Artificial Intelligence (AI) and mental disorder art therapy

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According to the National Institute of Mental Health, 1 in 5 adults in the United States suffer from mental disorders. Mental disorders can lead to significant distress and social isolation. Art was suggested as a therapeutic approach that aims to encourage self-reflection, increase self-esteem, and reduce social isolation. Artificial intelligence (AI) can be utilised in art therapy to support individuals suffering from mental disorders. although AI tools can significantly support the healthcare system and ease the pressure on it, AI is not completely perfect in in-depth interpretation and analysis of mental disorders' symptoms as it understands mental disorders' symptoms literally. The extent AI can "actually" understand human emotions and reflect them in art creation is not fully determined, and it will, at least partly, be explored herein. This manuscript is going to discuss how AI was used in mental disorder art therapy. Furthermore, it will assess how AI interpretate the three most common mental disorders (depression, bipolar, and anxiety) through visual art and compare it to interpretations from a human point of view. Socio-cultural aspects of using AI in art therapy will be discussed, and future developmental aspects of AI in art therapy will be suggested.

Keywords: artificial intelligence (AI); art therapy; mental disorder; virtual reality; visual art

According to the National Institute of Mental Health, 1 in 5 adults in the United States suffer from mental disorders (NAMI). Furthermore, the National Alliance of Mental Health indicated that the three most common mental disorders in the United States are anxiety disorders, major depression, and bipolar disorder (ACHN). Mental disorders can lead to significant distress and social isolation. Art was suggested as a therapeutic approach that aims to encourage self-reflection, increase self-esteem, and reduce social isolation (Apotsos, 2012; Laranjeira et al., 2019; Richardson, Jones, Evans, Stevens, & Rowe, 2007). For example, a study in a Portuguese acute inpatient facility that assessed the effect of art therapy on individuals admitted to an acute psychiatry ward found that art therapy was useful in the recovery process (Laranjeira et al., 2019). A systematic review confirmed that art therapy was effective in psychosocial rehabilitation in people suffering from mental disorders (Apotsos, 2012). Furthermore, a study by Richardson et al. showed that art therapy for 6 months positively improved the negative symptoms in individuals suffering from schizophrenia (Richardson et al., 2007).

With the emergence of artificial intelligence (AI), researchers can efficiently collect and analyse information from online databases about how to use art therapy to support individuals suffering from mental disorders. For example, the University of Waterloo created a digital art therapy program called DeepThInk; which allows individuals to express themselves through digital paintings more vividly (Du et al., 2024). Furthermore, Generative Adversarial Networks (GANs) were suggested as assistant tools to inspire individuals and guide their painting process in art therapy (He & Liu, 2023). CareYaYa, an AI art therapy tool, showed promising results in art therapy for individual suffering from dementia (Davis, 2024).

However, researchers still lack knowledge about how realistic information AI can give when it comes to the interpretation of humans suffering from mental disorders. In other words, AI can collect information from the online database, analyse and link this information together to reflect human emotions in times of crisis as an art piece, but those reflections are a combination of a pool of information and not individualised. Art Therapy usually refers to visual arts such as painting, drawing, sculpture, and collage. Art therapy also refers to other types of creative arts including music and creative writing. For this review, we are going to focus only on the visual aspect of art therapy. This review is going to discuss how AI was used in mental disorder art therapy. Furthermore, this review will assess how AI interprets the three most common mental disorders through visual art and compare it to a human interpretation from an individual point of view.

AI and its usage in mental disorder art therapy

Many people who suffer from mental disorders might not be able to translate their feelings and emotions into an art piece simply because of their lack of artistic skills. AI allows those individuals to type their thoughts using AI tools that create an art piece, and then continue to adjust the information they provide to an AI program until they produce the piece of art that matches what they want to express and communicate visually about their feelings (Gao et al., 2023). Furthermore, AI serves as an intelligent understanding tool of artwork by recognizing and classifying patterns and objects. Therefore, AI can be used to assess individuals' emotions when painting. For example, a study in China implemented AI tools to assess autistic students' emotions in the classroom (Hu, 2022). AI analysed students' facial expressions while painting in the classroom and showed that painting can be a rehabilitation therapy for autistic children (Hu, 2022).

The shortage of experts in art therapy worldwide makes it challenging to provide appointments for those suffering from mental disorders and interested in art therapy. Moreover, the interpretation of art pieces made by clients is subjective because it relies on the psychologist's expertise, training, and approaches (He & Liu, 2023). As a solution, AI can provide remote painting therapy assistance and a high level of image analysis and recognition (He & Liu, 2023). Also, an AI art therapy system can provide continuous support to its users and optimise its function to best fit each user. In the United States, researchers developed "Mind Palette" which is a mobile application that incorporates mental disorder art therapy and generative AI technology. Mind Palette allows self-expression through art

and provides users with the opportunity to interact with an AI chatbot, receive recommendations to overcome negative thoughts, facilitate cognitive-behavioural therapy (Yoo, Kim, & Lopes, 2023).

AI interpretation of mood and anxiety disorders

AI tools, within seconds, can collect data, analyse it, and create images based on what the users are typing. However, to what extent AI can "actually" understand human emotions and reflect them in art creation is not fully determined. To approach this dilemma, the authors of this manuscript tried to create paintings on a piece of paper reflecting their overall understanding of human emotions when suffering from the three most common mental disorders (depression, bipolar, and anxiety, Figure 1). Afterwards, AI-generated art about the human emotions in the three most common mental disorders was created using three random, widely used, free, and easy-to-access AI-powered tools including Microsoft Bing (www.bing.com), Leonardo AI (leonardo.ai), and Craiyon (www.craiyon.com). To create those images using AI, the following sentences were used: depression feeling expression in art, bipolar feeling expression in art, and anxiety feeling expression in art. The images created by AI based on these sentences were disturbing showing strong emotions of despair and used mainly dark colours (figures not included). Therefore, to make the expression of those mental disorders less negative, the wording provided to AI was altered as the following: depression feelings art in an optimistic way, bipolar feelings art in an optimistic way, and anxiety feelings art in an optimistic way. The images created by each one of the AI programs; Microsoft Bing, Leonardo AI, and Craiyon are shown in Figures 2, 3, & 4 respectively.

Figure 01

Figure 02

a

b

c

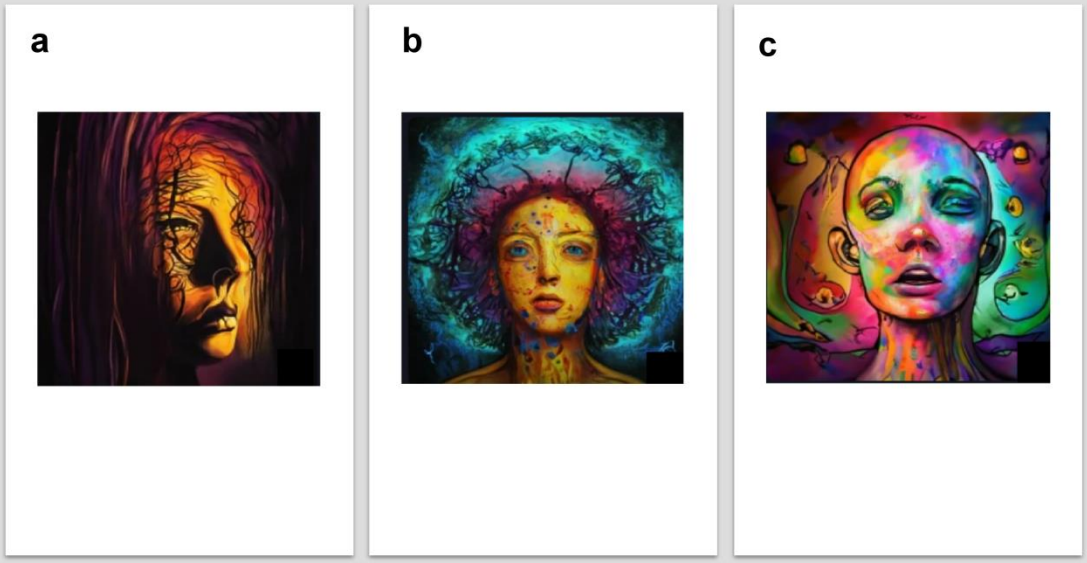
Figure 03

a

b

c

Figure 04



Images created by a human and AI were compared. Images created by a human reflected the emotions of mental disorders deeply, and not in a direct way. For depression, the sadness was reflected as massive tears going all the way to the heart and surrounding it with melancholy (Figure 1, a). For bipolar disorders, the contrast of the emotions was reflected through the contrast of a butterfly. The body is dark and looks sad while the wings are super colourful and cheerful (Figure 1, b). Finally, for anxiety disorders, the art showed an intact colourful centre that suddenly starts to become disconnected in many parts of the peripheral area showing sudden uncertainty and unstable feelings and emotions (Figure 1, c).

AI-generated images reflecting the emotions of mental disorders were interesting. When the term: (mental disorder feeling expression in art) the results seemed to reflect the main feature of each mental disorder literally, but also in a disturbing way showing people screaming under stress or sitting in a position that reflects severe agony. The colours of the figures were generally dark and mainly black, white, and shades of grey (figures not shown). To make the art pieces produced by AI tools more cheerful, the term given to the AI tools was changed to: (mental disorders feelings art in an optimistic way). The change in the term led to less disturbing figures. AI tools provided 4 to 9 options of art images per mental disorder that were very similar in their concepts so only one image of those suggestions was shown herein per disorder per program (Figures 2,3, & 4). Microsoft Bing AI tool added some bright colours for the depression art (Figure 2, a), presented the contrast of bipolar symptoms with the contrast of day and night (Figure 2, b), and showed anxiety as a cloud of mixed feelings (Figure 2, c). Leonardo AI tool showed depression as a person sitting on a cliff with some ballons around (Figure 3, a), bipolar as a face with half of it colourful and the other half less colourful (Figure 3, b), and anxiety as the person sitting and watching the world fall apart (Figure 3, c). Craiyon AI tool showed depression as a forest at sunset (Figure 4, a), bipolar as a halo around a person's head that started dark and then became more colourful (Figure 4, b), and anxiety as a person's head surrounded by uncertainty (Figure 4, c).

Our results show that AI is not completely perfect in the in-depth interpretation and analysis of mental disorders. This agrees with a previous study that showed that AI can analyse electronic health records and provide a moderate predictive performance by capturing only 2 out of every 3 subjects suffering from a generalised anxiety disorder or major depression disorder (Nemesure, Heinz, Huang, & Jacobson, 2021). In a survey filled by psychiatrists from 22 countries, only 17% felt that AI

would replace a psychiatrist in delivering empathetic care, while 75% believed that AI would be useful in documenting medical records, and 54% believed AI would synthesise information (Doraiswamy et al., 2020). Those results showed that physicians believed that AI can only be supportive but does not replace the mental health care provided by humans (Doraiswamy et al., 2020). Although AI is not perfect in reflecting human emotions, it cannot be ignored that AI can match human experts in analysing human cognition such as the level of concentration. For example, a study in South Korea used computer technology to analyse colour-related elements of an art therapy tool (structured mandala). The study which aimed to assess the level of concentration in people aged 60- to 90-year-old suspected of having dementia, found that computer technology was consistent in analysing colour-related elements with human experts (Kim, Kang, & Kim, 2009). Comprehensive studies are needed in the future to provide solid evidence and a detailed understanding of AI's "actual" capabilities in art therapy for individuals suffering from mental disorders. For example, a research study is needed when experts in different artistic expressions can participate, and their artwork would be analysed in depth and compared with AI art creations to develop a detailed understanding of the differences between human and AI interpretations of mental disorders.

Sociocultural aspects of using AI in art therapy

Many factors can hinder people from using AI tools as an art therapy approach for mental disorders. One of the important factors is that not everyone is aware of mental health applications (Apps) that use AI and are already easily accessible such as those available on mobile phones. For example, a study in India used a survey that targeted people aged 16 years and above, found that only 57.86% of the study participants were aware of mental health Apps such as Woebot, Headspace, or Happify (Roy, 2023). Furthermore, although AI tools have the potential to improve the efficiency of healthcare systems, AI does not have the actual human warmth, empathy, and humour (Kerasidou, 2020). Those factors are essential to establishing trust and for developing a holistic understanding of the emotions and experiences of a person undergoing a mental health assessment and treatment. Another factor that might deter people from using AI tools for mental health therapy is the client's privacy, informed consent, and autonomy. Programs that use AI are data "hungry". They collect a lot of detailed and personal information, and that information might be stored, memorised, and could leak to third-party venders. Furthermore, stigma linked to mental illnesses makes people from many countries around the world hide their mental health struggles and avoids seeking help from any resources (Corrigan et al., 2014).

AI tools are costly, time-consuming to produce, and need continuous updates and improvements. Therefore, high-income countries are already using AI tools widely in the healthcare system, while low-income countries are mainly accessing AI tools for healthcare through mobile phone health applications (Wahl et al., 2018). This means using AI for mental disorder treatments cannot be completely described as being inclusive, and the homeland or geographic location of the person can affect its accessibility.

Future developmental aspects of AI in art therapy

The ideal AI tools should have genuine human feelings and reactions. Whether this is achievable or not is unknown. In the meantime, researchers should continue to refine the AI algorithms to have a better reading and interpretation of human feelings and emotions especially when it comes to art therapy for mental disorders; when situations like being at risk might occur and need immediate assistance. Furthermore, advanced longitudinal analysis is essential. AI tools should be able to effectively analyse each person's art expressions over time and use it to track any changes in their emotional and cognitive states and use this analysis for a personalised treatment plan. Moreover, some supportive AI features can be added to the AI art therapy tools to enhance their abilities to analyse and assess the user's emotions. For example, suicide is the seventh cause of death worldwide. AI can be used for suicide behaviour detection through suicidal visual cues such as facial expressions and eye gaze (Dhelim et al., 2023). This feature in detecting visual cues can be added to the AI art therapy tools as a supportive feature capable of linking art expression with facial expression. Adding these AI tools to the art therapy programs can provide supportive information that refines the art

therapy tool's ability to read the user's emotions, detect any changes in those emotions, and provide timely help and support. Another example is using machine learning algorithms to detect the level of stress or depression in patients while using art therapy tools which can enhance the ability of AI art therapy tools to interpret the emotions of the users (Nixon et al., 2022).

AI depends on data quality. Therefore, linking AI tools to trusted and expert-built data resources may provide a better interpretation of users' art. While creating AI tools for art therapy, experts should take into consideration the social and cultural differences too. For example, in the language of some Native American tribes, there is no word for "depression". individuals in these communities tend to express their symptoms of depression in physical terms rather than emotional ones (Kring & Johnson, 2018). Data privacy while using AI tools is also a concern and can be lessened by using clear and informed consent, and by giving the users control over who has access to their data. Providing advanced AI algorithms for art therapy that are reliable, easy to access, and cheap is another challenge too. Until a solution is found to this issue, using simple, publicly available tools that are not specialised in analysing users' psychopathology might lead to dangerous applications of AI-based art therapy or the abandonment of such tools as they might be seen as insufficient.

AI potential in mental disorder art therapy can go further than just providing assessments and creating an exclusive treatment plan for every subject based on their needs. AI should provide a holistic and immersive approach to enhance the engagement of users and make art therapy a unique experience. This can be done through the integration of virtual reality (VR) technology with AI tools. Combining VR and AI can give individuals the opportunity to immerse themselves in the environments they choose, explore those environments, and express their feelings genuinely. Those environments may provide interaction with real or virtual people allowing an exceptional experience in art therapy by deeply exploring the users' inner world, understanding their concerns, and suggesting empathetic art interventions.

CONCLUSION

AI tools were used in different ways in mental disorder art therapy. AI is not completely perfect in in-depth interpretation and analysis of mental disorders' symptoms as it understands mental disorders' symptoms literally. The extent AI can "actually" understand human emotions and reflect them in art creation is not fully determined. Therefore, although AI tools can significantly support the healthcare system and ease the pressure on it, they might not be completely reliable in art therapy for mental disorders and still benefit from a lot of improvements and having a human filter or oversight to mitigate the literal interpretation of AI to patients' emotions is still needed.

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