Synesthesia: a unique perspective on life

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Colored hearing, shapes one can taste, letters and numbers with personalities, and sounds that produce physical sensations. To most people this experience sounds like something out of a movie, but for some individuals this is a reality. Until recently scientists deemed this phenomenon a result of an overactive imagination, but after closer review these occurrences were revealed to be a real condition and it was given the name synesthesia; this name, derived from Greek essentially means to identify together (Carpenter). Scientists believe that synesthesia occurs when two senses are mixed and trigger one another; for example, grapheme-color synesthesia occurs when letters or numbers are perceived as having colors (Scientific American). This happens automatically and involuntarily, classifying it as a neurological condition; however, synesthesia is not found in the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) or the *International Classification of Disease* (ICD) because it is not maladaptive, but is atypical, and is not considered to be a psychological disorder (Scientific American). Even though researchers believe that anywhere from one in 10, 000 to one in 5, 000 people possess synesthesia, the condition’s commonality is hard to determine. Researchers have trouble calculating how many people have this condition because there are over thirty types of synesthesia; this makes testing for different forms difficult because one test does not detect all types of the condition (Gross).

Although synesthesia is a neurological condition it does not have any debilitating mental effects. In fact, synesthetes’ linked senses can increase their chances of remembering objects or calculating solutions to problems;

this has led to better scores on memory and intelligence tests (Gross). Tests for mental disorders such as schizophrenia have also come back negative for a majority of synesthetes; this eliminates the belief that synesthesia is a symptom of psychological disorders (Gross).

There are numerous variations in the expression of synesthesia that can be split into two general categories, projective and associative. Projective is when the synesthete sees colors, forms, or shapes; a projecting synesthete may see colors or objects in space that the average human would not see (Burns). Associative synesthesia on the other hand, is when a strong connection is felt between a stimulus and an unrelated trigger; associating synesthetes may be triggered by a stimulus such as a sound and feel very strongly that the stimulus has a color or personality (Burns). Some projective types include grapheme-color and spatial sequence. Grapheme-color synesthesia, the most common form of synesthesia, is characterized by individual letters and numbers having their own color (Sagiv and Robertson). Spatial sequence occurs when numbers are physically seen as points in space and time (Science). Some associative forms of synesthesia are auditory-tactile and ordinal linguistic personification. In cases of auditory-tactile synesthesia sounds induce physical sensations in parts of the body (Naumer and Bosch). Ordinal linguistic personification, abbreviated as OLP, is when numbers, days of the week, months, and letters can have personality and/or gender (Simner and Hubbard). For example, an OLP synesthete may believe that July is friendly, while November is shy, and September is confident. Also, some forms of synesthesia, such as chromesthesia, can have projective and associative variations. Chromesthesia involves sounds

triggering colors; a projecting synesthete with chromesthesia may hear a violin and see red circles while an associating synesthete will hear a violin and insist that it is red (Cytowic). This unique synesthesia is believed to contribute to perfect pitch in music because of the visual connection between different notes (Ward). Some disorders are not formally classified as forms of synesthesia, but are believed to have a connection with the condition. Misophonia, a disorder that is distinguished by strong emotions being triggered by sounds, is similar to some types of synesthesia and is thought to be related to the neurological condition (Cytowic).

Despite synesthesia’s recent classification as a neurological condition, its history dates back to ancient Greece when philosophers asked if musical timbre was quantifiable; in fact, individuals such as Isaac Newton and Goethe believed that musical notes and colors shared similar auditory frequencies (Gage). After German physician Sachs provided the first description of what is now chromesthesia, Gustav Fechner conducted the first survey of grapheme-color photisms (triggered colors and synesthetic visuals) in 1876; other scientists such as Francis Galton followed suit in the 1880s (Galton). Research into synesthesia flourished for a while until the 1930s when the theory of behaviorism emerged and pushed synesthesia into the background (Sagiv and Robertson). However, with the growing popularity of the internet in the 1990s, synesthesia also reemerged; synesthetes reached out to each other and formed groups and organizations, such as the American Synesthesia Association, that were dedicated to different forms of synesthesia and research to help uncover the mysteries of the condition

(Ward). Even with all of the research and interest, however, little information is conclusive about the condition.

Few tests exist that help determine whether or not a person has synesthesia. One prevalent approach is the test-retest or the Stroop test (DUJS). The Stroop test involves asking potential synesthetes what colors are associated with letters. In several sessions synesthetes have a 93% consistency after one year, while non-synesthetes have a 38% consistency after one week (DUJS). Synesthetes' consistency is due to the fact that the color-letter associations are established as a child and rarely change if at all (DUJS). Once established, the associations are involuntary and automatic, indicated by faster answering and reaction time when tested using the Stroop method (DUJS). However, the Stroop test is not effective for everyone as it only tests a few forms of synesthesia, meaning that if a person fails the Stroop test they could still possess another form of synesthesia (DUJS). The diversity of the condition is a factor that makes testing and diagnosis so challenging and ambiguous.

On a biological level, scientists have produced a few theories explaining what causes synesthesia. One theory states that increased communication between regions of the brain that specialize in different functions can account for the different types of synesthesia (Carpenter). Others believe that different processing centers of the brain overlapped during development and caused the brain to intermingle normally separate functions, such as hearing and physical sensations (DUJS). An alternate theory is that a reduction in the amount of inhibition along normally existing feedback pathways causes synesthesia (DUJS). Support for this theory derived from

evidence of temporal lobe epilepsy, head trauma, stroke, and brain tumors leading to acquired forms of synesthesia (Neckar and Petr). After traumatic brain injuries, the brain tries to regain full function and may rewire itself (Ward). This can result in a sort of detour around the injured areas; when this occurs, senses that were previously independent may cross and interact with each other creating acquired forms of synesthesia (Ward). The cross-wiring hypothesis mentioned in Dartmouth University's Undergraduate Journal of Science is derived from the idea that mutations in the genes that control synaptic pruning can leave wires behind that can lead to pathways forming in the brain and senses being triggered by one another (DUJS). This hypothesis is supported through genetic evidence; synesthesia is also more prevalent in men than women; this suggests that this condition can be sex-linked (DUJS). Another theory suggests that all infants are synesthetes because they are unable to differentiate between different senses (DUJS). It can be assumed that most people outgrow this phase of development while a few people retain these abilities and continue to live with various synesthetic experiences. Despite numerous theories on the origin of synesthesia, the exact cause is still undetermined and requires more testing.

The biological perspective, which emphasizes how biology effects behavior (Rathus), supports synesthesia because studies show that the condition runs in families and concerns the biological makeup of the brain (Carpenter). Other psychological perspectives do not correspond with synesthesia because it is not learned, it is not influenced by cultures, and it does not stem from underlying desires. Therefore, with the information currently available from studying synesthesia, scientists can conclude that the

biological perspective is the only verified perspective that corresponds with this neurological condition.

Seeing colors, feeling sounds, or tasting words may sound bizarre to most people, but for a select few this is an actuality. The classification of synesthesia was difficult to determine due to the lack of concrete information, and the condition continues to mystify people today, but advancements in technology and continuing research efforts are working towards illumination concerning the neurological condition. As ground-breaking conclusions continue to emerge, a deeper understanding of the condition will grow and result in a more accepting view on synesthesia as well as a new perspective on how life can be lived.

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