A Historical Survey of Cross-modal Interactions in Musical Compositions

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Abstract. Cross-modal views in musical compositions have already received a considerable amount of contemporary scholarly attention. Within Science, a cross-modal perception is associated with the term, “Synesthesia”, which indicates a union of human beings’ five major senses including sight, hearing, touch, taste, and smell. The most common type of synesthesia in musical realms is the sound-color correspondence, in which an individual tone or a specific harmony relates to a certain color, shape, or colorful pattern. Aside from the scientific methods, a great number of studies were contributed by philosophers who interpret the cross-modal interaction as metaphorical expression. This study will investigate the sound-image correlations in human senses from a philosophical point of view with metaphorical aspects utilized in the musical compositions.

1. Introduction

Many scientific studies have considered how musical perception is achieved by sensory interaction through the lens of modern science. Most of these studies address the multisensory methodology of color-hearing perception and examine synesthetic experience through a mechanistic approach. Even though the contemporary scientific views of synesthesia utilize techniques derived from cognitive science and clinical neuropsychology to understand intact brain function, it is obvious that the discussion of the cross-modal associations has existed centuries ago before the definition of synesthesia was first summarized as the term “hyperchromatopsia” in 1848 by the French ophthalmologist, Charles-Auguste Édouardo Cornaz (1825-1911), indicating the perception of too many colors. Significantly, since then, scholars have shown a keen interest in the intersensory perception of both image and sound. The research on synesthesia reached a peak by the 20th century. Further still, the sensory fusion of synesthesia opens a new field of cross-modal studies, and the relevant researches persist to the present.

One of the most important symptoms of synesthesia is automatic self-consistency which distinguishes from the learnable behavior of imagination, but scientifically it is difficult to identify a true synesthete. Besides, there is no sufficient evidence to determine whether genetic or environmental factors resulted in synesthesia. Therefore, it is significant to examine the historical cross-modal examples of literal and rhetorical presentations in musical works with a philosophical standpoint.
2. The Philosophical Views of the Cross-modal Concept

The concept of interaction between senses originated from the ancient Roman and Greek civilizations. Aristotle discussed the coordination of the five human senses in his *De sensu et sensibilibus* (On Sense and The Sensible). He stated:

If, then, the sensibles denominated co-ordinates though in different provinces of sense (e.g. I call Sweet and White co-ordinates though in different provinces) stand yet more aloof, and differ more, from one another than do any sensibles in the same province; while Sweet differs from White even more than Black does from White, it is still less conceivable that one should discern them [viz. sensibles in different sensory provinces whether co-ordinates or not] coinstantaneously than sensibles which are in the same province. Therefore, if coinstantaneous perception of the latter be impossible, that of the former is a fortiori impossible [1].

In addition to Aristotle’s theory in sensory interaction, Plato believed that the coordination of senses existed, and he illuminated the motion of celestial bodies through musical nomenclature in his *Theaetetus* (dialogue). Moreover, Pythagoras’s doctrine of *Musica Universalis* (music of the spheres) adopted a similar theory. He proposed that the orbital motion of the earth produced an inaudible symphony in mathematical proportions within the different astronomical movements [2]. Debates and observations concerning sound-color correspondence appear in many philosophical writings, particularly during the Enlightenment when multisensory association became a prominent discussion. Some important studies related to this period are Marin Mersenne’s *Harmonie universelle* (1637), Athanasius Kircher’s *Musurgia universalis* (1650), and *Ars magna lucis et umbrae* (1646), sensory experiments of Robert Boyle (1664) and John Locke (1690), as well as Voltaire’s *Elements of Newton’s Philosophy* (1738) [3]. Later, Johann Wolfgang von Goethe (1749-1832) published his *Zur Farbenlehre* (Theory of Color) in 1810. In this book, he proposed a thesis concerning the melody of colors based on the treatise *Optique des couleurs* (1740) by Louis Bertrand Castel (1688-1757) [4].

3. The Sound-image Correlations

3.1. Examples in the Middle Ages and the 16th Century

The correlation of visual image to sound in musical works serves as a means for emotional statements beyond the language, and the relationship between visual art and sound in the musical realm has existed for many centuries. For example, Baude Cordier’s choral work, *Belle, Bone, Sage* (Beautiful, Good, Wise, ca. 1385) was notated in the shape of the heart as a symbol of metaphor. In the late sixteenth century, in 1558 precisely, the music theorist Gioseffo Zarlino (1517-1590) wrote one of the earliest treatises *Le Istitutioni Harmoniche* (Harmonic Institutions) with a discussion of acoustic properties and the form of harmonic ratios. He related musical unisons and octaves to white and black, with the intermediate colors of red, green, and blue assigned to the consonances within the range of the octave [5]. The term “Mannerism” also originated in the 16th century, which indicates an interest in the correlation of visual image and sound in both the art and music fields. In art, it refers to the artistic style as seen in late Gothic painters’ works in northern Europe from 1500 to 1530, yet in music, it was perceived as a compositional style relating to Ars Subtilior [6].

3.2. Examples in the 17th and 18th Centuries

In the 17th century, Jean Baptiste Dubos (1670-1742) reinforced the analogy between music and
paintings in his work, *Critical Reflections on Poetry and Painting* (1715). He claimed that the way in which music presents tones sighs, accents, and modulations is similar to the visual presentation of the forms and colors of nature [7].

The link between visual art and musical taste in the 18th century can be observed in Leopold Mozart’s correspondences during his European tours with family, at the time when he particularly showed a strong enthusiasm for the leading painter of the past, Peter Paul Rubens (1577-1640). It is evidential that Leopold Mozart, the father of Wolfgang Amadeus Mozart’s (1756-1791), incorporated the aesthetic views of painting into his educational principles in order to inspire his son’s compositional skills [8]. Another example of a multisensory case in the 18th century was made by the Irish painter James Barry (1789-1865). His *Orpheus, oil on canvas* (1777-84) portrays a scene from Christoph Willibald Gluck’s opera *Orfeo ed Euridice* (*Orfeo and Euridice* 1762) [9].

### 3.3. Examples in the 19th Century

In the late 19th century, the interdisciplinary composer, Alexander Scriabin (1872-1915), reveals his experience of the synesthetic embracing of music, color, sound, light, and fire simultaneously together through his fifth symphony, *Prometheus, Poem of Fire*, Op.60 (1908-1910). In this composition, his utilization of a colored-organ part produces the color changes and specific meanings. The color keyboard was originally called *clavier à lumières*, also known as the *Luce*, which was played like a piano but projected just color-light on a screen in the concert hall. Scriabin’s Mystic chord was influenced by the third volume of *The Secret Doctrine* written by the Russian occultist and philosopher, Helena Petrovna Blavatsky (1831-1891), in which she introduces the knowledge of the theosophical theory of color and sound [10]. Corresponding to Blavatsky’s classification of three fundamental colors of red, yellow, and blue, Scriabin’s main utilization of colors possesses these three colors as well. Besides, he conceptualized other keys to convey other colors which were based on their closest proximity in the color spectrum, with specific correlations to the circle of fifths within the twelve major keys [11]. Generally, Scriabin’s design for the color wheel in *Prometheus* resembles the color-theory of the Austrian philosopher, Rudolf Steiner (1861-1925), who had constructed his color system based on the *Theory of Color* by Johann Wolfgang von Goethe (1749-1832).

### 3.4. Examples in the Contemporary Era

In the 20th century, the Hungarian composer György Ligeti (1923-2006) has both sound-color and grapheme-color synesthetic examples in his musical works. For instance, his work *Continuum* (1968) possesses a reference to “a pattern-illusion piece à la Maurits Escher”, imitating Escher’s topological idea in his prints [12]. The fractal structures of topology came from physical phenomena such as trees, leaves, and sound waves, which were discovered by the Polish-born mathematician and innovator, Benoît Mandelbrot (1924-2010), who specialized in the field of fractal geometry. Furthermore, Ligeti associated his orchestral piece, *Clocks and Clouds* (1972-1973), with the impression of melting clocks in Dali’s painting, *The Persistence of Memory* [13]. In this artwork, Dali expresses two innovative ideas of the 20th century. First, people during this era began to view time as fourth dimension space. Each individual has a self-evident concept of time in contrast to the absoluteness of time, according to his or her own experience. Second, the melting clock implies the fractal design of objects which has a significant definition in both mathematics and the visual arts. Ligeti’s works elaborate on the continuous experiment of time frames through periodic structures, with his application of repetitive patterns and motives [14].
These patterns construct fixed rhythmic duration and usually have sudden displacements of accent in the middle of the piece. This approach constitutes a space-time sphere that allows a performer to have an extra degree of freedom within repetitions in the musical performance.

4. Conclusion
Concluding from the examples given above, the musical analogy of image, visual art, religion, as well as geometry is expressed in the amplitude data of many composers’ works. The integration of visual images and sound in the musical works is rich in both rhetorical and symbolic expression. The musical components, as well as colors, interestingly exhibit an enchantment of an innovative landscape, in which the composers pursue a musical portrayal of spiritual moments. The historical views of the cultural background strongly influence the artists and inspire them to reflect these thoughts in their musical compositions. It is my hope that this article may be a helpful resource for the examination of cross-modal associations in the genre of audio-visual compositions from philosophical understandings.

References