “dull, clunky, and oppressive” description, much in the way a clinician working with combat veterans would understand that the smell of gasoline or meat burning on a barbeque pit might trigger an emotional upheaval in the veteran.

And in another fascinating reply to the question about colors that incite an adverse emotional response, another participant reported “grayish yellow (‘sweat stain’ yellow or ‘urine stain’ yellow)” caused severe stress and sadness. This same participant also reported a traumatic event of being sexually molested as a child. While it is impossible to

draw conclusions from an anonymous survey, one can speculate about the connection between these aversions to the perpetrator.

Mostly, shades of green and yellow followed by orange and gray, were the colors most commonly reported as causing emotional distress. Figure 8 contains a list of participant responses describing colors that caused emotional distress or discomfort and Figure 9 depicts the emotional effect of seeing the adverse color.

Which Colors Cause Emotional Distress or Discomfort	
1	Green/grey, purple/grey, and especially colors saturated with black (or Fiesta-ware colors- there are no auditory overtones and they are dull, clunky, and oppressive.
2	Orange, Grey
3	Sickly, slightly greenish yellows
4	Black
5	Dark grey, copper
6	Some shades of green
7	Light green
8	No but, this background color for the survey is pretty tough (at the time the participant took the survey, the background color was fuchsia, simply because it was the least reported as being offensive).
9	Some pop music produces strange glittery colours which are annoying to a point where I have to turn it off as it makes me feel claustrophobic almost.
10	Orange
11	Light blue (blanket) and a combination of green/white/orange (quilt).
12	Orange - yuck!
13	They are not colors, but they are words. These words are items of 2 association chains. The first begun with Manhattan, and the second begun with the special word of another word-sensitive synaesthete. The items of the first chain are almost all Hungarian proper names, and the items of the second chain are from different word-arts and different languages. For a long years one of these words was pain for me, but this is gone. This word was for long years my special word, Manhattan, but when the special word of the another synaesthete

	came, it was displaced, and disappeared. The new pain-word was 25 in Hungarian, and so on. The other items were enjoyable, but they also disappeared in one month-two years. The word Manhattan was taboo for long years. I can use the word, that the second pain-word was, but I cannot mention it in this context. After more years the disappeared ones had reappeared, and there is a pain-word no anymore. Sorry for my English. (This participant was Hungarian and reported a serious trauma in her childhood).
14	Green
15	Muted tones of orange
16	Red/orange
17	Bright yellow + white, mustard brown
18	Yellow, green, red
19	Brown & yellow together
20	Grayish yellow ("sweat stain" yellow or "urine stain" yellow)
21	Green
22	Dark blue
23	Most green colors, but not grass green or celery
24	White, yellow, orange, pink
25	A certain shade of dark green
26	Gray, shades of yellow
27	White
28	Turquoise

Figure 8. Colors that participants described as causing emotional distress or discomfort.

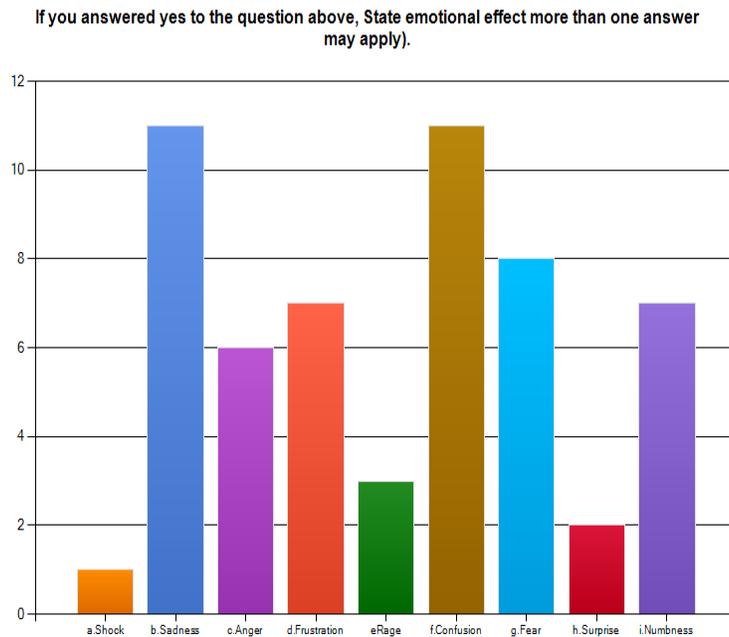


Figure 9. Emotional effects of seeing an adverse color.

Different Sets of Findings:

Not surprisingly, many of the findings obtained from the survey data corroborated with previous research studies and with the hypothesis set forth in this research. The overwhelmingly female to male statistic was confirmed; as was the belief that more synesthetes tend to gravitate towards careers in the arts as opposed to the general population. Furtherer, there was no substantial evidence to suggest that drug interactions can mute synesthesia, nor were there any significant neurological connections between synesthesia and other neurological disorders. However, as mentioned earlier in this discussion, many synesthetes reported neurologically related optical synapses of bright “light flashes”.

There were fascinating findings which resulted from the questions generated by the research in the course of the data analysis process, but which were not specifically set forth at the inception of the study. Primarily, there appears to be consensus of synesthetes who report an aversion to colors that can be associated with trauma. Further, the large presence of depression among synesthetes was unexpected.

Paradoxically, a statistic that was unexpected was the discovery that the majority of the population surveyed reported having suffered from depression at one period in his or her life, which implies that synesthetes will represent a large portion of individuals seeking mental health treatment and therapy. Therefore, it would be beneficial to educate clinicians about the sensation in order to effectively work with the population.

To explicate, the first narrative question was: “Are you currently in therapy and if so, have you disclosed your synesthesia.” As I did not anticipate that so many of the surveyed synesthetes would be in therapy, it was disappointing to know that so few had chosen to discuss the sensation with their therapist.

One participant reported the following about his or her experience of disclosing synesthesia “I disclosed, but the therapist misinterpreted my synesthesia.” Misunderstanding synesthesia is the biggest dilemma that synesthetes face when choosing to self-disclose.

A logical connection between the two sets of hypotheses could be drawn regarding traumatic experiences and the reported rates of depression. With N=52, a large number of respondents (48.1%) reported witnessing a traumatic event such as sexual assault, physical assault, or witnessed a horrifying event in which he or she felt his/her life or that of someone close was in serious danger. Those who reported positively

replied with great detail and emotion. For example, one participant noted that “the September 21, 1999 earthquake in Taiwan, and subsequent cholera and typhoid epidemics” were horrifically traumatic. And another reported witnessing his or her parents going to a burning building. There were also reported incidents of childhood sexual abuse, adult rapes, adult physical abuse, and witnessing deaths.

A following question was asked whether or not the participant’s aversion to a certain color was believed to be related to the traumatic event. Of those answering the question (N=31), 29% responded yes, and further, that the traumatic memory was attached to a particular color.

Finally, the participants were asked whether or not they believed that synesthesia could be affected by trauma. Though it was clear that several of the participants misunderstood *cause* and *affect*, the replies were powerful and well-thought. While one participant was skeptical, the response was articulate. The person wrote: “I doubt it, but I suppose that synesthetic responses that happened to be taking place at the same time a trauma occurred might subsequently be "attached" to the trauma, not synesthetically directly but because the memories would be melded.”

And another participant was certain about the relation by writing “... yes -- each person has a color, and normally it is a person that causes a traumatic event, leading to a negative association with that color.”

From the research and following survey, I concur with the conclusion that for a color synesthete, each person and object has a color. If a synesthete has endured a traumatic event, there will be a color aversion associated with the memory. What remains

to be researched is what clinical methods might be employed to treat trauma and depression in the synesthetic population.

CHAPTER V

DISCUSSIONS AND CONCLUSIONS

There were several implications of the study findings in relation to the central issue of emotional effects associated with certain color(s) if that color is attached to a traumatic event. Foremost, the study suggested that there *is* an aversion to certain colors that can be stressful, or cause sadness, anger, numbness, repulsion and confusion in the synesthete. What this implies is that the current methods of treating trauma should be employed when working with individuals of this population. That is, that the therapist working with synesthete has an understanding of the defenses mechanisms and symptoms of trauma by indentifying the triggers and stressors attached to the index trauma similarly to the manner in which one would treat the narrative of a war-related traumatic memory. Unpacking a traumatic experience would have significantly different implications for a synesthete when color involuntarily invades perception. A therapist who is unfamiliar with synesthesia could provoke further emotional damage or perhaps dissociation if he or she is unaware of the enormous impact that color has on a synesthete.

The question remains *how* to educate the field of social work about synesthesia and the particular manner in which synesthetes are greatly affected by color in their environment especially in a therapeutic environment. When the participants were directly asked to answer “what would be helpful for you to educate non-synesthetes in understanding how you are affected by the sensation,” most of the participants wanted non-synesthetes to understand that that synesthesia is an involuntary sensation and *not* a disorder.

The most reasonable and realistic approach to educating clinicians is outreach and more publishable research that could be presented at conferences in which clinicians are required to attend, such as the hours needed for continuing education for maintaining a professional license. Another educational approach would be to add the study of synesthesia to mental health curriculums, but it would entail careful and sensitive explanation to prevent a swift and unfortunate labeling of the experience as a mental health disorder.

Further, while previous synesthesia research has been directed towards learning about what synesthesia *is*, this study concluded startling rates of depression and high incidences of individuals with synesthesia reporting having sought treatment for depression. What this study also revealed was the synesthete's fear of disclosing the sensation to clinicians (doctors, psychologists, social workers, and nurses). As 62 % of the participants indicated having suffered from depression or a depressive disorder, one might also conclude that these individuals would be more likely to be prescribed antidepressants, and therefore, if there *is* either an enhancement or muting of the synesthetic experience, how might these changes alter memories? For instance, many color synesthetes report that persons, animals, days of the weeks, months, numbers and so forth are involuntarily color-coded. If color perception is coded, it is conceivable that the synesthete who has spent the majority of his or her life with the assistance of colored memory would have to reframe memorization in a non-chromatic fashion, or rather, in a different region of the brain. The implications of this could be devastating and perhaps, lead to further depression or even confusion and forgetfulness. By virtue of example, a

woman named J. wrote: “I am currently taking two anti-epileptic drugs and I have definitely had a change in my synesthesia.”

The emotional and mental effects of losing synesthesia are still unmeasured largely because emotional experience is individualistic. Therefore, future research could be directed at studying a larger population of synesthetes over a longer period of time to measure changes in the experience of synesthesia related not only to medication, but to aging, stress levels, and trauma.

Another area of research could be directed at observing how synesthetes adapt to a non-synesthesia world if the experience is cross-culturally different by virtue of language. If certain languages are more expressive than others, as is the case with the romance languages, would the emotional responses of individuals with synesthesia be the same if a traumatic memory is recalled in another language? For example, one of the participants who responded to the survey self-disclosed as being Hungarian. She described a strong emotional response to hearing the word “Manhattan”. She reported that later, her painful word was “25.” She did not elaborate *why* she had a strong reaction to hearing the mention of that particular city or number, yet it is plausible that a person who speaks French might have a negative reaction to a color attached to a word in French, but the English or German translation would have no bearing at all.

In the mind of a synesthete, the word “dog” could be a bluish color in English, yet the same word in Spanish “perro” would be brownish-tan. If a synesthete had been ferociously attacked by a dog at some time in his or her life, would reframing the memory in Spanish be more therapeutically cleansing? A similar example is provided in the name ‘Joseph,’ which could be greenish-gray in English, while the Spanish variant

'Jose' is blackish-gray. If a synesthete disliked or had a traumatic association with someone named Joseph, would thinking of Joseph as a Spanish word in a different color be less injurious? Studying the cross-cultural linguistic effects of synesthesia could provide insight into how certain areas of the brain respond to the same word in another language.

Lastly, the research for this thesis did not overtly conclude that there were any significant correlations between the presences of synesthesia with other neurological disorders, yet surprisingly, many participants mentioned conditions that could be related to seizure disorder. There were several other neurological disorders in the population, such as Multiple Sclerosis (2 persons reporting), and more than 12 mentions of chronic headaches and/or migraines. Again, this type of study was admittedly ambitious for this particular research project. To fully evaluate the correlation between higher incidences of co-presenting neurological disorders would involve the assistance of a neurologist. While the study *does* confirm a high incidence of individuals reporting "strong flashes of light" appearing before closed eyes, there is no systematic method to actually make any official medical diagnosis. In this case, Hypothesis III was at best, premature in gauging a large number of neurological conditions in synesthetes.

There remains much to be learned about synesthesia. Past research, while burgeoning, has not concentrated on whether or not any current medical or mental health treatment models should be adapted for persons with synesthesia. With the report of extremely high incidences of depression (62%) within study participants, at the very minimum, future research should be directed towards mental health treatment models to learn more about the emotional disturbances related to the activation of a certain color in

the mind's eye, and what factors attribute to the large presence of mood disorders in these individuals. Perhaps some of the rates of depression are related to being misunderstood and fearful of exposing the sensation.

And finally, if the actual rates of persons reporting with synesthesia are higher than past research has reported and expected, the education to bring about awareness of synesthesia must take place in order to establish a measurable population that deserves being recognized as noteworthy. Synesthetes are a population of unique individuals who are at risk for being diagnosed with a mental disorder by simply disclosing the sensation. Synesthesia is not depression, anxiety, epilepsy, or any medical condition. Possibly, synesthesia is simply a sixth sense.

In closing, the findings of the survey confirmed the hypothesis that there is an emotional link associated with certain color(s) if that color is attached to a traumatic event. As stated earlier, the study also confirmed that there *is* an aversion to certain colors that can be stressful, or cause sadness, anger, numbness, repulsion and confusion in the synesthete. The significance of these findings is the opportunity for mental health clinicians that work with synesthetes to develop an understanding of *which* color(s) trigger a traumatic or disturbing memory, and *why* the color became disturbing to the synesthete. If the clinician is trained to listen for cues that are related to color/word associations such as an aversion to yellow that in a synesthetes mind, is related to the word "truck", the clinician can find common themes that could identify what the association to a truck conjures up in the synesthete's unconscious. If clinicians perceive the traumatized synesthesiac's color aversions as not odd, but instead, a keyhole into

understanding that in addition to the five senses of sight, smell, touch, sound and taste, the synesthete taps into a sixth sense that incorporates color.

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Appendix A: Human Subjects Review Approval Letter



Smith College
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February 12, 2010

Lynn Goodie

Dear Lynn,

Your latest revision has been approved and we are now able to give final approval to your study.

Please note the following requirements:

Consent Forms: All subjects should be given a copy of the consent form.

Maintaining Data: You must retain all data and other documents for at least three (3) years past completion of the research activity.

In addition, these requirements may also be applicable:

Amendments: If you wish to change any aspect of the study (such as design, procedures, consent forms or subject population), please submit these changes to the Committee.

Renewal: You are required to apply for renewal of approval every year for as long as the study is active.

Completion: You are required to notify the Chair of the Human Subjects Review Committee when your study is completed (data collection finished). This requirement is met by completion of the thesis project during the Third Summer.

Good luck with your project.

Sincerely,

A handwritten signature in black ink, appearing to read "Ann Hartman".

Ann Hartman, D.S.W.
Chair, Human Subjects Review Committee

CC: Colette Duhaime-Wright, Research Advisor

Appendix B: Letter of Informed Consent

Dear Participant,

Hello--thank you for taking the time to read this letter. My name is Lynn Goode, and I am a graduate student in the Masters of Social Work (MSW) program at Smith College School for Social Work. I am conducting a study on persons who are aware that they have synesthesia, in particular, the form of synesthesia known as grapheme, or color synesthesia. Self-identified color "synesthetes" associate color with letters, numbers, and words. It is an involuntary combining of the senses. I am gathering data through an anonymous internet survey site to determine if individuals who have synesthesia experience any emotional distress or joy associated with a certain color or colors. I am interested in this research in order that medical and mental health professionals can better understand the manner in which color affects emotions within the synesthetes. I will use the information as part of my MSW thesis.

As a volunteer participant, you will be asked to complete an electronic internet survey that will ask various questions about the experience of colored synesthesia. To participate in the study, the individual should have awareness that he or she has synesthesia. It is estimated that 1 in every 100 persons report being aware of having this trait. Further a participant must be over the age of 21 and have access to the internet. The survey will take approximately 1 hour for the questionnaire. If the participant chooses, he or she may answer some of the narrative questions that will follow the survey. I will transcribe the results into a written thesis. However, in the event that I will need a professional transcriber, he or she will sign a confidentiality pledge.

As the survey will be asking specific questions about emotions and memories, it is possible that the participant may experience mild emotional stress or discomfort. If this occurs in the course of the survey, a list of referral sources will be provided to aid the participant. My intention is to gather material in which to assist and educate mental health and medical health workers with a better understanding of the condition, and to reduce any perceived stigmas or misinformation about synesthesia. Please be advised that there will be no monetary compensation for participating in the study.

Any participant will not be asked to provide his or her identity, but certain questions will be specific to age, gender, sexual preference, geographic location, occupation (if applicable), and medications that the individual has taken in the past five years. Other than me, my research advisor, a statistician, and a possible transcriber will also have access to the data obtained from the survey. Confidentiality is assured and protected to the highest standards possible. Again, should any transcriber be employed to assist the process, he or she will be mandated to sign a confidentiality pledge. In any publications or presentations, the data obtained from the survey will be presented as a whole, and if participants choose to participate in the narrative section, their identities will be carefully disguised. Further, all data from the electronic questionnaire will be kept secure by the internet site that will be hosting the survey, and any data I receive will be kept in a secure location for a period of three years as required by Federal Guidelines. Should I need to have access to the data beyond the three-year period, the materials will be kept in a secure location and destroyed when no longer needed.

Participation in this study is voluntary. At any time during this study, a participant may withdraw from the process, or refuse to answer any question. The last date for

withdraw is March 15th, 2010. Since the data that is entered is anonymous, it is possible that the data may not be withdrawn from the electronic server that receives the data. I may be reached by email at Lgoode@Smith.edu in the event of any additional questions. Further, should the participant have any concern about his or her rights, or any aspects of the study, please contact me or the Chair of the Smith College School for Social Work Human Subjects Review Committee at (413)585-7974.

YOUR SIGNATURE INDICATES THAT YOU HAVE READ AND UNDERSTAND THE ABOVE INFORMATION AND THAT YOU HAVE HAD THE OPPORTUNITY TO ASK QUESTIONS ABOUT THE STUDY, YOUR PARTICIPATION, AND YOUR RIGHTS AND THAT YOU AGREE TO PARTICIPATE IN THE STUDY.

Participant's signature

Lynn Goode

Date signed

Date signed

Appendix C: Survey Questions

1. Age
2. Race
3. Highest Grade Completed
4. Gender
5. What is your occupation?
6. At what age did you begin to read in your native language
7. Were you aware that you saw letters in color when you first learned to read?
8. At what age did you learn you had colored synesthesia?
9. Do you know any immediate or extended family members who also share the phenomenon?
10. If yes, state the relative (ex. Mother, father, brother, aunt, grandparent).
11. Do you have any neurological disorders or disease(s)?
12. Please list the condition or disorder.
13. Have you ever witnessed or experienced a traumatic event?
14. Please comment on the event.
15. Are you grieving over the loss of a significant relationship due to death, divorce or breaking off relations and/or contact with another person?
16. Does a particular color(s) provide an adverse emotional reaction for you?
17. If yes, which color(s)?
18. If yes, what emotion(s) do you experience?
19. If yes to above questions, is this color attached to an aspect or person from the traumatic event or you experienced?

20. Have you ever suffered from depression?
21. If yes, frequency and duration.
22. Have you ever taken any anti-depressants or anti-psychotic drugs?
23. Has your synesthesia been affected by anti-depressant or anti-psychotic drug?
24. Is your synesthesia as active or as present as it was when you were a child or under the age of eighteen?
25. Has your synesthesia ever disappeared?
26. If yes, has it reappeared?
27. Are you negatively affected by a certain color of a room, of clothing, or an item?
28. If someone you dislike has a name that is associated with a color, do you consciously dislike that color?
29. Are you currently in therapy or have you ever been in therapy? If yes, please indicate if you have disclosed your synesthesia traits with your therapist?
30. What is the most enjoyable aspect of having synesthesia?
31. What is the most disturbing aspect of synesthesia?
32. What would be helpful for you to educate non-synesthetes in understanding how you are affected by the sensation?
33. Do you believe that synesthesia can be affected by a personal trauma or traumatic events