Mini Review

Insightful Gaze: Bridging Art and Science Through Eye Tracking in Clinical Research

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Abstract

This study examines how people with different art education levels explore the visual arts when they are shown three neoclassical paintings that include a person and statue. Using eye-tracking techniques, we examined the hypothesis that those who have received professional art instruction have more frequent fixations, especially on the statue. Thirty participants analyzed the artwork visually; they included people who had studied art studies in the past as well as those who did not. The results shed light on the complex relationship between artistic skills and visual focus, providing insights into how past experiences influence how people perceive art.

Keywords: Eye tracking, Paintings, Clinical research

Introduction

Utilizing eye tracking as an advanced methodology in human research, this study converged disciplines to investigate the intersection of visual perception and cognition [1]. Inspired by neoclassical art, characterized by the revival of classical themes and aesthetics from ancient Greek and Roman art, we employ eye tracking to analyze viewer engagement [2]. This study aimed to decode the cognitive mechanisms underlying these clinical phenomena. The examination involved 30 individuals, tracking fixation counts and the average of trigger times on the paintings, including a statue and portraits, situated in close proximity to human portraits. In all three paintings, the statues were positioned on the left side of the subjects. Additionally, it is noteworthy that all statues have symbolic meanings. We hypothesize that individuals with art studies backgrounds, due to their familiarity with artistic symbolism, will focus more on these symbolic elements than those without such backgrounds. Interdisciplinary inquiry offers potential advancements in clinical assessment and intervention strategies. Furthermore, the insights gained from this study hold promise for enhancing clinical research methodologies and informing the development of novel intervention approaches.

Materials and Methods

This study aimed to measure the relationship between participants' art background, trigger time, fixation points, and the utilization of eye-tracking technology, employing statistical analysis to discern patterns and correlations.

Participants

Thirty volunteers with normal or corrected-to-normal vision participated in this study. Their backgrounds vary across disciplines, primarily in art studies or other fields. All testing followed the protocols and ethical standards of the NBML Institute of Tehran, and informed consent was obtained from all participants. The table one analyzed the relationship between education and age.

Stimuli

Three stimuli, oil paintings from the neoclassical period, were selected (Figures 1-3). These high-resolution digital versions were obtained from various free-access databases and anonymized to remove artist, date, size, and inventory information. The stimuli comprised portraits, each 298×405 pixels in size, centered on a

gray background measuring 720×405 pixels. During the viewing session, participants observed the pictures through a Pupil Core Glass, with a 0.60° accuracy (with calibration), 0.02° precision, and a resolution of 720p at 60Hz. It is noteworthy that the painter of the three paintings is Pompeo Batoni (January 25, 1708 - February 4, 1787), an Italian painter who displayed solid technical knowledge in his portrait work and numerous allegorical and mythological picture [3].
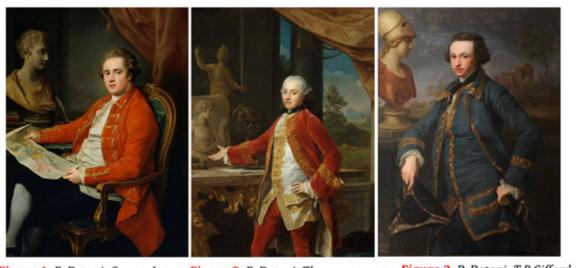

Figure 1: P. Batoni, *George Legge,* 1788. **Figure 2:** P. Batoni, *The young man,* 1760. **Figure 3:** P. Batoni, *T.P.Giffard,* 1776 ca,.

Figure :

After conducting eye-tracking analyses, heat maps of fixation points were generated to visually represent the distribution of participants' gaze patterns across the neoclassical paintings. These heat maps offer a graphical depiction of the areas within the artwork that attracted the most visual attention from the participants.

Figure 4 illustrates the heat maps corresponding to each painting, providing a visual summary of participants' visual exploration tendencies. The interpretation of these heat maps alongside the quantitative data adds depth to our understanding of how individuals with varied levels of art education engage with artworks.

Figure 4: The overlay generated heat maps from eye tracking data collection of 30 subjects seeing 3 neoclassic paintings (for image info see Figure 1).

Descriptive Analysis

The study comprised 30 participants (15 females, 15 males, SD=3.1, Avg=22.93), with a slightly negatively skewed distribution. The sex distribution was relatively symmetric, with a mean value of 1.5. The participants' education levels averaged 1.4, with a slight positive skew. On average, participants had approximately 9885 fixations during the study, with a negatively skewed distribution. Trigger times for responses averaged 0.2299 s, showing a negatively skewed distribution (Table 1).

Table 1: Descriptive statistical data of the participants were obtained using SPSS version 26.

Descriptive Statistics							
	N	**Mean**	**Std. Deviation**	**Skewness**		**Kurtosis**	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Age	30	22.93	3.107	-0.015	0.427	-0.684	0.833
Gender	30	1.5	0.509	0	0.427	-2.148	0.833
Education	30	1.4	0.498	0.43	0.427	-1.95	0.833
Fixations count	30	9885	2077.752	-2.927	0.427	11.158	0.833
Trigger time (Avg)	30	0.23	0.268	2.167	0.427	5.17	0.833

Regression Analysis

In our regression analyses, we found that age had a significant negative effect on fixation count (B=-263.385, p=0.037, β=-0.394), indicating that as participants' age increased, their fixation count tended to decrease. The 95% confidence interval for this effect ranged from -510.009 to -16.760. However, sex and education did not significantly affect fixation count (p=0.757, 0.421 respectively), as their confidence intervals spanned both positive and negative values. Regarding trigger time, none of the variables - age, sex, or education - had a significant effect (p=1.00, 0.548, and 0.158, respectively). The confidence interval for all three variables was zero, indicating a lack of statistical significance. Therefore, while age appeared to be a significant predictor of fixation count, sex and education did not show significant predictive power. Furthermore, none of the variables was a significant predictor of trigger time.

Conclusion

The findings of this research were based on the fixation count and trigger time. This indicates that age had a significant negative ef-fect on fixation count, suggesting that older participants tended to have fewer fixations while viewing the artworks. However, sex and education did not significantly affect fixation count. Similarly, none of the variables (age, sex, and education) had a significant effect on trigger time. These findings provide insights into the factors influencing visual attention during art observations and suggest avenues for further research. Overall, this study bridges art and science by using eye-tracking technology to explore how art education influences visual perception, with potential implications for clinical research and interventions.

References

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