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Outcomes of Therapeutic Artmaking in Patients Undergoing Radiation Oncology Treatment: A Mixed-Methods Pilot Study

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Abstract

A cancer diagnosis can be extremely stressful and life-altering for patients. Chronically high levels of stress can increase inflammation and affect the progression of the cancer. Psychosocial interventions could reduce stress and address cancer patients' emotional, psychological, and spiritual needs. This mixed-methods pilot study compared 2 single-session arts-based approaches for patients in active radiation treatment in a large urban hospital. Participants were assigned to either the active control of independent coloring or the therapeutic intervention of open studio art therapy. Participants completed pre-session and post-session saliva samples and standardized psychosocial measures of stress, affect, anxiety, self-efficacy, and creative agency. Both conditions significantly increased participants' positive affect, self-efficacy, and creative agency, and decreased negative affect, perceived stress, and anxiety. No changes of note were seen in the salivary measures. Participants' narrative responses corroborated the quantitative findings and highlighted additional benefits such as supporting meaning-making and spiritual insights. Both arts-based interventions can support the emotional, psychological, and spiritual needs of cancer patients while each has features that may be more suited to the needs of certain patients. Further replication of these findings could support our initial findings that suggest that patients could benefit from having art studio spaces with art therapists and choices of art materials available on the oncology unit.

Keywords

radiation oncology, art therapy, psychosocial well-being, coloring, open studio, IL-6, cortisol, affect

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Medical treatment, especially the grueling and multifaceted process of cancer treatment, can be both emotionally and physically stressful for patients.[1] Receiving a diagnosis of cancer can be a traumatic experience in and of itself, and it can result in fears about the course of the illness, changes in mood related to the prognosis, stress related to undergoing and managing the treatment, changes in self-identity, and existential reflections on mortality.[1,2]

Emotionally challenging psychosocial stressors can also induce molecular and chemical changes in the body that can affect cancer outcomes.[3] Stress, both chronic and acute, can induce physiological changes through the activation of biological signals that trigger responses in autonomic pathways such as the hypothalamic-pituitary-adrenal (HPA) axis to produce immediate responses such as fight or flight reactions or longer lasting effects such as low levels of generalized inflammation.[3-6] As a stress response system, the HPA axis can trigger responses beneficial to survival in cases of acute danger; however, it becomes maladaptive under conditions of chronic stress. Molecular responses to chronic stress can lead to suppressed immune responses, changes to the microenvironment of the tumor, and chronic inflammation.[3] HPA axis activation is frequently measured through blood plasma or salivary cortisol levels and can indicate activation of the relevant pathway. Cytokines are a diverse type of small protein molecules made and secreted by many different cell types to send a specific signal to

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other cells by traveling from the secreting cell to another cell, which can be nearby or in another part of the body. The inflammatory cytokine, interleukin 6 (IL-6), is "involved in inducing cell proliferation, differentiation, and programmed cell death"[6(p259)] and signals the liver to release C-reactive protein, which then participates in further immune response. Pro-inflammatory cytokines that increase with stress, such as IL-6, appear to play a role in tumor growth and progression, while IL-6 itself may work "as a prognostic indicator of survival and metastasis in human cancers."[3(pS43)]

With the increased understanding of the impact of stress and mental health on patient prognosis,[7] there is a call to provide psychosocial supports in cancer care, particularly for more distressed patients.[8] Cancer patients have expressed the desire for these interventions to address mental, emotional, social, and spiritual aspects of well-being.[8] The variance in quality, quantity, and types of complementary therapies offered to patients can vary greatly. Therefore, more research is needed to determine the benefits of various psychosocial interventions to alleviate suffering and improve cancer outcomes.[7,8] Art therapy interventions could be helpful in addressing these psychosocial needs as the arts can provide an opportunity for patients to communicate unsayable experiences visually[7,9] and experience positive emotions and relaxation through a facilitated form of creative self-expression. Art therapy is defined as "an integrative mental health and human services profession that enriches the lives of individuals, families, and communities through active artmaking, creative process, applied psychological theory, and human experience within a psychotherapeutic relationship."[9] Unlike traditional talk–based psychotherapies, art therapy offers a safe space for patients to express their thoughts, fears, and concerns nonverbally in a visible form before processing with the therapist.[8,10]

Art therapy in cancer care research has had many variables including the following: implementing a variety of art therapy approaches, using combined interventions that incorporate art therapy, offering differing lengths of interventions, and implementing interventions at different times within the patient's oncological treatment.[2,11,12] Studies have reported decreased depression and anxiety in cancer patients after a mindfulness-based art therapy intervention.[13,14] Radl et al[7] studied Self-Book© art therapy during active cancer treatment and found improvements in spiritual well-being. However, in both the mindfulness interventions and the Self-Book© art therapy, the role of the art and the positive psychology elements of the intervention could not be separated. In a program evaluation of single sessions of art therapy during active oncology treatment, Glinzak[2] found decreased reported distress after art therapy in 4 different care settings: the infusion clinic, oncology floor, individual sessions, and an art therapy open studio. Notably, the largest decrease in distress was found in the less restrictive open studio format. Single sessions of group art therapy for patients in the hospital waiting for chemotherapy resulted in decreased anxiety, drowsiness, and tiredness.[15] While Wiswell et al[16] found limited improvements in quality of life over 5 sessions of art therapy during chemotherapy, they proposed that art therapy may have prevented the usual decline in quality of life during chemotherapy. This study, however, was small and lacked the necessary control group to provide definitive evidence. Studies of non–art therapy artmaking interventions for cancer patients have also described artmaking as an enjoyable distraction that can allow for self-expression[10] and may also provide group support and opportunities for self-reflection around the cancer experience.[17]

Given the diversity of these interventions, it can be difficult to determine the impact of specific elements of art therapy, the therapist, or the arts for cancer patients. Using the adaptive response theory of art therapy, Kaimal[18] proposed that the mechanisms of change through art therapy are a dynamic interplay of active artmaking, reflective review of the art product, engagement by the patient, and facilitation by the art therapist. The art therapist facilitates adaptive responses in the therapeutic choices made to set up the space, choice of art media, and directives to first facilitate safety and belonging and reduce stress thereafter. The art therapist facilitates the session to encourage imagination and creative self-expression to enhance self-efficacy, agency, improved mood and affect, reduce stress (through a sense of safety and belonging facilitated by the therapist), and overall psychosocial well-being. Ennis et al[17(p2)] proposed that artmaking is engaging and enjoyable such that it produces "involuntary attention" and that this makes it effortless and "restorative." Bozcuk et al[19(p68)] proposed that the art therapist's presence may add to the integration of the experience as "the patient's elaborations of meaning and subject of their paintings enabled catharsis of negative feelings, and sharing and discussion of associated problems, feelings, and thoughts." In a study investigating the specific effects of artmaking versus art therapy, Kaimal et al[20] compared coloring with open studio art therapy sessions with a trained art therapist for healthy adults. They found significantly larger increases in positive affect, self-efficacy, and creative agency after the open studio art therapy session as compared with the coloring session, while the coloring and art therapy sessions both had similar positive effects on perceived stress and negative affect. Similarly, when comparing a longer term intervention of 8-week group art therapy intervention to a coloring control group, Czamanski-Cohen et al[21] found a significantly higher acceptance of emotion and emotional awareness along with decreased signs of depression after art therapy compared with coloring groups for patients who had already completed cancer treatment. While both groups described pleasurable experiences, the art therapy group described more emotional reflection, supporting Czamanski-Cohen et al's[21] prediction that emotional

processing may act as a mechanism for art therapy with patients who have recently completed cancer treatment.

This current study is founded on the established finding that patients who are undergoing active treatment for cancer have underserved psychosocial concerns that could potentially be met with art therapy. With adaptive response theory[18] as an underlying framework and building on the previous findings with relatively healthy adults,[20] this mixed-methods pilot study compared 2 brief self-expressive visual arts experiences for patients undergoing radiation oncology treatment. Given that length of patient radiation treatment sessions at the site varied from few days to several weeks, a short within-group 2-session intervention model was examined to assess outcomes.

Methods

Study Design

The study used an embedded mixed-methods design[22] in order to better understand the relevant outcomes for the 2 arts-based approaches. This involved embedding qualitative data into the quantitative framework of the study. Both forms of data were analyzed separately and then compared at the end in order to gain a more nuanced understanding of the quantitative results and identify further themes and considerations for future research with this population.

Participants and Setting

The investigators received institutional review board approval and recruited patients who were receiving radiation treatment through publicly displayed flyers and in-services for health care providers who referred patients. Inclusion criteria were being a patient undergoing treatment or who recently concluded radiation for any type of cancer as well as having physical and cognitive ability to attend 2 sessions of approximately 45 minutes each in the dedicated art therapy studio space during their visit to the radiation oncology unit. We did not track the cancer diagnosis beyond the fact that participants were receiving radiation treatment. However, some of the patients revealed the following cancer diagnoses during participation in the study: brain tumors, cancer of the spinal cord, glioblastoma, and skin, uterine, cervical, ovarian, neck, thyroid, lung, and prostate cancers. Participants were not required to have any prior art experience and were blinded to the format of the 2 sessions by being told that they would be participating in 2 sessions involving visual self-expression. Forty patients expressed interest in the study, but 18 did not participate due to treatment ending prior to scheduling of sessions, living out of the commutable region as many people traveled to the site for treatment, worsening condition of illness, or scheduling difficulties during the days available for the study. A total of 22 participants enrolled in the study with 15 participants completing both sessions. Seven participants dropped out prior to completing the second session due to exacerbation of symptoms, moving away from the area, or completing treatment. The participants ranged in age from 26 years to 92 years with an average age of 61. Twenty participants identified as white, one as African American, and one as biracial.

Participants completed informed consent, pre- and post-measurements, and both sessions in a small room outside the radiation oncology unit in an urban hospital associated with a large university in the northeastern United States. The radiation oncology unit is known for serving patients with advanced and hard-to-treat cancers. This studio space for the study was a converted storage room, which was set up to create an environment conducive to art therapy including a range of art supplies, art images on the walls, plants, desk space, lighting, and a table and chairs for participants and therapists. Sessions took place during 1 of 2 available daily time slots every week based on participant availability. The art supplies for the session were arranged and ready when participants arrived, which helped set the context of the space as a makeshift but welcoming art therapy studio space.

Instruments

Saliva was collected for measurement of the concentrations of cortisol (as an indicator of stress), IL-6 (a biomarker for immune system response), and C-reactive protein (as a biomarker for inflammation and immune responses). However, many participants reported difficulties in producing sufficient saliva; therefore, only cortisol and IL-6 levels were analyzed for enough participants to run the statistical analyses. Cortisol is considered relatively stable in frozen saliva samples. The "delay between HPA axis activation and change in salivary concentration of cortisol can be as long as 15 to 20 minutes,"[4(p256)] and cortisol levels can take over an hour to fully decrease given an approximately 1-hour half-life in saliva.[23] Salivary IL-6 levels appear to peak immediately after stressors, prior to their peak in blood serum.[6] Saliva samples were collected using the Sarstedt Salivette saliva collection tool. The pre-intervention saliva samples were stored on ice in the room during the intervention, and then, both samples were transported on ice to a laboratory where they were stored in an −80°C freezer. After all participants completed the interventions, all of the saliva samples were analyzed in duplicate using an ELISA (enzyme-linked immunosorbent assay) kit for the appropriate analyte, and concentrations were reported in units of nanograms/milliliter.

Affect was assessed using the 20-item self-report Positive and Negative Affect Schedule (PANAS) with a 5-point scale ranging from "not at all" to "extremely" at the

present moment regarding feelings such as "excited" or "distressed."[24] This commonly used scale has 2 validated subscales describing positive and negative affect with convergent and divergent validity demonstrated.[25] The 2 subscales have shown good internal consistency reliability (Cronbach's $\alpha = .89$ for positive affect; Cronbach's $\alpha = .85$ for negative affect) in a large sample of the general adult population.[25]

Participants' perceptions of the relationship between their level of stress and ability to cope was measured using the 10-item Perceived Stress Scale.[26] This scale has moderate to good convergent validity and good internal consistency reliability (Cronbach's $\alpha = .84$) in a sample of 1236 adults with insignificant differences for gender.[27] This scale measures responses on a 5-point scale from "never" to "very often."

The General Self-Efficacy Scale[28] was used to measure the participants' self-perceptions of their overall ability to cope and deal with challenging situations. This 10-item scale has shown to have good content and discriminate validity given its correlations to self-regulation and general optimism with weaker correlations to domain specific self-efficacy measures.[29] It also shows high internal consistency reliability with studies across multiple countries finding Cronbach's α from .86 to .94 in adult populations including cancer patients.[29] For this scale, participants marked their response at the present moment with 4 possible responses ranging from "not at all" to "exactly true."

Participants' creative agency was measured using 5 items selected from scales of creative self-efficacy and identity.[30,31] These 5 items related to the individual's perception of their ability to come up with creative ideas. In a study of healthy adults, these creative agency items were found to have high internal consistency reliability (Cronbach's $\alpha = .90$).[20] Participants were rated for their response at the present moment ranging from "not true" to "very true."

Anxiety was measured using the 4-item short version of the Patient-Reported Outcomes Measurement Information System (PROMIS) tool for anxiety in adults. This scale was created from existing anxiety measures using extensive testing against these legacy measures as part of a National Institutes of Health initiative to develop nonproprietary item banks for research. The PROMIS tool includes both computerized adaptive testing and set short-form measures, with the anxiety short forms, as used in this study, demonstrating strong internal consistency reliability with Cronbach's $\alpha = .93$.[32] This scale asked participants to mark in the moment, on a 5-point scale from "never" to "always" what most closely matched their perception of how frequently they experienced the items. See appendix for questions.

Qualitative data were collected through post-intervention open-ended survey questions. Participants were asked to respond 2 questions: (1) What was it like to make the artwork? (2) Could you share what you created and/or what it represents to you? The therapist also wrote field notes and took a photograph of the artwork with participant permission. The responses, field notes, and artwork constituted the qualitative data for the study.

Procedures

All open studio sessions and associated data collection were facilitated by 3 trained art therapists, while one dance/movement therapist facilitated some of the coloring sessions and associated data collection. Participants were assigned either open studio art therapy or coloring and received the other session on a different day. This was done to avoid any practice or sequential effects of all the participants doing the same session first. Participant group assignment was accomplished by alternating sessions based on ID numbers. Odd-numbered ID participants received the coloring condition first, while the even-numbered ID participants received the open studio condition first.

The 2 conditions differed by choice in art media, opportunities of creative expression, processing of the artwork, and active facilitation of the session by the art therapist. We aimed to conduct a preliminary comparison of the 2 approaches on pre- to post-intervention changes in psychological measures and salivary biomarkers and incorporate themes from a qualitative analysis of the patients' narrative responses and artwork.

In the open studio art therapy sessions, participants were invited to make art for 45 minutes using any of a variety of art materials set out in the room including: 2 sizes of paper, A4 (8¼″ × 11″) and A11 (11″ × 17″), modeling clay, collage materials, pencils, color pencils, oil pastels, chalk pastels, crayons, and markers. For this study, we focused primarily on these structured media in order to align with recommended clinical practices for short-term interventions.[20,33,34] These options were selected to provide opportunities for creative self-expression without the regressive and harmful aspects of very fluid art media that might be counter-productive for the patients. Participants were not given a specific directive but were informed that the art therapist was available to demonstrate how to use any art media or offer guidance in the artmaking process at the participant's request. Participants were told that there were no expectations as their art would not be judged for artistic quality, and they could create any kind of imagery, using one or more materials. As is recommended for the open studio format, if time allowed, the art therapist made their own art alongside the participant and followed the participant's lead in engaging in verbal interaction. While some participants worked quietly, others chose to talk about the art, their lives, or reflect on their cancer while working. At the end of the session, the art therapist and participant verbally processed the artwork and the artmaking process. These sessions, based on work

by Allen,[33,35] Moon,[34] and Kaimal et al,[20] were designed to be "studio art therapy" sessions during which an art therapist facilitates a flexible opportunity for open artmaking guided by the participant's selections to create images of whatever they prefer.

In the active control condition of the coloring sessions, the room was prepared with a package of coloring pages, markers, colored pencils, and a pencil sharpener. Participants had a choice of picking 1 from 6 preprinted coloring sheets. Art media options for the coloring condition were only markers or color pencils. Participants were instructed to pick a coloring page and were told that the therapist would be just outside the door or sitting off to the side of the room. They were left to color independently for 45 minutes with a 5-minute warning before the end of the session.

At the beginning of each session, participants completed a packet with demographic information, had their first saliva sample collected, and completed the quantitative self-report pre-survey measures. Immediately after the art session, participants completed the quantitative measures again and provided brief written comments on their experience of making the artwork and what it represented to them. The second saliva sample was collected immediately after they had completed all post-session surveys. Data collection spanned a 1-year period.

In both conditions, participants were offered the choice of taking their art with them. Every participant took the open studio condition artwork, while some left the coloring sheets behind. After the participants left, the researchers documented field notes the same day including verbalizations, themes, observations, and photographs of the artwork, which were then saved and imported into an encrypted file server.

Data Analysis

As this was an exploratory study, and data were not available to provide effect size estimates in this population, no a priori sample size requirements were established.

Quantitative Data Analysis. Statistical analyses were performed using SPSS (version 24.0; IBM Corp, Armonk, NY). We tested the comparative effects of open art therapy studio compared with the coloring intervention using a 2 × 2 within-subjects factorial analysis of variance (ANOVA). The first factor was condition (open studio vs coloring), and the second factor was time (pre- vs post-intervention). To show whether or not there were changes overall from pre- to post-intervention, regardless of condition, we examined the main effect of time. Assumptions of normality and homogeneity of variance of the model were determined by examining the histograms and Q-Q plots of the standardized residuals and Levene's test, respectively. Two extreme outliers were detected using plots of Cook's distance for the IL-6 variable and were removed from the distribution to better meet the model assumptions. Given the especially small sample size available for the biomarker data (n = 6 and n = 10), we conducted nonparametric Wilcoxon tests for paired data, in order to determine potential pre- to post-intervention changes in each condition separately.

Qualitative Data Analysis. The qualitative data, open-ended survey questions and researcher field notes, were compiled for each participant separately and imported into the software program Dedoose. An a priori coding scheme, informed by the quantitative measures and extant literature, served as an initial coding guide, while we also created new codes based on the data. Thematic analysis procedures were drawn from Braun and Clark's[36] approach, including (1) familiarizing with the data, (2) generating initial codes, (3) searching for themes, (4) reviewing potential themes, (5) defining and naming themes, and (6) completing the final report. Two researchers analyzed and coded the complete dataset independently and subsequently compared results in order to provide credibility for the study[37]. Additional codes were added referencing the artmaking experience, the content of the artwork, reflections on art media, and references to the illness experience. Codes were clustered and reviewed in order to identify areas of similarity for thematic development and later defined and named. In addition, the data of the 15 participants who completed both open studio and coloring conditions were examined further in a side-by-side format for each individual.

Results

Quantitative Results

A 2 × 2 within-subjects factorial ANOVA demonstrated a significant effect for time on every psychological outcome (Ps < .045; see Table 1). Participants in both interventions demonstrated improvements across the board; effect sizes ranged from large (partial $\eta_p^2 = .257$) to very large (partial $\eta_p^2 = .454$), suggesting that between 25.7% and 45.4% of the outcome variation is accounted for by the effects of time. A time by condition interaction effect was tested to determine if there were group differences in the pre- to post-intervention changes; however, no differences in change between intervention types emerged (Ps > .189). Examining the effect sizes in Table 1 (see partial η^2), we see that between 1.1% and 12% of the variance was attributable to the differences between condition over time (for the psychological measures). Given the small sample size, large to very large effects would have been necessary to observe a statistically significant interaction between condition and time. Open art studio and coloring were equally effective in improving mood, anxiety, stress, self-efficacy, and creative agency for this sample.

Table 1. Estimated Marginal Means for Open Studio Art Versus Coloring Conditions Pre- and Post-intervention.

	Open Studio Art Therapy		Coloring		Time Main Effect	Time by Condition Effect
	N	Mean (SE)	N	Mean (SE)	*F* (df)	*F* (df)
Creative agency						
Pre-intervention	15	19.64 (0.96)	15	18.00 (1.19)	10.69 (1, 14)	0.18 (1, 14)
Post-intervention	15	21.64 (0.88)	15	20.29 (0.82)	$P = .006$	$P = .675$
Effect size (partial η^2)[a] =					0.451	0.014
Self-efficacy						
Pre-intervention	15	33.87 (1.11)	15	32.27 (1.27)	6.56 (1, 14)	0.49 (1, 14)
Post-intervention	15	35.33 (0.93)	15	34.33 (1.07)	$P = .023$	$P = .494$
Effect size (partial η^2) =					0.319	0.034
Positive affect						
Pre-intervention	15	36.93 (2.38)	15	34.13 (2.16)	8.49 (1, 14)	0.15 (1, 14)
Post-intervention	15	41.67 (2.26)	15	38.33 (1.82)	$P = .011$	$P = .700$
Effect size (partial η^2) =					0.378	0.011
Negative affect						
Pre-intervention	15	17.33 (1.91)	15	17.47 (1.98)	9.19 (1, 14)	0.62 (1, 14)
Post-intervention	15	13.40 (1.35)	15	12.40 (0.83)	$P = .009$	$P = .445$
Effect size (partial η^2) =					0.396	0.042
Perceived stress						
Pre-intervention	14	23.57 (1.97)	14	25.14 (2.06)	10.81 (1, 13)	0.41 (1, 13)
Post-intervention	14	19.93 (2.20)	14	20.36 (1.66)	$P = .006$	$P = .532$
Effect size (partial η^2) =					0.454	0.031
Anxiety						
Pre-intervention	15	7.53 (0.82)	15	9.27 (1.01)	4.85 (1, 14)	1.91 (1, 14)
Post-intervention	15	6.20 (0.68)	15	6.73 (0.64)	$P = .045$	$P = .189$
Effect size (partial η^2) =					0.257	0.12
Cortisol						
Pre-intervention	10	2.59 (1.21)	10	1.51 (0.23)	0.02 (1, 9)	1.19 (1, 9)
Post-intervention	10	2.05 (0.55)	10	1.86 (0.80)	$P = .896$	$P = .305$
Effect size (partial η^2) =					0.002	0.116
IL-6						
Pre-intervention	6	15.03 (3.25)	6	12.11 (3.03)	3.54 (1, 5)	3.66 (1, 5)
Post-intervention	6	8.02 (3.11)	6	15.27 (3.15)	$P = .119$	$P = .114$
Effect size (partial η^2) =					0.414	0.423

Abbreviations: SE, standard error; df, degrees of freedom; IL-6, interleukin 6.
[a]Partial η^2 represents the variance in the outcome explained by the effect after removing other effects (like a partial correlation coefficient); partial $\eta^2 > .20$ is considered a large to very large effect size.

Changes were not evident for cortisol or IL-6 in either condition using the factorial ANOVA approach (see Table 1). The Wilcoxon non-parametric tests for paired data also showed no changes from pre- to post-intervention in the open studio group (cortisol $P = .422$; IL-6 $P = .646$). In the coloring group, non-parametric tests showed a non-significant increase in cortisol ($P = .115$), and no changes in IL-6 ($P = .241$).

Qualitative Findings

The analysis of the field notes and the patients' written responses revealed 3 groups of themes: (a) themes aligned with the quantitative data (feeling more positive, feeling more relaxed, sense of agency); (b) themes independent of quantitative data (meaning-making, desire for artmaking in future, addressing aspects of the illness experience); and (c) condition-specific themes (reminiscing, existential reflection, straightforward distraction).

For group (a), the theme of *Feeling More Positive*, the participants consistently reported enjoying the artmaking and described their experiences as fun, energizing, and inspirational. A male open studio participant shared: "I was uneasy at first. After working on the artwork, it was fun, and the time went fast," whereas a second female participant separately shared: "It felt good. I felt good trying out different medias and using things as a source of inspiration. I felt energized and inspired." A female participant in the

Figure 1. Open studio collage.

Figure 2. Open studio painting.

coloring condition also found positivity stating, "[Coloring] made me happy! It felt good."

The second theme, *Feeling More Relaxed*, supported a calming effect for participants. A male participant expressed that "[the Open Studio] felt great. I feel a great sense of relief to get my fears out of my head and on paper." Two female participants in the open studio condition shared that "it was relaxing in a way but also stimulating in a way" and found the session "calming and took my mind off what is going on this week. Actually restful which I needed."

For one male participant who struggled to write following brain surgery, there was a notable difference in writing ability and overall dexterity following the open studio condition (Figure 1). The participant remarked that he was able to handwrite better "because I am relaxed now." For the coloring condition, several participants reported a sense of timelessness and sustained focus on the present moment, stating the coloring condition was "peaceful, calming, [and] transformed unpleasant thoughts and anxious feelings."

Participants seemed to undergo a transformation from initial hesitancy to agency, forming the third theme: *Sense of Agency*. A male participant found the open studio condition to be: "Very interesting! I was fearful at first but found ways to deal with what and how to make something creative and useful. I now feel much more confident." Development of agency was observed when a female participant expressed criticism toward her image stating, "This doesn't look good at all . . . it's not how I pictured." As the participant continued to work on the image, blending some of the lines she remarked, "Oh, that's better." In the coloring condition, a female participant described, "Putting different colors together I thought wouldn't look right. I was wrong I think it looks pretty good." Another male participant stated, "I'm a terrible artist—I really am." However, at the end of the session shared, "She (my wife) would have been surprised [to see me draw]." In another experience, a participant noted, "Time goes by fast!" and in response to his coloring process, "I'm a budding artist!"

The second group (b) of themes were unrelated to the quantitative data and included meaning-making, desire to do art in the future and addressing aspects of the illness experience. The first theme in this group, *Meaning Making*, referred to participants deriving meaning from their artwork. In the open studio condition, images and collages inspired memories, personal accomplishments, and resilience in the face of illness. A male open studio participant described his painting (Figure 2) as representing both internal and external changes through a "dynamic between warm and cool colors" and added that this alternating of colors demonstrated "how the world can be cold when we are warm inside and vice versa." Other female open studio participants explained that "Pine tree in field [represents] the need to grow and learn. To have a sense of accomplishment and be proud. To overcome difficulties" (Figure 3) and "My [artwork] represents a belief that anything is possible."

In the coloring condition, choosing the coloring page design and color selection were the catalysts for meaning-making, representing personal characteristics and preferences, as well as experiences of illness and resilience. This was reflected by a female participant who explained that "I chose teal because that is the color of Ovarian Cancer" (Figure 4). Another female participant shared,

Figure 3. Open studio drawing.

Figure 4. Coloring condition drawing.

Figure 5. Open studio–mixed media drawing.

> I colored in a flower. . . . Flowers grow through the dirt when taken care of, some stay through the harsh weather, some may die and grow back in the spring. . . . Cancer patients have to go through a lot and make changes in order to come out okay. I think the flower represents that for me also.

Participants expressed interest and excitement in future artmaking opportunities in the second theme: *Desire for Future Artmaking*. Some participants described interest in taking art classes or purchasing art materials for continued artmaking at home. One female participant was "very excited and interested in scheduling [a] second session" and noted,

> After I got home I was so inspired just by seeing the art supplies on the table last week that I finally felt brave enough to pull out all of my art and portfolio from under my bed and take a look at it.

Other participants expressed interest in continued artmaking during treatment, as one participant stated that she "wished art therapy was offered as part of care."

In the third theme, *Addressing Aspects of the Illness Experience*, participants shared physiological and psychological impacts of cancer, changes in lifestyle and quality of life as a result of illness, experiences of healing and radiation treatments, and, for some participants, fear of cancer returning after being in remission.

Participants' verbal responses and processing with the researchers indicated references to life outside of treatment and diagnoses. In response to her artwork, a researcher noted that one participant "described her image (Figure 5) as 'exploding' like the radiation breaking up tumors. The image was one of healing for her, which she described as 'out with the old (tumor) and in with the new.'" Another researcher noted: "He shared about his recent struggles in coping with his experiences with cancer (diagnosis, treatment, current remission, family history). He stated that although he is in remission, he lives in fear of the cancer returning: 'what if?'" Similarly, another noted: "She said that with her cancer she feels like she can't do much anymore, and certainly not things like she used to." Participants also mentioned how interpersonal relationships were affected following the cancer diagnosis. One female participant shared "the diagnosis and my appearance brought out people's kindness and I was very grateful for that."

For the third group (c) of themes, there were 2 themes unique to the open studio condition and one specific to the coloring condition. In the first theme for open studio, *Reminiscing*, participants made associations to people, places, and things during and after artmaking in the open studio condition. Several participants reflected on early childhood experiences, prior artmaking experiences, and experiences beyond the context of their treatment:

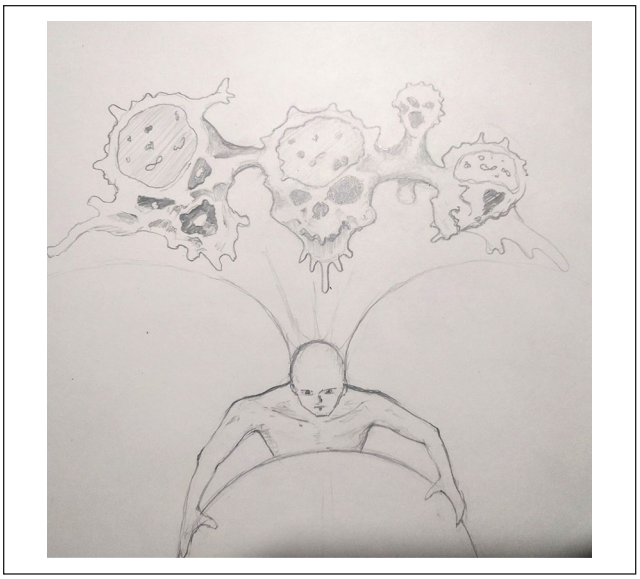

Figure 6. Open studio drawing.

> [The participant] shared about his wife, her cancer diagnosis (melanoma), and her work as a photographer. He reminisced about a recent cruise to Alaska, sharing about history, animals (eagles and dogs) that he saw while traveling Alaska. [Another participant] reminisced about early experiences related to his wishes to be a dancer. . . . He shared his love of playing the saxophone, starting from an early age.

Additional memories were described by participants:

> She remarked how long it had been since she had been able to just play and work with materials on her own. . . . He reminisced about taking art courses in high school, sharing some of the terms and techniques he learned at that time.

During the artmaking process, several participants addressed death and dying, which was the final open studio theme: *Reflections on Spirituality and Existential Concerns*. One male participant shared, "I expressed my fear of illness and cancer and my desire to protect my world and life. Not wanting to die before my time" (Figure 6). He described the image as, "The 'world' that is being held by the figure as 'the end' of his life." He shared about "'protecting' the time he has left and his fears that if his cancer returns, he may not have much time." One participant "talked about not being afraid of death but of 'how' she would die." Another "shared about buying a nice silk shirt to wear when she is finished with treatment, remarking with a smile: 'If I'm still around.'"

Last, the theme that was unique to the experience of the coloring condition was *Straightforward Distraction*. Participants expressed that coloring was a positive and uncomplicated distraction; however, some participants expressed a "hurried" feeling to complete the coloring sheet. One male participant shared that they found the coloring "gave me something uncomplicated to focus on." Another female participant shared that it "helped me to focus on something positive."

Discussion

In this article, we examined outcomes of 2 sessions of therapeutic artmaking as brief psychosocial interventions for patients undergoing treatment in a radiation oncology unit at a large urban hospital system. The study showed changes in each of the psychological measurements, regardless of condition from pre- to post-intervention. Improvements in positive and negative affect could be useful in improving cancer patients' overall health and well-being with a potential reduction in unhealthy levels of chronic stress. Improvements in creative agency and self-efficacy could be meaningful for cancer patients who may have lost their sense of control through the cancer diagnosis. Therefore, experiencing an ability to cope and transform their situation, even on the small scale of overcoming challenges with art materials, could help them recover a sense of their own agency, including with single-session interventions as demonstrated in this study. While we did not see significant changes in the biomarker data, the difficulties of retrieving samples suggest replications with a larger cohort are needed.

The findings are somewhat different from those of our previous studies with relatively healthy adults where we found significant lowering of cortisol levels within one session[38] as well as limited impact of coloring compared with the open studio condition.[20] It is possible that when expanding a study from a healthy population to one that is unwell and in significant stress, expected results would be different. It is heartening, however, that both conditions were found to be helpful to the patients. The self-reported data indicated that participants found value in both the self-directed sessions and the ones facilitated by the art therapist indicating a potentially adaptive role of artmaking.[18]

The qualitative data shed further light on why this might be the case as well the nuances of what participants experienced in each session. Overall, the qualitative findings supported the quantitative findings in that participants reported positive outcomes in both sessions similar to studies with relatively healthy adults.[20] Additionally, participants reflected on the meaning of the artwork and how the illness changed their perception of life and their own behaviors and approaches. Observations of patient behaviors were also indicative of reduced stress through the session including relaxed posture in the studio, reduced hand tremors, seeking additional sessions, and referring other participants. The qualitative findings also highlight the nuances of how artmaking helps improve mood and self-efficacy, reduces anxiety and stress, and promotes meaning-making and reflections of the existential aspects of the

illness experience. Both sessions promoted relaxation and well-being from engaging in visual self-expression. It is of note that the processes for this might have been different in each session. In the coloring condition, the relaxation and improved well-being likely came from the experience of distraction and completing a focused task. These findings align with those of Holt et al,[39] as well as Kaimal et al,[40] which suggested that coloring supports increased focus and mindfulness. Drake and Winner[41] identified distraction as a process of improved outcomes in individual visual expression. This was, however, not the process observed to support improved outcomes in the open studio session. In the open studio session, the facilitated experience of self-expression[20,21] with a trained art therapist helped participants reflect and make meaning of the illness leading also to existential reflections on how it affected their life, invariably for the better (improved relationships, gratitude, efficient use of time, etc). Coloring may offer a more straightforward artmaking experience due to the pre-existing coloring sheet, which allow for the selection of colors and designs that are both meaningful and aesthetically pleasing to the patient. Furthermore, pre-existing coloring sheets may also provide a clearer sense of completion of the image. Coloring a pre-made design may also create feelings of pressure to fill in the image with color within a specific timeframe, such as one session. Patients seeking structure, straightforward engagement, and relaxation may benefit from coloring, and these differences have important clinical implications for offering choices that align with patients' psychosocial needs.

In contrast to the structure provided by coloring, open studio artmaking may be perceived as challenging, as this process requires the participant to engage in decision-making and emotion processing[20,21] related to art materials and the content of the artwork. For some participants, a wide array of artmaking options elicited a sense of playfulness, exploration, and spontaneity. For others, especially those unfamiliar with art processes, open artmaking initially provoked feelings of anxiety. Patients resolved initial feelings of anxiety as they engaged in open art through their session and established a sense of creative agency and self-efficacy.[20,40] With the support of an art therapist, patients can become familiarized with the different qualities of art materials and how to successfully achieve desired effects with art materials. Open studio may also assist patients in the exploration of existential and spiritual concerns.[7,40] Through open studio artmaking, participants developed personal imagery and symbols that reflected existential and spiritual meanings related to their lives, relationships, illness, and healing experiences. Disclosure of these concerns took place on both visual and verbal levels as patients described their experiences both literally and metaphorically. Patients were given the opportunity to create artwork focused on experiences that may be challenging to verbalize, particularly concerns focused around illness experiences and mortality. Even considering these disclosures, this was only a 1-hour session, and many participants selected collage and other more structured art media,[33,34] indicating that they may have been limiting the depth of their processing by going only to a certain point of reflection in a more structured framework. Having a variety of media available enabled participants to select materials that were either more structured (such as collage images, drawing pencils) or somewhat more fluid/less controllable (drawing media that can be watered down or blended: water soluble oil pastels, chalk pastels, watercolor pencils, watercolor paints, and model magic clay).[42] The fact that some participants responded more positively to the coloring (indicating the desire for structure and containment) while others were more interested in the open studio art, in part due to the expressive qualities of the media, suggests that some participants may have had increased readiness for emotional processing than others. On the other hand, Czamanski-Cohen et al[21] found that participants who had completed cancer treatment appeared to benefit from the depth of emotional processing offered by the art therapy groups in contrast to the coloring groups, indicating that art therapy may need to support different levels of emotional processing in order to address different goals for cancer patients at different stages of treatment and recovery.

Given that both conditions resulted in positive change, the potential of a dedicated studio space in a hospital environment to promote health and well-being is suggested.[2,40] The quiet time to work on the coloring sheet helped participants focus and distracted them from their stresses for a while, and the open studio conditions encouraged discussion and reflection as well as creative self-expression. Both conditions were beneficial, albeit the mechanisms of the effects were likely different and need to be tested in future work around the adaptive responses facilitated through art therapy.[18] Thus, a studio space led by an art therapist could serve as a respite space for patients, encouraging self-expression in ways that feel right to the individual in a given moment.[18] For patients actively receiving treatment, coloring may provide a structured process that encourages focus and relaxation. For patients toward the end of treatment or for individuals in remission, open studio artmaking may offer the opportunity to process deeper feelings centered around illness, relationships with caregivers and loved ones, spirituality, and existential issues.

There were several limitations in the study, with the main one being the small sample size. Given that patients are in the midst of treatment and focused on getting through the rigorous schedule of commuting and attending treatment, it was difficult to recruit a larger sample as many patients found it hard to make time for 2 sessions. Several patients expressed interest but were eventually unable to schedule a time that worked for them. In addition, due to difficulties such as scheduling and fatigue, 7 participants

did not complete the second session. Recruitment challenges are not uncommon in studies of cancer patients, and this is something that needs to be considered for future replication and long-term intervention studies.

Another limitation is the use of an active coloring control group without a "no art" control group, which means that it is possible that some of the improvements found in the self-report measures of both art groups might have resulted from participants responding more favorably after receiving attention from the researchers or time away from their stressors. In addition, participants had a choice of a variety of coloring sheets that further provided a sense of agency and creativity. Future studies would benefit from a wait-list control or potentially a passive control group such as viewing artwork or reading independently in the studio space. The use of self-report measures repeated in such a short time frame increased these potential threats to validity as this could have allowed the participants to respond more favorably the second time. This should be addressed with an additional no-art control group in future studies. Previous studies with a healthy adult population had, however, demonstrated change in these self-report measures after a 1-hour intervention along with significant differences between the open studio and coloring active control groups.[20] It must be noted that some of the measures were created to assess participants' experiences in the moment, while 2 others were designed to ask about experiences over the past week or month. Although we had verbally invited participants to complete these according to their state in the present moment rather than the period of time written on the tool provided, this modification could potentially limit the validity of these 2 measures.

The analysis of salivary biomarkers was limited by difficulties with collecting sufficient saliva for analysis as many participants had dry mouth or reduced saliva production, which can be a particularly common side effect of radiation for head and neck cancers[43] or a result of stress.[6] These challenges with salivary flow rate could complicate the interpretation of the data as decreased salivary flow can change concentrations of biomarkers in saliva,[6] while salivary biomarkers already suffer from debates around their reliability as they appear to respond at different time frames and intensities than the blood serum levels of the same biomarker.[5,6] We did not track and control for patients' medications or concurrent therapies such as chemotherapy, steroids, or cough medications, which might all be predicted to affect salivary flow, cortisol production, or inflammatory responses, which may have biased the measurements. The extreme responses in the IL-6 levels further reduced the sample size for the biomarker data as 2 extreme outliers were removed to meet the model assumptions. Further research with a larger sample and use of controls for concurrent therapies or medications could build on these promising initial findings.

As anticipated, themes emerged out of the qualitative findings that highlighted potentially relevant outcomes of art therapy for this population, which we had not addressed with our quantitative scales, namely, the presence of existential and spiritual insights. Given that our participants described existential and spiritual insights and participants in another art therapy study for cancer patients showed improvement in spiritual well-being,[8] we recommend future research in this area to add a spirituality instrument, such as the Functional Assessment of Chronic Illness Therapy Spiritual Well-being (FACIT-SP)[44] or the Meaning in Life Questionnaire.[45] Instruments that capture changes in immune markers as well as shifts in meaning and purpose in life could be used in addition to the scales utilized in this study to more fully assess the impact and outcomes of arts-based approaches.

Conclusions

This exploratory pilot study examined outcomes of 2 visual arts–based sessions, coloring and open studio art therapy, using psychological and physiological indicators. While the small sample size requires cautious interpretation, for these participants both conditions resulted in positive outcomes indicating that a dedicated studio space with a range of artistic expressive opportunities could result in improved health and well-being for patients undergoing the stressors of oncology treatment. The sessions also highlighted and illustrated participants' existential reflections on life and approaches to coping. Further research is needed to validate these initial findings from this pilot study.

Appendix

Survey Scales and Questions

Patient-Reported Outcomes Measurement Information System (PROMIS) Tool for Anxiety in Adults. Please respond on a 5-point scale of "Never" to "Always"

1. I felt fearful
2. I found it hard to focus on anything other than my anxiety
3. My worries overwhelmed me
4. I felt uneasy

Perceived Stress Scale (PSS). Please respond on a 5-point scale of "Never" to "Very Often"

1. Been upset because of something that happened unexpectedly?
2. Felt that you were unable to control the important things in your life?
3. Felt nervous and "stressed"?

4. Felt confident about your ability to handle your personal problems?
5. Felt that things were going your way?
6. Found that you could not cope with all the things that you had to do?
7. Been able to control irritations in your life?
8. Felt that you were on top of things?
9. Been angered because of things that were outside of your control?
10. Felt difficulties were piling so high that you could not overcome them?

Positive and Negative Affect Scale (PANAS). Please respond on a 5-point scale from "Not at all" to "Extremely"

1. Interested
2. Distressed
3. Excited
4. Upset
5. Strong
6. Guilty
7. Scared
8. Hostile
9. Enthusiastic
10. Proud
11. Irritable
12. Alert
13. Ashamed
14. Inspired
15. Nervous
16. Determined
17. Attentive
18. Jittery
19. Active
20. Afraid

General Self-Efficacy Scale (GSE). Please respond on a 4-point scale from "Not at all" to "Exactly True"

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone opposes me, I can find the means and ways to get what I want.
3. it is easy for me to stick to my aims and accomplish my goals.
4. I am confident that I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in trouble, I can usually think of a solution.
10. I can usually handle whatever comes my way.

Creative Agency Scale (Adapted From Beghetto[30] and Tierney and Farmer[31]). Please respond on a 5-point scale from "Not true" to "Very True"

1. I am good at coming up with new ideas.
2. I have a lot of good ideas.
3. I have a good imagination.
4. I feel I am good at coming up with novel ideas.
5. I have confidence in my ability to solve problems creatively.

Authors' Note

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GK and WL were the Principal Investigators for the study and contributed to the overall design, oversight, and implementation of the study; GK, KCH, and RDH contributed to data collection, data analysis and interpretation, and wrote sections of the manuscript; JLM performed statistical analysis and wrote sections of the manuscript related to the quantitative data analysis; JB contributed the literature review, qualitative findings section, and edited and formatted the manuscript. All authors contributed to manuscript revisions and have read and approved the submitted version.

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Ethical Approval

Research in this study was conducted in compliance with the World Medical Association declaration of Helsinki.

Informed Consent

All participants in this study gave written informed consent in compliance with Drexel University's Institutional Review Board.

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