Exploring the Impact of Digital Art Therapy on People with Dementia: A Framework and Research-based Discussion

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Abstract— **Motivation: To meet the needs of people with dementia, there is a growing demand for interactive products. On the other hand, art therapy promotes creativity and compassion in this population. However, traditional therapy has accessibility and cost challenges. Therefore, investigating digital art therapy as an alternative is needed.**

Objectives: This study discusses digital art therapy's role for people with dementia as a non-pharmacological intervention. It identifies emotional and physical needs using a framework and emphasize the value of creative digital art therapy.

Methodology: This study reviews research on art therapy for dementia and a psychophysiological experiment to contrast traditional and digital art therapy is suggested as part of the study's methodology.

Findings: Digital art therapy improves feelings, reduces anxiety, and boosts social interaction in this population as it has impacts on their mental and physical well-being.

Impact: Using creative digital art therapy as part of dementia treatment has important implications and calls for more research.

Novelty: This paper suggests an experiment and presents a framework for using digital art therapy to meet the needs of people with dementia.

Keywords—Dementia, Art Therapy, Digital Art Therapy

I. INTRODUCTION

The World Health Organization (WHO) estimates that there are about 50 million people globally who have dementia. It was projected that this number will rise to 82 million by 2030 and 152 million by 2050 [1]. Therefore, according to Hodge et al. [2] with the rising in the number of PWD, designing interactive products for this group has become a growing interest in HCI. And as a result, designing based on new therapeutic approaches with the help of technologies is one of those subjects. However; to design new technologies in physical or digital approaches and products, it is essential to thoroughly understand the users, their contexts, and practices. This becomes more crucial when creating healthcare solutions since consumers may be particularly vulnerable due to their impairments [3].

In this paper we are trying to find the gap in the use of Digital Art Therapy for PWD based on the assumption of related works. According to de Witte et al. [4] there is a big tendency to employ various artistic techniques to enhance health and wellbeing. They claimed that these forms of art might be utilized by art therapists as an intervention or in arts programs created for in daily life uses as a side benefit to foster health. In addition, Carós et al. [5] state that one of the treatments to prevent the progression of Alzheimer's, as they referred to as a kind of dementia, is the development of therapies. However, the emphasized challenges for PWD to obtain the therapy include cost, availability of the areas where therapy occurs, and commuting to these locations. These factors make it crucial to look into the requirements of, and strategies for, Art Therapy interventions for PWD.

We will first define dementia and identify concerns of PWD to better understand the difficulties that PWD face. After that, we'll explore the definitions of Art Therapy and its various forms as interventions. In the last section of this paper, we will give suggestions for adopting Art Therapy interventions that can address the requirements of persons with dementia.

II. Dementia

A. Definition of Dementia

Dementia is a growing health problem in the world today. With the number of older adults rising, the number of PWD will likely increase too. The global population aged 60 years or over was 962 million in 2017, and it is expected to rise to 2.1 billion by 2050 [6].

According to the CDC "dementia is not a specific disease but is rather a general term for the impaired ability to remember, think, or make decisions that interfere with doing everyday activities. Alzheimer's disease is the most common type of dementia. Though dementia mostly affects older adults, it is not a part of normal aging" [7].

B. Challenges of People with Dementia

Dementia affects how people perceive objects, interact with others, and act, as well as how they process information in their brain. Identifying the needs of PWD is more difficult since this population is emotionally frail and sensitive. PWD are facing a complex disease that decreases their cognitive functions such as memory, executive functioning, communication, and decision-making abilities [8]. One challenge that older people face in the aging process is their sensory and mobility disorders will increase. Through this phase of life, seniors need support with various tasks, from activities of daily living (ADLs), such as eating, bathing, grooming, to instrumental activities of daily living (IADLs), such as medication management, financial management, scheduling, and solving their problems as cognitive functioning tasks. Currently, caregivers in nursing homes or the homes of older adults take care of these tasks. Caregivers of PWD usually blame themselves because they have to take away the feeling of being independent from care receivers since PWD's cognitive abilities are reduced [9].

We have developed a model [10], to compile all needs of PWD from those that are connected to ADLs to those that are related to IADLs. Based on how other scholars have categorized the demands of PWD using various approaches, we discovered in our earlier study that there are two basic groups into which we may split all of these needs, as seen in the Figure below, Emotional needs, and Physical needs.

In this model, in accordance with the Human-Centered Design methodology, we place individuals with dementia in the center and attempt to study every aspect of their daily lives, from the simplest to the most critical activities. The aim of our strategy in creating this model was to identify the relationships among the everyday activities, emotions, and difficulties faced by individuals who have dementia. We will elaborate on each component of the model in the paragraphs that follow, outlining how this need was identified and why we believe it needs to be addressed.

This model states that since PWD are roaming and need assistance, one amongst their "Emotional Needs" is "Safety." Moreover, this group requires "Social Connection" on an emotional level since they are fearful of being abandoned and need to connect with their relatives, friends, and members of larger social networks.

Additionally, two subcategories of "Physical need" for PWD can be determined using this model: "Cognitive Impairment" and "Physical Impairment". Some characteristics of the first category, "Cognitive Impairment", include thinking, learning, reasoning, and short-term memory. Regarding short-term memory impairment, PWD need to be reminded to recall the names, find objects, and take their medications. Furthermore, due to their "Learning" intellectual disabilities, they require specific directions on what to do and how to accomplish it. However, exercise, requirements for doing everyday duties, and language disability are all included in the second category, "Physical Impairment."

In the sections that follow, we'll go over some definitions of art therapy and explain why, in consideration of the model we've developed, we expect digital art therapy can answer some of the needs of PWD.
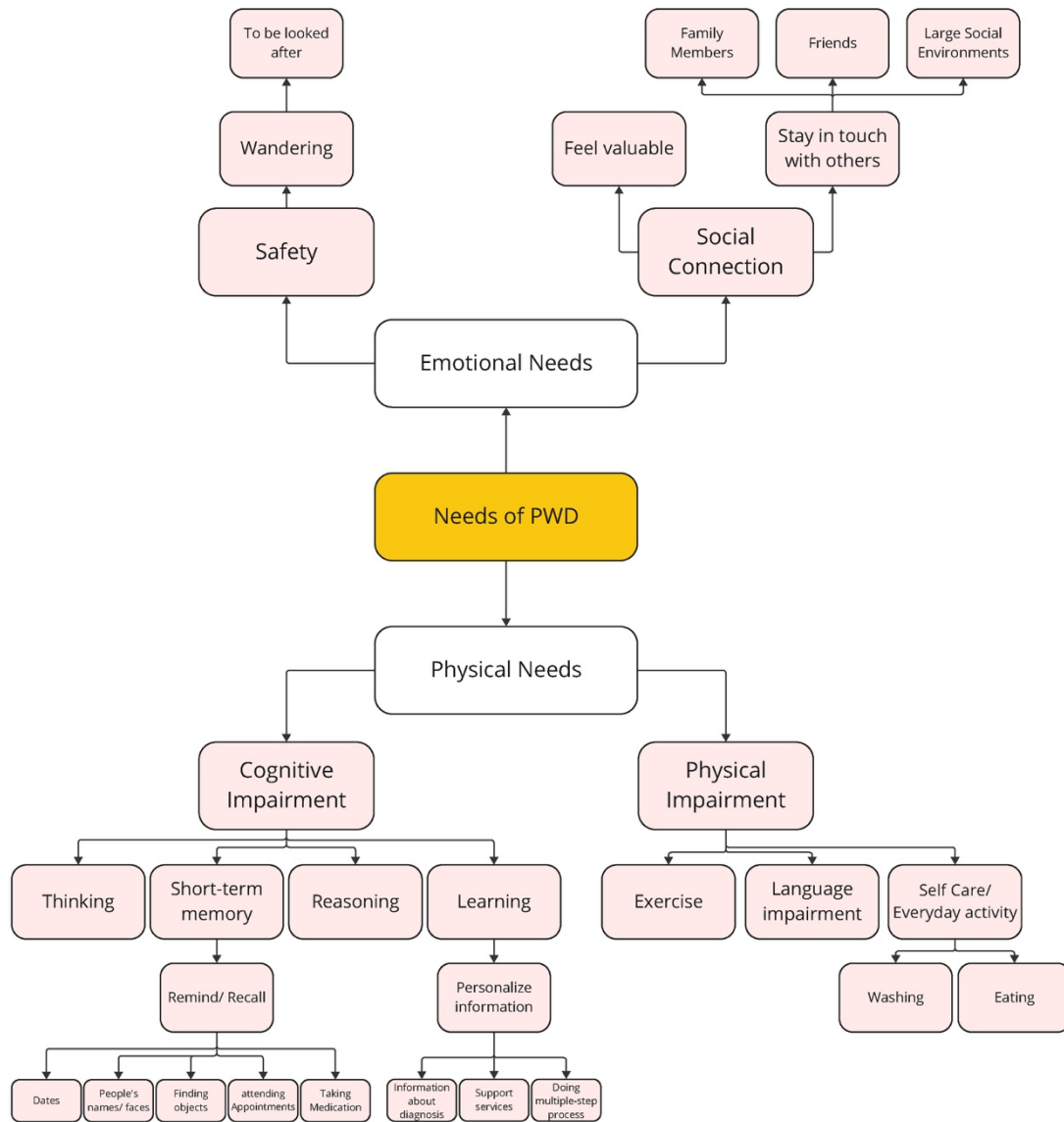
Fig. 1. Model of Needs of People with Dementia

III. ART THERAPY

A. Definition of Art Therapy

Art Therapy is defined as "an integrative mental health and human services profession that enriches the lives of individuals, families, and communities through active art-making, creative process, applied psychological theory, and human experience within a psychotherapeutic relationship" [11]. The American Art Therapy Association expanded on the notion of Art Therapy by noting that, "Through integrative methods, Art Therapy engages the mind, body, and spirit in ways that are distinct from verbal articulation alone. Kinesthetic, sensory, perceptual, and symbolic opportunities invite alternative modes of receptive and expressive communication, which can circumvent the limitations of language. Visual and symbolic expression gives voice to experience, and empowers individual, communal, and societal transformation" [11].

Patients who participate in Art Therapy sessions are invited to "express themselves creatively" to improve their psychological well-being [12]. There are six types of Creative Art Therapies (CATs) according to de Witte et al. [4], Art therapy, Dance/movement therapy, Drama therapy, Music therapy, Psychodrama, and Poetry/bibliotherapy.

Rudolf Arnheim proposed hedonism, pleasure, symbolic communication, trying out, and integrity as factors to address his own query "What is it that endows the arts with the healing powers you see at work?"[4]. A decade later, Blatner (1992) stated that clients project their feelings and ideas into the artistic medium that serves as a transitional object, describing the core therapeutic concepts of all CATs as a theory of praxis. In addition, Blatner (1992) claimed that imagery, symbolism, originality, spontaneity, fun, and role expansion are distinctive qualities of CATs. Recently, Jones (2021) claims that "artistic projection, the

triangular relationship, perspective and distance, embodiment, non-verbal experience, the playful space and the informed player, the participating artist-therapist, and the active witness" are fundamental principles underlie all art therapies [4].

B. Traditional Art Therapy

Through the creative process and the final output, the art therapist motivates verbal and nonverbal self-expression as well as reflection. During a psychotherapy session with an art therapist, according to Witte et al., one form of CATs uses a spectrum of 2- and 3-dimensional structured and unstructured visual art instruments such as pencils, paints, chalk, crayons, clay, textiles, etc. [4].

C. Digital Art Therapy

As Lazar et al. [13] noted, Art Therapy approaches have evolved along with conceptions of the relationship between art and psychotherapy. In order to employ technologies in Art Therapy sessions, Peterson noted, participants in their study claimed that assistive technologies from low-tech to high-tech alternatives allowed them to take their hands off of their clients' work. Clients also benefited from this as they felt the full power in their artwork and the creative process [14].

In Digital Art Therapy, online communication tools and the use of digital media for the creation of art are two aspects of the use of technology in Art Therapy that are equally relevant to in-person practice [12]. However, Zubala et al. [12], stated that there are multiple reasons that Digital Art Therapy is not being used in Art Therapy sessions currently. The main obstacle for therapists towards using digital arts medium in therapy sessions is the absence of comprehensive research on digital art creation. the significance of more specialized technology-oriented ethical codes for practitioners and the little guidance provided by professional groups, a few attempts to create electronic tools specifically for Art Therapy -which causes the lack of technical input from art therapists-, discussion about whether the sensory aspect of materials would be lost if art were created with digital tools, and potential client effects are other concerns.

The use of Digital Art Therapy faces some challenges, according to Zubala et al. [12], some of those limitations include the cost of the equipment, the requirement for extra time to learn and adjust to new environment, technical difficulties, a lack of training, ethical and privacy issues, and missed sensory quality.

Other obstacles exist for distance Art Therapy, which uses technology for Digital Art Therapy, in addition to the aforementioned problems. Those include issues with privacy and safety, managing interruptions, technological limitations, image quality, and being unable to watch the creation of art [12].

D. Related Works in Art Therapy

Technology can play an important role in taking care of older adults and their caregivers' lives. However; using technology, like every new "object", has two sides. It can help their users as much as it can ruin their mental model and health. And an underlying component of the design process is frequently participants' capacity to verbally convey ideas, feelings, and desires [13]. Therefore; as Bannon and Bødker [15] wrote, "…we have to take the use process, and not the artifact, as the central object for our study" (p. 24). In result, in order to use technology in Art Therapy in care, it is essential to know the components and process of care. According to Roberts and Mort [16] caring is an attempt in three domains: monitoring, physical care, and social-emotional care.

Making Art Therapy accessible for everyone, creating social engagement, empowering clients to give them this chance to connect from their own place which makes them more active and let them feel more autonomous, and decreasing resistance to therapy and art making are pros of using technology in Art Therapy [12]. Therefore, Art Therapy can help to meet needs of PWD as according to the American Art Therapy Association, "Art Therapy … effectively supports personal and relational treatment goals as well as community concerns. Art Therapy is used to improve cognitive and sensory-motor functions, foster self-esteem and self-awareness, cultivate emotional resilience, promote insight, enhance social skills, reduce and resolve conflicts and distress, and advance societal and ecological change." [11]. In addition, some not all of the five clusters of CATs therapeutic factors, according to de Witte et al. [4] "hedonism (pleasure and play), aesthetics, symbolism (non-verbal communication), enactive transitional space, and generativity" could be helpful for PWD. Due to barriers of PWD, such as physical impairments of holding objects, digital arts media can create an art making environment [12] and can be used by them to interact with space or make art on a tablet device using tiny gestures [12]. Digital art making tools might be in fact an ideal medium for clients easily overwhelmed by tactile sensations [12], allowing them to sustain a safer and longer art making experience [12].

IV. How Art Therapy Can Help to Meet Needs of People with Dementia

To summarize other scholars' works in dementia, Art Therapy, and Art Therapy for PWD, we created a table based on our previous model of PWD's needs (Fig. 1). In order to show how and why we believe that Art Therapy, and more specifically Digital Art Therapy, could be beneficial for this population, we attempted to connect the needs of PWD and Art Therapy in Table I.

V. Why Digital Art Therapy Can Help People with Dementia in Emotional Impairments

We believe that Digital Art Therapy, which could be done remotely, could become highly beneficial for addressing the demand for "Safety" since it eliminates the need for clients— PWD —to commute to other locations where Art Therapy is practiced. Because of their unique brain health state, PWD are less likely to wander, thus neither clients nor their caregivers need to be concerned. Additionally, employing digital tools in Digital Art Therapy can boost a client's self-esteem because they rarely need to handle tactile materials, which are difficult for them to use on their own and may require aid from others.

Additionally, engaging in Digital Art Therapy alongside a qualified art therapist helps foster a bond between the client and the therapist. PWD may benefit from this interaction in meeting their "Social Connection" needs. It is important to note that, in our opinion, the involvement of art therapists does not negatively or positively impact PWD's sense of self-worth. This is because art therapists are simply another participant in the process who is creating art, rather than someone who will assist clients with holding objects, etc. Furthermore, group therapy sessions, which are easier to access in the context of Digital Art Therapy, can assist PWD build networks and communicate with others. Furthermore, we discovered that utilizing Digital Art Therapy can help PWD develop their skills and enhance their self-esteem.

VI. Why Digital Art Therapy Can Help People With Dementia in Physical Impairments

Our review of the literature led us to conclude that Digital Art therapy can benefit dementia patients' "Short-term Memory." They could become more independent, have higher self-esteem as a result and also have better cognitive and sensory-motor function, if Digital Art Therapy is used in Art Therapy sessions.

Additionally, it can help with "Thinking" demands as well. Digital Art Therapy as one approach of Art Therapy, can also provoke insights while at the same time minimizing and resolving conflicts because of the instincts of art.

Furthermore, we consider that Digital Art Therapy can help PWD with their "Learning" demands because of the same reason, reducing and resolving conflicts and helping them learn new things easier.

PWD also need to accomplish their "Daily Activity," as shown in Fig. 1, and doing so while being independent may have a positive impact on their self-esteem. According to the results of our study, Digital Art Therapy can improve self-awareness, and therefore may enhance independence in PWD. Digital Art Therapy might thus be quite helpful for this population, in our interpretation.

According to Fig. 1, the other criteria of PWD is included as "Language Impairment" under the category of "Physical Impairment". Like other forms of Art Therapy, one characteristic of Digital Art Therapy is giving clients a chance to interact nonverbally. As a result, we suspect that using Digital Art Therapy to treat PWD could be quite advantageous. Moreover, since making art digitally doesn't require assistance with speaking, Digital Art Therapy can foster emotional resilience and develop a sense of independence.

The last necessity indicated in "Physical Impairment" for PWD is "Exercise." Clients could create art with the help of Digital Art Therapy, which was previously stated as a sort of Art Therapy. Since even a small movement can sometimes benefit PWD and motivate them to do more, we believe that Digital Art Therapy can encourage PWD to move and mix their art creation with exercise.

TABLE I. The Connection between Digital Art Therapy and the Needs of People with Dementia

	Emotional Impairments		Physical Impairments						
	Safety	Social Connection	Cognitive Impairments				Physical Impairments		
			Short-term Memory	Thinking	Learning	Reasoning	Daily Activity	Language Impairment	Exercise
How "Digital Art Therapy "Helps?	No wandering as there is no need to commute to a place where Art Therapy takes place. Fostering self-esteem.	Creating a relationship with an art therapist as a participant in the process. Doing group Art Therapy and interacting with others.	Improving cognitive & sensory-motor function. Increasing independence.	Promoting insights. Reducing & resolving conflicts.	Reducing & resolving conflicts.	-	Fostering self-awareness. Increasing independence.	Creating the chance of non-verbal communication. Cultivating emotional resilience. Increasing independence.	The ability of making art with tiny gestures. Increasing independence.

		Enhancing social skills. Fostering self-esteem.							

VII. FUTURE STUDY

A. Method

Considering PWD's need to be independent and barriers of holding objects, we propose a study to compare the success of Digital Art Therapy as the newer type of therapeutic intervention compared to the traditional Art Therapy. This study will experimentally examine the effect of Digital Art Therapy and traditional Art Therapy on emotional arousal of PWD. In a 2 (Type: Traditional Art Therapy versus Digital Art Therapy) x 2 (Order: Traditional Art Therapy/ Digital Art Therapy versus Digital Art Therapy/ Traditional Art Therapy) within subjects' experiment. One group will use digital technology in the form of Leap Motion application to do mid-air gestures to create a digital painting. The other will use traditional canvas and tactile tools. In order to reduce the effects of being experimented on the results, we are going to divide participants in two groups. In addition, to achieve the goal of this study, we are going to place electrodes on the medial side of each participant's foot while they are using their hands to measure their arousal level, and level of calmness during the Art Therapy sessions. To determine if the experiment is positive or negative to them, we are going to measure valence in addition to arousal. In order to have the result and perform that, electrodes will be placed on the Zygomaticus major on participants' faces.

In addition to all the measurements described above, we will ask subjects a series of questions with 5-point scale responses at the end of each Art Therapy session to have their Self-report answers.

B. Hypotheses

For this proposed study, we have 2 hypotheses:

H1: Applying digital painting to Art Therapy sessions will increase positive feelings of PWD compared with painting with tactile materials during Art Therapy sessions.

H2: Using digital painting applications in Art Therapy sessions instead of tactile materials will increase the sense of independence of PWD.

VIII. CONCLUSION

In conclusion, this paper sought to emphasize the advantages of using digital art therapy with people with dementia (PWD). The authors highlighted the potential of digital art therapy for this population by evaluating prior research on the needs of PWD and utilizing a developed model that categorized emotional and physical needs. Based on the proposed model, definitions of art therapy, and prior research on various forms of art therapy, a comprehensive table was given that demonstrates the positive aspects of digital art therapy in addition to a psychophysiological experiment.

To further investigate the effects of digital art therapy on cognitive function, independence, and the development of interactions between PWD and their art therapists, future research projects will concentrate on putting these recommendations into practice in experimental settings.

This study advances knowledge of how digital art therapy can improve the wellbeing of PWD. It emphasizes how crucial it is to use digital art therapy as a successful intervention to meet the demands of this demographic as digital art therapy has the potential to make a big difference in the lives of people with dementia by enhancing cognitive function and creating meaningful connections.

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