

## Eye-Tracking in Out-of-Home Advertising: Exploring the Application of Gestalt Principles

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### Abstract:

Out-of-home advertising is a form of visual communication that integrates human visual perception and psychological experiences to create aesthetic pleasure. In this research, eye-tracking technology is utilized to investigate how the properties of Gestalt principles, when applied to out-of-home advertising, impact people's visual cognitive processes. **The problem** is Firstly, exploring how the application of eye-tracking can elevate the capacity to attract and sustain client attention. Secondly, it investigates the importance of incorporating Gestalt principles alongside eye-tracking technology to bolster the overall effectiveness of out-of-home advertising campaigns. Lastly, it seeks to integrate eye-tracking strategies into out-of-home advertising, shedding light on their role in amplifying and reinforcing the overall efficacy of such advertising. This paper follows a descriptive methodology to analyze some out-of-home advertising samples. **The primary objective** of this study is to utilize eye-tracking technology to investigate how Gestalt principles are applied in out-of-home advertising. The focus is on examining how out-of-home compositions influenced by Gestalt principles impact eye movement characteristics and gaze distribution of viewers. **Results:** The study reveals that out-of-home advertisements with Gestalt principles significantly influence fixation, sightline distribution, and subjective evaluations of aesthetics and complexity. Closure composition images, which exhibit a sense of completeness, tend to simplify cognition, leading to fewer fixations and saccades, longer fixation durations, and more concentrated sightlines, evoking a stronger feeling of beauty. On the other hand, out-of-home portraying similarity evokes more fixations and saccades, longer saccade durations, and greater scattering of sightlines, indicating feelings of complexity and unsightliness. Those findings hold significance for theories of art and design and offer valuable insights into both the theory and application of out-of-home advertising. By understanding how Gestalt principles impact viewers' cognitive processes, advertisers can create more effective and aesthetically pleasing out-of-home advertisements.

### Keywords:

Eye-tracking, Gestalt Principles, Out-of-Home advertising, Proximity, Continuity, Similarity, Closure, Figure-Ground

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### Introduction:

The world of advertising is a constantly evolving landscape, driven by the quest to capture the attention and engage the emotions of consumers. In this pursuit, marketers have delved into various strategies and techniques, seeking to understand the intricacies of human cognition and perception to create compelling advertisements.

One of the most intriguing and promising fields in this endeavor is eye-tracking, which harnesses the power of neuroscience to decipher how the human brain responds to marketing stimuli. Within the

realm of eye-tracking, the application of Gestalt principles in out-of-home advertising emerges as an area ripe for exploration and innovation.

out-of-home advertising, encompassing billboards, posters, transit ads, and other forms of visual communication in public spaces, represents a unique challenge and opportunity for advertisers. With only a fleeting moment to capture the attention of passersby, out-of-home advertisements must be visually striking and impactful. The integration of Gestalt principles into the design of these advertisements holds the potential to significantly

enhance their effectiveness.

Gestalt psychology, founded on the idea that the human mind naturally organizes sensory stimuli into meaningful patterns and structures, offers a compelling framework for understanding how individuals perceive and process visual information.

The principles of Gestalt, such as proximity, similarity, closure, and continuity, provide a roadmap for designing visual elements that resonate with viewers on a subconscious level.

### **Problem statement:**

#### **The problem statement as follows**

- 1- How can the utilization of eye-tracking enhance the ability to capture and maintain client attention toward out-of-home advertising?
- 2- What is the significance of integrating Gestalt principles with eye-tracking in supporting the effectiveness of out of home advertising campaigns?
- 3- What is the impact of implementing eye-tracking on enhancing and supporting the effectiveness of out-of-home advertising?

### **Objectives are to:**

- 1- Evaluating the effects of incorporating Gestalt principles into out-of-home advertising on fixation patterns, saccades, and general visual attention.
- 2- Determine how viewers personally perceive the aesthetics and complexity of out-of-home advertising that incorporates Gestalt principles.
- 3- Understanding the emotional and cognitive responses elicited by viewers when exposed to out-of-home advertising influenced by Gestalt principles.
- 4- Investigates the practical implications of out-of-home advertising practice, thus providing valuable insights to advertisers and designers.

### **Methodology:**

This paper follows a descriptive methodology to analyses some out-of-home advertising samples and experimental methodology.

### **Delimitations:**

**Temporal Boundaries:** From January 2023 till the end of the research.

**Spatial Boundaries:** The study covers several local models.

### **Research hypothesis:**

#### **The research assumes**

- 1- The utilization of eye-tracking significantly enhances the ability to capture and maintain client attention toward out-of-home advertising.
- 2- Integrating Gestalt principles with eye-tracking significantly supports the effectiveness of out-of-home advertising campaigns.
- 3- Implementing eye-tracking has a significant impact on enhancing and supporting the

effectiveness of out-of-home advertising.

### **Significance of the Study:**

#### **The Significance of the research lies in:**

##### **Education and Academic Community**

This research provides valuable insights into innovative methods to enhance the effectiveness of out-of-home advertising. It serves as an educational resource for students, researchers, and educators in fields like advertising, psychology, and design. By bridging the gap between theory and practice, it equips individuals with practical knowledge on utilizing eye-tracking and Gestalt principles.

##### **Environment and Society**

The study carries significance for society at large by addressing the impact of advertising on the visual environment. Through the exploration of more effective and engaging advertising techniques, it has the potential to reduce visual clutter, enhancing the aesthetic quality of public spaces. Furthermore, by comprehending viewer reactions, this research can contribute to the creation of socially and environmentally responsible advertisements.

##### **Industry and Trade**

Within the advertising industry, this research holds substantial importance. It offers the prospect of revolutionizing advertising practices, making campaigns more efficient and impactful. Advertisers and designers can derive practical insights to craft content that effectively captures and retains viewer attention. This not only elevates the efficacy of advertising campaigns but also furnishes a competitive advantage for companies within the advertising sector.

### **Theoretical framework:**

#### **The Relationship Between Out-of-Home Advertising and Gestalt Principles**

Gestalt principles provides valuable insights into how the human eye perceives images, showcasing a tendency toward Gestalt, where complexities are deciphered into points, lines, and surfaces. In the context of out-of-home advertising, the principles of Gestalt are utilized to establish a harmonious relationship between the main object and its surroundings. The concept of closure generates order, while using similar elements adjusts the pace of the advertisement, and properties of continuity and proximity regulate lines and spacing. Emphasizing a holistic view of the mind, Gestalt principles categorizes well-known principles, such as proximity, similarity, continuity, and closure.

In the realm of out-of-home advertising, beginner creators often encounter issues like sloppy composition, vague subjects, and poor organization. Applying Gestalt principles can act as an effective remedy for these problems, guiding advertisers to produce more compelling and coherent advertisements. However, it's crucial to recognize

that Gestalt principles is not a rigid formula for creation, but rather a valuable framework that aids in conveying visual information effectively.

By understanding concepts like figure and ground, simplification, and grouping principles, advertisers can better comprehend and describe the composition of images or the visual syntax within an advertisement. The Gestalt principles serve as tools to enhance the quality of out-of-home advertising, guiding creators towards more convincing and captivating visuals.

In the world of out-of-home advertising, one can observe that grabbing people's attention effectively does not necessarily require complex visuals. In fact, overly intricate advertisements may overwhelm viewers' cognitive capacity. Many timeless and impactful out-of-home advertisements are visually straightforward yet powerful in their messaging. For instance, contemporary advertisers like Ralph Gibson focus on exploring single objects or themes using techniques like overexposure, creating a highly granular and contrasted visual style. Such works align with Gestalt psychology, enabling viewers to naturally form Gestalt cognition when observing these out-of-home advertisements, evoking boundless emotions and sensations.

By incorporating the principles of Gestalt principles into out-of-home advertising, advertisers can craft visually compelling and coherent advertisements that resonate with their target audience. The concepts of proximity, similarity, and closure, among others, serve as valuable tools in organizing elements within an advertisement and guiding viewers' perception and understanding of the message conveyed.

### **Eye-Tracking**

Eye-tracking analysis is a valuable tool for understanding visual perception, encompassing complex information. Initially focused on studying static pictures, research has evolved to explore more intricate and diverse dynamic videos. By observing viewers' eye reactions, specifically their gaze trajectories, we can gain insights into high-level cognitive processing and visual image perception. (Mariana Macedo, 2021)

Throughout eye movement research, there is a growing consensus on the relevance of fixation points and their duration in understanding visual attention and cognitive processing during art appreciation. These studies have paved the way for investigating eye movements and gaze patterns in the context of out-of-home advertising inspired by Gestalt principles.

### **Out-of-Home Advertising**

Out-of-home advertising Encompasses various promotional approaches that engage consumers while they are outside their homes. It strategically

targets individuals in public spaces, during commutes, while waiting, or within specific commercial locales. As an essential component of multimedia advertising, out-of-home advertising serves versatile roles in product communication, ranging from impactful, large-scale campaigns during product launches to smaller, high-frequency strategies for ongoing support.

Its potency lies in its ability to swiftly reach and engage consumers, particularly as research indicates people spend significant time driving, using public transportation, or walking in urban environments, rendering them highly receptive to out-of-home advertising. Consequently, utilizing out-of-home advertising can potentially enhance customer attraction. Moreover, it offers the advantage of reinforcing core campaign messages or advertising objectives initially conveyed through broadcast or print media, characterized by its clarity, strong brand representation, and rapid impact.

### **Gestalt Principles**

The inception of the Gestalt theory dates to the early 20th century when psychologists conducted a thorough analysis and proposed a theory regarding the visual perception of objects by humans. (Raquel Addams, 2019)

Gestalt principles, also known as Gestalt laws, represent a set of guidelines elucidating the processes by which the human eye perceives visual elements. These principles are designed to illustrate how intricate visual scenes can be simplified into more basic shapes and, notably, how our visual perception tends to consolidate these shapes into a singular, unified form rather than as distinct individual elements. The term "Gestalt" originates from the German words for "shape" or "form," and these principles were originally formulated by Max Wertheimer, a psychologist of Austro-Hungarian descent, in the late 19th and early 20th centuries. Subsequent refinements and developments in these principles were made by psychologists such as Wolfgang Köhler in 1929, Kurt Koffka in 1935, and Wolfgang Metzger in 1936. (Norman D., 2022)

### **Experimental work:**

#### **Sample/Participants**

We assembled a group of 16 participants, consisting of 8 males and 8 females, all falling within the age range of 18 to 25 years. It's noteworthy that our entire participant pool comprised college students who actively engaged in the entire experimental procedure. To ensure unbiased results, we presented all stimuli to each participant in a random order using a within-subject design.

#### **Materials:**

An eye-tracking device /Tobii Pro Nano

#### **Procedure:**

Prior to the commencement of the experiment, each

participant was seated 60 cm away from a 21-inch CRT screen, with the screen's center aligned with the participant's line of sight.

An eye-tracking device, the Tobii Pro Nano, was configured to record gaze trajectories at a sampling rate of 60Hz, following a thorough 9-point calibration process.

The experiment began with the reading of instructions, followed by a series of practice trials to ensure participants' familiarity with the experimental setup.

Participants were instructed to move the mouse cursor to the center of a cross symbol displayed on the screen, which triggered the presentation of

photographs. The gaze trajectory during the viewing process was meticulously recorded.

Each advertising image was shown for a duration of 10 seconds, and they were presented in a randomized order. This sequence was repeated 40 times to encompass the entire set of advertising images.

Following the presentation of each stimulus, participants were asked to provide subjective ratings for the psychological complexity and aesthetics of all photos. They used a Likert scale ranging from 1 to 5, with 5 indicating high aesthetic appeal, and a similar scale was used to rate complexity, ranging from very simple (1) to very complex (5).

The entire experimental session for each participant had a duration of approximately 10 minutes.

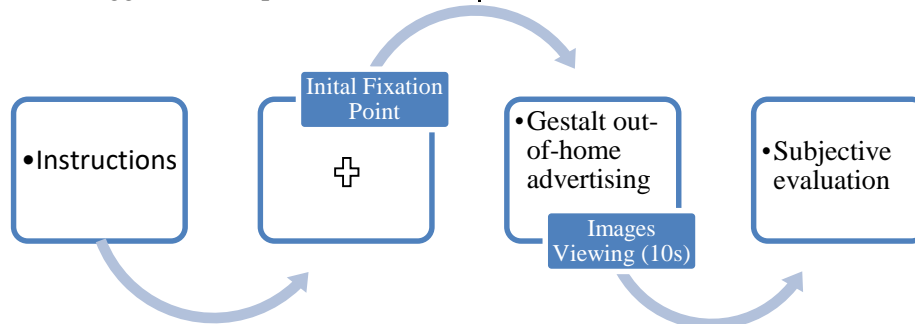


Figure 1 Illustration of steps of Experimental Procedure

**Experimental Manipulation:**

**Independent Variables:** This research focuses on Gestalt principles, including closure, figure-ground, similarity, continuity, and proximity

**Dependent Variables:** The study measures various aspects of eye movement behavior, specifically the total number of fixations, total fixation duration, number of saccades, saccade duration, Spatial Dispersion Index (SDI) of fixation, as well as participants' subjective evaluations of aesthetics and complexity.

**Experimental stimuli**

The experimental stimuli for this study were selected and validated using a focus group interview method.

To ensure the criteria's validity, four senior experts and scholars, each with over 15 years of practical experience, participated in the interviews. Prior to the interviews, a preselection of out-of-home advertisements was made, and during the group discussions, the four experts evaluated and selected the out-of-home advertisements that adhered to the gestalt criteria. The study focused on five gestalt properties: closure, figure-ground, similarity, continuity, and proximity, as depicted in Figure 3. The experts identified and selected ten Out-of-Home advertisements, which served as the experimental stimuli for further analysis.





Figure 2 Stimulus material designed by researcher

**Gestalt Principles:**

**Proximity**

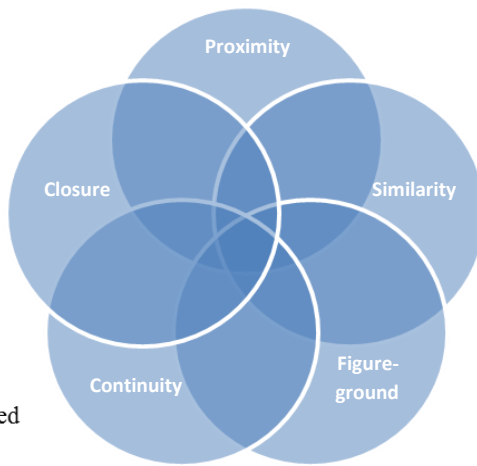
When different elements are laid out close to each other, they are perceived to be belonging to the same group

**Closure**

Reification or closure refers to making something concrete, bringing something into being, or making something real.

**Continuity**

Elements which are aligned with each other are perceived as visually associated



**Similarity**

Objecta with shared visual characteristics are automatically taken to be related

**Figure-ground**

The figure-ground relationship in design explores between positive and negative spaces.

Figure 3 Gestalt Principles designed by researcher

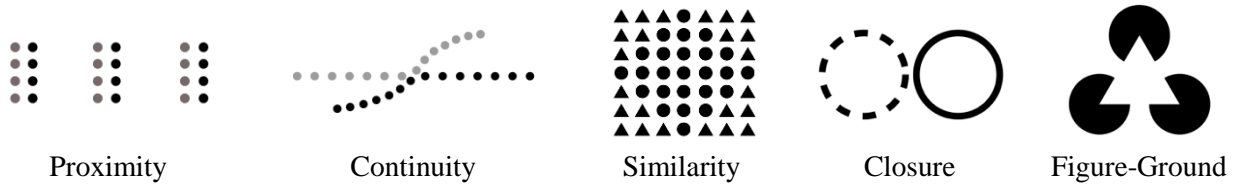


Figure 4 Illustrations of principles of gestalt designed by researcher

**Proximity:** Proximity, an important principle of grouping, exerts significant influence over visual cues such as color or shape similarity. It highlights that the perceived distance between objects in a display shapes our perception of their organization into sub-groups. (Jaimon M.,2023) Objects in

proximity are seen as grouped, while those farther apart are not. The closer the elements, the stronger their perceived relationship. Combining elements from different groups forms a visual cluster that the brain recognizes as an integral part of a unified image. (Jeff 2010)



Figure 5 Proximity: Items that are closer appear grouped with eye-tracking technique

In Figure (5), the main characters place next to each other and exhibit a consistent format, suggesting their shared purpose. When elements are positioned in proximity, the human brain perceives them as a unified entity, forming a distinct shape.

Proximity is a principle that designers can explore to create a winning out-of-home advertising. This is because there is room to introduce unique, individual elements that may even be used independently. Figure 5 is an example of the proximity. (Addams R., 2019)

**3.Similarity**

According to the law of similarity within the Gestalt principles, the human brain organizes individual elements into cohesive groups and perceives them holistically if they possess similar traits. These shared attributes can encompass various aspects,

including size, color, texture, and shape. By arranging objects in comparable ways, whether through form, color, or shape, we perceive them as more connected than those lacking common features. This principle of similarity plays a crucial role in how our minds processes visual information. In Figure (6), the identification of elements becomes easier when they are enlarged or colored differently. In out-of-home advertising, the similarity principle is applied more extensively than one might anticipate. It involves grouping objects together based on their color to communicate relationships between them. Alternatively, designers may strategically exclude one element to draw attention to another. This principle is widely utilized to ensure visual coherence and guide viewers' focus within graphic compositions.



Figure 6 Example of Similarly principle in out-of-home advertising by using eye-tracking technique

This principle helps users perceive relationships between elements and navigate outdoor advertising more intuitively. Additionally, the similarity principle can be leveraged to highlight specific elements or draw attention to important information by contrasting them with distinct visual attributes. Overall, the principle of similarity plays a crucial role in enhancing the consumer experience and promoting effective communication in out-of-home advertising see Figure (6)

### 3. Figure/Ground

The figure-ground relationship in design explores between positive and negative spaces. Designers can

strategically utilize negative and positive spaces to establish a visual hierarchy, experiment with the closure principle, manipulate sizes, and create emphasis on specific elements. Figure (7) an example of the figure-ground relationship in design can be observed in two ways. Firstly, the text positioned on the Center are clearly placed on top of dark background image, creating a distinct figure-ground contrast. Secondly, the white text on the bottom located on the center stands out prominently against the black background, further exemplifying the figure-ground principle.



Figure 7 An example of Figure/Ground principle using eye-tracking technique designed by researcher

### 4. Continuity

The principle of continuity posits that humans tend to perceive and organize continuous parts of objects, with the eye naturally following along that direction unless interrupted. This principle can be

advantageous in out-of-home design as it aids in connecting various elements of the advertising. For instance, a continuous element can be used to unify different colors or ideas within the design.



Figure 8 An example of the application of the continuity principle in out-of-home advertising using eye-tracking technique.

The advantage of the continuity principle lies in its ability to guide viewers' attention and effectively convey a desired message. By strategically employing this principle, designers can lead viewers along a visual path of their choosing and leave them with the intended message. When applied correctly, this can yield significant impact. By focusing on gestalt principles, designers can find inspiration and explore various creative paths. When facing a creative block, examining these principles can provide guidance and spark new ideas. Ultimately, analysing design in terms of design principles and gestalt elements enhances our understanding of

effective out-of-home advertising and its profound influence on consumers. (Kareem, 2023)

**Closure**

The closure principle refers to the human brain's ability to fill in missing information and perceive complete shapes or patterns. By leveraging this gestalt principle, designers can use shapes strategically to evoke imagery without explicitly depicting it, allowing viewers' minds to complete the visual experience. This principle suggests that the human brain naturally seeks patterns and, with the right amount of information, can mentally fill in the gaps to perceive a complete pattern.



Figure 9 An example of the application of the continuity principle in Out-of-Home advertising using eye-tracking technique.

This approach can lead to the creation of highly creative and distinctive out-of-home advertising, leveraging the power of the viewer's imagination to complete the intended visual pattern. (Paget I., 2017) Figure 8 The utilization of eye-tracking technology provides clear evidence of how the closure element's effectiveness, the deliberate placement of one advertisement over another, and the design emphasizing closure all work cohesively to guide the viewer's gaze in naturally completing the visual connection.

the impact of gestalt properties is notable. It was observed that gestalt properties have significant effects on both the number of fixations ( $F(3.2175=15.121, p < 0.05)$ ) and fixation duration ( $F(3.2175=7.900, p < 0.01)$ ), influencing the overall distribution of where people focus their gaze. Specifically, out-of-home advertisements featuring the closure property had the fewest fixations and the longest viewing time, indicating that they are more intricate and require more time to comprehend. Conversely, out-of-home advertising with the similarity property clearly had the highest number of fixations, suggesting that this type of advertising is more complex and demands more effort to understand, as illustrated in Figure 10 and Figure 11.

**Results of the experimental study:**

**The effect of gestalt properties**

In the analysis of the variables related to the total number of fixations and the total fixation duration,

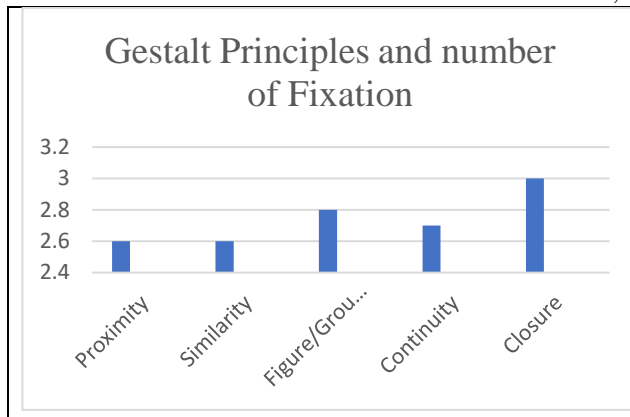


Figure10 The Number of fixations of different gestalt principles

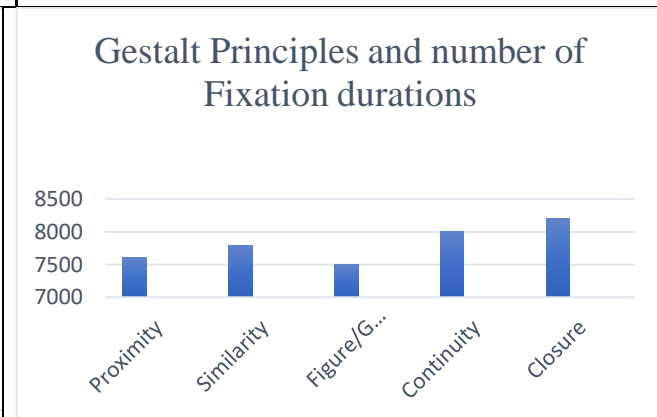


Figure11 The Number of fixation durations of different gestalt principles

5. In the analysis of the total number of saccades and the duration of saccades, the study revealed

significant primary effects of gestalt properties. Specifically, the number of saccades ( $F(3.2175 = 6.786, p < 0.01)$ ) and saccade duration ( $F(3.2175 =$





7.412,  $p < 0.01$ ) were influenced by these properties, images featuring the similarity property exhibited a higher number of saccades with longer durations, indicating that content with a high degree of similarity tends to be more complex and challenging to view. In contrast, images with the closure property were found to facilitate easier viewing, as depicted in figure 12 and figure 13.

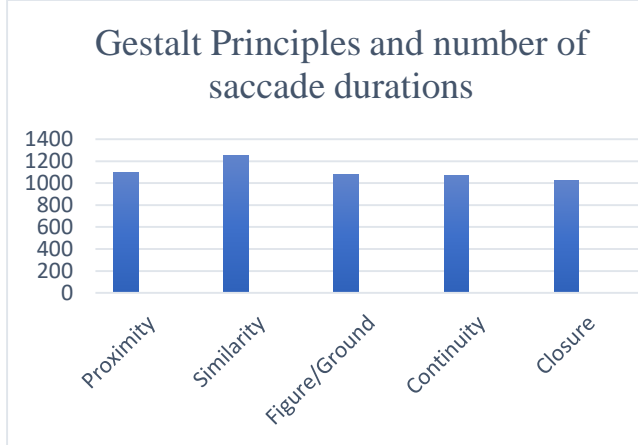


Figure 12 The Number of saccade duration of different gestalt properties

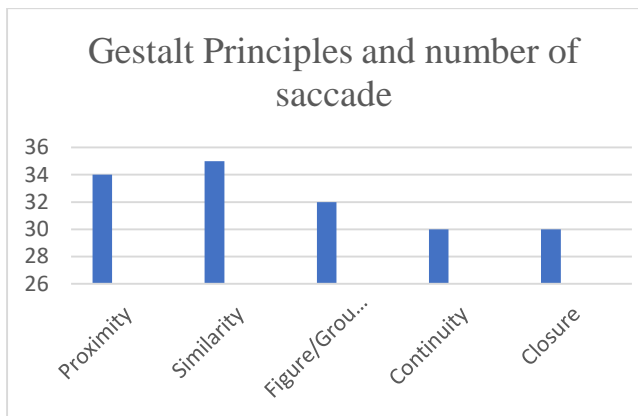


Figure 13 The Number of saccades of different gestalt properties

In the subjective part of the experiment, participants were asked to provide ratings for two aspects: complexity and aesthetics. The analysis revealed that gestalt principles significantly influence aesthetics ( $F(3.2175 = 3.763, p < 0.05)$ ), showing that different gestalt properties affect aesthetic ratings differently, as depicted in the figure. Further analysis demonstrated that the type of gestalt property also significantly affects the perception of complexity ( $F(3.2175 = 26.567, p < 0.01)$ ). This implies that different gestalt principles evoke varying degrees of complexity for viewers, particularly with similarity and proximity properties, which scored higher in complexity but lower in aesthetics. Moreover, figure-ground and closure property images received higher subjective aesthetics ratings but lower complexity ratings. The study also identified a positive correlation between subjective assessments of complexity and aesthetics.

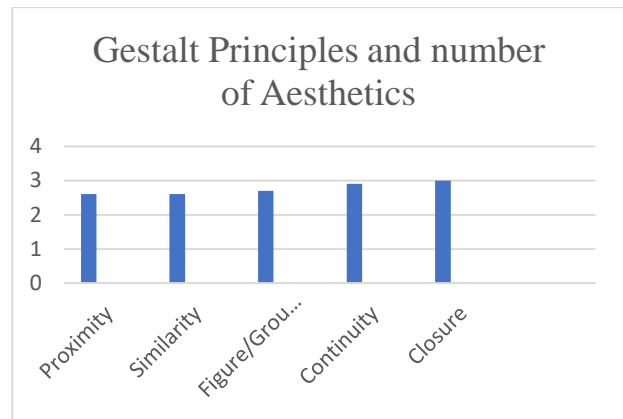


Figure 14 Gestalt Principles and number of Aesthetics

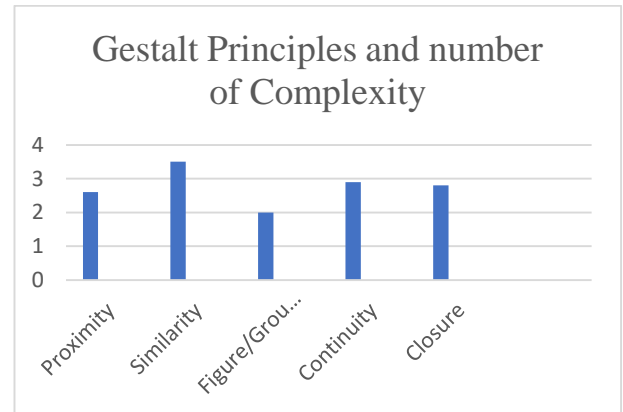


Figure 15 Gestalt Principles and number of Complexity

In Conclusion out-of-home advertising with the similarity principle, it's important to note that viewers frequently shifted their gaze and made longer eye movements. Their line of sight covered a wider area, indicating that they were consistently making comparisons. This, in turn, required more time and mental effort to maintain their attention, especially when exposed to repeated viewings of the advertising content.

The two subjective measures, complexity, and aesthetics reflected viewers' psychological perceptions of the content. Significantly, compositions with the similarity property were considered more intricate but less aesthetically pleasing. In contrast, compositions with the figure-ground property were seen as less complex and more stable.

This observation aligns with principles of art design theory, where the visual system tends to organize elements into a coherent whole. Consequently, figure-ground-type compositions displayed less dispersed gaze patterns, scoring lower in terms of complexity compared to other types in out-of-home advertising.

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