



Psychological Evaluation of Media Art Focusing on Movement

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Abstract. This study investigates the psychological impact of the movement elements of media art on viewers. As a new art form with contemporary media often exhibited in public places, media art plays a crucial role in stimulating thoughts, raising social issues, and designing various experiential spaces. Therefore, understanding how each element within media art affects human psychology is indispensable.

We took the abstract and diverse characteristics of Tosa Art as a subject and categorized the movement elements of the artwork into five categories: vertical, horizontal, scattered, rotational, and symmetrical. We then had 30 participants evaluate the impact of each category on four psychological factors: impression, relaxation, motivation, and creativity. As a result, while the “rotational” category significantly influenced impression, motivation, and creativity, the impact of the “vertical” movement was minimal.

Our findings align with existing research that visual movements draw attention, reinforce memory, and induce emotions and behaviors. This study adds a new perspective to understanding the psychological effects of art and emphasizes the importance of evaluating movement as an element of the artwork.

However, as a limitation, this study primarily focuses on movement, not considering other potential influencing factors such as other visual elements, the context of the work, and individual personality traits. Given that the research is specifically centered on Tosa art, there is also a need to experiment with a broader range of artists. Future research needs to explore these factors to fully grasp the overall psychological impact of media art.

Keywords: Media art · movement in media art · psychological evaluation

1 Introduction

1.1 Research Background

Determining which elements of an art piece influence people’s psychology and how this connects to the evaluation of the work is an essential yet challenging question. It can be meaningless to extract specific elements of an art piece, such as color, movement, or shape, and investigate whether these elements leave impressions on individuals.

Assessing art pieces created by artists by breaking them down into their components is a valuation of those components themselves and, as numerous previous studies have recorded, cannot always be considered an evaluation of the work. In other words, when evaluating a piece, it is critical to look at and assess the elements within the work. In other words, if we can gain a fundamental understanding of how elements such as color, shape, and in the case of media art, movement within an art piece influence human psychology, this would be beneficial in understanding how to appreciate art and what types of art pieces are suitable for specific situations.

Media art is a new form expected to be viewed by many people in public places using the latest media, such as projectors and LED displays. As seen in New York's the 9/11 Memorial Museum and Times Square, media art is anticipated to raise social issues through visual expression, stimulate thought, and create various experiential spaces for visitors. Therefore, its exhibition in various situations and locations will advance.

Given recent trends, it is essential to conduct evaluative research on the impact of various elements within media art on human psychology.

1.2 Tosa Art

Naoko Tosa, one of the authors, has been creating media art where new technologies play a significant role. She has used high-speed cameras to uncover the beauty hidden within various natural and physical phenomena. In particular, she has been interested in the behavior of fluids and has attempted to create media art by capturing the dynamics of fluids using a high-speed camera [1]. This field is known as "fluid dynamics," and a variety of research has been conducted in this area [2, 3]. The beautiful movement of fluids captivates many people, and another field of study is "visualization of fluid motion" [4]. However, most visualizations only show the behavior of stable fluids, with unstable and unpredictable behaviors being rare. Naoko Tosa, a new media artist, has created many media art pieces using high-speed cameras to express such unstable and unpredictable behaviors in the form of art.

This study uses her media art as a subject to analyze how the components within media art psychologically impact the audience, contributing to the future application and evaluation methods of media art.

2 Related Research

The idea that evaluating art based on its constituent parts can lead to different interpretations from viewing the art as a whole that can be explained by Gestalt psychology, a concept developed in Max Wertheimer's "Experimental Studies on Seeing Motion (1912)" [5]. Through a series of experiments using frame-switching in film projectors, he conducted experiments on the perception of motion through vision.

Wertheimer discovered that when individual static images are displayed in succession at a constant speed, they are perceived visually as a continuous motion. He analyzed this phenomenon, concluding that this type of perception is not simply due to the quick succession of individual images but rather a tendency of the human brain to perceive continuous motion as a "whole."

This study was instrumental in establishing the foundations of Gestalt psychology and supporting the theory that the process of visual perception is more than just the simple sum of individual visual stimuli. In other words, it laid the groundwork for advocating the main principle of Gestalt psychology, “the whole is greater than the sum of its parts.”

The central idea of Gestalt theory, “the whole is greater than the sum of its parts,” has deeply influenced the visual understanding and practice of art and design. It was vital in discussions about how visual organization, spatial arrangement, balance, and symmetry influence the interpretation of a piece. This is illustrated in Roy R. Behrens’ “Art, Design and Gestalt Theory (1998)” [6]. In the paper, Behrens investigates in detail how the principles of Gestalt psychology influenced the art and design movements of the early 20th century, particularly the Bauhaus, and discusses how Gestalt theory has been integrated into the visual understanding and practice of art and design. For instance, Behrens highlights the foundational courses in Bauhaus education, where the exploration of essential visual elements like color, shape, and material aimed to understand how these elements shape a piece’s overall visual impression and meaning. This exploration is deeply rooted in the principles of visual organization and perception of Gestalt theory.

Furthermore, Behrens provides specific examples of how Gestalt theory has influenced artists and designers’ creations and understanding of their work. The “Dada Cafe” logo design demonstrates how visual elements are grouped to form a pattern. The logo is designed based on the principle of similarity in Gestalt theory, where similar visual elements are perceived as belonging.

Thus, the elements have no meaning when evaluated separately for art and design. Instead, what matters is how these elements impact the viewer. At the same time, crucial previous research has been presented from the viewpoint of evaluating works, which will be introduced.

On the other hand, research on how people evaluate art forms such as paintings began with Fechner’s initiation of experimental aesthetics in the late 19th century. This started with quantitatively measuring human emotions, such as comfort and discomfort. Since then, various psychological studies have been conducted on the beauty and style of art.

For instance, Farkas [7] conducted a study using Surrealist paintings to investigate the types of art that people prefer and discovered that famous artworks were favored. Winston and Cupchik [8] experimented on whether experts or novices prefer fine art paintings or secular paintings. The result showed that experts tend to prefer fine art, while novices tend to prefer secular paintings.

Remarkably, numerous studies have compared abstract paintings with figurative ones [9–11]. For example, Friedman compared the preferences for the abstractness and complexity of paintings among three adult groups: students receiving elementary education, students receiving art education, and professors and graduate students. She found that the first group preferred paintings with the lowest levels of abstractness and complexity, while the third group preferred paintings with high abstractness and complexity [9]. Pihko et al. varied the degree of abstraction in paintings and examined the preferences for abstract art among amateurs and professionals. They found that abstraction influences the aesthetic judgments of amateurs but not professionals [10]. Belke et al. investigated whether evaluations change when style information is provided and discovered that such information positively shifts the subjects’ opinions [11].

While evaluations of fine art, such as paintings, have been widely studied in prior research, temporal art forms like media art are scarce. With the proliferation of high-luminance projectors and large LED displays, the frequency of media art appreciation is increasing, and evaluating media art is a critical issue. This study is a challenging endeavor that attempts to evaluate media art, drawing on the evaluation methods of fine art established so far.

3 Media Art to Be Evaluated

Media art introduces an additional element of time or motion compared to traditional fine arts like painting. As discussed in Sect. 2, while evaluations are plentiful for traditional art forms, focusing on this unique aspect - the temporal axis - is essential when evaluating media art. Hence, it is necessary to define criteria for aspects beyond the time dimension, including only those that meet these standards, to streamline the evaluation of media art. Here, we employ the following criteria:

- (a) We focus on works that do not incorporate human subjects. When artworks use human subjects, they resemble art forms such as film, leading audiences to evaluate narrative and other aspects. We can better understand how viewers value media art by excluding humans as subjects.
- (b) Works that engage with natural objects fit this category. When artworks involve artificial artifacts, viewers, similar to the situation (a), often judge these based on their interpretation of what they represent. To prevent this, we consider it best to include works that primarily deal with natural phenomena or objects.
- (c) Consequently, works that do not use computer graphics (CG) fit the criteria.

The art created by Tosa aligns well with these criteria for the following reasons:

- (1) The primary focus is on natural phenomena. Tosa art is characterized by capturing and portraying the hidden beauty in nature rather than human-made creations. In this way, it satisfies conditions (a) and (b).
- (2) Given that CG is not used, thus fulfilling condition (c).

4 Media Art Content Used in the Experiment

4.1 Targeted Media Art

Table 1 presents a selection of 24 representative works from Tosa art [12–15], also detailing their distinct features concerning the following aspects:

- (1) What are the predominant types of movements included?
- (2) Is the expression abstract or figurative?
- (3) What primary colors are used?

In this psychological experiment, we decided to select artworks for evaluation by focusing on movement among these factors.

Table 1. Representative media artworks by Naoko Tosa

No.	Title	Movement	Figurative /Abstract	Color
1	Sound of Ikebana:Spring	Hor.+Ver.	Abstract	Red
2	Sound of Ikebana:Summer	Hor.+Ver.	Abstract	Blue
3	Sound of Ikebana:Autumn	Hor.+Ver.	Abstract	Purple
4	Sound of Ikebana:Winter	Hor.+Ver.	Abstract	Dark
5	Genesis : Blue	Horizontal	Abstract	Blue
6	Genesis : Red	Horizontal	Abstract	Red
7	Genesis : Green	Horizontal	Abstract	Green
8	Genesis : Purple	Horizontal	Abstract	Purple
9	Four Gods : Turtle	Vertical	Abstract	Blue
10	Four Gods : Red Phoenix	Vertical	Abstract	Red
11	Four Gods:Blue dragon	Vertical	Abstract	Blue
12	Four Gods:White tiger	Vertical	Abstract	White
13	Volcano	Vertical	Abstract	Black
14	Shan-Shui	Vertical	Abstract	White
15	Moon Flower	Scatter	Fig.+Abs.	Flower Color
16	Space Flower	Scatter	Fig.+Abs.	Flower Color
18	Space Jungle	Scatter	Fig.+Abs.	Flower Color
17	Oiran	Scatter	Fig.+Abs.	Flower Color
19	Utsuroi	Scatter	Figurative	Flower Color
20	Miyabi	Rotation	Fig.+Abs.	Flower Color
21	Twin Lions	Symmetric	Fig.+Abs.	Blue, Red
22	Organic Geometry	Symmetric	Abstract	White, Red
23	Wind god	Horizontal	Abstract	Blue, Red
24	Thunder god	Horizontal	Abstract	Black, purple

Hor.: Horizontal, Ver.:Vertical

4.2 Preparation for the Experiment

Artwork Classification: The artworks were categorized into five distinct classes according to the type of movement they exhibited: vertical, horizontal, scatter, rotation, and symmetry.

Artwork Selection: Two artworks were chosen for each type of movement, specifically:

Vertical movement: Artworks No. 10 and No. 12

Horizontal movement: Artworks No. 23 and No. 24

Scattering: Artworks No. 15 and No. 19

Rotation: Artwork No. 20

Symmetry: Artworks No. 21 and No. 22

Artwork Grouping: Artworks were then arranged into two separate groups:

Group α: Artworks No. 10, No. 23, No. 15, No. 20, and No. 21

Group β: Artworks No. 12, No. 14, No. 19, No. 20, and No. 22

Creation of Movement Sets: Five sets were established, each sorted by “movement” in a different order:

Set 1: vertical, horizontal, scatter, rotation, symmetry.

Set 2: scatter, rotation, vertical, horizontal, symmetry.

Set 3: rotation, vertical, symmetry, scatter, horizontal.

Set 4: horizontal, rotation, scatter, vertical, symmetry.

Set 5: symmetry, vertical, rotation, horizontal, scatter.

Participant Division: The subjects were distributed into ten separate groups.

Assignment of Group and Set: Based on the experimental design method, each group was allotted an artwork group and a movement set.

5 Experimental Conditions

5.1 Subjects

Thirty Kyoto University students were used as subjects. The breakdown was 13 males and 17 females. They were randomly assigned to one of 10 groups of 3 students.

5.2 Experimental Equipment

The following experimental equipment was used.

Projector model (brightness): Epson EB-2155W (5000 lumens)

Screen size: 70 in.

Distance between subject and screen: 2 m

After viewing each artwork, the subjects were asked to answer the questionnaire using the subjects’ smartphones using Google Forms.

5.3 Experimental Environment

The laboratory used for this experiment was equipped with the abovementioned devices, as illustrated in Fig. 1. Moreover, viewing the media art pieces took place under dimmed lighting conditions.

5.4 Evaluation Items

The evaluation was centered on two main aspects: the impression elicited by each image (Impression factor) and the psychological impact each image had on the subjects (Effect factor). The Effect factor consisted of assessing whether participants felt relaxed (Relaxation factor), motivated (Motivation factor), and inspired to think increased creatively (Creativity factor). The questions that formed the Impression, Relaxation, Motivation, and Creativity factors are listed below. A psychologist, one of the authors, established these questionnaire items and validated them in other art evaluation experiments [16].



Fig. 1. Experimental environment

Impression Factor involves questions such as: Comfortable or Uncomfortable, Familiar or Unfamiliar, Beautiful or Not beautiful, Calm or Restless, Interesting or Boring, Warm or Cold, Changeable or Not changeable, Luxury or Sober, Individual or Ordinary.

Relaxation Factor involves questions such as: At ease or Not at ease, Secure or Not secure, Pleasant or Not pleasant, Relaxed or Not relaxed, Healed or Not healed.

Motivation Factor involves questions such as Enthusiastic or Not enthusiastic, Immersed or Not immersed, Curious or Not curious, Motivated or Not motivated, Aroused or Not aroused.

Creativity Factor involves questions such as Associate or Do not associate, Immersive or Not immersive, Activated or Not activated, Inspired or Not Inspired, and In the zone or Not in the zone.

6 Experimental Results and Discussion

6.1 Experimental Results

The original data obtained from the evaluations were first averaged for each of the five types of movements and then further averaged for each factor, including the impression, relaxation, motivation, and creativity factors. Subsequently, to enable straightforward comparisons of the results, these were standardized with an average of 50 and a standard deviation of 10. The resultant values are presented as bar graphs in Figs. 2, 3, 4 and 5. Figure 2 presents the evaluation results for the Impression Factor. The vertical movement received a score of 39.66, horizontal movement scored 48.22, scatter scored 51.71, rotation scored 65.99, and symmetry scored 44.42. Subsequently, Fig. 3 displays the evaluation results for the Relaxation Factor, with vertical movement scoring 52.53, horizontal movement scoring 58.02, scatter scoring 53.46, rotation scoring 53.46, and symmetry scoring 32.53.

Furthermore, Fig. 4 reveals the evaluation results for the Motivation Factor: vertical movement was rated 32.21, horizontal movement scored 50.47, scatter scored 52.81, rotation scored 59.83, and symmetry scored 52.68. Lastly, Fig. 5 outlines the evaluation results for the Creativity Factor, with vertical movement receiving a rating of 43.75, horizontal movement scoring 53.26, scatter scoring 35.93, rotation scoring 60.4, and

symmetry scoring 56.66. Through the analysis of these data, it became evident that there is a notable difference in the psychological impact elicited by each movement element in Tosa art.

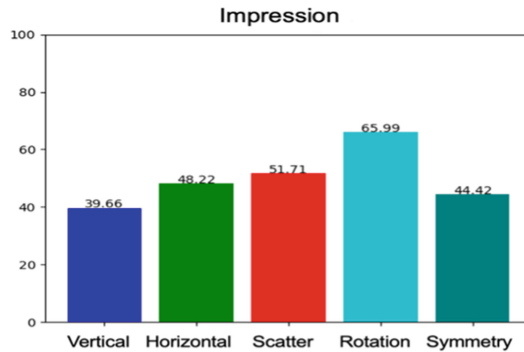


Fig. 2. Results related to the impression factor.

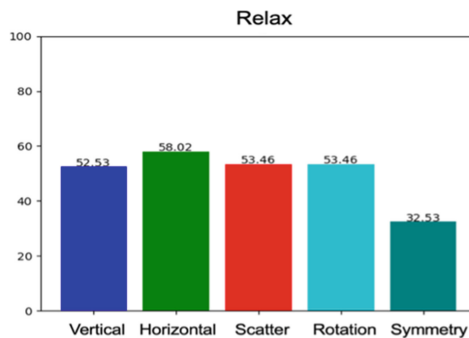


Fig. 3. Results related to the relaxation factor.

6.2 Considerations

This study was undertaken to provide answers on how elements of motion in media art impact viewers' psychology. Our proposed inquiry centered on how artworks influence individuals' psychology and, consequently, how these effects shape evaluations of the pieces. To deduce answers, our research primarily focused on new forms of media art, assessing how their motion elements affect viewers' psychology.

Our results revealed significant variability in the psychological impact exerted by the motion characteristics of artworks. Specifically, rotating motions had a profound influence on viewers' impressions, motivation, and creativity. In contrast, vertical motions were found to have minimal impact. These findings suggest that rotating motions capture viewers' attention, stimulate spontaneous actions, and activate imagination through visual emphasis, energy, vitality, and the introduction of new visual patterns and forms.

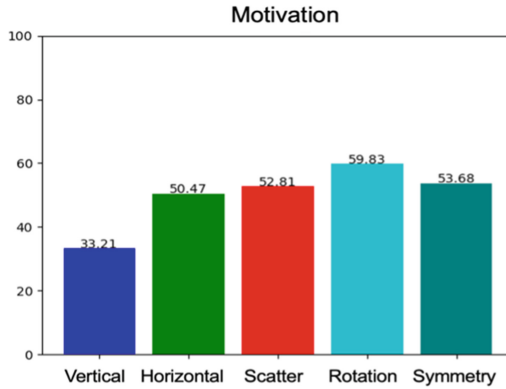


Fig. 4. Results related to the motivation factor.

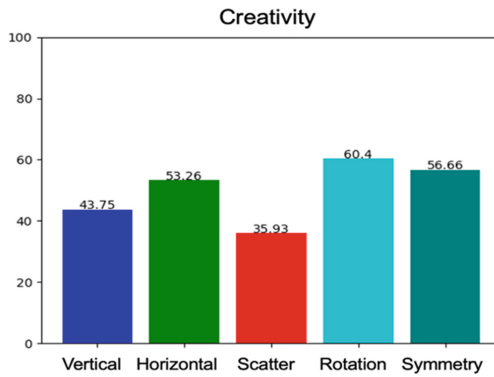


Fig. 5. Results related to the creativity factor.

These findings align with existing research. For instance, prior studies have reported that visual motions capture attention and enhance memory and recognition [17]. Research on the capacity of motion to elicit emotions and behaviors [18] has also been conducted, and our results support these investigations.

Moreover, this research offers a fresh perspective on understanding the psychological impacts artworks have on individuals. Traditionally, artworks have been evaluated based on elements such as color and shape. However, this study unveiled the impact of an artwork's motion elements on viewer psychology. This constitutes an essential step towards a deeper comprehension of art evaluation, providing new insights into how art appreciation influences individual psychological experiences.

Our research contributes to understanding the specific impacts when evaluating media art, especially when anticipated for public display. By considering the effects on viewers' impressions, emotions, behaviors, and creativity, it becomes feasible to contemplate more appropriate artwork selections and exhibition methods.

However, our study primarily focused on motion elements, not giving due consideration to other visual elements, the context of the work, and other potential influencing

factors. Resolving this requires analyzing factors that are both conscious and unconscious. To uncover conscious factors, introducing qualitative investigations like semi-structured interviews to deeply explore viewers' experiences, feelings, interpretations, and reactions to the artwork would be essential. Additionally, integrating psychological data, such as heart rate, for analyzing unconscious factors is deemed necessary.

Furthermore, the evaluation of viewers' experiences primarily relied on self-reports. While self-reports are valuable sources of information, they might only capture a partial account of viewers' experiences. Impressions of beauty, color, and movement in artworks are heavily influenced by an individual's past experiences, cultural background, and environment, as demonstrated in many preceding studies [19–21]. Hence, future research needs to determine whether the impressions derived from the artwork's motion are universally intuitive or reflect past experiences.

Additionally, our experiments were conducted focusing on works by Tosa. Based solely on these results, drawing conclusions for artworks by other artists would be presumptuous. Moving forward, experiments on various artists' works are essential to validate if these findings are universally applicable. Nonetheless, our research is significantly meaningful as a precursor to evaluating media art pieces appropriately in the future.

In conclusion, our research offers new insights into the effects of motion elements in media art on viewer psychology. These findings present a new framework for understanding the relationship between art appreciation and viewer psychology, providing valuable insights for future research. We anticipate that the results of our study will find further applications in understanding the creation, appreciation, and evaluation of art and deepening comprehension of human psychology.

7 Conclusion

This study elucidated the impact of motion elements in media art on the psychology of viewers. Specifically, it revealed that different movement characteristics of art pieces, such as vertical, horizontal, scattered, rotational, and symmetrical movements, exert varied effects on viewers' impressions, relaxation, motivation, and creativity. Notably, rotational movements were found to have the most significant impact on viewers' psychological responses. This suggests that rotational movements, by presenting visual emphasis, energy, vigor, and introducing new visual patterns and shapes, capture the attention of viewers, stimulate spontaneous actions, and enhance imagination.

These findings deepen our understanding of how motion, as a visual element, is involved in the evaluation of art pieces and the psychological experiences of viewers. They offer new insights into how the appreciation of media art affects individual psychological experiences. Moreover, these insights contribute to a more concrete understanding of the impact on evaluations of media art intended for public exhibitions, providing guidelines for the selection of more appropriate artworks and exhibition methods.

For future research directions, it is essential to consider other visual elements of art pieces, the context of the work, cultural backgrounds, and individual experiences as potential influencing factors. The incorporation of qualitative research and psychological data, such as heart rate measurements, should also be considered. Furthermore, by

studying works from different artists, there's a need to verify the extent to which our results can be generalized across a broader spectrum.

In conclusion, this research provides new insights into the relationship between motion elements in media art and viewers' psychology, confirming its significance. These findings propose a novel framework for the creation, appreciation, and evaluation of art, potentially deepening our understanding of human psychology. We anticipate that this research points to new directions that can enrich the evaluation and experiences of viewers in media art.

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