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Music therapy, how does it change the way of perceiving colours for patients with breast cancer undergoing radiotherapy?

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Abstract

The choice of colours according to their positive or negative connotation could be an indirect way of reflecting individual's psychology. This concept has never been explored in oncology. The aim of this study is to investigate the evolution of colour choices reflecting the psychology of breast cancer patients receiving music therapy (MT) during their radiotherapy (RT).This is a prospective study which enrolled two groups of breast cancer patients undergoing RT: first group attending weekly MT sessions during their RT courses (MT arm) and second group who didn't attend to MT sessions (control arm). Patients were asked to choose the colour reflecting their psychology at different assessments: before RT (T0), during RT (T1), at the end of RT (T2) and 2 months after RT (T3). Sixty patients were included and equally divided between both arms. In the MT arm, the evolutionary profile of colours with positive connotation showed a significant increase between T0-T1, T0-T2 and T0-T3 (p=0.014, p=0.021 and p=0.021 respectively). However, in the control arm, it showed a significant decrease between T1-T2 and T0-T2 (p=0.008 and p=0.039 respectively) and a significant increase between T2-T3 (p=0.003).Their comparison showed a significant improvement at T2 in favour of MT arm (p=0.001). Thus, MT seems to boost positive psychology in breast cancer patients undergoing RT by ameliorating their perception of colours. Consequently, it would be interesting to integrate it into cancer treatment and to involve psychologists during the patients' assessment to better understand their colours choices.

Keywords: music therapy, art therapy, psycho-oncology, radiotherapy, colours, breast cancer.

Introduction

Music therapy (MT) as an art therapy technique and a modality of psycho-support has a great potential to improve individuals' psychology and their way of perceiving things (Lai SYCK, 2017). In patients with cancer, the treatment phase is considered as psycho-traumatizing and could lead patients into negativity and despair (Güner P, 2017). To avoid these bad consequences, it would be interesting to integrate music therapy during period of treatment (Köhler F et al, 2020). The choice of colours by individuals according to their positive or negative connotation could be an indirect way reflecting the individual's psychology (Shirai M and Sochi T, 2023). However, this topic has rarely been discussed in the literature and never in oncology.

Purpose of the study

This study seeks to investigate the evolution of colour choices reflecting the psychology of breast cancer patients attending to MT sessions during their treatment by adjuvant radiotherapy (RT).

Patients and methods

Study design

This is a prospective mono-centric study with a control arm, carried out from June to December 2022 in the Radiation oncology department of Habib Bourguiba University Hospital in Sfax (Tunisia) and which enrolled two groups of patients with non-metastatic breast cancer undergoing adjuvant RT: a first group attending weekly MT sessions during their RT courses (MT arm) and a second group of patients who didn't attend to MT sessions (control arm). The selection criteria for including patients in one or the other of the two groups were patient availability. Inclusion criteria were women with non-metastatic breast cancer, aged over than 18 and with World Health Organization (WHO) performance status <=1, proposed for adjuvant RT and interested in MT. Exclusion criteria were patients who discontinued RT treatment and/or did not regularly attend to MT sessions and/or were lost to follow-up after RT.

Music therapy sessions

MT sessions were performed weekly during RT treatment totalizing 3 to 4 sessions per patient. The session duration was ranging from 1 hour and 30 minutes to 2 hours and was conducted by a certified music therapist.

Patients' assessment

Patients were asked to choose the colour that reflects their psychological state at different times of assessment: before the onset of RT (Baseline assessment = T0), during RT (after two weeks of RT = T1), at the end of RT (=T2) and 2 months after the end of RT (=T3).

The interpretation of the colours chosen by the patients was based on the Psychology of colours in "Your brain health", a blog featuring the various psychological symbolisations of colours, as well as their positive or negative connotations (DELÉCRAZ J, Psychology of Colours, 2017). In fact, bright colours represented hope and optimism, white represented peace, gray represented a sense of instability and black represented mourning and pessimism.

In our context, bright colours and white were considered to have positive connotation, and gray and black to have negative connotation.

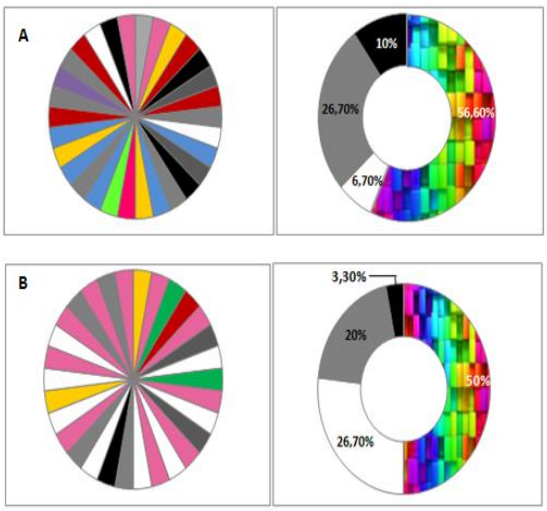
Data analysis

Data analysis was carried out using Statistical Package for the social sciences (SPSS) version 20. For comparisons between the two groups, the chi-square test was used when the conditions of application were verified. Otherwise, Fisher's exact test was used, when applicable. However, for comparison over time, we used the McNemar test. A test was considered statistically significant for a value of $p < 0.05$.

Results

Sixty patients were included in the study. These patients were equally divided between the two arms. The median age was 54 and 49.50 years in the MT and control arms respectively. Tumour status was predominantly locally advanced (86.7% and 90% in the MT and control arms respectively). A radiotherapy dose of 40 Gray (Gy) in 15 fractions was delivered in 60% respectively in both arms and a dose of 52.5 Gy in 20 fractions in 40% respectively in both arms.

At T0 assessment, in the MT arm, 17 patients (56.60%) had chosen bright colours, 2 patients (6.70%) had chosen white, 8 patients had chosen gray (26.70%) and 3 patients (10%) had chosen black. In total, 19 patients (63.30%) had chosen colours with positive connotation and 11 patients (36.70%) had chosen colours with negative connotation. However, in the control arm, 15 patients (50%) had chosen bright colours, 8 patients (26.70%) had chosen white, 6 patients had chosen gray (20%) and one patient (3.30%) had chosen black. In total, 23 patients (76.70%) had chosen colours with positive connotation and 7 patients (23.30%) had chosen colours with negative connotation (Figure 1).



A = Music therapy arm, B = Control arm

Figure 1. Colours spectra reflecting the psychological state of patients at T0

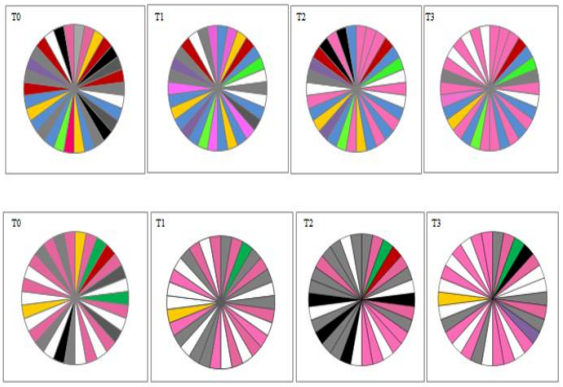
The evolutionary profile of the colours chosen by the patients was different between the two arms. In fact, in the MT arm, It was marked by an increase in the frequency of colours with positive connotation between T0 and T2, becoming stable thereafter at T3. However, in the control arm, this evolutionary profile was marked by a decrease in the frequency of colours with positive connotation between T0 and T2, followed by an increase at T3 (Table 1).

Table 1. Evolutionary profiles of colours chosen by patients reflecting their psychology in the two arms.

Chosen colors	T0 N(%)		T1 N(%)		T2 N(%)		T3 N(%)	
Bright colors	**Music+** 17(56.60%)	**Control** 15 (50%)	**Music+** 22(73.30%)	**Control** 13(43.30%)	**Music+** 24 (80%)	**Control** 10(33.30%)	**Music+** 24 (80%)	**Control** 15 (50%)
White	**Music+** 2 (6.70%)	**Control** 8(26.70%)	**Music+** 3 (10%)	**Control** 9 (30%)	**Music+** 3 (10%)	**Control** 5 (16.70%)	**Music+** 4 (13.30%)	**Control** 9 (30%)
Gray	**Music+** 8 (26.70%)	**Control** 6 (20%)	**Music+** 5 (16.70%)	**Control** 8 (26.70%)	**Music+** 1 (3.30%)	**Control** 11(36.70%)	**Music+** 2 (6.70%)	**Control** 5(16.70%)
Black	**Music+** 3 (10%)	**Control** 1 (3.30%)	**Music+** 0 (0%)	**Control** 0 (0%)	**Music+** 2 (6.70%)	**Control** 4 (13.30%)	**Music+** 0 (0%)	**Control** 1 (3.30%)
Colors with positive connotation	**Music+** 19(63.40%)	**Control** 23(76.70%)	**Music+** 25(83.30%)	**Control** 22(73.30%)	**Music+** 27 (90%)	**Control** 15 (50%)	**Music+** 27 (90%)	**Control** 24 (80%)
Colors with negative connotation	**Music+** 11(36.60%)	**Control** 7 (23.30%)	**Music+** 5 (16.70%)	**Control** 8 (26.70%)	**Music+** 3 (10%)	**Control** 15 (50%)	**Music+** 3 (10%)	**Control** 6 (20%)

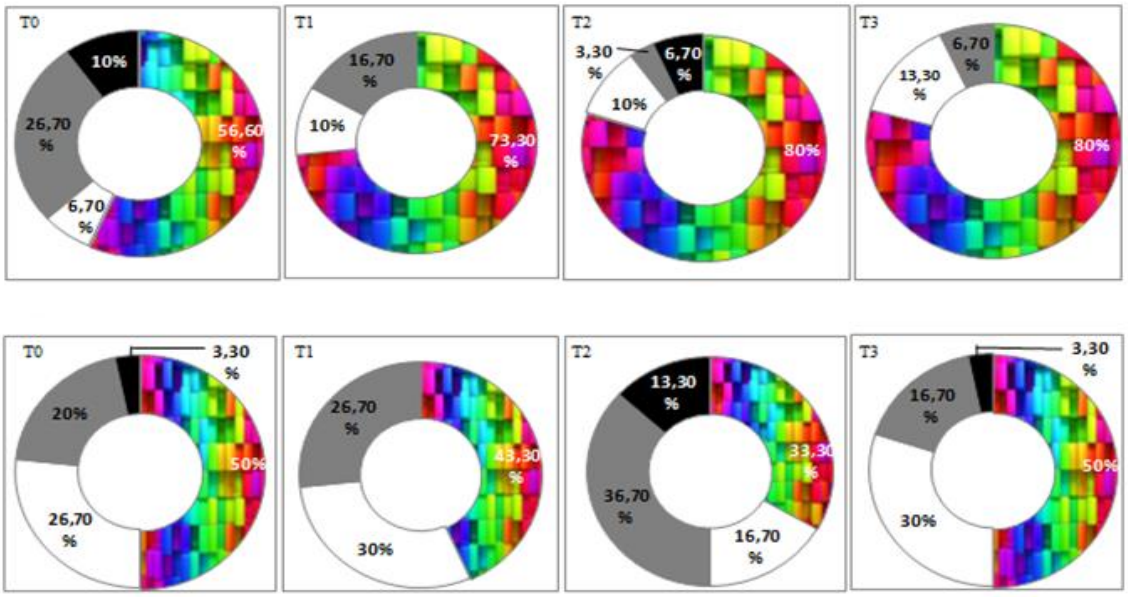
Music+ =Music therapy Arm, Control =Control Arm, N=Number.

The evolutionary profile of the spectra of colours chosen by the patients and their simplified spectra according to their symbolization was represented by these circular graphs (Figures 2 and 3).



A =Music therapy arm, B = Control arm

Figure 2. Evolutionary profiles of the colours spectra reflecting patient psychology in the two arms



A = Music therapy arm, B = Control arm

Figure 3. Evolutionary profiles of simplified colours spectra reflecting patient psychology in the two arms

The evolutionary profiles of positive connotation colours chosen by patients at the assessment times were different between the two arms. In the MT arm, there was a significant increase between T0-T1, T0-T2 and T0-T3 (p=0.014, p=0.021 and p=0.021 respectively). However, in the control arm, the statistical analysis showed a significant decrease between T1-T2 and T0-T2 (p=0.008 and p=0.039 respectively) and a significant increase between T2-T3 (p=0.003) (Table 2).

Table 2. Statistical analysis of the evolutionary profile of positive connotation colours chosen in each arm

Chosen colors with positive connotation (p)	T0-T1		T1-T2 T2-T3				T0-T2 T0-T3			
	Music+	Control	Music+	Control	Music+	Control	Music+	Control	Music+	Control
	0.014	0.655	0.317	**0.008**	**0.021**	**0.039**	0.655	**0.003**	**0.021**	0.763

Music+ = music therapy arm, Control = control arm.

The comparison of these evolutionary profiles at different assessment times between the two arms showed a significant improvement at T2 in favour of the MT arm (p=0.001) (Figure 4).

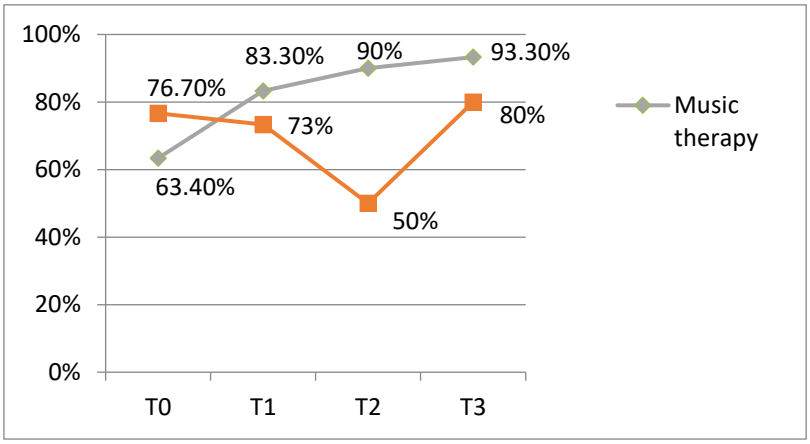


Figure 4. Comparison of the evolutionary profiles of positive connotation colours chosen at different assessment times between the two arms

Discussion

The choice of positive connotation colours seems to an index of positive psychology (Yunus Z, 2004). Additionally, hope and optimism are multidimensional parameters that may have a positive impact on a patient's psychological well-being (Laranjeira C and Querido A, 2022) and seem to be intimately related to the positive psychological effect of music (p=0.012) (Ziv N et al, 2011).

This impact has been widely studied in healthy adults and children, but rarely evaluated in the oncology field (Ziv N et al, 2011).

For the small number of studies that have focused on this topic, the results were in the majority of cases satisfactory, with an improvement in hope and optimism scores for the patients who attend MT sessions (p ranged between 0.035 and 0.04) (Verstegen A, 2016 and Bradt J et al,2021).

In addition, the choice of bright colours was one of the parameters reflecting people's positive psychology (Yunus Z, 2004), but no study to date has evaluated the potential of colours choice to reflect the psychological state of patients with cancer.

In our study, MT showed a significant improvement in the frequency positive connotation colours chosen during RT, at the end of RT and 2 months afterwards (p=0.014, p=0.021 and p=0.021 respectively). Furthermore, a significant difference, in favour of the MT arm, was demonstrated at the end of RT (p=0.001).

The highlights of our study were based on its prospective type, its exhaustive evaluation over time and its uniqueness in the oncology field in

this context. However, its limitations were the relatively small sample size, the lack of validated scientific sources for interpreting colour connotations and the absence of integrating psychologists into the various assessments over time.

Conclusion

MT appears to be a way of spreading and boosting positive psychology including hope and optimism in patients with breast cancer undergoing RT by ameliorating their own way of colours perception. Consequently, it would be interesting to integrate MT into the supportive care procedure of patients with cancer and to involve psychologists during their assessments to have an in-depth psychological analysis of colours choice.

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