

Tracking Eye-Movements Observing Titled And Untitled Art

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ABSTRACT

The knowledge of an artwork's title guides how a viewer will think of and, in turn, observe a painting. This study utilizes eye-tracking technology to determine how a pool of participants familiar and unfamiliar with paintings' titles looked at romantic landscape paintings by 19th century artist Thomas Cole. The participants were split into two groups: 1) a "Titled Group", who were provided the titles of paintings before viewing them, and 2) an "Untitled Group", who were *not* provided the titles of paintings before viewing them.

The paintings used consist of three different works by Thomas Cole, with the only preordained variability between the two groups being knowledge of the painting title or lack thereof. Using stimuli of a similar nature and from a single artist aids in maintaining a congruent art style among the paintings, therefore minimizing discrepancies in viewing patterns based on the nature of the art itself.

The results found in this study are not significant or uniform enough to draw strong conclusions. For one of the paintings (Mount Aetna From Taormina), the Titled Group were prone to fixate on the component of the painting most associated with the title faster (sooner when shown the painting) and longer overall as well as revisit it the most when compared to the Untitled Group. However, for the other two paintings (The Oxbow and Home In The Woods), there were mixed results. The Titled Group were faster to fixate on the component of the painting most associated with the title faster but fixated on it for a shorter time overall and revisited it less when compared to the Untitled Group. Some of these findings support previous results while some of these findings are contradictory.

KEYWORDS

eye tracking, visual attention, art, artwork, paintings, title, untitled

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1 INTRODUCTION

"A picture is worth a thousand words", but how much are the words that accompany a picture worth? Conventionally, artists provide

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titles to their paintings as a supplement to the viewer's understanding and interpretation of the art. In a way, a title guides how an observer will look at a painting. This makes one wonder exactly how much and in what way the title of an artwork influences how we observe it.

Some studies have been previously conducted on this topic; however, these studies tend to primarily, or only, focus on abstract paintings (Kapoula et al., 2009) or test for additional variables such as viewer understanding and liking of an artwork (Bubić, Sušac, and Palmović, 2017). This study aims to solely examine the difference in eye-movement patterns based on the provision or withholding of the title to paintings being observed. Additionally, the paintings used in this study are of a romantic landscape style and depict realistic and detailed imagery rather than obscure shapes and fragments, as is primarily found in the abstract art that previous studies have focused on.

2 BACKGROUND

Previous studies have examined the impact of eye-movements when providing and withholding the title information before viewing paintings. Specifically, studies conducted by Kapoula et al. [2009] and Bubić, Sušac, and Palmović [2017]. Both studies arrived at some similar conclusions and a few relative, additional findings.

The Kapoula et al. [2009] study was done to challenge the findings of an earlier study on this topic that claimed title knowledge did not impact eye-movements. However, the earlier study lacked the technological innovation of the modern time and did not use any contemporary eye-tracking technology. Kapoula et al. [2009] found that, when participants were provided the title name beforehand rather than not, there was increased fixation duration for all paintings shown and components of the painting associated with the title were fixated on for the longest and most immediately upon first exposure to the painting. This study utilized only abstract painting stimuli from the same artist.

The Bubić, Sušac, and Palmović [2017] study examined not only eye-movements, but also viewer feelings and interpretation of the paintings. The study found that, when participants were provided title information beforehand rather than not, the fixation duration increased and components related to the title were fixated on longer and almost immediately. Additionally, this study found that there were relatively more revisits to components associated with the title and that figures in the artwork were fixated on relatively longer and revisited more than AOIs in completely abstract paintings. This study utilized some purely abstract and some figural painting stimuli from the same artist.

3 EMPIRICAL VALIDATION

We conducted this experiment to evaluate whether previous findings in similar studies will hold up with a different style of artwork.



Figure 1: Mount Aetna From Taormina

Previous studies have primarily focused on abstract work, as has been referenced previously.

Previous findings have concluded that the knowledge of a paintings' title, when compared to a lack of knowledge of the same paintings' title, has yielded a higher overall fixation duration on components associated with the paintings' title, a quicker fixation on components associated with the paintings' title upon exposure to the painting, and a higher number of revisits to components associated with the paintings' title. These are consolidated findings from the studies of Kapoula et al [2009] and Bubić, Sušac, and Palmović [2017].

This experiment was aimed to test whether these findings would hold true with painting stimuli of a different art style. However, the procedure followed for this experiment is not identical to those in referenced studies. The consistent factor between these study and those referenced is solely the independent variable of title presence or absence.

Given that the referenced studies findings suggest that audience interaction with components of a painting associated with the title is affected by title knowledge, the data collected will be focused on how participants interacted with painting components related to the title.

3.1 EXPERIMENTAL DESIGN

This was a one-factorial, between-subjects experiment with two groupings of participants: the Titled Group and the Untitled Group. Volunteers were randomly assigned as members of either group.

All participants would be shown the same three paintings by Thomas Cole, all of which are of a similar art style. The paintings are titled: Mount Aetna From Taormina (Figure 1), The Oxbow (Figure 2), and Home In The Woods (Figure 3). The order in which the paintings are presented was completely randomized for all participants across both groups.

The sole independent variable for this experiment was the presence or absence of the painting titles. The impact that will be studied most closely will be how participants view components of the painting associated with the title. For Mount Aetna From Taormina, data comparison between the two groups will be focused on participant interaction with the large, white mountain pictured in the upper right section of the painting. For The Oxbow, data comparison between the two groups will be focused on participant interaction with the bend of the river in the center right section of the painting. For Home In The Woods, data comparison between the two groups will be focused on the cabin in the center right section of the painting. For all three paintings, these components are most directly associated with their respective title.



Figure 2: The Oxbow



Figure 3: Home In The Woods

3.2 PARTICIPANTS

10 male volunteers between 20 - 22 years of age. All participants were students in their 3rd or 4th Year of college at Clemson University. Each participant verbally consented to the experiment prior. Additionally, there was variable use corrective lenses, presence of eye conditions, and experience with artwork across the participants.

3.3 PROCEDURE

Before beginning the experiment, participants were asked to fill-out a pre-experiment questionnaire to indicate their age, gender, use of corrective lenses, presence of eye conditions, previous level of exposure to art/paintings, and whether the participant considers themselves an artist. Participants who considered themselves artists were asked to identify how advanced they considered themselves on a scale of "Novice" to "Expert".

Next, each participant was provided verbal instructions and expectations for the experiment and how the eye-tracker operates. Additionally, participants were consistently prompted to ask questions given any confusion during the entirety of the procedure. At this point, technical set-up for the experiment would begin.

Participants were seated in front of an eye-tracker and repositioned as necessary to achieve ideal visibility of their eyes. They were instructed to keep their heads still and only use their eyes to look around the screen. At this time, prior to any recording, each participant was calibrated with a 5-point calibration algorithm. This calibration process was repeated as many times as necessary until accurate calibration was achieved.

All participants were then shown a series of timed slides reiterating the verbal instructions provided previously. Instructional slides 1-3 were displayed for 10 seconds while instructional slide 4 was displayed for 20 seconds. Provided below is the text provided on the instructional slides:

SLIDE 1:

In this experiment you will be shown 3 paintings. Each painting will be shown for exactly 20 seconds.

SLIDE 2:

Before each painting is displayed there will be a 5 second pause. During this pause the screen will show one of the following:

+
(a crosshair)
or
+
painting title
(a crosshair and the painting title)

SLIDE 3:

Please look at the paintings as if you were observing them in a museum and do not look away from the screen.

SLIDE 4:

The experiment is about to begin.

A few reminders:

1. Do not look away from the screen until the end
2. You may or may not be shown the title of the paintings beforehand
3. You will have 20 seconds to look at each painting
4. Look at the paintings as if observing them in a museum

The experiment will automatically begin soon.

After the instructional slides the participant would then be shown the paintings with or without the title preceding it.

Following the instructional slides and the slides that included any relevant title information or the paintings themselves, the participant was asked to fill-out a post-experiment questionnaire. The post-experiment questionnaire asked participants to indicate how well they were able to view the images, perform the directed task, comprehend the directed task, and indicate how often they viewed similar artwork or if they were familiar with Thomas Cole or any of the paintings shown.

3.4 APPARATUS

GazePoint GP3 sampling at 60 Hz on a 60 cm screen with 1920 x 1080 px resolution.

4 RESULTS

Data related to participant interaction with the painting component most associated with the title was collected and compared between the Titled Group and Untitled Group. The component of the painting most associated with the title of the painting will be referenced as the paintings' SAOI, or "Significant Area Of Interest", from here forward in this paper.

For Mount Aetna From Taormina, SAOI was the large, white mountain in the upper right section of the painting.

For The Oxbow, the SAOI was the bend in the river in the center right section of the painting.

For Hom In The Woods, the SAOI was the cabin in the center right section of the painting.

Data was collected and averaged across the 5 participants in each group for the following metrics: time to first fixation on SAOI, total fixation duration on SAOI, and total revisits to SAOI. For this

experiment, an eye-movement was considered a fixation if the eye remained trained on a particular area of the painting for 150+ ms, and an eye-movement was considered a revisit if the eye fixated on a particular area, fixated elsewhere, and then fixated again on the same area.

NOTE: For the following presented data, all values are in relation to each painting's respective SAOI.

Mount Aetna From Taormina

SAOI: Large, white mountain in upper right section

Untitled Group

Average Time To First Fixation: 7.15 seconds

Average Total Fixation Duration: 1.43 seconds (7.15% of total average view time)

Average Revisits: 2.8

Titled Group

Average Time To First Fixation: 2.77 seconds

Average Total Fixation Duration: 2.27 seconds (11.34% of total average view time)

Average Revisits: 4.6

The Oxbow

SAOI: bend in the river in the center right section

Untitled Group

Average Time To First Fixation: 3.11 seconds

Average Total Fixation Duration: 4.28 seconds (21.42% of total average view time)

Average Revisits: 7.2

Titled Group

Average Time To First Fixation: 2.66 seconds

Average Total Fixation Duration: 2.86 seconds (14.31% of total average view time)

Average Revisits: 5.2

Home In The Woods

SAOI: cabin in the center right section

Untitled Group

Average Time To First Fixation: 1.28 seconds

Average Total Fixation Duration: 6.07 seconds (30.35% of total average view time)

Average Revisits: 7.2

Titled Group

Average Time To First Fixation: 1.04 seconds

Average Total Fixation Duration: 3.94 seconds (19.68% of total average view time)

Average Revisits: 5.6

When the data is compared between the Titled Group and Untitled Group, Mount Aetna From Taormina is the stimulus that produced results most aligned with the expected outcome. For Mount Aetna From Taormina, participants in the Titled Group, on average, were 4.38 seconds faster to first fixate on the SAOI, fixated on the SAOI for 0.84 seconds longer overall (a 4.19% increase in view time), and made 1.8 more revisits to the SAOI when compared to the Untitled Group.

When it comes to The Oxbow and Home In The Woods, the results tell a somewhat different story. For The Oxbow, the Titled

Group, on average, were 0.45 seconds faster to first fixate on the SAOI, but fixated on the SAOI for 1.42 seconds less overall (a 7.11% decrease in view time) and revisited the SAOI 2 fewer times when compared to the Untitled Group. For *Home In The Woods*, the Titled Group, on average, were 0.24 seconds faster to first fixate on the SAOI, but fixated on the SAOI for 2.13 seconds less overall (a 10.67% decrease in view time) and revisited the SAOI 1.6 fewer times when compared to the Untitled Group.

While both *The Oxbow* and *Home In The Woods* experience the same trend in a decrease in time to first fixation on the SAOI as *Mount Aetna From Taormina*, they experienced an opposite trend when it came to total fixation duration on the SAOI and revisits to the SAOI. It appears that when participants knew the title when viewing these two paintings, they spent less total time viewing and revisiting the SAOI even though they were quicker to acknowledge it.

5 DISCUSSION

The present study used eye-tracking to determine how participants would look at 3 different paintings by Thomas Cole when group was presented the title of the paintings beforehand and the other was not. It is particularly believed that there would be a significant impact on the participant's visual interaction with components of the painting associated with the title when they know the title versus not. These component most directly associated with the title are references as SAOIs, "Significant Areas Of Interest".

Overall, it seems that *Mount Aetna From Taormina* has supported previous findings, that when participants know the title of a painting, there is a faster fixation on SAOIs, longer fixation on SAOIs, and more revisits to SAOIs. *The Oxbow* and *Home In The Woods* suggested the opposite for the most part. A possible explanation for a difference between the three could reside in the location of the SAOIs in the chosen paintings. The SAOI for *Mount Aetna From Taormina* was less centered and in the upper right section of the painting while the SAOI for both *The Oxbow* and *Home In The Woods* was in the center right section of the painting.

6 LIMITATIONS & FUTURE WORK

This study faced several limitations.

While the participant age and student-status was consistent across participants, the total number of participants was not large enough to draw more concrete results. The average values can be more easily manipulated with such a small participant pool, especially if there are outliers. Additionally, the Titled Group included more people who require corrective lenses or have astigmatism while the Untitled Group included more people who considered themselves artists. This imbalance in vision correction, eye condition, and artistic background may have influenced results, especially with such a small number of participants already.

Another potential limitation is where the participants are looking before the painting is shown. The cross-hair and or title displayed before the paintings in this experiment were always in the upper center. However, it is not as simple to ensure participants hold their focus on that area of the screen before the painting appears. Some participants may look elsewhere after looking at the cross-hair or title and have a different starting position on the painting than

other participants. A different starting position may influence their scan pattern. This limitation may be addressed in future works by requiring participants to look at a particular area of the screen to advance to the painting etc..

When looking to the future, it would be great to see more studies testing effects of the title on the interpretation and observation of art. If this study were to be replicated with a larger participant pool with more evenly dispersed characteristics, it may yield more decisive results.

7 CONCLUSION

This study attempted to replicate previous findings with a similar independent variable but differing stimuli and procedure. Generally, the time to first fixation on the SAOI was decreased across all stimuli. That is, the SAOI was initially fixated on faster when the title was known. Aside from that, the other data, such as a shorter fixation on SAOIs and fewer revisits when the title was known for *The Oxbow* and *Home In The Woods*, has been contradictory to previous findings. Overall, the results, when all three stimuli and data from all participants are included, are not significant enough to draw strong conclusions.

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Mount Aetna From Taormina, by Thomas Cole
The Oxbow, by Thomas Cole
Home In The Woods, by Thomas Cole