

## A graphic Art Course for Cancer Patients and Changes in Regulatory Function of the Autonomous Nervous System

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mean age 54 years (SD 9.07); 13 of them participated at the course. Objective measures (i.e., heart rate) were obtained by instrumental measurements; validated self administered questionnaires were used to measure psychological distress. Assessments were done at baseline, and at the end of the course. Some questionnaires were administered also 6-months-after.

**RESULTS:** Comparing the measures at baseline with those at the first follow-up, improvements were noted, among participants, in Total Power ( $d=1.49$ ), and in Heart Rate ( $d=1.14$ ); there were a reduction in sleep problems of 43% at T1, and of 74% more six months later (T0= 54%; T1= 31%; T2= 8%); 23% of patients presented emotional distress at baseline, and 8% at T1, and 0 at T2. Among non participants the quality of sleep, Total Power, Heart Rate, and emotional distress scores remained stable. A large effect size was noted in the SNS/PNS rate that decreased from baseline to T1 ( $d=0.73$ ).

**CONCLUSIONS:** These preliminary results support the hypothesis that non-pharmacological treatment may improve subjective and objective health variables.

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**Key words:** Art course; Non-conventional treatment; Emotional distress; Sleep problems; HADS; Heart rate; Oncology

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### ABSTRACT

**AIM:** Non-pharmacological support to cancer patients is a growing need. The aim of this study was to investigate the objective and subjective patients' responses to a 12-week graphic art course.

**METHODS:** Participants were 20 women in treatment for cancer,

### INTRODUCTION

Patients with cancer diagnosis undergo a relevant impact on their life style, due to the therapeutic interventions, often debilitating at both physical and psychological level, as well as due to more introspective thoughts regarding the future expectations. Debilitating side effects

of therapeutic interventions may be prevented, at least in part, with specific supporting dietary and pharmacological interventions. This is regularly taken under account by most oncologists.

Less attention is usually given to the introspective thoughts, whose care is too often left to the single patient initiative. Rather, psychological support may present quite relevant beneficial effects, at many different levels, for instance leading to an improved compliance to therapy.

Many studies are investigating the effects of such supporting interventions on the perceived health state as well as on the actual response to therapy and novel methodologies and approaches are being proposed<sup>[1]</sup>. Supporting care based on creative art therapies have been recognized to be potentially effective on psychological symptoms and quality of life in patients with cancer<sup>[2]</sup>. Art therapy has been used in the field of psycho-oncology to support the mechanisms of adaptation to stress through creative techniques, and its effectiveness was evaluated in oncology<sup>[3-5]</sup>.

The principal aim of this study was to measure change, at short- and long-term, in psychological, physical and social variables, and heart rate variability in cancer patients, upon a graphic art course conducted by a non-therapist.

## METHODS

Twenty women under adjuvant chemotherapy for breast or colon cancer were approached at the Division of Oncology Hospital name (Day hospital), city. Seven of the twenty women were not interested in the graphic art course for the following reasons: (1) were too busy to commit to the 12 weekly course; and (2) live too far from the hospital, but they accepted to complete the objective and subjective measures, at baseline and at the first follow-up (3 months after).

Women were excluded if they were in physical and/or psychological rehabilitation therapy.

The study was a 12-week descriptive study, using a single group, non-randomized design; it has been approved by the Hospital Ethic Committee.

Demographic and clinical information were collected before the start of the graphic art course. Self-reported psychological distress data (subjective measures) were obtained using validated questionnaires at baseline (T0), at the first follow up (3-months after T0; T1), at the second follow up (6-months after T0; T2).

Heart rate variability (HRV), an objective measure of stress, was collected at baseline (T0) and at the first follow-up (T1).

### Instrumental measure

The SA3000P (by Medcore Co, LTD) is a FDA approved medical equipment that quantitatively shows the individual response to the stressor by measuring and analyzing the HRV. The HRV mirrors the Autonomic Nervous System (ANS) activity and the sympathetic-parasympathetic (vagal) balance; it is used as an indicator of homeostasis in ANS affected by internal or external environment, to detect the chronic or acute stress level. The HRV measures are easy to perform, are non-invasive and have reliable reproducibility under standardized conditions. Cautions before test were adopted (avoid testing immediately following exercise; perform with the person in a testing state-lying down and relaxed; do not talk or move during the test; breath normally; avoid alcohol, coffee, and smoking for at least 2 hours before testing; first 5 minutes recorded are not used for). Women, participants as well no-participants, immediately before the start of the graphic art course and immediately after the end underwent the instrumental measurement.

### Self-administered questionnaires

The Impact of Event Scale-Revised (IES-R)<sup>[6]</sup> is a 22-item questionnaire reflecting the three DSM-IV PTSD symptom dimensions (Intrusion, Avoidance, and Hyperarousal). Each item is answered on a 5-point Likert-type scale, from 0 (not at all), to 4 (very much). For comparability with other studies, patients with total scores  $\geq 50$  are considered emotional distress cases.

The Hospital Anxiety and Depression Scale (HADS)<sup>[7]</sup> is a 14-item questionnaire, seven-item measuring anxiety and seven depression, each scored from 0 (not present) to 3 (highly present). The HADS-Total score is the optimal measure for general distress<sup>[8,9]</sup>. Patients with total scores  $>16$  are considered psychological distress cases.

Sleep problems, perceived social support and physical functioning, together with socio-demographic and clinical information, and were also collected.

### Graphic art course

A professional visual arts teacher gave patients a three-month course of graphic art, on a weekly basis in the afternoon, for two hours. An art workshop was set up with a large unique table, chairs, professional art materials including colors and stationery. The graphic work was carried out on paper or cardboard. Three different creative paths were followed: graphic or fantastic/imaginary images, copying images, copy live. The teacher explained specific techniques to the use of colors and materials and he supported participants in their graphic works.

### Statistics

Data analysis was carried of all participants having at least two assessments (baseline and follow-up), regardless of their participation in the graphic art course.

Descriptive statistics were carried out for all variables of interest. Three HRV parameters measuring respectively the overall autonomic activity (Total Power), the heart rate (HR), and the balance of Sympathetic Nervous System and Parasympathetic Nervous System (SNS/PNS) have been calculated.

To evaluate the magnitude of the changes, effect sizes were calculated by dividing the difference in the mean scores at T0 and T1 by the pooled standard deviation [10. STATA11.0 (StataCorp, College Station, Tex) and SA3000P software were used.

## RESULTS

Table 1 shows the sample characteristics. Overall, the women had a mean age of 54 (standard deviation, SD 9.07) years. At baseline, women that non participated at the graphic art course had less years of education, lower mean Hearth Rate scores, and were more over weight, than women that participated. No statistically significant

**Table 1** Sociodemographic and clinical characteristics in participants and non-participants to the graphic art course ( $n=20$ ).

	Participants	Non-participants	<i>p</i> -value <sup>2</sup>
Female, <i>n</i>	13	7	
Age(yrs), median (IQR)	58 (46-65)	52 (49-62)	0.781 <sup>1</sup>
>8 years of study, <i>n</i> (%)	13 (100.0)	2 ( 28.6)	0.001
Married, <i>n</i> (%)	9 ( 69.2)	5 ( 71.4)	0.919
Sons (yes), <i>n</i> (%)	10 ( 76.9)	7 (100.0)	0.521
BMI, median(IQR)	24.5 (21-26)	27.0 (25-30)	0.088 <sup>1</sup>
Breast cancer, <i>n</i> (%)	9 (90)	9 (90)	1.000
Adjuvant cht (yes), <i>n</i> (%)	7 (53.9)	3 ( 42.9)	0.639
Graphic art sessions, median(IQR)	7 (3-12)	0	

<sup>1</sup>kruskal-wallis test; <sup>2</sup>*p*-value; <sup>2</sup>fisher exact test.

**Table 2** Measures of Total power, Heart Rate, SNS/PNS, perceived sleep disturbances, perceived social support, psychological distress cases, and emotional distress cases in participants and non-participants in the graphic art course, at baseline (T0), 3-months after (T1), 6-months after (T2).

		T0		T1		T2	
		Mean	SD	Mean	SD	Mean	SD
<b>Total Power</b>	Participants	5.7	0.74	6.8	1.49		
	Non-P	5.8	0.59	5.6	0.71		
<b>Heart Rate</b>	Participants	83.38	8.25	74.00	12.29		
	Non-P	76.57	8.32	72.36	11.20		
<b>SNS/PNS</b>	Participants	2.12	1.72	2.44	1.38		
	Non-P	2.69	1.12	1.87	2.26		
<b>Sleep problems</b>	Participants	6.54	2.98	4.81	3.46	4.5	1.77
	Non-P	3.93	3.49	4.64	3.36	-	-
<b>Social support</b>	Participants	8.26	1.50	8.30	1.70	7.88	1.41
	Non-P	8.65	2.00	8.17	1.83	-	-
<b>Physical functioning</b>	Participants	7.94	1.66	8.35	1.19	8.96	1.21
	Non-P	6.38	2.31	6.94	2.34	-	-
<b>IES <math>\geq 50</math>, N, %</b>	Participants	3	23.08	1	7.69	0	0.00
	Non-P	0	0.00	1	14.29	-	-
<b>HADS <math>\geq 16</math>, N, %</b>	Participants	5	38.86	4	30.77	6	46.15
	Non-P	4	57.14	3	42.86	7	100.0

differences were found in age, marital status, sons, and job.

Table 2 shows the means and SDs in Total Power, Heart Rate, SNS/PNS, perceived social support, and physical functioning scores, and the prevalence of perceived sleep disturbances, psychological and emotional distress in participants and non-participants in the graphic art course, at baseline (T0), 3-months (T1), and 6-months (T2) after.

Group undergoing the graphic art course (Participants). At T1, improvements with large effect sizes ( $d > 0.80$ ) were noted in Total Power ( $d = 1.49$ ), and in Heart Rate ( $d = 1.14$ ), while there was only a small change in SNS/PNS rate ( $d = 0.16$ ). The prevalence of patients that reported sleep problems was 54% at baseline, and decreased to 31% at T1, and 8% at T2; the emotional distress (IES  $\geq 50$ ) was 23% at baseline, and decreased to 8% at the first follow up, and to 0 at the second follow up. Differently, the prevalence of cases of psychological distress as measured by HADS, was 39% at baseline, 31% at T1, and increased to 46% at T2. There was a significant improvement in physical functioning from T0 to T2. No differences were found in the perceived social support, with scores that were around 80 (range 0-100) across the three measurements.

Among non participants the quality of sleep, social support, and physical functioning, as the Total Power score, the Heart Rate, and the prevalence of psychological and emotional distress remained stable. A large effect size was noted in the SNS/PNS rate that decreased from baseline to T1 ( $d = 0.73$ ).

Differences between participants and non participants were found in Total Power and Physical functioning, at T1.

## DISCUSSION

The aim of the present study was to measure the impact of a 12-weeks art-course given to cancer patients on subjective as well as objective measurements of stress.

Despite the overall low number of participants (20 patients in all, i.e. 13 patients undergoing the art-course vs 7 non-undergoing the course) we observed some improving trends in several variables, including the ability to sleep, physical functioning, Total Power and Heart Rate.

The parasympathetic nerves (namely the vagus) slows down the heart rate, while the sympathetic nerves accelerate it; thus the estimated Heart Rate comes from the reciprocal action of the two nervous systems and represents the balanced response to internal and external stimuli, with a dominant effect of vagous nerve, under rest conditions.

The trends founded in this study indicate several improvements

measured in individuals undergoing the graphical art course, observed both at early time immediately after the end of the course (T1) and 3 months after (T2).

Although the evaluation of the statistical relevance needs larger studies, this preliminary data indicate some improving trends of several signs of wellbeing.

The study has several limitations: a small number of patients attended the graphic art course, they are recruited only at a hospital, and they came from a limited range of cancer patients. The participants were all females, since they are more responsive to this type of investigation, as already reported<sup>[11]</sup>. In this preliminary study, we have used a before-and-after study design so that the observed changes can at best be interpreted as preliminary evidence of the effectiveness of the graphic art course.

Despite several studies indicating some effects of psychological support and artistic interventions<sup>[12,13]</sup> more high-quality, longitudinal study, are needed to further support data and observations maybe accepted at the intuitive level. Published studies investigating quality of life, psychological and spiritual needs of patients and knowledge of the factors allowing patients to cope with the disease and adapt to it have strongly increased<sup>[14-16]</sup>.

On the other hand a significant change was indeed achieved in objective measurements of heart rate variability, indicating a clear change in the total power parameter, in patients undergoing the art-course. Although HRV measurements may be affected by several external and internal factors and additional observations must be collected on larger numbers, data collected in the present study indicate a significant increase of the Total Power in patients undergoing the art-course. The HRV increase is generally a sign of increased regulatory function of the Autonomous Nervous System, and increased ability to keep the homeostasis and cope with stressing conditions. As reported elsewhere<sup>[17,18]</sup>, improved HRV suggests an increased vagal tone and reduced sympathetic activity. On the other hand patients not-undergoing the art-course were found to experience a significant reduction of the SNS/PNS ratio, likely indicating an increase of the Parasympathetic Nervous System, which may represent a sign of a stronger depression state.

Controversial effects of art-therapy based interventions have been reported in literature<sup>[13,19]</sup>, but this has to be considered somehow expected at this stage; in fact a real standardization of the methods to be used is still lacking. Such standardization should include the patients recruitment criteria, the type of interventions (e.g. the specific experimental methodology of art-therapy based intervention), and the

specific outcomes under evaluation. In the present study we focused on objective measurements (such as heart rate variability evaluations) besides the questionnaires, which represent more subjective measurements. Additionally, specific strategies were implemented to achieve more reliable results, including a particular attention to graphic-course modalities and details in the room where the art-course was given (professional art teacher, large space, natural light; friendly environment; relaxing music background). Such methodology helped participants to distract their attention from personal fears and cancer-related-uncertainty, achieving the opportunity to feel the possibility to construct a novel personal equilibrium state, and novel motivation stimuli.

## CONCLUSIONS

These results suggested that a graphic art course conducted by a non therapist may significantly help cancer patients, improving their homeostasis.

Neither of the patients following the graphic art course had specific graphic abilities. Some of the paintings prepared during the course were sold in a charity dinner.

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## CONFLICT OF INTERESTS

There are no conflicts of interest with regard to the present study.

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