

Research

An Analysis of Music Intervention in the Management of Anxiety by Spontaneous Mandala Drawing

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Abstract:

Spontaneous mandala drawing has demonstrated therapeutic potential in reducing anxiety. This exploratory study addressed the research question: Does instrumental ambient music enhance the physiological effects of spontaneous mandala drawing? To answer that, three female graduate-level volunteers (ages 29–48) participated in eight sessions (four conducted without music and four with instrumental background music) in which pre- and post-measurements of systolic and diastolic blood pressure and heart rate were obtained. Non-parametric statistical analysis (t-tests and non-parametric Mann–Whitney U test) revealed no significant differences between the Music and No Music conditions across the three physiological variables. Effect sizes were negligible, suggesting that ambient music neither enhanced nor interfered with the observed physiological changes. Heart rate exhibited minor but more consistent shifts, potentially indicating its greater sensitivity as a short-term anxiety marker. The raw data and individual plots revealed substantial inter-individual variability, particularly in systolic blood pressure. These findings highlight the subjective and context-dependent nature of music appreciation and artistic engagement. While limited by a very small sample size ($n = 3$), this study provides preliminary insights into the role of ambient music in mandala-making interventions. No significant differences were found between conditions, underscoring the therapeutic value of spontaneous mandala drawing itself and highlighting the importance of individual variability in art-based interventions. Given the exploratory nature of this study and the individualized responses observed, these findings highlight the value of contributing to interdisciplinary dialogues on art-based methodologies, embodiment, and emotional regulation.

Keywords: Mandala drawing; Mandala therapy; Anxiety reduction; Music intervention.

1. Introduction

1.1. Therapeutic Mandalas

Mandalas, well-known as symbolic diagrams long used in Eastern spiritual traditions as tools for meditation and healing, were introduced to psychotherapy in the early 20th century by the Swiss psychiatrist Carl Gustav Jung (Jung, 1973). Jung encouraged patients to draw within circles to access unconscious material and transform internal chaos into coherence by recognizing them as expressions of the *Self* that bring order, balance, and psychological integration (Jung, 1973).

In Brazil, psychiatrist Nise da Silveira observed that patients with schizophrenia spontaneously drew mandalas during therapeutic art sessions. Influenced by Jung, she understood imagery as a language of the unconscious. She was key in advancing clinical art as a respected, non-invasive therapeutic approach to mental illness (Mello, 2009).

In the 1970s, the art therapist Joan Kellogg analysed over 11,000 mandalas from psychiatric patients and developed *The Archetypal Stages of the Great Round*, a model of 12 stages of human development, later expanded with a *Stage 0*, representing interconnectedness (Kellogg, 1977). Based on her theory of the Great Round, Kellogg created the Mandala Assessment Research Instrument (MARI®), a psychological tool for evaluating one's mental state, relationships, and overall well-being. A valuable contribution not only for therapists but to individuals interested in self-knowledge through the exploration of the 12 archetypal stages to reduce anxiety and increase self-awareness was proposed by Susanne Fincher (Fincher, 2010).

1.2. Mandalas and Anxiety Management

The growing urgency to address mental health challenges has highlighted the importance of accessible, non-invasive interventions. Depression and anxiety remain the most prevalent mental disorders globally, including in Brazil, according to the Global Burden of Diseases Study (GBD 2019 Mental Disorders Collaborators, 2022). Their incidence increased further during the COVID-19 pandemic (COVID-19 Mental Disorders Collaborators, 2021). Mandala colouring has shown promise as a means of reducing anxiety in diverse clinical settings, including among COVID-19 patients (Khademi et al., 2021; Kirca & Dagli, 2024; Kirka et al., 2024; Sadeqi et al., 2024). Mandala art therapy has also been linked to increased hope among psychiatric inpatients (Kim et al., 2018).

However, following Jungian principles, drawing spontaneous mandalas, rather than colouring pre-designed patterns, offers a deeper psychological benefit. This process encourages active imagination, self-reflection, and integration of unconscious material, going beyond mindfulness-based stress relief.

A recent meta-analysis confirmed that mandala colouring and free drawing reduce anxiety, though evidence suggests spontaneous mandala drawing may foster greater insight and emotional expression (Jakobsson-Støre & Jakobsson, 2022; Campenni & Hartman, 2019). Mandala drawing helped patients with dementia to externalize thoughts and emotions otherwise difficult to articulate (Couch, 1997), and in individuals with intellectual disabilities to reduce stress (Schrade et al., 2011).

Henderson et al. (2007) validated mandala drawing as a non-verbal method for accessing unconscious content with participants with PTSD who experienced greater symptom reductions than controls, suggesting mandala drawing could supplement or even substitute verbal trauma therapies.

The healing power of spontaneous mandalas was also observed among older female cancer survivors (Yakar et al., 2021) and hospitalized adolescents with cancer (Gürçan & Turan, 2021). The MARI® test has also been applied in clinical settings, including among heart disease and cancer patients. Bruscia and Shultis (2017) found that patients often selected stages reflecting existential concerns about death while simultaneously expressing a creative will to survive. Their spontaneous mandalas revealed efforts to cope with illness and maintain meaning in life.

Despite the growing evidence supporting mandala drawing as a therapeutic tool, little is known about how background music may influence its effects. This study investigates

whether instrumental ambient music modulates physiological indicators of anxiety—specifically systolic and diastolic blood pressure and heart rate—before and after spontaneous mandala drawing sessions.

2. Material and Methods

2.1. Participants

Three female volunteers aged between 29 and 48 (37.7 ± 9.6) participated; two were master's candidates and one was a postdoctoral researcher at the Centre of Health Sciences, Federal University of Rio de Janeiro, between March and May 2023.

2.2. Procedure

The 40-minute workshops were held in a quiet study room, where participants had access to all necessary materials, including paper, oil pastels, a notebook, and a pencil. The workshop followed four steps:

- (i) a welcoming moment, allowing participants to share their feelings and state of mind from that day or week, and to achieve a baseline for the physiological variables;
- (ii) relaxation and grounding through breathing exercises, followed by the initial measurement of blood pressure and heart rate;
- (iii) a 20-minute mandala drawing session, followed by the final measurement of blood pressure and heart rate; and
- (iv) a sharing and reflection period.

Before and after the drawing activity, the systolic (*S*) and diastolic (*D*) blood pressure and heart rate (*HR*) were measured with a digital wrist blood pressure monitor. The results were analysed as the difference between the initial (*I* = right before drawing) and final (*F* = immediately after) measurements of the systolic ($\Delta S_{BP} = S_{BP}^F - S_{BP}^I$) and diastolic ($\Delta D_{BP} = D_{BP}^F - D_{BP}^I$) blood pressure and heart rate ($\Delta HR = HR^F - HR^I$). Two experimental conditions were established: mandala drawing without (Group I) and with (Group II) background ambient music.

Following the recommendation of Joan Kellogg (1973), oil pastel was chosen for its balanced fluidity – more expressive than pencil (a highly controlled medium) and more manageable than watercolour or gouache (which are more difficult to control). Sheets of A3 paper were cut into 29.7 cm squares, providing a large surface for free emotional expression. A circle was lightly drawn with a black pencil in the centre of the square. Participants were instructed to use the circle as a guide rather than a constraint, with the freedom to draw inside, outside, and/or across the circle.

After completing their drawings, participants were encouraged to observe their work closely from different angles, slowly rotating the paper to discover personal meanings through the lines and colours, and start journaling.

For the sessions with music, a playlist of instrumental compositions was curated, including works by Ryuichi Sakamoto, Kitarō, René Aubry, Alexis Ffrench, Ólafur Arnalds, Will Ackerman, and Brian Eno, among others.

2.3. Statistical Analysis

Data analysis was performed in Excel with 24 observations for each physiological measure (systolic and diastolic blood pressure, and heart rate), divided into two groups: Group I (no music, *n* = 14) and Group II (with music, *n* = 10). Descriptive statistics (means, standard deviations, medians, and ranges) were calculated for each group. Independent samples *t*-test and non-parametric Mann–Whitney *U* test were conducted to compare the groups. Cohen's *d* was calculated to estimate effect sizes and assess practical significance. Statistical significance was set at $\alpha = 0.05$.

2.4. Ethical Approval

Ethical approval was obtained from the Research Ethics Committee of the Institute of Psychiatry, Federal University of Rio de Janeiro (approval no. 5,925,361). Participation required accepting an electronic informed consent (e-IC) form, which was accessed before completing the registration form. The e-IC outlined the study purpose, confidentiality guarantees, voluntary participation, and the option to withdraw without data retention. Participants were informed that their contributions would include registering the physiological data (blood pressure and heart rate). The e-IC also included details about the workshop's structure, duration, and scheduling. Upon acceptance, participants were directed to complete the registration form.

3. Results

Anxiety levels were evaluated by physiological variables such as changes in systolic and diastolic blood pressure and heart rate (Condominas et al., 2025). The data analysis revealed considerable inter-individual variability in physiological responses to the mandala drawing sessions, both with and without background music. This variability is evident in the raw data, particularly in the change scores for systolic blood pressure (ΔS_{BP}), which ranged from -9 to +13 mmHg in Condition I (No Music) and from -7 to +22 mmHg in Condition II (Music). Similar dispersion was observed for diastolic pressure (ΔD_{BP}), ranging from -5 to +13 mmHg in Condition I and from -6 to +15 mmHg in Condition II. Both variables suggest that participants responded to the sessions in markedly individual ways. The variation in the changes in heart rate (ΔHR) was less pronounced, ranging from -8 to +4 bpm in the No Music condition and -7 to +5 bpm in the Music condition.

The variability of the data was related to one participant who consistently showed strong emotional responses to the mandala drawing exercises, which were often accompanied by physiological fluctuations. Her drawings were rich in symbolic content, and she occasionally became visibly moved, sometimes even crying, when interpreting her own work. This participant was undergoing personal and academic stress at the time of the study, which may have amplified the emotional resonance of the sessions. Notably, she reported improved emotional well-being during the workshop period and completed her Master's degree shortly thereafter.

Despite these personal and emotional differences, inferential statistics showed no significant differences between the Music and No Music conditions across all three physiological variables: systolic blood pressure (ΔS_{BP}), diastolic blood pressure (ΔD_{BP}), and heart rate (ΔHR). Results from both parametric (independent t-test) and non-parametric (Mann-Whitney U) tests confirmed this lack of statistical difference. Additionally, effect sizes (Cohen's *d*) were small, suggesting negligible practical differences between groups.

Table 1 presents the descriptive and inferential statistics for each variable. **Figures 1** and **2** summarize the results, emphasizing the wide variability in individual responses. Notably, ΔS_{BP} values exhibited the most pronounced spread, particularly under the Music condition, as seen in the scatter (**Figure 1**) and violin (**Figure 2**) plots.

Table 1. Statistical analysis of the effect of background music during mandala drawing on decreasing anxiety

Variable	Background Music		Independent t-test		Mann-Whitney Test		Cohen's <i>d</i>
	no	with	t	p	U	p	
ΔS_{BP}	-0.43 ± 5.15	0.90 ± 9.16	-0.41	0.685	69.5	1.000	-0.19
ΔD_{BP}	2.21 ± 4.90	2.30 ± 6.02	-0.04	0.971	74.5	0.814	-0.02
ΔHR	-1.43 ± 3.61	-0.50 ± 3.50	-0.63	0.535	59.5	0.555	-0.26

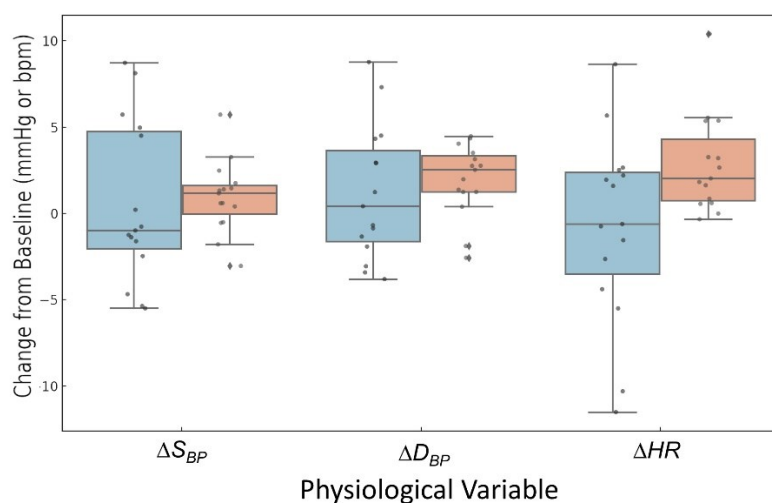


Figure 1. Changes in systolic blood pressure (ΔS_{BP}), diastolic blood pressure (ΔD_{BP}), and heart rate (ΔHR) following spontaneous mandala drawing, without (blue) and with (orange) instrumental music. Each dot represents one individual measurement. Outliers and individual variability are especially evident in ΔS_{BP} under the Music condition. No significant differences were observed between conditions.

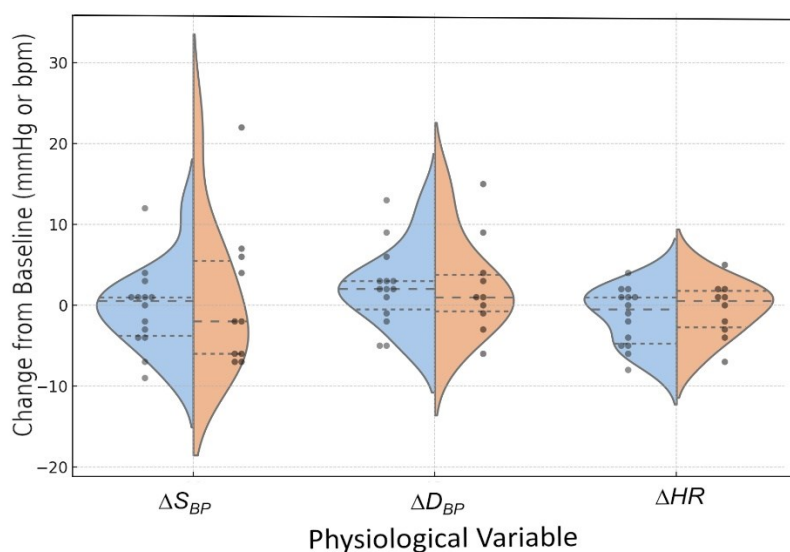


Figure 2. Violin plots showing the distribution of pre-post differences in systolic blood pressure (ΔS_{BP}), diastolic blood pressure (ΔD_{BP}), and heart rate (ΔHR) due to spontaneous mandala drawing sessions. The left half of each violin represents the condition without music, and the right half represents the condition with music. Despite individual variability, especially in ΔS_{BP} , no statistically significant differences were observed between conditions.

4. Discussion

This exploratory study investigated whether instrumental ambient music modulates the physiological effects of spontaneous mandala drawing on anxiety. While all participants showed changes in systolic and diastolic blood pressure and heart rate after the sessions, statistical analyses revealed no significant differences between the Music and No Music conditions. Effect sizes were negligible, suggesting that background music neither enhanced nor diminished the observed physiological responses.

These results are important in understanding the role of environmental factors, such as ambient sound, in therapeutic art practices. Ambient music is often assumed to be inherently calming, but in this context, it did not produce a measurable difference in physiological markers of anxiety. Interestingly, two participants reacted oppositely to the same playlist during one session: one expressed deep enjoyment, while the other was visibly disturbed. The latter described the music as irritating and intrusive; her mandala, typically light and harmonious, appeared dark and chaotic, reflecting her discomfort. She later reported that the playlist had negatively impacted her focus and emotional state during the session. Notably, this participant enjoyed the playlists in the other three music sessions, highlighting how subjective and context-dependent music appreciation can be.

This suggests that the core therapeutic value may lie in the spontaneous creation rather than in external stimuli accompanying the process.

One participant demonstrated intense emotional engagement during the workshops, accompanied by marked physiological variation across sessions. Her mandalas were often deeply symbolic and prompted strong personal insights. Although this case does not represent the group statistically, it highlights the profoundly individual nature of expressive art therapy. For her, the workshops appeared to catalyze a psychological turning point, coinciding with improved coping and the eventual completion of her Master's dissertation. This anecdotal evidence underscores the need to balance group-level analysis with individual-level observations when evaluating creative therapies.

Despite the small sample size, the violin plots allow the visualization of the variation in measurements, suggesting that heart rate has a smaller variation than blood pressure (systolic and diastolic). Data obtained from another group of participants showed the same pattern, strengthening the suggestion that heart rate measurement has a better outcome than systolic and diastolic blood pressure. The wide dispersion in physiological responses, particularly in systolic blood pressure, also reflects the complex and personal nature of anxiety regulation. It is plausible that individual factors, such as emotional state, personality traits, or life circumstances, played a stronger role than the presence or absence of background music.

Several limitations must be acknowledged. The small sample size ($n = 3$) reduces statistical power and limits generalizability. Furthermore, the sample consisted of graduate-level women in a high-stress academic environment, which may not reflect broader populations. Scheduling constraints, common among graduate students and researchers, also introduced challenges to participant continuity and data consistency.

Despite these constraints, the study contributes to the growing interdisciplinary conversation around STEAM-based mental health approaches. By combining artistic expression, therapeutic frameworks, and statistical analysis, this work illustrates the value of mixed-methods inquiry in evaluating non-verbal interventions. This exploratory study aimed to determine whether background music influences the physiological impact of spontaneous mandala drawing on anxiety. The absence of significant differences suggests that instrumental music neither enhances nor disrupts the benefits of the activity in this small sample. This finding is important from a therapeutic perspective. While music is commonly used to aid relaxation, it may not be necessary when the goal is to reduce anxiety through spontaneous artistic expression. Furthermore, the variability seen in physiological responses, especially from one participant, highlights the deeply personal and idiosyncratic nature of art-based interventions.

Nonetheless, the study adds value to the interdisciplinary dialogue within STEAM fields. By incorporating statistical analysis, visual data exploration, and psychological interpretation, this work models a holistic approach to investigating non-verbal therapies.

5. Limitations

Although only three participants completed both experimental conditions, the repeated-measures design allowed intra-individual comparison across sessions. Rather than aiming for statistical generalization, this exploratory framework prioritized the observation of personal responses to artistic engagement under different auditory conditions. Considering the significant heterogeneity in responses, the study aligns with idiographic and n-of-1 approaches, emphasizing variability, subjectivity, and context in therapeutic research. Expanding the participant pool in future studies could help assess how broadly these patterns apply while preserving attention to individual dynamics.

6. Conclusions

Spontaneous mandala drawing appears to be an effective tool for reducing anxiety, regardless of the presence of background music. In this exploratory study, instrumental ambient music did not significantly enhance or interfere with physiological indicators of anxiety—systolic and diastolic blood pressure and heart rate—suggesting that the core therapeutic benefit lies in the act of artistic expression itself.

It is worth noting that individual responses varied widely. One participant showed strong emotional engagement and notable physiological fluctuations. At the same time, another exhibited a rare adverse reaction to the music in one session, reflected in her comments and the visual qualities of her mandala. These findings underscore the highly personal nature of art-based interventions and the subjective experience of music.

Heart rate changes were less intense than blood pressure shifts, suggesting they may serve as a more direct and sensitive indicator of short-term emotional regulation. Future studies might consider including heart rate variability or other dynamic physiological measures to capture subtle shifts in anxiety.

While no significant differences were found between music and no music conditions, the small sample size (3 participants) prevents broad generalization. These findings should be interpreted as preliminary insights, emphasizing individual variability and personal factors in art-based methods. Nevertheless, this study contributes to ongoing interdisciplinary efforts to integrate artistic processes into mental health strategies. Further research with more diverse populations and larger samples will help clarify how individual differences mediate the therapeutic effects of spontaneous mandala creation, with or without music.

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki, and blood pressure measurements were voluntary. Ethical approval was obtained from the Research Ethics Committee of the Institute of Psychiatry, Federal University of Rio de Janeiro (approval no. 5,925,361).

Conflicts of Interest: The author declare no conflict of interest.

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