The Effect of Gender and Professional Background on Perceptions of Visual Quality in Hyperrealist Paintings

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Abstract

The focus of this study was perceived differences in the visual quality of photographs and hyperrealist paintings among viewers. The objective of the study was to examine how gender and professional background influenced perceived visual quality of photographs and hyperrealist paintings. Twenty-two participants tested ten experimental stimuli, composed of a hyperrealist painting and the source photograph for that painting. Study results showed that more participants felt that the overall visual quality of photographs was superior to that of hyperrealist paintings. Compared to female participants and participants who did not have a background in design, male participants and participants who had a background in design had higher opinions regarding the visual quality of hyperrealist paintings than of photographs. Gender differences produced differences of opinion regarding the temporality of the image. Differences in professional background produced differences of opinion regarding the diversity of color, the temporality of the image, and the detailing of the image.

Keywords: photography, painting, hyperrealism, visual quality

1. Introduction

People have long hoped to capture what they see with their eyes and to preserve that image for extensive periods of time. Painting is a way of preserving images (Gernsheim, 1986). Painters express the lights and shadows that they see and social realities that they perceive through their artistic techniques in paintings. Nineteenth century painters believed that the themes emphasized by Romanticism did not match daily life. They began to depict real life and faithfully record what they saw; this developed into the Realism movement. The invention of photography in the 1840s allowed people to more quickly capture true images of the world. In addition to capturing the beauty of the world, photography can reflect the realities of society. Photography spurred more diverse breakthroughs and experimentation in art. Many artists use photographs as an aid in choosing a topic. Hyperrealism is representative of this use of photographs.

Hyperrealism is also called photorealism. Hyperrealist painters project slides onto a canvas or develop or print photographs directly on a canvas to assist with creating lifelike paintings and to portray realistic visual effects (Ma & Choi, 2007). Therefore, the subject matter of hyperrealist paintings comes from photographs. After painters identify the emotions of the captured moment, they express these emotions on canvases using fine brushwork. Because of this delicate painting technique, hyperrealist paintings look

nearly identical to photographs at first glance.

Although the birth of hyperrealism was spurred by the invention of photography, it also created questions about differences between photographs and paintings. For example, do photographs portray the world in a realist or factive way? Are accuracy and reliability unique to photographs, or do other types of images possess these qualities (Benovsky, 2011)? Hyperrealist painters believe that some things cannot be expressed through photography techniques. They emphasize the expression of atmosphere and light to portray a captured moment and to convey the painter's inner emotions. Cutzu et al. (2005) believed that photographs could be seen as a unique subcategory of painting—that photographs are realistic paintings. Based on the preceding discussion, we attempted to examine the differences between photographs and hyperrealist paintings using experimental methods.

2. Literature Review

Sontag (1977) asserts that photographs capture appropriate objects. Like painting, photography is a portrayal of an image. In a sense, cameras capture reality and interpret the world as much as paintings do. However, when photographs are reproduced or reprinted on paper, they lose much more of their essence than paintings do. Chuck Close, a representative hyperrealist painter, believed that the primary goal of photorealist painting is to translate photographic information into pictorial information. He often used massive-scale hyperrealist paintings to portray things that the human eye cannot see. Confronted with these strange and unfamiliar images, Close's audiences often question what they have always believed to be real. Through sophisticated painting skills, hyperrealist paintings recreate a camera's vision and provide people with a more accurate way of seeing things (Ma & Choi, 2007). In contrast, Heyer (2011) believed that a hyperrealist painting should be more than objective reproduction of a photograph. It should be a reflection of a rapidly changing world based on a painter's meticulous observations of the components of the source photograph.

Benovsky (2011) focused on hyperrealism issues from a philosophical standpoint by comparing handmade paintings, film photography, and digital photography to explore the nature of photographs. Benovsky pointed out that unlike the real world, some photographs are black and white and some photographs have blurry sections. In addition, many classic photographs are distorted and photographs only portray the world from a specific angle. From this perspective, photographs and handmade paintings are both identical to what humans perceive of as the truth and photographs are not special. In other words, no

depiction of the world is truly realistic. This applies to photographs, paintings (even hyperrealist paintings), and normal human visual perception. However, if realism is viewed as a scale, then photographs can be viewed as being realistic to some degree.

Scientists in fields unrelated to art have begun to apply their technical vocabularies to the understanding of the art of painting. Athitsos et al. (1997) performed a statistical analysis of photographs and graphics based on the need to automatically distinguish between the two types of images on the Internet. They found that photographs have much greater variation in colors from pixel to pixel but that graphics have sharper edges and contain more saturated colors. Kim et al. (2014) performed a statistical analysis of a large database of artistic paintings using digital image processing techniques. They found that classical paintings and photographs used different colors. However, no significant difference was found between photographs and hyperrealist paintings in rank-ordered color-usage distribution.

In another objective quantitative survey, Cutzu et al. (2005) tested and categorized a digital database of 6000 paintings and 6000 photographs. They found that photographs and paintings differed in colors, edges, and textures. In color properties, when color information is removed (i.e., when a color image is converted to a grayscale image), paintings lose more visual information than photographs. Thus, Cutzu et al. deduced that paintings depict objects primarily through the use of color and not by systematically changing the intensity of the image. In edge properties, perceived edges in photographs are mostly caused by changes in intensity, whereas perceived edges in paintings are mostly caused by changes in color. Compared to photographs, paintings have greater variations in color, more unique colors, and a higher proportion of highly saturated colors. In texture properties, the texture of the image is a key indicator for distinguishing between photographs and paintings.

The aforementioned studies show that differences between photographs and paintings can be found through both philosophical discourse and scientific analysis. However, few studies have examined subjective perceptions of the differences between photographs and paintings from the viewer's perspective, particularly of the differences between photographs and hyperrealist paintings, which are nearly indistinguishable to the naked eye. Therefore, we examined the differences between photographs and hyperrealist paintings based on the subjective visual perceptions of viewers.

3. Method

3.1 Experimental Design

Three factors were evaluated in this study: gender, professional background, and visual quality. The gender factor had two values: male and female. The professional background factor also had two values: design and non-design. The visual quality factor had 12 indicators: richness of details, softness of details, detailing of lights and shadows, diversity of colors, sharpness of edges, vividness of objects, realism of objects and scenes, temporality of the image, emotionality of the image, detailing of the image, clarity of the focal point, and clarity of direction of light. Ten experimental scenarios were presented, each comprising an experimental stimulus that included one photograph and one painting. All participants were asked to complete all ten scenarios during testing.

3.2 Subjects

The participants were 22 graduate students (16 males and 6 females). Their ages were 24–30 years; the average age was 25.4 ±1.7 years. Among all participants, 11 had a professional background in design and 11 did not (Table 1). All participants had uncorrected or corrected visual acuity of 0.8 or higher in both eyes and no participants had color vision deficiencies.

Table 1.Respondents' demographics N=22

QualitativeVariable		*No. of Samples*	*Percentage*
Gender	Male	16	72.7
	Female	6	27.3
Professional background	Design	11	50.0
	Non-design	11	50.0
QuantitativeVariable	*Mean*	*Standard deviation*	*Min. - Max.*
Age	25.4	1.7	24 - 30

3.3 Devices and Materials

The equipment used in the experiment comprised a personal computer (Dell Precision T3500), a projector (Epson EMP-820), and a projection screen. The experimental stimuli were 10 slides. Each slide contained two images, namely, a hyperrealist painting by artist Chang-Kuo Li and the source photograph for that painting, arranged horizontally (Fig. 1). The positions of the photograph and the painting on the slide (A or B) were determined randomly. As shown in Table 2, the questionnaire that participants completed contained 12 indicators of visual quality; possible responses were Image A or Image B. The indicators of visual quality were identified through expert interviews as possible differences between photographs and hyperrealist paintings. Participants were asked to evaluate image pairs and determine which image performed better on each of the indicators of visual quality. This pair wise comparison data was collected during testing.

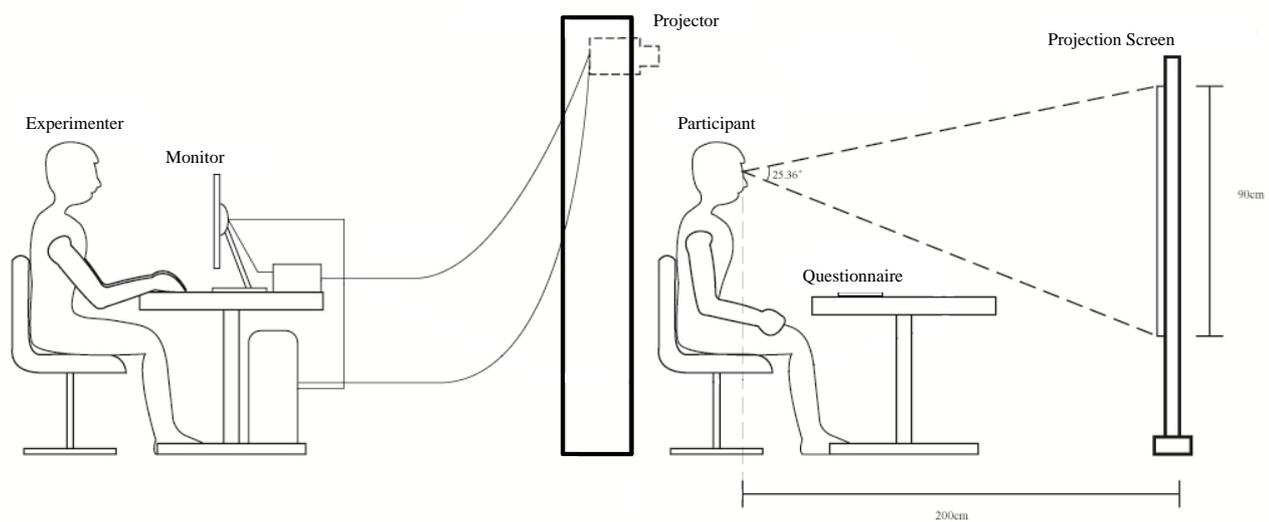**3.4 Experiment Environment Settings**

The arrangement of the experimental environment is shown in Figure 2. The visual quality questionnaire was placed flat on a table that was 73 cm in height. The distance between the participants' eyes and the projection screen was 200 cm. The projected image was 90 cm in height. The participants' vertical viewing angle was approximately 25.36°. These environmental settings were held constant for all participants, but participants were free to adjust the chair to a comfortable position.

A   **B**
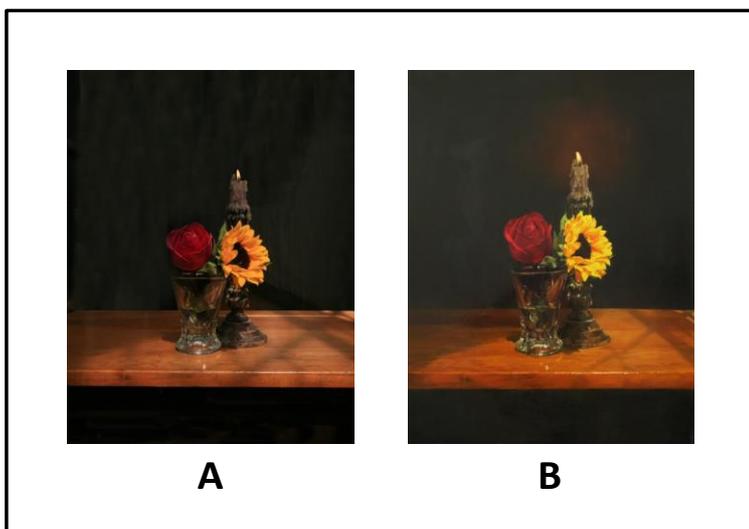
Figure 1. Example of an Experimental Stimulus

Table 2. Visual Quality Questionnaire

Visual quality indicators	Image A	Image B
1. Richer details	□	□
2. Softer details	□	□
3. More detailing of lights and shadows	□	□
4. More diverse colors	□	□
5. Sharper edges	□	□
6. More vivid objects	□	□
7. More realistic portrayals of objects and scenes	□	□
8. More temporality	□	□
9. More emotionality	□	□
10. More detailing of images	□	□
11. Clearer focal points	□	□
12. Clearer directions of light	□	□

Figure 2. Experimental Environment Settings

3.5 Experiment Procedures

Prior to testing, participants were informed of the experimental procedure and special instructions. Each participant was asked to first adjust the chair for maximum comfort and then to focus on the center of the projection screen. After testing began, one experimental stimulus was shown on the screen and participants filled out the visual quality questionnaire; this comprised one trial. Participants controlled how long each stimulus was displayed on the screen. A two-minute interval was introduced between trials to eliminate fatigue effects. Participants were required to complete all 10 trials. The 10 experimental stimuli were displayed in a randomized order.

3.6 Dependent measure and data analysis

The dependent measure was the response ratio between the two types of images, photographs and hyperrealist paintings. Data were analyzed by descriptive statistical analyses and chi-squared tests of independence, which were completed using the Statistical Package for the Social Sciences (SPSS) software. Statistical significance was defined as 0.05.

4. Result and Discussion

4.1 Overall Response Ratios for Each Factor

Table 3 lists the number of responses and the percentages for each image type by factor. In general, 59.3% of all participants felt that the overall visual quality of photographs was superior to that of hyperrealist paintings. In terms of gender, 56.9% of male participants and 65.7% of female participants felt that the overall visual quality of photographs was superior to that of hyperrealist paintings. In terms of professional background, 53.8% of participants who had a background in design and 64.8% of participants who did not have a background in design felt that the overall visual quality of photographs was superior to that of hyperrealist paintings. In terms of visual quality, the majority of participants felt that compared to hyperrealist paintings, photographs had sharper edges (83.2%), more realistic portrayals of objects and scenes (79.1%), clearer directions of light (79.1%), clearer focal points (75.9%), more detailing of lights and shadows (70.5%), richer details (64.5%), more vivid objects (63.6%), more diverse colors (56.8%), and more temporality (56.8%). In contrast, compared to photographs, hyperrealist paintings were thought to have softer details (85.9%), more emotionality (81.8%), and more detailing of images (50.5%).

Table 3. Number of Responses and the Percentages for Each Image Type by Factor

Factor	Photograph		Hyperrealist painting		Total
	Freq.	*%*	*Freq.*	*%*	
Overall	1565	59.3	1075	40.7	2640
Gender					
Male	1092	56.9	828	43.1	1920
Female	473	65.7	274	34.3	720
Professional background					
Design	710	53.8	610	46.2	1320
Non-design	855	64.8	456	35.2	1320
Visual quality					
Sharpness of edges	183	83.2	37	16.8	220
Realism of objects and scenes	174	79.1	46	20.9	220
Clarity of direction of light	174	79.1	46	20.9	220
Clarity of the focal point	167	75.9	53	24.1	220
Detailing of lights and shadows	155	70.5	65	29.5	220
Richness of details	142	64.5	78	35.5	220
Vividness of objects	140	63.6	80	36.4	220
Diversity of colors	125	56.8	95	43.2	220
Temporality of the image	125	56.8	95	43.2	220
Detailing of the image	109	49.5	111	50.5	220
Emotionality of the image	40	18.2	180	81.8	220
Softness of details	31	14.1	189	85.9	220

4.2 Response Ratios for Each Indicator of Visual Quality by Gender

Table 4 lists the number of responses, percentages, and chi-squared test of independence results for each image type by gender. At a significance level of $\alpha = 0.05$, differences in response ratios between genders were statistically significant only for temporality of the image ($p < 0.001$) and diversity of color ($p = 0.016$). No other differences were statistically significant.

For temporality of the image, 53.1% of male participants felt that hyperrealist paintings were superior to photographs, but 83.3% of female participants felt the opposite, that photographs were superior to hyperrealist paintings.For diversity of color, 51.9% of male participants and as many as 70% of female participants felt that photographs were superior to hyperrealist paintings.

4.3 Response Ratios for Each Indicator of Visual Quality by Professional Background

Table 5 lists the number of responses, percentages, and chi-squared test of independence results for each image type by professional background. At a significance level of $\alpha = 0.05$, differences in response ratios between participants of different professional backgrounds were statistically significant for diversity of color ($p < 0.001$), temporality of the image ($p < 0.001$), richness of details ($p = 0.001$), clarity of the focal point ($p = 0.018$), detailing of the image ($p = 0.035$), and emotionality of the image ($p = 0.036$). No other differences were statistically significant.

For diversity of color, 56.4% of participants who had a background in design felt that hyperrealist paintings were superior to photographs, but as many as 70.0% of participants who did not have a background in design felt the opposite, that photographs were superior to hyperrealist paintings.For temporality of the image, 55.5% of participants who had a background in design felt that hyperrealist paintings were superior to photographs, but 69.1% of participants who did not have a background in design felt the opposite, that photographs were superior to hyperrealist paintings.For richness of detail, 53.6% of participants who had a background in design and as many as 75.5% of participants who did not have a background in design felt that photographs were superior to hyperrealist paintings.For clarity of focal point, 53.6% of participants who had a background in design and as many as 75.5% of participants who did not have a background in design felt that photographs were superior to hyperrealist paintings.For detailing of the image, 53.6% of participants who had a background in design felt that hyperrealist paintings were superior to photographs, but 52.7% of participants who did not have a background in design felt the opposite, that photographs were superior to hyperrealist paintings.For emotionality of the image, as many as 87.3% of participants who had a background in design and 76.4% of participants who did not have a background in design felt that hyperrealist paintings were superior to photographs.

Table 4. Cross Tabulation of Gender and Image Type Preferences by Indicators of Visual Quality

Visual quality indicators	Gender	Photograph		Hyperrealist painting		Total	p-value
		Freq.	*%*	*Freq.*	*%*		
Richness of details	Male	101	63.1	59	36.9	160	.472
	Female	41	68.3	19	31.7	60	
Softness of details	Male	21	13.1	139	86.9	160	.501
	Female	10	16.7	50	83.3	60	
Detailing of lights and shadows	Male	112	70.0	48	30.0	160	.809
	Female	43	71.7	17	28.3	60	
Diversity of colors	Male	83	51.9	77	48.1	160	.016*
	Female	42	70.0	18	30.0	60	
Sharpness of edges	Male	129	80.6	31	19.4	160	.098
	Female	54	90.0	6	10.0	60	
Vividness of objects	Male	97	60.6	63	39.4	160	.129
	Female	43	71.7	17	28.3	60	
Realism of objects and scenes	Male	124	77.5	36	22.5	160	.343
	Female	50	83.3	10	16.7	60	
Temporality of the image	Male	75	46.9	85	53.1	160	.000*
	Female	50	83.3	10	16.7	60	
Emotionality of the image	Male	30	18.8	130	81.3	160	.721
	Female	10	16.7	50	83.3	60	
Detailing of the image	Male	80	50.0	80	50.0	160	.826
	Female	29	48.3	31	51.7	60	
Clarity of the focal point	Male	118	73.8	42	26.3	160	.221
	Female	49	81.7	11	18.3	60	
Clarity of direction of light	Male	122	76.3	38	23.8	160	.091
	Female	52	86.7	8	13.3	60	

Table 5. Cross Tabulation of Professional Background and Image Type Preferences by Indicators of Visual Quality

Visual quality indicators	Professional background	Image type				Total	p-value
		Photograph		Hyperrealist painting			
		Freq.	%	Freq.	%		
Richness of details	Design	59	53.6	51	46.4	110	.001[*]
	Non-design	83	75.5	27	24.5	110	
Softness of details	Design	11	10.0	99	90.0	110	.081
	Non-design	20	18.2	90	81.8	110	
Detailing of lights and shadows	Design	71	64.5	39	35.5	110	.055
	Non-design	84	76.4	26	23.6	110	
Diversity of colors	Design	48	43.6	62	56.4	110	.000[*]
	Non-design	77	70.0	33	30.0	110	
Sharpness of edges	Design	95	86.4	15	13.6	110	.207
	Non-design	88	80.0	22	20.0	110	
Vividness of objects	Design	64	58.2	46	41.8	110	.093
	Non-design	76	69.1	34	30.9	110	
Realism of objects and scenes	Design	88	80.0	22	20.0	110	.740
	Non-design	86	78.2	24	21.8	110	
Temporality of the image	Design	49	44.5	61	55.5	110	.000[*]
	Non-design	76	69.1	34	30.9	110	
Emotionality of the image	Design	14	12.7	96	87.3	110	.036[*]
	Non-design	26	23.6	84	76.4	110	
Detailing of the image	Design	51	46.4	59	53.6	110	.035[*]
	Non-design	58	52.7	52	47.3	110	
Clarity of the focal point	Design	76	69.1	34	30.9	110	.018[*]
	Non-design	91	82.7	19	17.3	110	
Clarity of direction of light	Design	84	76.4	26	23.6	110	.320
	Non-design	90	81.8	20	18.2	110	

4.4. Discussion

Kim et al. (2014) concluded that photographs and paintings used different colors. The results of the present study showed that people perceived differences in the visual quality of photographs and hyperrealist paintings. Athitsos et al. (1997) and Cutzu et al. (2005) disagreed about the differences in colors and edges between photographs and paintings. Athitsos et al. concluded that photographs had greater variations in colors but that paintings have sharper edges. In contrast, Cutzu et al. concluded that paintings have more unique colors and greater color variations. Edges in paintings are created by changes in color, whereas edges in photographs are created by changes in intensity. In the present study, compared to hyperrealist paintings, photographs had more diverse colors. This result corroborates the findings of Athitsos et al. However, photographs had sharper edges; this result supports the findings of Cutzu et al.

In terms of gender differences (Figure 3), more male participants than female participants felt that the visual quality of hyperrealist paintings was superior to that of photographs. Male and female participants had nearly consistent opinions regarding diversity of color but females were more likely to feel that photographs had more diverse colors. This result is similar to that found by Athitsos et al. Gender differences were also found for temporality of the image. Male participants felt that hyperrealist paintings were superior to photographs in this regard, but female participants felt the opposite.

In terms of professional background differences (Figure 4), compared to participants who did not have a background in design, a higher proportion of participants who had a background in design felt that the visual quality of hyperrealist paintings was superior to that of photographs. Regardless of whether or not they had a background in design, participants had nearly consistent opinions regarding richness of detail and clarity of focal point. However, participants who did not have a background in design were more likely to feel that photographs were superior to hyperrealist paintings in these aspects. However, differences in professional background resulted in differences of opinion regarding the diversity of color, the temporality of the image, and the detailing of the image. Participants who had a background in design were more likely to feel that hyperrealist paintings were superior to paintings in these aspects; participants who did not have a background in design felt the opposite. In particular, participants who had a background in design were more likely to feel that hyperrealist paintings had more diverse colors than photographs; this result corroborated the findings of Athitsos et al. In contrast, participants who did not have a background in design were more likely to feel that photographs were superior to hyperrealist paintings; this result corroborated the findings of Athitsos et al.
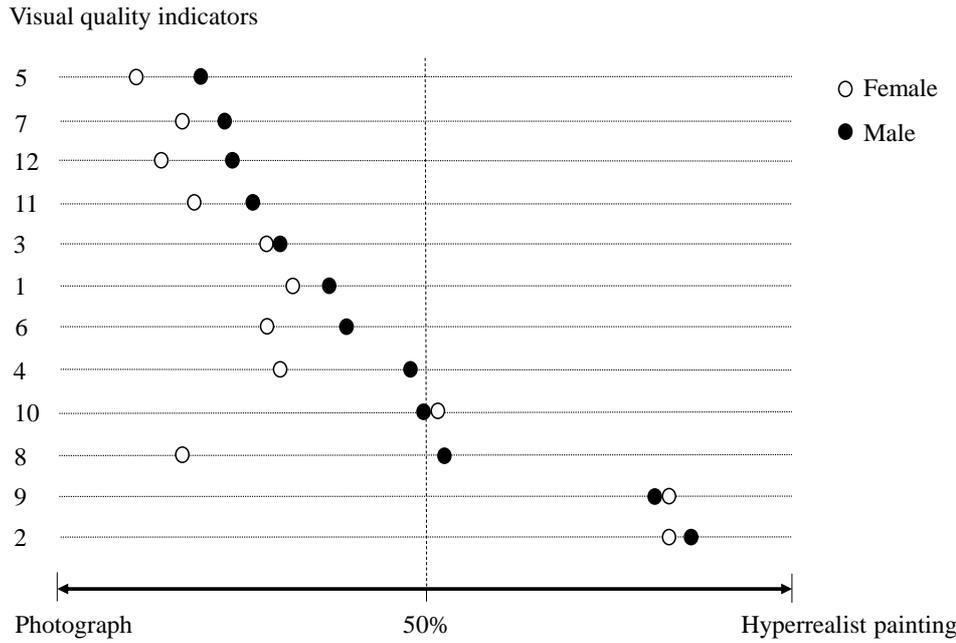
Visual quality indicators

Figure 3.Result Distribution of Visual Quality Indicators by Gender
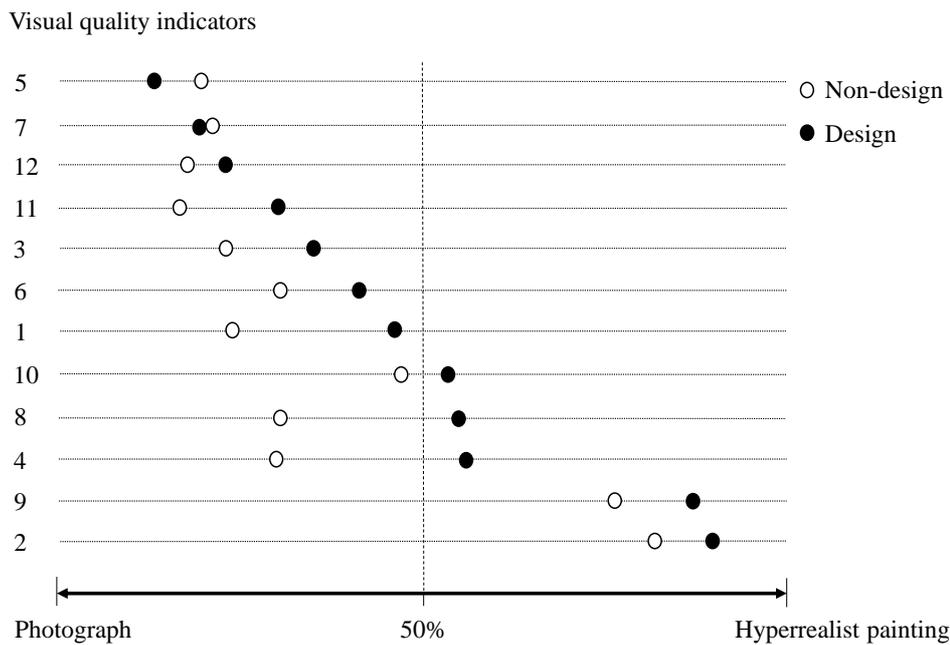
Visual quality indicators

Figure 4.Result Distribution of Visual Quality Indicators by Professional Background

5. Conclusion

The focus of this study was perceived differences in the visual quality of photographs and hyperrealist paintings among viewers. We examined how gender and professional background influenced perceived visual quality of photographs and hyperrealist paintings. Key findings of the study are summarized below:

(1) More participants felt that the overall visual quality of photographs was superior to that of hyperrealist paintings. However, participants felt that hyperrealist paintings had softer details, more emotionality, and more detailed imagery than photographs.

(2) Compared to female participants, a greater proportion of male participants felt that the visual quality of hyperrealist paintings was superior to that of photographs. Female participants were more likely to feel that photographs had more diverse colors. Gender differences were found for temporality of the image. Male participants felt that hyperrealist paintings were superior to photographs in this regard, but female participants felt the opposite.

(3) Compared to participants who did not have a background in design, a higher proportion of participants who had a background in design felt that the visual quality of hyperrealist paintings was superior to that of photographs. More participants who did not have a background in design felt that photographs had richer details and clearer focal points than hyperrealist paintings. Differences in professional background resulted in differences of opinion regarding the diversity of color, the temporality of the image, and the detailing of the image. Participants who had a background in design were more likely to feel that hyperrealist paintings were superior to paintings in these aspects; participants who did not have a background in design felt the opposite.

Reference

Athitsos, V., Swain, M.J., and Frankel, C. (1997). Distinguishing photographs and graphics on the world wide web. In Proceedings of the IEEE Workshop on Content-Based Access of Image and Video Libraries, 10-17.

Benovsky, J. (2011). Three kinds of realism about photographs. The Journal of Speculative Philosophy, 25(4), 375-395.

Cutzu, F., Hammoud, R., &Leykin, A. (2005).Distinguishing paintings from photographs. Computer Vision and Image Understanding, 100(3), 249-273.

Gernsheim, H. (1986).A concise history of photography.Dover Publications, New York.

Heyer, G. M. (2011). Explorations of the painted real: technological mediation in the work of four artists (Doctoral dissertation, Stellenbosch: University of Stellenbosch).

Kim, D., Son, S. W., &Jeong, H. (2014).Large-scale quantitative analysis of painting arts. Scientific reports, 4, 7370.

Ma, J. Y. & Choi, J. S. (2007).The virtuality and reality of augmented reality. Journal of Multimedia, 2(1), 32-37.

Sontag, S. (1977). On Photography. New York, NY: Farrar, Straus and Giroux.