IJACT 24-9-22

Study of the Art Healing Potential of Coloring and Drawing in Video Games for Mental Health

[1]Guo Putian, [2]Sunghoon Cho, [2]Zhou Jiani

[1]*Undergraduate Student, Zhongnan University of Economics and Law, China*
[2]*Assistant Professor, Department of Film and Visual Effects, International College,*
Dongseo University, Korea
E-mail: moses472530@gmail.com

Abstract

Academia and psychiatric practice have increasingly begun to recognize the positive relationship between art and mental health well-being. Coloring and drawing, in specific, are being highlighted as being particularly effective in improving mental wellness. Video games, despite having a negative reputation for promoting antisocial behavior and violence, are now being recognized as positive for mental health as they provide relaxation benefits that help users find inner tranquility. The following study experimented on the impact of video games that incorporate coloring and drawing games on improving mental health using 3 criteria: creative and artistic freedom; interactivity; and sense of immersion. The experiment focused on 1 coloring game (Chicory: A Colorful Tale) and 1 drawing game (Draw a Stickman: EPIC). The experiment found that coloring (Chicory) reduces loneliness, stress, anxiety, and softens the heart, while drawing (Stickman) increases focus, emotional control, adds excitement to life, and improves innovations. Further research into the specific benefits and challenges associated with this emerging form of digital art therapy is however recommended.

Keywords: Art, Coloring, Drawing, Healing, Mental Health, Video Games.

1. INTRODUCTION

The positive relationship between art and mental health well-being is increasingly gaining recognition in both academia and psychiatric practice [1, 2]. Mental health issues are increasingly taking center stage in contemporary society given the numerous people confronting challenges such as stress, anxiety, and depression. In response, some game developers have begun to focus on the potential therapeutic benefits of video games, leading to a proliferation of games that incorporate artistic elements such as painting and coloring, which are designed to facilitate therapeutic outcomes [3, 4]. In those video games, the immersive nature, interactivity and some other therapeutic elements of painting and coloring games provide players with a unique medium through which they can experience healing of the mind and body in a more approachable way than traditional methods [5]. During the game, players often experience different emotional resonances and anxiety-reducing feelings [6].

This is despite the fact that video games are often criticized for having negative psychological impacts on people including its role in increasing antisocial and violent behavior [7]. Nonetheless, certain appropriate video games have been found in research to serve as a form of therapy in terms of improving players' cognitive behavior and helping them relax from the hustle and bustle of everyday life. With the development of art therapy, integrating art forms such as painting and coloring into video games is changing the way we approach mental health, providing customized experiences to meet the emotional and psychological needs of different individuals.

While a lot of related research has arisen, most of the previous studies have analyzed them separately or simply mentioned them as one of the small factors in healing, lacking a deeper, integrated analysis. As such, the current study will make an effort to dig deeper and fill this gap. With this in mind, the following study seeks to answer the Research Question: "What are the therapeutic effects of video games that integrate art forms such as drawing and coloring?"

2. THEORY

2.1 Theoretical Background

The self-determination theory (SDT) posits that autonomy, competence, and relatedness are the three fundamental psychological needs that humans need to satisfy in order to experience well-being [8]. The theory is often used to understand why people play video games and has been used to highlight how video games enhance well-being [9, 10]. SDT can be used to understand that playing video games improves well-being given that they satisfy all three fundamental psychological needs.

The social cognitive theory (SCT), on its part, argues that human behavior derives can be understood as the interplay of personal factors (e.g. ethics and self-efficacy), environmental factors (e.g. family backgrounds) and behavioral factors (e.g. togetherness) [11]. Based on this notion, the theory proposes that a person's goals drive human behavior and the exercising of control over internal cognitions, actions and external sources of influence regulates this behavior [12, 13]. People identify with other people to achieve positive feelings or results like a sense of community or a boost to their self-esteem. When playing video games, identifying with a character allows players to feel connected to the character in such a strong way that they can even become completely immersed in the game and empathize with the specific character's emotions and goals in the game [14]. When this interaction grows to where a person's desire is to model themselves after their favorite game character, they are able to develop feelings of relatedness and connection. This demonstrates the power of video games.

2.2 Literature Review

Using video games as a means of healing has been a topic of interest and research in recent years. Several studies [15, 16] have highlighted the positive impact of video games on mental health, including their ability to reduce stress, improve mood, and enhance cognitive function. Additionally, video games have been found to be effective in treating various mental health conditions, such as depression and anxiety [17].

One of the key ways in which video games contribute to healing is through their ability to provide an immersive and engaging experience for the player which helps players to temporarily escape from their problems and focus on the game environment, which can be particularly beneficial for those experiencing stress or anxiety [18]. Also, video games often require players to solve puzzles and complete challenges, which can stimulate cognitive function and improve problem-solving skills [19].

However, despite the potential benefits of video games for healing, it is important to acknowledge the potential risks associated with excessive gaming. Excessive gaming can lead to physical health problems, such as eye strain and obesity, as well as negative impacts on mental health. Therefore, it is crucial to promote responsible gaming practices and ensure that individuals maintain a balanced approach to their gaming habits.

In addition to video games, the therapeutic benefits of coloring and drawing have gained significant attention in recent years, particularly in the context of stress reduction and mental health promotion. Researchers have increasingly been keen on exploring the potential healing effects of engaging in such artistic activities within the virtual environment of video games [20]. The role and effects of Expressive Arts Therapy (EAT) is one area that has attracted considerable attention in research. EAT is a tool for facilitating emotional expression and processing in individuals experiencing grief, trauma, and other forms of psychological distress that involves combining various forms of artistic expression, including visual art, music, and movement [21]. Through EAT, people can tap into their internal experiences and communicate emotions that may be difficult to put into words as it emphasizes on the process of creation, rather than the final product, therefore leading to greater introspection, self-awareness and personal growth [22].

Previous studies have shown that EAT can be effective in treating a range of psychological disorders, including depression and anxiety [23]. This is because the approach provides a non-threatening and non-judgmental space for clients to explore and express their emotions, providing a sense of control and empowerment over their mental health and well-being [24]. Moreover, the potential of EAT lies in its ability to provide a creative and holistic approach to healing and growth, integrating the mind, body, and spirit in the therapeutic process. As creative expression is a fundamental aspect of the human experience, individuals find this form of therapy particularly meaningful and relevant to their personal journey of healing and self-discovery.

Apart from EAT, the connection between drawing and coloring towards healing has been the subject of research. Previous research has shown that engaging in coloring and drawing activities can have significant positive effects on mental health. For example, studies conducted by psychologists at different colleges [20, 25] have found that coloring reduced stress levels and increased levels of relaxation in participants, while others [26, 27] found that drawing can be a powerful tool for reducing anxiety and depression.

While both activities involve creative expression, there are differences in their cognitive demands and the level of engagement they offer. According to a study [28], drawing is a more cognitively demanding activity than coloring, as it requires visual analysis and abstraction of essential features to be included in the drawing. Therefore, drawing may result in a greater balance of challenge and skill and thereby a greater state of flow, leading to more significant mood improvement. On the other hand, coloring is a low cognitive demand activity that acts as a distraction from negative thoughts, leading to better immediate mood [28].

3. EXPERIMENT

3.1 Methodology

To investigate the therapeutic effects of video games that integrate art forms such as drawing and coloring, the study chose video games that encompass these artistic gameplay formats. These games were classified into 'drawing' and 'coloring' games according to the specific art forms used. Based on a comprehensive evaluation of factors such as age restrictions, popularity, and gameplay, five (5) mainstream drawing and coloring games that have gained a certain level of social acceptance in the market were selected to investigate the therapeutic effect that video games with these art forms can bring to players.

Among them, the video games with the drawing elements were "Draw a Stickman: EPIC" and "Passpartout: The Starving Artist," whilst those with coloring elements were "Chicory: A Colorful Tale," "Pixel Art: Color Island," and "Tint", Table 1 shown the details as below:

Table 1. Sampled Video Games

Title	Art Form	Issuer	Nation	Platform	Number of Supported Languages	Date Issued	Genre	Age Limit	Free
Chicory: A Colorful Tale	Coloring	Finji	USA	Steam, Switch, PS	11	2021	Adventure, Indie, RPG	7+	×
Tint	Coloring	Lykkegaard Europe Limited	Cyprus	IOS	16	2019	Puzzle	4+	√
Pixel Art: Color Island	Coloring	Athena FZE	United Arab Emirates	Android, IOS	8	2019	Puzzle, Casual	12+	√
Passpartout: The Starving Artist	Drawing	Flamebait Games	Sweden	IOS, Steam	13	2016	Casual, Indie, Simulation	All Ages	×
Draw a Stickman: EPIC	Drawing	Hitcents	USA	Windows, Android, IOS	11	2012	Action, Adventure, Casual	12+	×

3.2 Research Plan

The specific research plan of the study experiment is outlined as follows:

1. Data Collection: relevant data about the games was gathered including the game titles, age restrictions, release dates, game genres, and availability.
2. Practical Experience: the researchers engaged in hands-on gameplay of the selected video games to understand the narrative logic, user interface, and genuine user experiences. The gameplay process was recorded in real-time to gain a more accurate understanding of the research subjects.
3. Theoretical Analysis: Through preliminary research and practical gameplay experience, an in-depth analysis of the specific video games that integrate art forms of painting and coloring was conducted. The unique gameplay features and therapeutic effects such as players' emotional experiences and improvements in cognitive behavior were explored.
4. Summary and Conclusion: Based on the collected data and in-depth exploration, the therapeutic effects of these visual games were summarized and corresponding recommendations and prospects proposed.

3.3 Study Criteria

In order to understand the healing role of art in video games, we chose to use gameplay containing drawing or coloring as the primary criterion not just the painting mechanism alone, in addition to the following 3 elements and creative points:

a. Creative and artistic freedom
b. Interactivity
c. Sense of immersion

4. RESULTS AND DISCUSSION

4.1 Analysis of Chicory: A Colorful Tale

Nowadays, with the gradual understanding of the therapeutic effects of coloring, a number of books and apps with coloring as the main function have emerged, but the combination of coloring and video game play settings is still relatively rare. After screening using the above criteria, the study selected the following three video games that contain coloring elements:

- Chicory: A Colorful Tale
- Tint.
- Pixel Art: Color Island

The study then settled on "Chicory: A Colorful Tale" as the main subject of study (see Fig.1). It is a top-down adventure game in a coloring book world where players can color on anything, use painting powers to explore new places, solve puzzles, help friends, and change the world.

Figure 1. Chicory: A Colorful Tale

4.1.1 Creative and Artistic Freedom

The experiment found that the combination of coloring and puzzle-solving mechanics in the game, which is a more relaxed style of gameplay compared to other adventure games in the market, can reduce the sense of challenge for some core-game players and carries a great deal of risk for both the game's developer and publisher. However, it is also this relaxed, artistic gameplay that allows for the creative coloring activities of players who are supposed to be solving puzzles in the adventure genre, especially since this creativity is not forced upon them by the game, but rather by the player's spontaneity.

On top of that, the art form of coloring is extremely low judgmental unlike other art forms such as painting. Painting outlines figures and objects, and with a reference point, both experienced painters and people who have never painted before can easily see if the painting is good or bad. Coloring, however, does not attract judgment on the art, but rather gives specific observations on the player's choices. This lack of judgment helps in healing the inner world of adults.

4.1.2 Interactivity

When players play Chicory, their attention tends to be drawn somewhere else while solving puzzles (see

Fig.2). Sometimes, they may notice a new color in an area, or be distracted simply because they like the look of a particular scene or thing. They often end up spending a lot of time painting every scene with their favorite color, with flowers, trees, the ground and sky, including the ever-fluttering butterflies, all of which the player can give color to, and all of which will be saved over the course of the game. This makes the game highly engaging (see Fig.3 and 4).

Figure 2. Starting Screen of the Game

Figure 3. Game Indoor Coloring

The game analyzes the colored artwork on several levels, and the final result is like a priority list of observations, such as "This area is darker" or "You prefer green" (see Fig.5). As a player, it's a gratifying and fun experience to feel that the game is paying attention to what you are doing and giving you feedback.
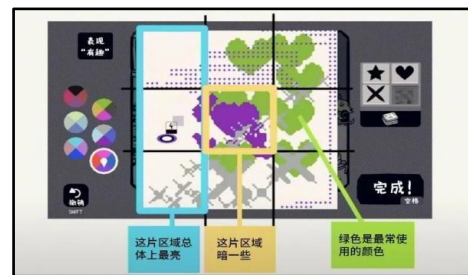

Figure 4. Game Outdoor Coloring

Figure 5. Color Analysis Area of the Game

4.1.3 Sense of Immersion

The fact that players do such "mindless" things shows that they become easily immersed into the game. Figure 6 shows the interface where the main character will color the landscape in fron. Furthermore, the game uses narratives, characters, and role-playing to stimulate self-expression in the main coloring quests, and such switching of quests and thoughts to suit the player's mood can happen at any time during the action (see Fig.7). The coloring gameplay and the adventure game vehicle give this video game a unique charm: adventurous but not too aggressive, casual but not too boring. This helps immerse players into the game and gives it an addictive quality.

Figure 6. Breakout Screen of the Game

Figure 7. Dress-up Image of the Game

4.2 Analysis of Draw a Stickman: EPIC

In order to better explore the healing effects of video games that incorporate elements of drawing, the following two games were selected:

- Draw a Stickman: EPIC
- Passpartout.

The study then zeroed in on Draw a Stickman: EPIC as the main subject of study (see Fig.8). This game tells the story about an original cartoon hero, a stickman drawing by players who needs to save his friend who heads straight into the dangers of the cartoon adventure book. It is a simple adventure game where the whole world is depicted from the player, whether the hero is handsome or not, whether the world is beautiful or not, it all depends on the player's drawing level, which has low requirements, even someone with a kindergarten level of brushstrokes could easily get started.

Figure 8. Draw a Stickman: EPIC

4.2.1 Creative and Artistic Freedom

This visually hand-drawn style offers players a pure graffiti adventure, such as drawing a weapon to defend against monsters, drawing the flame and lightning to clear the obstacles, and drawing a key to open the treasure chest and the door. Fig. 9 and 10 show the self-portraits of the different players that will subsequently move through the game in this image. The game combines drawing with various other elements-adventure, action, puzzle solving, and ultra-high degree of freedom which have never been experienced in other games. This

engages a player's creative thinking and allows players free reign of their artistic expression.

Figure 9. Dinosaur Self-Portrait   **Figure 10. Ghost Self-Portrait**

4.2.2 Interactivity

The biggest selling point of this game is that the drawing style of the game depends on the player's drawing skills and its unique drawing mechanism, enabling strong interactivity. Fig. 11 shows the location of the player with the self-portrait of Matchmaker. Fig. 12 shows the Matchmaker player preparing to leave the current level through the small yellow door. From drawing a rain cloud to nourish plant growth, to drawing an ax to bring down a gate, the environment is at the player's disposal. As the player draws their way through 14 levels with a hidden bonus level, they explore a variety of different environments and encounter unusual creatures, which makes the game highly engaging.
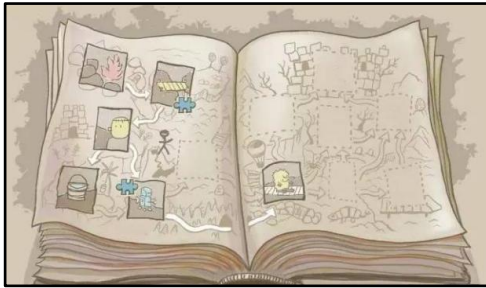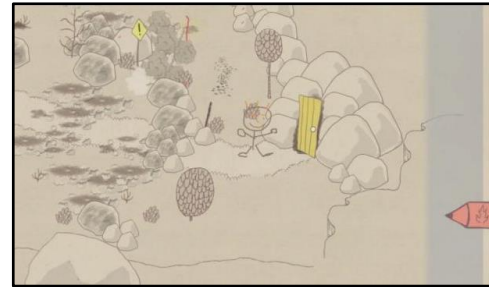

Figure 11. Screenshot of Player's Location

Figure 12. Exit page for the current level

4.2.3 Sense of Immersion

Due to the non-linear nature of the gameplay, the next level to be unlocked depends on how a player tackles the current environment, and each level is filled with hidden secrets and achievements, which brings a variety of development that make game players eager to pick up their electronic pencils and enter this legendary Matchstick Men adventure game. Fig.13 shows the achievement trophies achieved by Matchmaker player.

Figure 13. Player Achievement Showcase

4.3 Findings

Table 2 shows the experiment discovered several different healing effects in these video games.

Table 2. Healing Impacts of Each Game

Title	Art Form	Game Feature	Healing Effect	Healing Game (As the Main Purpose)	Main Purpose (If not Healing Game)	Realistic Significance and Inspiration Games
Chicory: A Colorful Tale	Coloring	Working with two people	Reduces loneliness,	×	Explore scenarios,	Explore the world, Confront

		online, Sweet style of pure hand-drawn animation, Beautiful scene design, Well-crafted dialogue	Soften heart, Cuts down on stress and anxiety		Solve puzzles, Beat levels	challenges, Independent thinking, Close to nature(animals), Maintain innocence
Tint	Coloring	The visual impact of watercolor style, The peaceful background music of natural birdsong	Reduces overthinking, Cuts down on stress and anxiety	√	/	Relax yourself, Solve puzzles, Close to nature, Find beauty in life
Pixel Art: Color Island	Coloring	Pixel visual style, Many places to explore, Offline	Reduces overthinking, Cuts down on stress and anxiety, Boosts memory, Increases focus and emotional control, Enhances intuition	√	/	Enjoy the moment, Explore the world, Develop the spatial awareness, Strengthen memory power
Passpartout: The Starving Artist	Drawing	Cartoon visual style, Third person simulation business gameplay, High freedom, Fun interacting with NPC	Increases focus and emotional control, Improve confidence, Reduces loneliness, Improve innovation capability	×	Role play, Simulated operation	Take work and life seriously, Encourage creativity, Listen to others selectively, Discover the business value of interests
Draw a Stickman:	Drawing	Pencil-drawing visual style,	Increases focus and emotional	×	Explore scenarios,	Explore the world, Confront

EPIC	Puzzle solving gameplay,	control,	Solve puzzles,	challenges,
		Add excitement to ordinary life,	Beat levels	Independent thinking,
	Unique adventure settings			
		Improve innovation capability		Master the overall situation

From the above analysis, it is evident that the use of coloring or drawing elements has a positive impact on mental health. Based on the experiment findings, the "Chicory: A Colorful Tale" game was found to reduce loneliness, stress, anxiety, and soften the heart, and the "Draw a Stickman: EPIC" game was found to increase focus, emotional control, add excitement to life, and improve innovation.

From the perspective of inner healing, in coloring video games, the gameplay that involves moving from coloring in white and black to a multitude of colors brings players inner satisfaction due to the different visual effects and meanings from the combination of colors.

In drawing video games, the powerlessness that people experience in their everyday lives that prevents them from changing their own situations and surroundings is replaced by a high degree of freedom and power. This gives players a feeling of control and thus calmness.

Both the coloring and drawing video game use childish styles and shapes in the form of cartoon graffiti which reduces the anxiety that may be brought about by some more adult-like storylines (like violent conflicts), and allows players to subconsciously immerse themselves in a fantasy world that differs from their real life, allowing them to create their own fantasy world in a more immersive and casual way. Moreover, most of these games also use beautiful sceneries and designs, allowing players to enjoy the fun of creation and to appreciate the thought-provoking storyline, and at the same time, the excellent dialogue and well-produced music also designed to match the use of coloring and drawing art, working together to build excellent effects. This full experience is relaxing and eases their mental burdens, thereby reducing stress and anxiety levels.

5. CONCLUSION

The healing effects of drawing, coloring and video games have garnered increasing attention in recent years as potential tools for improving mental health. More and more game developers are integrating these elements. The study used an experimentation methodology to answer the Research Question: "What are the therapeutic effects of video games that integrate art forms such as drawing and coloring?" The study found that coloring games reduce loneliness, stress, anxiety, and soften the heart, while drawing games were found to increase focus, emotional control, add excitement to life, and improve innovation.

The creative, interactive, and immersive nature of video games therefore creates cognitive and social benefits that make them a valuable tool for improving mental health. As such, the healing effects of coloring and drawing in video games offer a promising medium for therapeutic intervention. By combining the creative and expressive nature of coloring and drawing with the immersive and interactive nature of video games, people have the opportunity to experience a unique form of healing and self-discovery through the relaxing properties of the games.

The research could inform the development of targeted interventions and tools (especially video games) for mental health professionals, and provide a reference for the future direction of artistic healing games for game developers and people seeking more convenient forms of therapy. The potential of video games as a means of healing is thus a promising area of research that continues to expand. Further research is, however, needed to explore the specific benefits and challenges associated with this emerging form of digital art therapy. It is also

crucial to investigate the potential risks associated with excessive gaming.

ACKNOWLEDGEMENT

REFERENCES

[1] D. Fancourt and F. Saoirse, "What is the evidence on the role of the arts in improving health and well-being?", *Health Evidence Network Synthesis Report*, No. 67, 2019. *https://www.ncbi.nlm.nih.gov/books/NBK553773/?report=classic*

[2] C. Lee, L. Li-Ching Lin, and H. Hung, "Art and cultural participation and life satisfaction in adults: the role of physical health, mental health, and interpersonal relationships", *Frontiers in Public Health,* Vol 8, p.582342, 2021. DOI: 10.3389/fpubh.2020.582342

[3] N. Johannes, V. Matti, and A.K. Przybylski, "Video game play is positively correlated with well-being", *Royal Society Open Science,* Vol 8, No. 2, 202049, 2021. DOI: 10.1098/rsos.202049

[4] A.J Cangas, N. Navarro, J.M.A Parra, J.J. Ojeda, D. Cangas, J.A. Piedra, and J. Gallego, "Stigma-stop: a serious game against the stigma toward mental health in educational settings", *Frontiers in Psychology,* Vol 8, p.1385, 2017. DOI: 10.3389/fpsyg.2017.01385

[5] B. Halldorsson, C. Hill, P. Waite, K. Partridge, D. Freeman, and C. Creswell, "Annual research review: immersive virtual reality and digital applied gaming interventions for the treatment of mental health problems in children and young people: the need for rigorous treatment development and clinical evaluation", *Journal of Child Psychology and Psychiatry,* Vol 62, No. 5, 584-605, 2021. DOI: 10.1111/jcpp.13400

[6] F. Pallavicini, A. Pepe, and F. Mantovani, "Commercial off-the-shelf video games for reducing stress and anxiety: systematic review", *JMIR Mental Health,* Vol 8, No. 8, e28150, 2021. DOI: 10.2196/28150

[7] Medeiros, Bruno Gonçalves de, Carlos Eduardo Pimentel, Maurício Miranda Sarmet, and Tailson Evangelista Mariano. ""Brutal Kill!" Violent video games as a predictor of aggression", Psico-USF 25, 2020. DOI: 10.1590/1413-82712020250205

[8] C.K Wang, J.W.C Liu, Y.H Kee, and L.K Chian, "Competence, autonomy, and relatedness in the classroom: understanding students' motivational processes using the self-determination theory", *Heliyon*, Vol 5, No. 7, 2019. DOI: 10.1016/j.heliyon.2019.e01983

[9] P.J.C Adachi and T.Willoughby, "The link between playing video games and positive youth outcomes", *Child Development Perspectives*, Vol 11, No. 3, pp.202-206, 2017. DOI: 10.1111/cdep.12232

[10] F. Reer and N.C. Krämer, "Psychological need satisfaction and well-being in first-person shooter clans: Investigating underlying factors", *Computers in Human Behavior,* Vol 84, pp.383-391, 2018. DOI: 10.1016/j.chb.2018.03.010

[11] A.J Van Rooij, R. Daneels, S. Liu, S. Anrijs, and J.V Looy, "Children's motives to start, continue, and stop playing video games: Confronting popular theories with real-world observations", *Current Addiction Reports,* Vol 4, pp.323-332, 2017. DOI: 10.1007/s40429-017-0163-x

[12] D.H Schunk and M.K. DiBenedetto, "Motivation and social cognitive theory", *Contemporary Educational Psychology,* Vol 60, p. 101832, 2020. DOI: 10.1016/j.cedpsych.2019.101832

[13] J.S Lim, M. Choe, J. Zhang, and G. Noh, "The role of wishful identification, emotional engagement, and parasocial relationships in repeated viewing of live-streaming games: A social cognitive theory perspective", *Computers in Human Behavior,* Vol 108, p.106327, 2020. DOI: 10.1016/j.chb.2020.106327

[14] C. Teng, "Impact of avatar identification on online gamer loyalty: Perspectives of social identity and social capital theories", *International Journal of Information Management,* Vol 37, No. 6, pp.601-610, 2017. DOI: 10.1016/j.ijinfomgt.2017.06.006

[15] F. Pallavicini, A.Ferrari, and F.Mantovani, "Video games for well-being: A systematic review on the application of computer games for cognitive and emotional training in the adult population", *Frontiers in Psychology,* Vol 9, p.407892, 2018. DOI: 10.3389/fpsyg.2018.02127

[16] M.C Carras, A.Kalbarczyk, K.Wells, J.Banks, R.Kowert, C.Gillespie, and C.Latkin, "Connection,

meaning, and distraction: A qualitative study of video game play and mental health recovery in veterans treated for mental and/or behavioral health problems", *Social Science & Medicine,* Vol 216, pp.124-132, 2018. DOI: 10.1016/j.socscimed.2018.08.044

[17] R. Pine, T.Fleming, S.McCallum, and K.Sutcliffe, "The effects of casual video games on anxiety, depression, stress, and low mood: a systematic review", *Games for Health Journal,* Vol 9, No. 4, pp.255-264, 2020. DOI: 10.1089/g4h.2019.0132

[18] G. Tao, B. Garrett, T. Taverner, E. Cordingley, and C. Sun, "Immersive virtual reality health games: a narrative review of game design", *Journal of NeuroEngineering and Rehabilitation,* Vol 18, pp.1-21, 2021. DOI: 10.1186/s12984-020-00801-3

[19] E. Choi, S.Shin, J.Ryu, K.Jung, S. Kim, and M. Park, "Commercial video games and cognitive functions: video game genres and modulating factors of cognitive enhancement", *Behavioral and Brain Functions,* Vol 16, pp.1-14, 2020. DOI: 10.1186/s12993-020-0165-z

[20] J. Eaton and C.Tieber, "The effects of coloring on anxiety, mood, and perseverance", *Art Therapy,* Vol 34, No. 1, pp.42-46, 2017. DOI: 10.1080/07421656.2016.1277113

[21] C.A. Malchiodi, "Trauma and expressive arts therapy: Brain, body, and imagination in the healing process"*, Guilford Publications*, 2020. DOI: 10.1093/mtp/miac008

[22] N. Rogers, "Person-centered expressive arts therapy: A path to wholeness", *In Approaches to Art Therapy*, pp. 230-248, Routledge, 2016. DOI: 10.4324/9781315716015-21

[23] K. Dunphy, S. Mullane, and M. Jacobsson, "The effectiveness of expressive arts therapies: A review of the literature", *Psychotherapy and Counseling Journal of Australia,* Vol 2, No. 1, 2014. DOI: 10.59158/001c.71004

[24] Daly, M., "Expressive mindfulness: a trauma-sensitive expressive arts therapy group method", *Expressive Therapies Capstone Theses*. 208, 2019.

[25] D.A Sandmire, S.R Gorham, N.E Rankin, and D.R Grimm, "The influence of art making on anxiety: A pilot study", *Art Therapy,* Vol 29, No. 2, pp.68-73, 2012. DOI: 10.1080/07421656.2012.683748

[26] N. Turturro and J.E. Drake, "Does coloring reduce anxiety? Comparing the psychological and psychophysiological benefits of coloring versus drawing", *Empirical Studies of the Arts,* Vol 40, No. 1 pp.3-20, 2022. DOI: 10.1177/027623742092329

[27] N. Altay, E.Kilicarslan-Toruner, and Ç. Sari, "The effect of drawing and writing technique on the anxiety level of children undergoing cancer treatment", *European Journal of Oncology Nursing,* Vol 28 pp.1-6, 2017. DOI: 10.1016/j.ejon.2017.02.007

[28] N. A Curry and T.Kasser, "Can coloring mandalas reduce anxiety?", *Art Therapy,* Vol 22, No. 2, pp.81-85, 2005. DOI: 10.1080/07421656.2005.10129441