

An Empirical Study on the Psychological Improvement Effects and Satisfaction of Korean Traditional Painting Generative AI

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Abstract— Recent advancements in generative AI technology have made it possible to generate art pieces for traditional Korean painting as well. Visual image generation through generative AI can occur autonomously as well as through co-creation with creators. This technological progress has opened up possibilities for utilizing generative AI in art therapy, aiming to achieve psychological well-being during the creation or appreciation of artworks or improving the therapeutic process. However, the measurement of psychological improvement resulting from the collaborative creation process using generative AI has not been attempted thus far. Therefore, the purpose of this study is to experimentally ascertain whether the creation of visual images through generative AI leads to psychological improvement for creators or viewers. 40 participants experienced the generative AI-based traditional Korean painting experience web developed by ALLBIGDAT Inc, a generative AI company in Korea, and conducted a survey on the psychological state of each before and after the experience. As a result, it was found that imperfections and serendipity had a significant effect on enhancing satisfaction with collaborative creations. In addition, the age considered as a control factor also showed statistically significant results, indicating that the higher the age, the higher user’s satisfaction.

Keywords— *Generative AI, Artwork, Catharsis, Imperfection, Serendipity, User satisfaction*

I. INTRODUCTION

The media used in traditional Korean painting includes brushes, ink, and water. Through adjustments in brush speed, water quantity, and other factors, subtle sensory expressions are achievable [19]. Additionally, the act of applying ink contributes to finding emotional stability and introspection. In

the case of traditional Korean paper (hanji), its soft texture and familiarity as a traditional medium are advantageous in inducing catharsis. With the recent advancement of generative AI, collaborative creation between humans and AI, known as co-creation, has become feasible, with an observed improvement in quality. Generative AI outputs, such as those produced by language models like LLM, and artistic creations like DALL.E or midjourney, are expected to contribute to increasing knowledge productivity by supporting or even replacing knowledge labor. Notably, generative AI possesses the capability to create artistic works, extending to visual art, making art creation feasible through AI.

However, art therapy utilizing traditional Korean painting has predominantly relied on works created directly by individuals, without exploring the distinctive effects that may arise from experiencing or participating in the co-creation process with generative AI, introducing elements of randomness, surprise, and mimesis into artworks. Consequently, there has been minimal discussion on the potential differential effects of experiencing or creating art with generative AI in the context of art therapy. In essence, while art therapy has conventionally involved individuals directly creating artworks, the therapeutic effects of engaging in creative activities with generative AI remain largely unexplored. Therefore, the purpose of this study is to experimentally determine whether the creation and appreciation of artworks through the co-creation experience of humans and artificial intelligence using generative AI in the field of visual art demonstrate therapeutic effects. The therapeutic domains under consideration include stress,

anxiety, psychological well-being, stress, and feelings of despair.

II. LITERATURE REVIEW: GENERATIVE AI AND ART THERAPY

Recently, AI has been utilized in the eHealth field [8]. Firstly, AI can contribute to fostering health literacy among the general public by providing educational content related to healthcare [10]. Additionally, AI chatbots like Woebot, leveraging large language models, can assist in cognitive and psychological improvement. AI possesses the capability to enable personalization of services, thereby contributing to personalized medicine. AI-based personalized medicine refers to an approach in modern medicine that prioritizes the utilization of an individual's profile or personal context to provide tailored diagnoses and prescriptions. This method aims to address the unique characteristics of each individual, making it one of the foremost objectives in contemporary medical practices. Furthermore, the potential recommendation features facilitated by AI are expected to enable automated treatment [1], on top of automated diagnosis [7].

Currently, in the industry, artificial intelligence (AI) technology, especially generative AI, is being employed in collaborative creation processes among individuals, organizations, and enterprises [9]. Particularly, the collaborative creation process between companies and consumers, as well as between producers and consumers, serves as a driving force for jointly creating value.

From this perspective, humans can engage in collaborative creation through generative AI. Generative AI refers to a type of artificial intelligence capable of autonomously generating text or content that is similar to human-created content [13]. In fact, even before the advent of generative AI, the field of human-computer interaction has been building intelligent creative systems through interactions between humans and computers [11], [6]. Notably, in the realm of human-computer interaction, AI supports human visual tasks [24]. Recently, collaborative creation based on generative AI has been applied to professional tasks in various fields, including content creators, educators, therapists, and others. The collaborative creation model with generative AI is illustrated in Table 1.

[Table 1] Generative AI and the Creative Field

Area	Description	Citations
Metaverse	Developing content within the metaverse in collaboration with artificial intelligence (AI).	[4]
Intelligent Robot	In educational settings, human educators receive assistance from intelli	[15]

	gent robots to conduct education.	
Art	Guidance in digital painting provided by artificial intelligence.	[16]
Intelligent Robot	Collaborative painting service development for emotional and psychological therapy using painting robots.	[2]
Music	Assisting novice composers in creating simple musical scores.	[3]
Textbooks	Co-development of textbooks using ChatGPT.	[13]
Healthcare	Joint interaction with patients involving ChatGPT.	[13]

When experiencing a collaborative creation process utilizing text-to-image technology, a type of generative AI, where individuals input prompts to generate images, the resulting artwork will possess the following characteristics. Firstly, intentional imperfection. Similar to the representation in Yoon Jungwon's exhibition "Beauty in Imperfection," rather than drawing vibrant and beautiful flowers, the generated artwork may depict withering and distorted flowers, offering an experience of the cyclical nature of creation and destruction in seemingly unfamiliar and peculiar forms. Such imperfections may be perceived as more beautiful and authentic than perfection, fostering a sense of observation through which individuals can find healing.

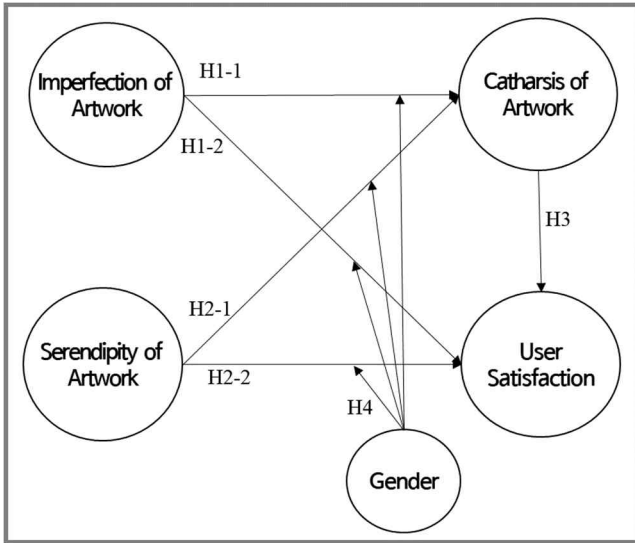
Secondly, serendipity. Serendipity, defined as the unexpected (positive) experiences or outcomes obtained by chance, frequently manifests in generative AI artworks. While we provide prompts to generative AI to draw something specific, the results often surpass our imagination or expectations, producing unintended artworks [12]. This can evoke a wow effect and enhance the emotional state of the viewers.

The psychological effects of such generative AI artworks may include, firstly, catharsis. Catharsis, also translated as purification, refers to the psychological purification process where suppressed emotions are expressed externally through language or action, leading to mental and emotional stability. Specifically, catharsis can be experienced through Korean paintings generated by generative AI [18].

Secondly, user satisfaction. Users who appreciate generative AI artworks may experience psychological satisfaction, similar to the satisfaction felt by visitors paying admission fees to museums to view and appreciate traditional artworks. Given the potential connection to the desire to frequently enjoy and possess one's favorite pieces, satisfaction with generative AI artworks is significant.

III. RESEARCH MODEL & METHOD

In this study on generative AI and artworks, we propose the research framework illustrated in Figure 1. Artwork generated by generative AI, rather than being perfectly identical to those created by humans, may offer a greater sense of catharsis and satisfaction through perceived imperfections. Additionally, generative AI has the capacity to produce works that were neither contemplated nor expected by human artists. Experiencing satisfaction and catharsis akin to receiving an unexpected gift may result from such unpredicted creations. Furthermore, psychological improvement and satisfaction derived from such artwork may vary by gender, as evidenced by numerous studies indicating that art therapy is more effective for middle-aged women. Hence, in this study, it is hypothesized that the imperfections and serendipity introduced by generative AI in artwork may have a moderating effect on the impact of catharsis and satisfaction, contingent upon gender. Lastly, it is anticipated that catharsis related to artwork will positively influence user satisfaction.



[Figure 1] Research Model

A. Subject

This study targeted working professionals, specifically middle-aged individuals, and selected a total of 40 participants who agreed to the research objectives and participation. It is noteworthy that most studies on Korean ink painting art therapy have been applied through single-group programs with 8 to 12 participants [15]. In this study, two experimental groups were randomly selected, one focusing on ink wash painting and the other on ink wash coloring, each comprising 20 participants. Table 2 presents the characteristics of the experimental participants.

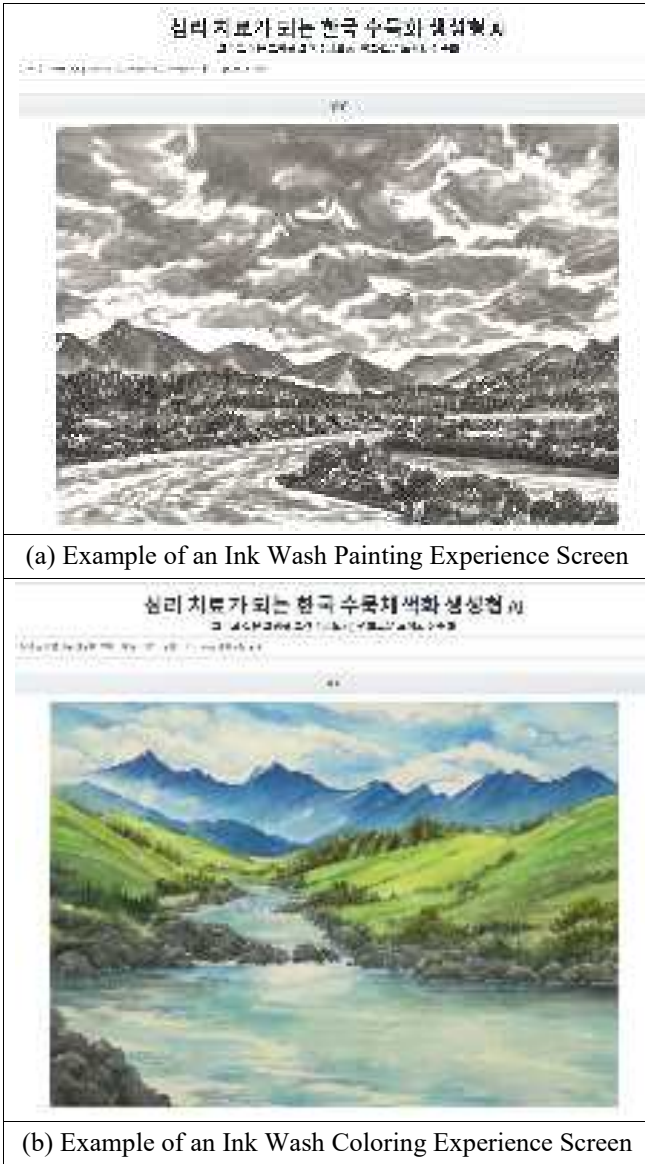
[Table 2] Demographics

Category	Value	Freq	Ration
Gender	Men	18	45.0%
	Wemen	22	55.0%
Ages	20's	5	12.5%
	30's	7	17.5%
	40's	9	22.5%
	50's	15	37.5%
	60's or higher	4	10.0%
Academic	Highschool	7	17.5%
	Undergrad	4	10.0%
	Grad	29	72.5%
Experience on Generative AI	Yes	34	85.0%
	No	6	15.0%

B. Stimulus

The stimuli for the experiment were presented using a generative AI-based Oriental painting experience web developed by the South Korean generative AI company AllBigDate Corporation. An illustration of the interface is provided in Figure 2.

The stimuli consist of thousands of Korean ink wash and ink wash coloring images produced by the collaboration between the company and the university over the past two years. Additionally, standard prompts for these images were established. To achieve this, over 100 art major undergraduate and graduate students directly created the original images, which were classified into four categories (A, B, C, D) based on their level of sophistication and detail. Two generative AI models, StyleGAN and Stable Diffusion, were considered for the study. Stable Diffusion, a deep learning text-to-image model released in 2022, was particularly employed for generating detailed images based on textual descriptions. The creation of generative AI related to ink wash and ink wash coloring in this study is the first of its kind in the world.



<Figure 2> Stimulus

C. Procedure

The experimental procedure was primarily based on [18] with the modification that participants did not directly create traditional Korean paintings but rather utilized a generative AI tool trained in Korean painting for artwork generation. The experimental sequence proceeded as follows. Participants, a total of 40 middle-aged individuals who agreed to the research objectives, completed a pre-survey in designated spaces sequentially at predetermined times. The pre-survey included items related to individual profiles, previous experiences with generative AI, and current psychological states. Prior to the experience, an independent samples t-test was conducted to examine the homogeneity of psychological states between the experimental and control groups, revealing no significant differences.

Following the completion of the pre-survey, participants moved to adjacent experimental rooms. Six PCs were

arranged in the experimental room, and participants randomly selected a PC to use. Of the six PCs, three were designated for the ink wash painting experience (control group), while the remaining three were assigned for the ink wash coloring experience (experimental group). The random PC selection resulted in 18 participants choosing ink wash painting and 22 participants opting for ink wash coloring.

Participants, seated at their selected PCs, input prompts for the pictures they wanted to generate while viewing the displayed screen. The scene of the participant's setup is depicted. Prompts, limited to 400 characters, could be changed multiple times during the 20-minute session.

Upon completion of the experience, participants filled out a post-survey. The post-survey included evaluations of the generated images (mimesis, imperfection, catharsis, quality, etc.), a reevaluation of their psychological states from the pre-survey, and responses regarding overall satisfaction and intention to reuse the generative AI. The entire experimental process took approximately 40 minutes per participant. Participants were given a 10,000-won gift card as compensation. A summary of the experimental procedure is provided in Table 3.

IV. RESULTS

A. Causal Analysis

The analysis focused on factors influencing satisfaction with collaborative creation using generative AI. Multiple regression analysis was conducted, and the results, as shown in Table 6, indicated that mimesis and serendipity resulting from the generative AI experience significantly influenced the enhancement of satisfaction with collaborative creation.

The significance of this table is as follows: Satisfaction with generating Korean paintings through generative AI tools and experiencing them is influenced by imperfections and serendipity. Firstly, the output of generative AI should not be identical to that created by a human artist; a certain level of difference enhances satisfaction. Additionally, serendipity refers to valuing and finding satisfaction in unexpected or unpredicted aspects of artworks generated through generative AI.

[Table 3] Regression Analysis

Y = Satisfaction	Coefficient	t-value	p-value
Const.	-0.653 (.777)	-0.840	0.407
Imperfections	-0.048 (.114)	1.623	0.075
Serendipity	0.442 (.149)	2.967	0.006

Catharsis	0.193 (.138)	1.401	0.171
Overall Quality	0.180 (.167)	1.078	0.289
Gender	0.143 (.214)	0.668	0.509
Adj. R-Square = .749, F-value = 27.617 (.001)			

This is also an analysis of the factors influencing the intention to reuse collaborative creation using the generative AI tool. For this purpose, a multiple regression analysis was conducted, and the results, as shown in Table 7, revealed that imperfection and serendipity arising from the generative AI experience significantly influenced the enhancement of satisfaction with collaborative creation. Additionally, age, considered as a control factor, also showed statistically significant results, indicating that the intention to reuse increases with higher age.

V. DISCUSSION

A. Academic Implications

The results of this study have the following scholarly implications. Firstly, it is the first research to investigate the psychological improvement effects of the collaborative creation process of art involving generative AI. Generative AI has demonstrated its potential as a collaborator in various domains of human creation, including art [20], design [25], novels [17], and play script production [23], [17], beyond programming or document tasks. However, studies measuring the effects of collaborative creation, as conducted in this research, have been scarce. Through this study, the depth of research can be expanded from exploring the possibilities of collaborative creation with generative AI to measuring its effectiveness at the level of case analysis.

Secondly, an empirical study was conducted on how evaluations of images generated by generative AI affect user satisfaction and intention to reuse. This study is unique in incorporating traditional assessment elements for artistic works, such as mimesis [14] and catharsis [5], along with additional evaluation factors for AI-generated recommendations, including imperfection and serendipity. Notably, the inclusion of mimesis and catharsis, despite their potential applications in art therapy [5], fills a gap in the absence of survey tools in previous studies. The development of survey items in this study may prove useful for subsequent research.

Thirdly, the finding that the psychological improvement effects of generative AI are generally more pronounced in women than in men adds credibility to the study. This aligns with various previous studies on the effectiveness of art therapy, which primarily targeted middle-aged women [22].

B. Practical Implications

The results of this study have the following practical implications. Firstly, based on the findings of this study, it is possible to develop mobile applications for smartphones that allow users to assess their psychological states while appreciating artworks generated by generative AI or engage in psychological improvement and therapy. Mobile applications designed for art therapy purposes already exist in various forms, such as diagnostic and interpretative, entertainment-oriented, counseling and therapy scheduling, and specific therapeutic goal-oriented applications [20].

Secondly, the therapeutic methods obtained from the results of this study could be integrated into non-invasive art therapy approaches utilizing biomarkers such as HRV, salivary cortisol, and brainwaves [20].

C. Future Research Directions

Despite its significance, this study has several limitations. Firstly, the measurement of art therapy effects used in this study relied on a survey-based approach, which may raise concerns about its accuracy. To address this issue, it may be necessary to supplement or replace the survey-based measurements with the use of biomarkers. For example, heart rate variability (HRV) is utilized as an indicator of autonomic nervous system activity, salivary cortisol as a stress hormone, and brainwaves as diverse mental health evaluation indicators related to emotion, cognition, and behavior [21]. Therefore, the use of biomarkers could enhance the objectivity of the measurements based on surveys in this study.

Secondly, there is a lack of statistically significant differences in measuring the effects between ink wash painting (Sumukhwa) and ink wash color painting (Sumuk Chaesaenghwa). However, considering the overall trend showing psychological improvement after experiences with both ink wash painting and ink wash color painting, and the tendency for ink wash color painting to exhibit a more pronounced psychological improvement effect compared to ink wash painting, it appears that further evidence is needed by expanding the size of the experimental groups.

Thirdly, the type of picture to be compared is limited. It would be better if the impact of generated AI images are compared with various pictures other than ink wash painting (Sumukhwa) and ink wash color painting (Sumuk Chaesaenghwa) paintings in the viewpoint of psychological therapy.

Fourth, additional comparisons are needed, such as comparing the psychological improvement effects of collaborative art creation with AI with those of collaborative art creation with humans, and comparing the psychological improvement effects between the inputted prompts and the search results obtained using those prompts as keywords.

However, this study primarily focused on verifying the existence of the psychological improvement effects of the collaborative creation experience with generative AI for Korean painting.

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