

Measuring the Impact of Fixation Patterns on Personal Interpretations of Artwork

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ABSTRACT

Artwork is entirely subjective. One person's interpretation of such is based solely on their personal experience and perception of the elements within the piece and can differ completely from another person's interpretation, despite both being subjected to the same piece of artwork. The present study measured the impact of fixation patterns on personal interpretations of artwork. 8 participants (5 female, 2 male, 1 prefer not to say) were asked to view a series of artworks while their gaze was tracked with an eye tracker. Each participant viewed each stimuli for 30 seconds and then completed a short survey on their personal interpretation of the artwork. The data was then interpreted to find patterns between subjects who had similar fixation points and interpretations of the artworks. Results showed no strong correlation between a person's most viewed fixation and most revisited fixation and their personal interpretation of a piece of artwork. We discuss the possible future experiments to find a link between fixation points and interpretation of artwork

KEYWORDS

eye tracking, art saliency, artistic interpretation

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1 INTRODUCTION

The interpretation of artwork is a very interesting concept; particularly due to the fact that art itself is entirely subjective, and so there can be an infinite amount of ways to interpret a specific piece of art. Subjectivity is based on personal opinions and feelings rather than fact. A painting may look "ugly" to one person but "beautiful" to another despite the painting itself remaining unchanged. Or maybe to one a certain painting is symbolism for war or inner turmoil, while to another the same painting symbolizes freedom and happiness within oneself, again, despite the painting remaining unchanged. To understand why this is, one must first understand how we see and perceive art in a more scientific sense. Similarly

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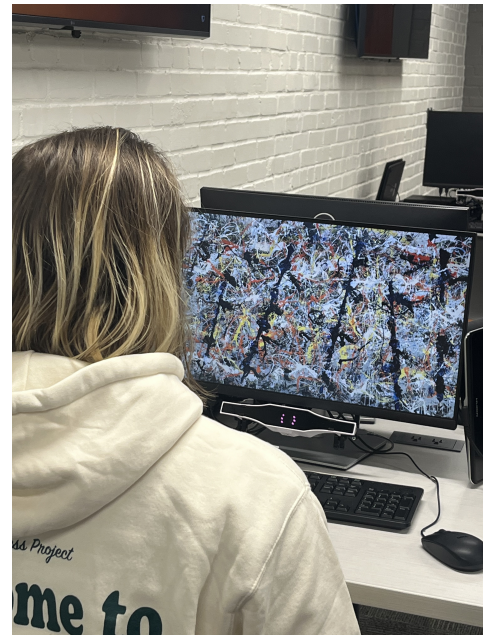


Figure 1: Experiment set-up

to how artwork itself is created, the interpretation of art rides on many different factors, including childhood, upbringing, personal world views, life experiences and more. Interpretation of a piece of art does not solely rely on where the gaze is fixated, and this is important to note. However, that isn't to say that fixation patterns relevant to personal interpretation cannot be found. Gaining a deeper understanding of how we view art is a vital step to laying the foundation for future experiments on perception and interpretation of both figurative and more abstract artworks. This paper describes an experiment to further benefit the existing research on our perception and interpretation of artwork and how where we look can influence our personal interpretation. For example, if two people focus on the same section of the same painting, would they interpret the meaning similarly? We set up our experiment to test this idea.

2 BACKGROUND

Because art is so subjective, there are many different experiments that can and have been carried out in the interest of understanding how human beings perceive art in different contexts. An interesting eye-tracking study was done by Rodrigo Quiroga and Carlos Pedreira (2011) wherein they sought to understand how perception of



Figure 2: *An Allegory of the North and South* by Jason Terry

a piece of artwork would change if the work was slightly modified from the original. The experiment was done on 10 participants, who were shown a variety of original paintings from artists Molina, Mondrian, Rembrandt and Francesca, as well as versions modified in Adobe Photoshop, in a randomized order. The study revealed that there were commonalities between the participants' fixation patterns relevant to the changes in harmony, balance, focal point, and other artistic elements, but still a large variability depending on the subjects' own interests and level of artistic appreciation [Quian Quiroga and Pedreira 2011]. Another study conducted by Villani et al. experimented with how we perceive art in paintings depicting individual actions versus paintings depicting social actions. The experiment was conducted on 44 participants who were shown 10 classical-style paintings which contained either individual or social actions, created by varying artists, without the title being disclosed to them. A visual saliency map was used to determine the fixation points in both forms of paintings, which led to the conclusion that, when shown a piece of art depicting a social action, the participants' gazes fixated longer on the faces of the subjects in the painting because facial expressions are crucial to understanding the social context of said action. The opposite was found to be true in paintings depicting individual actions - the participants' gazes fixated less on the face of the subject and was more evenly spread around the human figure because the facial expression was not required to understand the context of the action [Villani et al. 2015]. The conclusions drawn in these experiments inspired us to think about the possibilities of using fixation patterns from gaze-tracking to study the perception of art. Because the previously mentioned experiments studied more baseline hypotheses and did not dig into the personal interpretation of the artworks shown to the participants, we decided to carry out our own experiment to study the connection between one's fixation points and their interpretation of an artwork. In our experiment, we aim to narrow down the participants' interpretation to a few select points via multiple choice questioning, and through this draw connections and group our participants based on their answer selections. The dwell time of the participants from each group are then compared, and we can analyze the correlation between the fixation points and the various interpretations of the stimuli.



Figure 3: *American Gothic* by Grant Wood

3 HYPOTHESIS

We assume that there would be a connection between a person's fixation points and how they personally interpreted a piece of artwork and that the elements of an artwork that a person's gaze is drawn to first would influence how they interpreted the meaning of the piece as a whole. Therefore, we hypothesized that people who fixated on the same element in a piece of art would have the same or similar interpretations of the meaning. Thus we set up our experiment in order to evaluate these core assumptions.

- (1) Participants who have similar fixation points will also have similar interpretations of the artwork presented.
- (2) Participants who have seen the artwork previously may have differing interpretations of the piece, regardless of similar fixation patterns to other participants.

4 METHODOLOGY

4.1 Participants

Eight current students at Clemson University, undergraduates and graduates, volunteered to participate in the study. All participants had normal vision with no visual impairments, and all read an informational consent form before participating. All participants were confirmed to be majoring in something other than art.

4.2 Apparatus

Stimuli were displayed on a 22-inch Dell 22FP monitor at a resolution of 1920 x 1080. Participants sat approximately (measure) from the display. Eye movements were tracked in real-time using a Gazepoint G3 corneal reflection eye tracker, mounted below the monitor, with a sampling rate of 60Hz and an angle accuracy of about 1°.

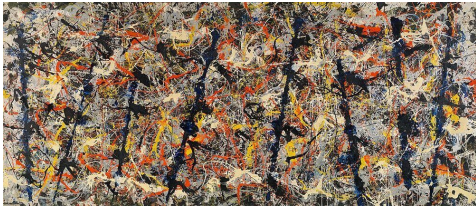


Figure 4: *Blue Poles* by Jackson Pollock

4.3 Stimuli

Stimulus for each participant consisted of a series of three original artworks by various artists, instructions, and post-view questionnaire's in a slideshow format. The paintings used in the experiment were *An Allegory of the North and South* by Jason Terry (Figure 1), *American Gothic* by Grant Wood (Figure 2), and *Blue Poles* by Jackson Pollock (Figure 3). The names and artists of the paintings were not disclosed to the participants. Participants were faced with instructions, viewed each stimulus individually, and then were subsequently asked to answer two multiple-choice questions; one on whether they had seen the artwork before, and one describing their personal interpretation of the piece. The eye-tracking device was re-calibrated between each stimuli to ensure the best possible data.

4.4 Procedure

Participants were greeted by the researchers and escorted to the appropriate computer lab, where they read the consent form. They were then seated in front of a computer and asked to complete a pre-experimental demographic questionnaire in which they disclosed their age, gender, and any visual impairments they may have. Upon completion of the questionnaire, participants completed a 9-point calibration task that was a default of the Gazepoint software. The calibration was validated by an experimenter by asking the participants to look at specific points on the screen while their line of gaze was being estimated in real time. If the estimate was inaccurate, the 9-point calibration was repeated and retested for validation. An experimenter verbally presented an overview of the experiment to the participant, followed by instructions being shown on screen. The participants read that they would be shown a painting for thirty seconds, then answer two brief questionnaires before repeating the sequence twice more. Once the participants had viewed the first painting, they were asked to answer a yes-or-no questionnaire on whether they had seen the image previously. They were then asked to answer a multiple choice questionnaire, selecting which common interpretation of the painting most closely resembled their personal interpretation. Once both questionnaires were completed, instructions for re-calibration were shown on screen, and the calibration process was repeated before the next painting was shown and the process repeated. The experiment lasted approximately (amount of time).

4.5 Experimental Design

The experiment employed a single factor between-subjects design. The participants performed the experiment individually and were not influenced by other participants or the observers. The main

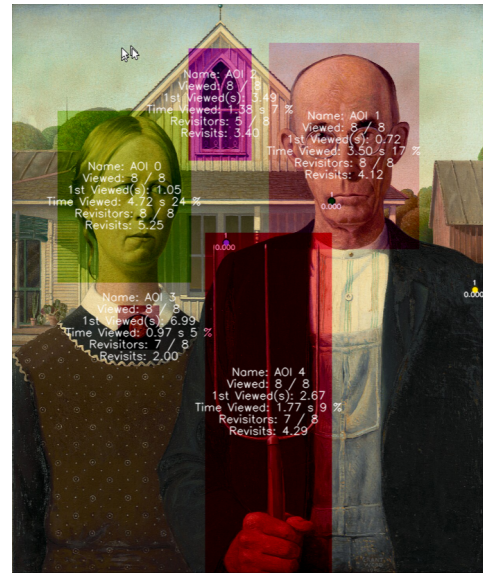


Figure 5: Average statistics for *American Gothic*

dependent variables were the participants' answers to the interpretation multiple choice question following each painting. The independent variables were the amount of time given to view each painting as well as the differing paintings themselves along with varying popularity.

5 DISCUSSION

The overall focus of this study was to determine if similar fixation points could determine the personal interpretation one may have of a piece of art. Our results indicate that there is very little correlation between a person's main fixation (object viewed for the most amount of time) or their most revisited fixation and their personal interpretation of the piece. There was no significant data to suggest that there is a strong connection between these two variables. However, there were still some interesting connections that we observed during the experiment.

5.1 Observations

When looking at all of the collected data, it was obvious that there wasn't a strong correlation between our fixation variables and one's personal interpretation of any of the three paintings. The results of Participant 7 (26, M) were more aligned with the sort of results we were expecting to see for most, if not all of the participants of our study. Participant 7's most viewed fixation point when looking at the painting *An Allegory of the North and South* was the depiction of the two slaves on the left side of the painting. Subsequently, they marked their interpretation as the painting being a commentary on slavery in the United States during that time period. Similarly, Participants 3 (22, F) and 5 (24, F) both fixated primarily on the woman in the center of the same painting. They both marked their interpretation as the painting showcasing the fruits of women's labor during that time period, while Participant 2 (22, F) spent the most time looking at the slaves but interpreted the painting in the

same way despite having a different fixation. This may be due to the additional observation of Participant 2's most revisited point in the painting being the woman in the center, however, they did not spend the most time looking at that particular thing. Similarly, there was a good number of participants in our study who came to the same interpretation, but fixated on different points in the painting that led them to that conclusion. The most picked interpretation for *American Gothic* within our participant pool was that it is a commentary on the idealism of "The American Family". Participant 3's longest viewed point was the man's face, while Participant 4 (21, F) and Participant 7's longest viewed point was the woman's face. Participant 8 (24, N/A) also came to the same conclusion about the interpretation, but their most viewed point was the window located in the top center of the painting. Interestingly, though, Participant 3, 4, and 8's most revisited points included the woman's face, which is commonality that may have led them to a similar interpretation. Participant 7's most revisited point was the pitchfork. Another interesting observation was that of the interpretations and fixation points of our third painting, *Blue Poles*. The majority of our participant pool focused on the same area of the painting when viewing *Blue Poles*, however, each interpretation choice was picked at least once. This may be due to the extremely abstract nature of the painting, as it can be difficult to truly understand the meaning or have a personal interpretation on something that looks like a bunch of mismatched lines strewn across a canvas. 6 participants spent the most time viewing the large blue pole near the center of the painting, while the other 2 participants spent the most time viewing the lines in the top right corner. Interpretations included the painting having to do with flowing ideas from the unconscious, a depiction of seasonal depression, a depiction of mixed emotions, and a showcase of balance and chaos working together. All participants' most revisited point was the center pole excluding Participant 8, who had revisited the upper right corner the most frequently. We also took the average fixation (point with the most time spent being viewed) and average most revisited point for each painting. For *American Gothic*, the point that was viewed for the most amount of seconds between participants was the woman's face. It was also the most revisited point between participants. For *An Allegory of the North and South*, the point that was viewed for the most amount of seconds between participants was the woman centralized in the painting. It was also the most revisited point between participants. And for *Blue Poles*, the point that was viewed for the most amount of seconds between participants was the large blue pole just to the right of the center. It was also the most revisited point between participants. All this being said, the data clearly does not show any strong evidence of fixation points and personal interpretations of artwork being connected. As much as we were hoping we would find something, it looks like further experimentation will have to be done in order to pinpoint an exact connection between fixations and how the brain comprehends the meaning behind what the eyes are seeing.

6 LIMITATIONS & FUTURE WORK

As the data provided shows no strong correlation between a person's fixation points and their interpretation of a piece of art, future



Figure 6: Average statistics for *Blue Poles*

experiments would have to be done if we wish to pinpoint a connection. A wider range of demographic would be useful in future work, as our participant pool was majority female (63%) and this could have an impact on personal interpretations and fixations in paintings. Additionally, 87% of the participant pool was Caucasian as under the age of 24. The lack of diversity in age, gender, and race could skew interpretations in one similar direction. More diversity across this criteria could advocate for better data as well as a larger pool in general. Furthermore, future experiments may deal with different variables other than the ones discussed in this study in order to search for a connection elsewhere.

7 CONCLUSION

In this experiment, we asked participants to view three paintings at random with varying interpretations and styles while we measured their fixations, the time spent viewing these fixations, and their most revisited point in the paintings. The results of this study indicate that there is no strong evidence of a connection between fixations and personal interpretation, or that people who have similar fixations will share similar interpretations of a piece. However, there were some interesting observations made during our study that may lead to better answers to this possible connection in future experiments.

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