Pharmakon or the healing art: experience of artistic-transformative transdisciplinary workshops in fibromyalgia syndrome

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Abstract

Objective

Fibromyalgia syndrome (FM) is a chronic pain syndrome often related to trauma and stress. A multidisciplinary therapeutic approach is recommended. Transformative experiences (TE) allow for a profound and immediate change that helps breaking the maladaptive emotional/behavioural loop elicited by chronic stress and trauma. In this study, TE was specifically elicited through transformative art (TA) in different ways.

The aim of this study is the validation of the efficacy (in terms of quality of life and sleep, self-esteem, self-efficacy) of transdisciplinary artistic-transformative pathways in patients with FM.

Methods

8-month observational study evaluated the effectiveness of three TA online workshops in FM patients: in group 1 participants reviewed their autobiography and illness in a humorous sense; in group 2 participants were guided to express their realities of illness in poetry; group 3 was based on the guided narration of works of art according to visual thinking strategies integrated with the principles of narrative medicine. Tests were administered at baseline and post-workshop.

Results

109 FM patients completed the study. No differences were found among the three groups at baseline in terms of clinimetric variables. Overall, the three groups showed a statistically significant improvement of the Pittsburgh Sleep Quality Index (PSQI), Response to Stressful Experiences Scale (RSES), WHO-5 Well-Being Index (WHO-5) and Global Health scale (GH). No significant difference was found for The Mindful Attention Awareness Scale. In Group 1, patients ameliorated in almost all parameters. Sleep and the 3rd dimension of SAP improved in patients of Group 2, whilst self-esteem and WHO-5 did in Group 3.

Conclusion

Our research shows that art as TA leads to significant improvements of the psychophysical condition of FMS patients. TA can be seen as a crucial mediator for overcoming the trauma/stressors, likely by generating "pivotal mental states" that aid rapid, deep learning, mediating psychological transformation to overcome trauma and stress.

Key words

fibromyalgia, transformative experience, transformative art, chronic pain, multidisciplinary treatment

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Background

Fibromyalgia syndrome (FM) is characterised by chronic widespread pain, sleep disturbances, chronic fatigue, and many other nonspecific symptoms, such as mood tone alterations, gastrointestinal disorders, locoregional pain syndromes, and so on (1). The pathogenesis of FM remains mostly unclear, although the phenomenon of central sensitisation is probably at the centre of the aetiopathogenetic process; frequently, FM is also correlated in adults with a traumatic event, strong and short-lived, or of slight entity but prolonged in time, of organic, psychophysical, interpersonal or environmental nature (stressors) (2). It can therefore be affirmed that FM is a complex and multidimensional systemic syndrome, linked to living conditions and dysfunctional/adaptative relationships (organic, social, psychological), of which many aspects still need to be investigated and clarified, in order to improve diagnostic and therapeutic approaches (3). Given these premises, it is clear how fundamental a therapeutic approach that welcomes the patient with FM from multiple points of view is: multidisciplinary treatment is in fact at the centre of the latest EULAR guidelines for FM (4).

In the present study, we used the transdisciplinary method (TrDip). Transdisciplinarity is defined by UNESCO as "the 'intellectual space' in which it is possible to explore and unveil the nature of the multiple connections between isolated issues, the space in which issues are rethought, alternatives reconsidered and interrelationships revealed" (5) and therefore allows us to approach complex systems more effectively. Since FMS can be considered a complex condition, the TrDip method seemed to us the best way to create a therapeutic path for patients with FMS. Specifically, the chosen methodology was that of artistic-transformative transdisciplinary workshops: on the one hand, because art can be considered the only intrinsically transdisciplinary language and tool, on the other hand, because the aim is to transform the experience of chronic illness to experiment with alternative or complementary modes of care to pharmacological treatment, within a multimodal approach.

The present study aimed at validating the efficacy (in terms of quality of life and sleep, self-esteem, self-efficacy) of artistic-transformative transdisciplinary paths in patients with FM.

Materials and methods

Study design

This is an observational prospective study lasting 8 months (from February 25th, 2021 to October 16th, 2021) that evaluated the effectiveness of three different artistic-transformative workshops in patients with FM. Patients were divided into three workshops according to their preference. Tests were administered at time 0 (pre-workshop) and time 1 (post-workshop, up to 5 days after the end of the workshop). After the time 0 tests, each group received a preliminary meeting for the presentation of the tools that would be used during the workshop.

Activities were carried out entirely through group videoconferencing due to the restrictions caused by the SARS-COV-2 pandemic, using the Zoom platform, together with the workshop leader, the artistic director (CV), and the scientific director (MS).

This study was conducted in accordance with the ethical standards set forth in the 1964 Declaration of Helsinki and its subsequent amendments. The hospital's Ethics Committee of Rome (protocol number 219/CE LAZIO1 dated 22/01/2021) approved the study.

Participants

Participants were recruited thanks to the collaboration of the Italian Fibromyalgia Syndrome Association, a nonprofit organisation (AISF odv), through newsletters.

Inclusion criteria were:

- Age >18 years;
- Ability to understand and sign informed consent;
- Diagnosis of FM according to ACR 2010/2011 criteria (6).

Exclusion criteria were:

- Comorbidities with severe mental disorders or neurodegenerative diseases that would limit their ability to participate in the study.

For physicians and caregivers included in Workshop 1, inclusion criteria were:
- Age >18 years;
- Ability to understand and sign informed consent;
- Experience with patients with FM.

Those participants who were interested and agreed to participate signed a written informed consent.

A total of 106 out of 113 patients with FM who met the selection criteria were recruited, as well as 48 physicians and caregivers.

Study arms

The study was divided into three different transdisciplinary artistic-transformative experiences: Workshop 1 ('Art that heals'), Workshop 2 ('Recalibrating'), Workshop 3 ('Ascending to the background by crossing the boundary'). Each participant chose which research arm to participate in according to their personal inclinations.

Workshop 1 ('Art that heals')

56 patients and 48 physicians and caregivers were recruited. Each group was composed, where possible, of 5 patients and 5 physicians/caregivers. In addition to the preliminary meeting for the presentation of evaluation tools and administration of tests at time 0 and a final meeting for the administration of tests at time 1, each group participated in 2 meetings, with a two-day interval between the two. The artistic director, expert in transdisciplinarity (CV), the scientific director, expert in narrative medicine (MS), and a psychotherapist (GC) acted as conductors and were present at all meetings.

In the preliminary phase, each patient was asked to complete a complete medical history form and a motivational form, in which they highlighted a specific problem or difficulty in their life for which they could not find a solution (also creating a priming effect on the traumatic experience). The first meeting, lasting about 4 hours, was structured around the enjoyment of art through audio-visual media. The audio-video was processed using a method similar to that used for thematic apperception tests (TAT), which use art as an ambiguous stimulus to identify personality and detect some of the particular dominant emotions, feelings, complexes, and conflicts of personality (7, 8). This ambiguous stimulus was pursued through the use of contemporary art museum works filmed in a 'cinematic' way focused on the natural movement of the gaze, integrated with a 'disturbing' audio track, with the intention of causing discomfort and fear to generate hyperplastic transient and intense mental and cerebral states (PIMS), which according to Brouwer's theory (9) occur under conditions where acute stress intervenes in a condition of chronic stress producing physiological and functional changes. The audio-video medium lasted about 20 minutes. After enjoying it, all participants were invited to choose the work that had produced the greatest involvement in them and to complete a guided narration form, which integrated two questions inspired by visual thinking strategies (VTS) techniques (10-12): (i) What story does it tell? (ii) Looking at the painting, what situations come to mind?

We instructed the participants to complete a narration form based on the chosen work and the story told, and to include personal elements related to the emotions they felt during the viewing. The criteria of narrative medicine were used to guide this process (13, 14). Patients then read their narration forms while doctors/caregivers and all participants listened carefully. At the end of the exercise, participants were invited to ask questions to deepen or clarify aspects of the narration. This created a fruitful, transdisciplinary exchange enriched by all different points of view (15). Using the material written by the patients, combined with the contents that emerged during the dialogues, the artistic director created a brief elaboration in the form of a poem that we called bio-narrative poetic-metaphorical-transformative (bio-NPMT). This elaboration included a synthesis of the patient's biography, obtained using his or her own words but reassembling the story in order to highlight the traumatic node that emerged, for its integration into the patient's experience, and its possible transformation (word/key technique and subsequent shifting) (16). In the second meeting, lasting about two hours, each patient was given his or her own bio-NPMT and was asked to reflect on it and try to answer the initial form question again (individual problem considered insoluble), to verify possible visions of resolution. The doctors were then asked to develop a personalised therapeutic indication in the following days, using the bio-NPMT as a guide, along with the data contained in the medical history form. At the final meeting, the doctors read the therapeutic indications and further discussion was opened up. The time 1 tests were completed after 3–5 days.

Workshop 2 ('Recalibrate')

This workshop had 17 participants and consisted of a total of 14 meetings, each lasting four hours, in addition to the preliminary and final meetings. In the first seven meetings, the facilitator (LC), one of the leading Italian experts in poetry therapy and autobiographical methodologies in relationship counselling, guided the participants in expressing their realities of chronic disease/illness/sickness through verse. In the second seven meetings, the facilitator (GDA), an expert in creative writing workshops, invited the participants to re-elaborate their experiences of illness using creative writing in prose, using humour as a transformative experience (TE) (17) to allow a reversal of the narrator's point of view. Three different stories were elaborated in succession: the first story humorously described one's condition from a stranger's point of view (fictional); the second humorously described one's condition from a family member's point of view (fictional); and the third humorously described one's condition from one's own point of view (real).

Workshop 3 ('Tracing back to the background crossing the border')

This workshop had 40 patient participants and consisted of three meetings, each lasting three hours, in addition to the preliminary and final meetings. In each meeting, after explaining the proposed exercise through slides and completing the exercise through draw-

ings, geometric logic games, or short narratives, ample space was given for discussion and feedback. In the first meeting, the coordinator (YP) proposed an autobiographical self-reflective path aimed at stimulating the recognition of what is hidden from patients' habitual gaze, their habitual way of thinking and telling themselves their identity and experiences, using a mixed methodology (frontal/interactive with skill exercises through drawing and the use of tables on visual perceptual illusions). This methodology was chosen for its function of inducing a change in perspective, making the perception of "foreground" and "background" ambiguous (18). In the second meeting, the theme of emotional self-awareness was developed through a mixed methodology (frontal/interactive) as the ability to manage one's dissonant emotions (19). In the third meeting, the humorous methodology was used for transformative purposes through a mixed approach (frontal/interactive, with skill and creativity exercises), intended as a particular way of approaching reality using lateral, creative thinking, with the use of the bi-associative technique, the operation that brings together two reference schemes or associations of reasoning that are usually considered incompatible to produce a transformative displacement (20, 21).

Outcome measures

- Rosenberg self-esteem scale (RSES) (22): was used to measure self-esteem. This instrument consists of 10 items that are answered on a four-point Likert scale. The total scores of each scale range from 10 to 40. Higher scores indicate higher self-esteem.
- Perceived auto-efficacy in complex problem management scale (SAP) - Italian version (23): consists of four different dimensions: emotional maturity, *i.e.* people's beliefs about their ability to manage stressful situations, to face unexpected events, to have good self-control over difficult events and situations; finalisation of the action, *i.e.* people's beliefs about their ability to set concrete and achievable goals; relational fluidity, *i.e.* people's beliefs about their own ability to interact and compare with others, to give and ask for help, to maintain good relations with others and to manage interpersonal conflicts; context analysis: people's beliefs about their ability to 'read' the context in which they operate in, to understand the requests that come from the people of the environment, to use an appropriate language for the different circumstances. The total score is obtained by summing each answer of the questionnaire;
- Mindful attention awareness scale (MAAS) (24): is a self-report measure designed to assess present attention and awareness. It includes 15 items to be rated on a 7-point Likert scale from 1 (almost always) to 7 (almost never), with higher scores being indicative of greater mindfulness.
- WHO5: The 5-item World Health Organisation Well-Being Index (WHO-5) is a short and generic global rating scale measuring subjective well-being. The WHO-5 was derived from the WHO-10 (25) and was subsequently validated (26). It comprises 5 positively phrased aspects of well-being in a single uni-dimensional scale.
- Pittsburgh sleep quality index (PSQI): it retrospectively measures sleep quality and disturbances, and provides a brief but clinically useful assessment of multiple sleep disturbances (27). It consists of 19 items that generate seven component scores, the sum of which (range 0–21) yields a global measure of sleep quality, with higher scores indicating poorer sleep (>5 indicates sleep disturbance);
- Euroqol-5d (EQ5D): EQ-5D is an instrument which evaluates the generic quality of life developed in Europe and widely used. The EQ-5D descriptive system is a preference-based HRQL measure with one question for each of the five dimensions that include mobility, self-care, usual activities, pain/discomfort, and anxiety/depression (28).

Table I. Demographic characteristics of the study population.

Demographic data	Total FM (n=109) Mean (SD) or n (%)
Age (years)	52.9 (10.9)
Sex	
Females	106 (97.3)
Males	3 (2.7)
Years from diagnosis	11.2 (8.6)
BMI (kg/m^2)	24.6 (4.6)
Marital status	
Married/living with partner	46 (42.20)
Single	58 (53.21)
Widowed	3 (2.75)
NR	2
Education level	
Secondary school	11 (10.09)
High school	37 (33.94)
University degree	58 (53.21)
NR	3

Table II. Clinimetric test medians and interquartile (IQ) ranges of the study population at baseline.

Clinimetric test	Total FM (n=109) Mean (IQ range)
PSQI	11 (8 to 14)
MAAS	3.7 (3,3571to 4,3571)
SAP	16 (14 to 19)
EQ5D	50 (40 to 60)
WHO5	28 (16 to 44)
RSES	18 (14 to 22)

PSQI: Pittsburgh Sleep Quality Index; MAAS: mindful attention awareness scale; SAP: Perceived Autoefficacy in Complex Problem Management Scale (Italian); EQ5D: Euroqol-5d; WHO5: 5-item World Health Organisation Well-Being Index; RSES: Rosenberg self-esteem scale.

Results

109 FM patients completed the study. Three of them were males. All patients completed the questionnaires, but only sixty-seven of them shared their demographic data (age, height, weight, years from diagnosis). Among these, the mean age was 52.9 (standard deviation [SD] 10.9), mean BMI 24.6 (SD 4.6) and mean years from diagnosis 11.2 (SD 8.6). Population characteristics in term of demographic data are shown in Table I.

The totality (n=109) of FM patient sample completed all the clinimetric tests at baseline. Medians and interquartile ranges (IQ ranges) of the study are shown in Table II.

Analysis of final grouped data

Data analysis made by a Wilcoxon

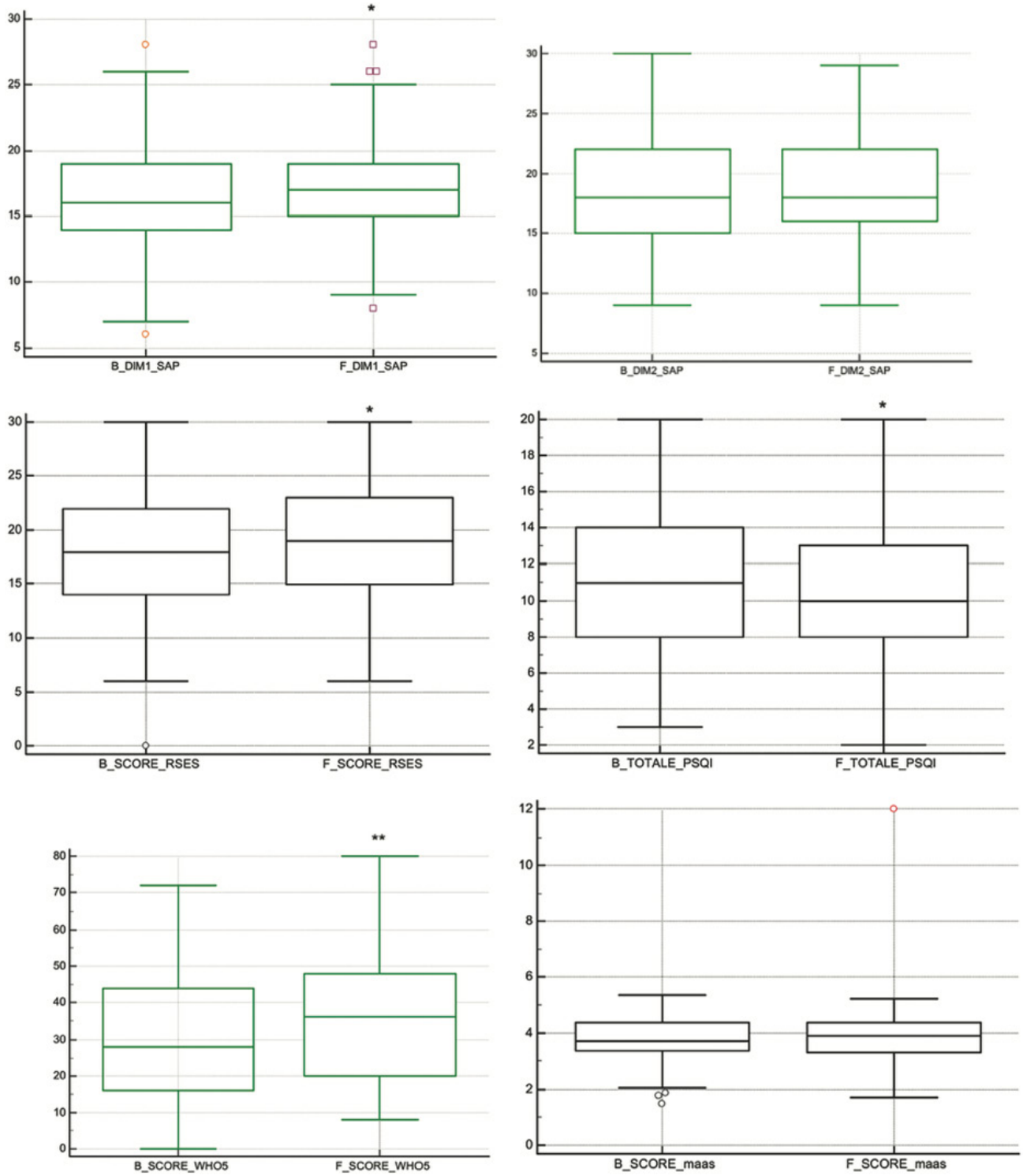


Fig. 1. Blox plots showing PSQI, MAAS, WHO-5, RSES clinimetric tests of the study population altogether after the intervention. **: $p<0.001$; *: $p<0.05$. PSQI: Pittsburgh Sleep Quality Index; MAAS: Mindful attention awareness scale; SAP: Perceived Autoefficacy in Complex Problem Management Scale (Italian); WHO5: 5-item World Health Organisation Well-Being Index.

non-parametric test of the three groups in conjunction showed a statistically significant amelioration of the PSQI ($p<0.05$), RSES ($p<0.05$), WHO5 ($p<0.001$) and EQ5D ($p<0.05$) (Fig. 1). No significant difference was found for MAAS ($p=0.2663$). Dividing the SAP in its different domains, a significant effect of the intervention was found for Domain 1 ($p<0.05$), but not for Domain 2 ($p=0.1110$), 3 ($p=0.8908$) and 4 ($p=0.4567$) (Fig. 2).

Analysis of final data divided by intervention

A Wilcoxon non-parametric test was performed to compare baseline and final results of the three groups separately (Fig. 3). The best performance was

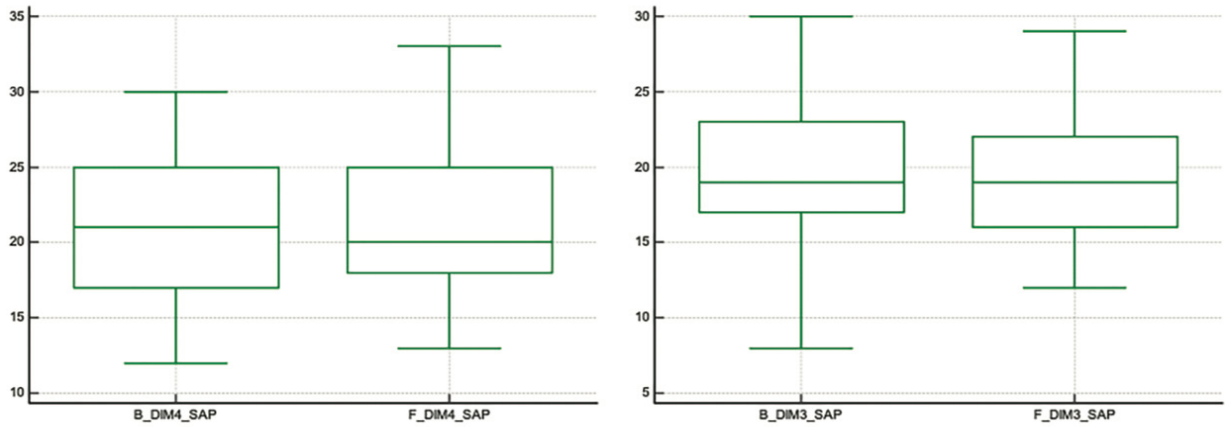


Fig. 2. Blox plots showing the other dimensions of the SAP of the study population altogether after the intervention. *p<0.05.

seen in Group 3, since patients ameliorated in almost all parameters: PSQI (p<0.05), GH (p<0.05), SAP dimension 1 (p<0.05), 2 (p<0.05) and 4 (p<0.05), WHO-5 (p=0.0013). MAAS (p=0.895), RSES (p=0.0673) and SAP dimension 3 (p=0.0573) resulted nonsignificant, although very close to significance. Sleep (p<0.05) and the 3rd dimension of SAP (p<0.05) improved in patients of Group 2; whilst self-esteem (p<0.05) and WHO-5 (p<0.05) did in Group 1.

Specifically, it was found that the 3rd study arm (humour therapy with bi-sociative technique) resulted in improvement in almost all evaluated parameters, particularly in the quality of sleep, overall health status, self-efficacy (in the dimension related to emotional maturity, analysis of the context, and goal setting), perceived well-being, attention, and self-esteem; the 2nd study arm (re-calibrating writing workshop) resulted in improvement in the quality of sleep and self-efficacy (in the dimension of relational fluidity); the 1st study arm (audio-visual art therapy) resulted in improvement in self-esteem and perceived well-being.

In addition to the quantifiable results of administered tests, patients who participated in the first study arm reported the following experiences:

- A deep emotional content emerged in a single session, similar to what typically arises after years of psychotherapy;
- Patients perceived greater clarity regarding their own psychophysical condition;
- Patients felt more empowered, experiencing an increase in autonomy and decision-making ability in their lives. In some cases, this led them to take action they had postponed for years;
- Almost all patients fully accepted the use of the bio-NPMT card as a diagnostic tool, and many immediately identified with the proposed metaphorical synthesis.

Results

The tests demonstrated improvements in several parameters: self-esteem in arm 1; perceived well-being in arms 1 and 3; sleep quality in arms 2 and 3; perceived self-efficacy (relational fluidity dimension) in arm 2; general health status in arm 3; perceived self-efficacy (in dimensions related to emotional maturity, contextual analysis, and goal setting) in arm 3; and attention in arm 3.

The lack of improvement in the MAAS across all arms might be attributed to a structural bias related to the choice of test type. The proposed activities encourage a process of free association and introspection, which does not focus on logical-rational activities.

Arm 1. Improvement in self-esteem and perceived well-being. Group 1, subjected to stress-inducing stimuli, facilitated the emergence of emotionally unsettling content in the immediate term but aimed at subsequent transformation. This methodology did not initially provide patients with a sense of a structured and secure pathway (as guided by the facilitators). Instead, it fostered emotional fluidity, "forcing" subjects to seek guidance in greater self-awareness and self-esteem, which later emerged in the tests alongside perceived well-being. This was attributed to the welcoming and non-judgmental group atmosphere. Furthermore, this arm involved only one transformative session (the other two were focused on experiential feedback) and employed a complex methodology that may not be well-suited for purely quantitative evaluation.

Qualitative outcomes reported by patients:

- Emergence of profound emotional content within a single session, compared to years of psychotherapy.
- Greater clarity regarding their psychophysical condition.
- Increased sense of responsibility, autonomy, and decision-making capacity, leading to long-postponed actions.
- Full acceptance of the bio-NMT card as a diagnostic tool, with many patients identifying immediately with the proposed metaphorical synthesis.

Arm 2. Improvement in sleep quality and perceived self-efficacy (relational fluidity dimension).

This group was the longest, encompassing 16 weekly sessions. This duration likely facilitated strong group dynamics and a perception of building a useful process to address experiences of illness and trauma, leading to emotional relief and improved sleep.

Arm 3. Improvement in sleep quality, general health status, self-efficacy (in emotional maturity, contextual analysis, and goal-setting dimensions), perceived well-being, and self-esteem. This group used the bisociative humour

technique, stimulating both emotions (surprise, amazement) and rationality (recognising previously unperceived connections). The intensive nature of the work (three sessions) and the focus on laboratory activities (drawing, writing) created a favourable group environment for experience-sharing. Significant quantitative improvements in contextual analysis, goal-setting, and self-esteem were likely compounded by the improvements in sleep quality and general health perception, which were linked to emotional relief fostered by the methodology and group climate.

Discussion

The psychological profile of patients with FM is recognised as a determinant in the syndrome's phenomenological complexity (29). However, FM is no longer classified as a somatoform mental disorder (30). Studies indicate that women with fibromyalgia exhibit lower levels of positive psychological resources (*e.g.*, life satisfaction, optimism, emotional repair) and higher levels of negative resources. Thus, tailored therapies targeting deficits in positive psychological resources could be of clinical interest (31). Both biological and psychosocial factors play a fundamental role in determining, exacerbating, and perpetuating FM symptoms. Consequently, integrated therapeutic approaches, including psychoeducational or psychological support therapies, are appropriate for these patients. While chronic widespread pain, fatigue, sleep disturbances, and other somatic symptoms have neurophysiological and endocrinological bases, these biological aspects are also correlated with psychological variables (32). From a psychoneuroendocrine-immunology (PNEI) perspective, psychological, neurological, endocrine, immune, and environmental factors contribute to at least some of the dysfunctional mechanisms underlying FM.

This study aimed to establish correlations between psychological transformation and organic health status, based on a PNEI approach, and validate the use of transformative artistic experiences as part of a multimodal therapy for FM (33). Our research did not focus on traditional art therapy, which is generally considered complementary and/or supportive to standard multimodal therapy, as indicated by the WHO (34), and is already utilized for the treatment of FM. Instead, it was based on the idea that art, when applied in a transformative manner, can induce decisive and lasting psycho-physical changes, likely mediated by the endocannabinoid system (ECS) and psychoneuroimmune modulators (PIMS).

The analysis of this study's results demonstrates that transformative artistic laboratories led to improvements in parameters such as self-esteem in arm 1; perceived well-being in arms 1 and 3; sleep quality in arms 2 and 3; perceived self-efficacy (relational fluidity dimension) in arm 2; general health status; and self-efficacy (in dimensions related to emotional maturity, contextual analysis, and goal setting), along with attention, exclusively in arm 3. No improvements were observed in specific parameters, such as the MAAS scale (mindfulness and awareness).

TA may function as a mediator in overcoming trauma/stressors (both psychological and biological) within a PNEI framework, by reactivating the ECS, which is deficient in FM, as highlighted by E. Russo (35). From a practical perspective, these strategies could be integrated into FM therapy as workshops offered to patients during their care pathways, within a multimodal or preferably transdisciplinary (TrDip) setting (36). Collaborations with cultural institutions, as seen in existing global practices, could further foster intersectoral dialogue for integrated projects bridging culture and healthcare systems (37, 38). This approach could relieve the rheumatologist's workload, as patient educational activities (functional adaptation to the disease) would be handled within the transformative artistic framework, achieving results in significantly less time compared to supportive psychotherapy. Moreover, TA could yield significant clinical improvements as its action on the ECS would offer advantages both in emotional regulation, akin to traditional art therapy, and physiological benefits by addressing ECS hypofunction related to system wear and tear.

Group 1: 'Art that heals'

The hypothesis underlying this approach draws from Semir Zeki's studies on the neuroaesthetics of the sublime (35) and his essay on the "visual shock" in Francis Bacon (39), which suggests that the experience of the sublime extends beyond sensory experience by activating brain areas involved in imagination. Based on this, we hypothesised that art could serve as an effective catalyst in implementing transformative experiences (ET) (17) within a very short time frame.

The projection of traumatic contexts was posited to be facilitated by the activation of top-down processes described by Erik Kandel (40-42). According to Kandel, greater image ambiguity requires higher levels of observer engagement (43). In this study arm, 25 patients spontaneously correlated the narrative perceived in their chosen artwork during the audio-visual experience with events in their own lives. Another 28 patients achieved similar correlations during group discussions. Three participants withdrew, remaining at a more formal conversational level.

TA allowed many patients to express profound emotional content that had not been clarified even after years of psychotherapy. The process involved healthcare professionals from various specialties, offering diverse perspectives on patient care. The TrDip method (44) enabled the integration of specialised expertise through the bio-NMT tool-a transformative framework developed from previous research on the use of metaphor in psychotherapy (16) and narrative medicine (45).

By reaching a symbolic re-elaboration of their lived experiences (45), patients used this metaphorical synthesis as a lens to highlight issues emerging during sessions. Sharing the anamnesis card and bio-NMT with their treating physician facilitated a "three-dimensional view" of the patient.

Laboratory 2: 'Recalibrating'

The first phase focused on exploring autobiographical experiences using Poetry Therapy, led by Dr. L. Cupane. Poetry's intrinsic qualities, including

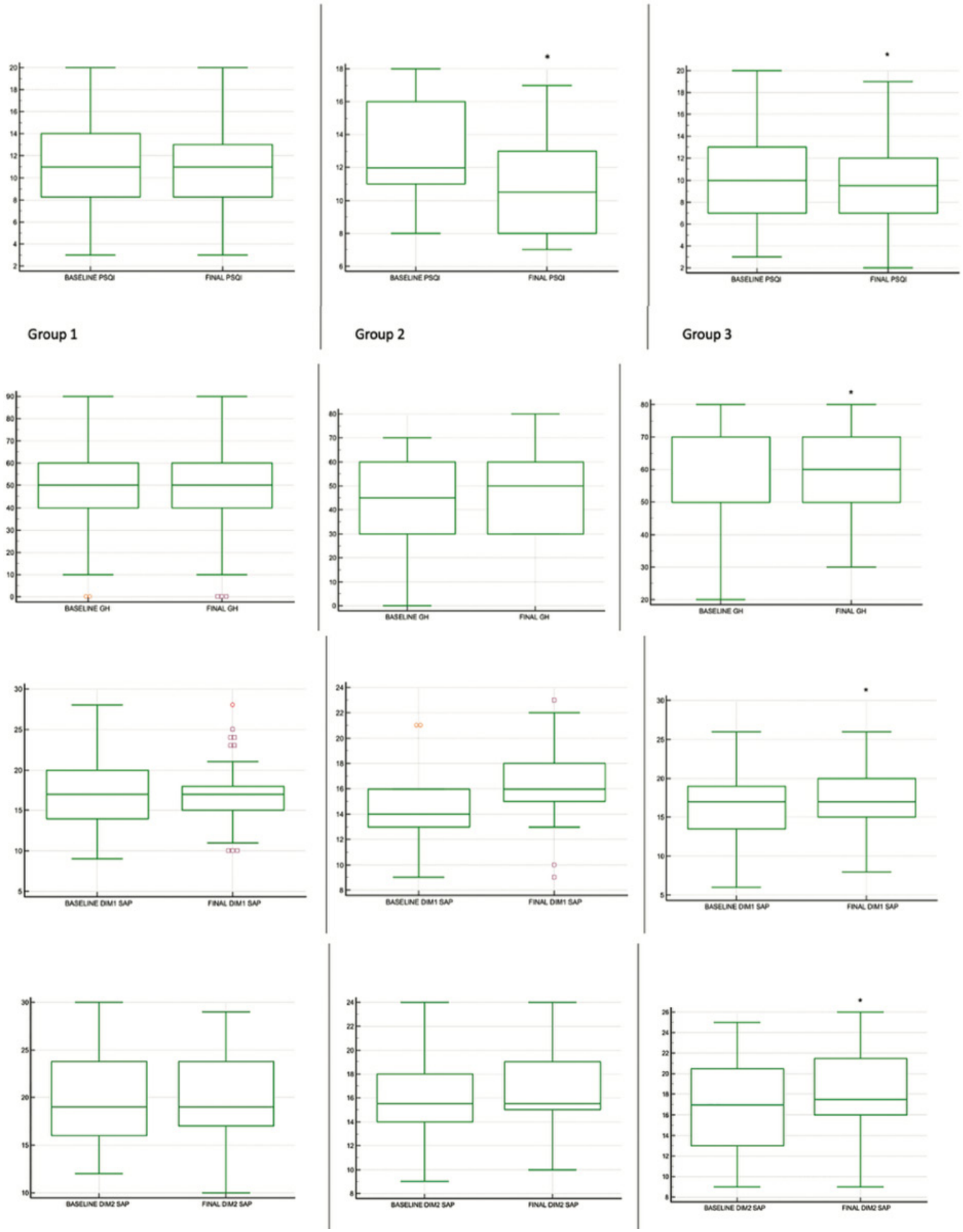
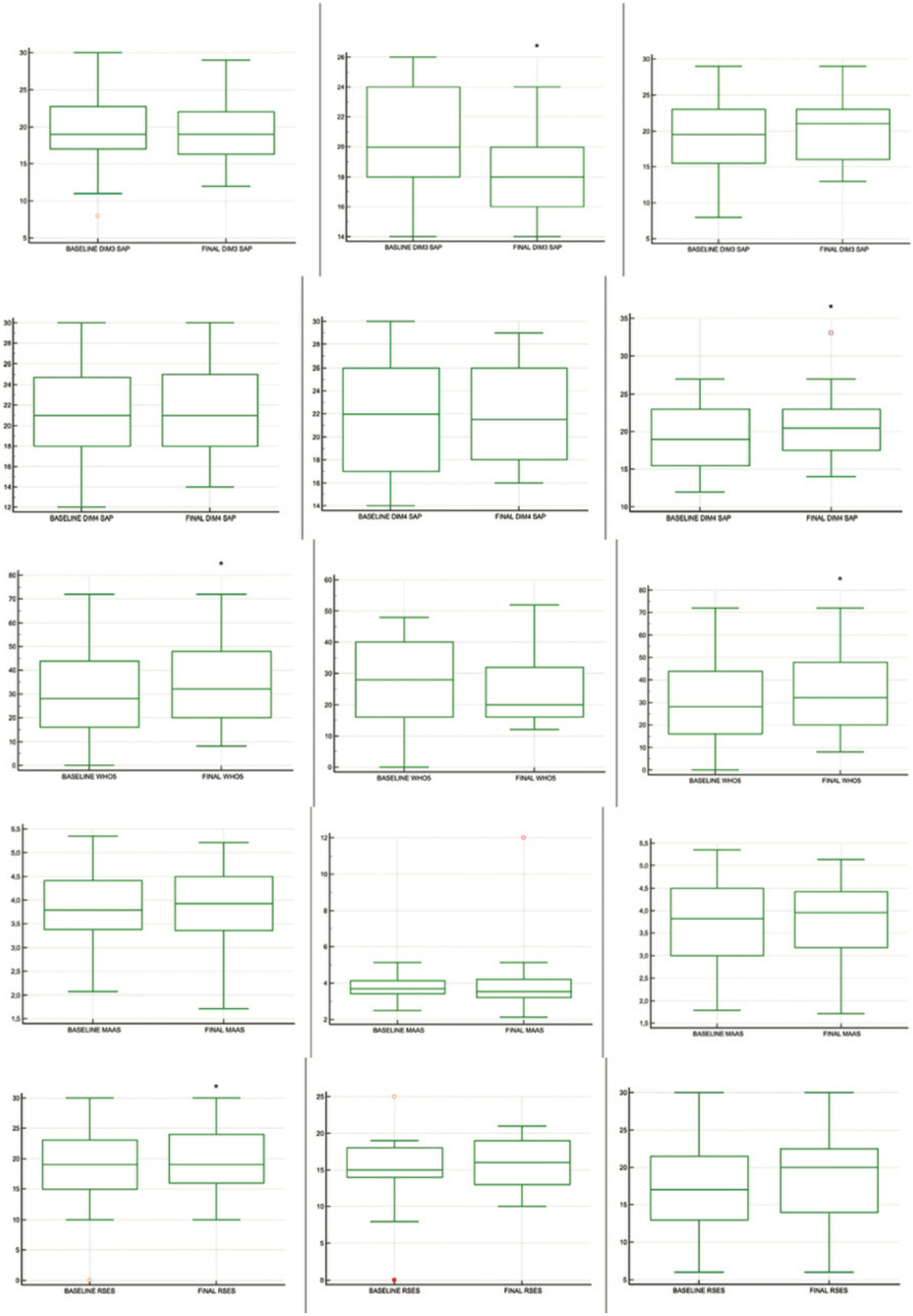


Fig. 3. Box plots of clinimetric test results after the intervention, divided in the three intervention groups.
PSQI: Pittsburgh Sleep Quality Index; MAAS: mindful attention awareness scale; SAP: Perceived Autoefficacy in Complex Problem Management Scale (Italian); WHO5: 5-item World Health Organisation Well-Being Index.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rhythm, soundplay, synesthesia, imagery, metaphor, oxymoron, and other rhetorical figures, were deemed valuable for transformation and healing. These elements facilitate a dialogue and reconnection between fragmented or conflicting experiences, balancing polarities within individuals and fostering a sense of wholeness and harmony (46).

Sharing personal emotions and experiences enabled group members to recognise parts of themselves and others, fostering a sense of belonging to a community with shared challenges related to illness.

The transformative work in the second phase, led by G. D'Amato, encouraged participants to reframe their illness narratives (previously expressed in poetic form) through creative prose writing with a humorous tone. Humour facilitated a narrative perspective shift, aligning with the study's objectives. This approach encouraged participants to address challenging topics with lightness, maintaining respect for the individual and their story.

Laboratory 3: 'Crossing boundaries to the unseen'

The transformative function of humour lies in its cognitive structure, enabling a dual perspective that allows for instantaneous meaning shifts. In contexts involving pain, humour operates as a powerful therapeutic tool, as demonstrated by recent research (47). Initiating interpretive leaps represents a critical first step toward change, with humour provoking such leaps by reframing habitual perspectives.

This workshop was designed as a reflective journey along the boundary between the seen and unseen, the conscious and unconscious-dimensions especially relevant to the invisible nature of FM. This boundary, which simultaneously separates and unites, depends on how it is crossed and utilised. The bisociative humour methodology employed (48) demonstrated its capacity to disrupt normal patterns, creating new interpretations and revealing latent aspects of personal experiences for novel ways of seeing, evaluating, and acting.

Limitations

- Challenges in structuring a standardised methodology due to diverse media and techniques.
- Lack of clarity in designing a linear study methodology, given the absence of comparable studies correlating multiple interdisciplinary findings.
- Difficulty in sourcing validated tests suited to measuring psychobiological and qualitative parameters correlated with the interventions.
- Absence of follow-up evaluations 2–3 months post-workshop to assess long-term effects.
- Limited qualitative analysis.
- Challenges in implementing the bio-NMT due to insufficient time and resources for training clinicians during arm 1 workshops.

Conclusions

This study applied art in a transformative sense. Despite observed biases, the findings support the hypothesis that TA experiences improve the psychophysical conditions of FM patients.

Within a PNEI framework, psychological, neurological, endocrine, immune, and environmental factors collectively contribute to FM dysfunctions. Cognitive-behavioural strategies and approaches targeting psychosocial and occupational dimensions are recognised as effective in multimodal FM management (33). Some studies have revealed that women with fibromyalgia exhibit lower levels of positive psychological resources, such as life satisfaction, optimism, and emotional repair, alongside higher levels of negative psychological resources. Consequently, developing tailored therapies for fibromyalgia aimed at addressing deficits in positive psychological resources could be of significant clinical interest (31).

Further investigation into the role of mitochondrial dysfunction in the pathogenesis of fibromyalgia (49) could provide valuable insights. This includes considering mitochondrial imbalances as preliminary biomarkers for diagnosis and follow-up in fibromyalgia patients and assessing the efficacy of various therapies. Additionally, exploring the role of mitochondria as mediators of the psyche-soma interaction (50, 51), the emerging field of mitochondrial psychobiology (52), which links psychic and biological processes, and the correlation with the endocannabinoid system (ECS), given the presence of cannabinoid receptors in mitochondria (mtCB1) (50, 51), could enhance our understanding of this complex syndrome.

To establish transformative parameters that enhance the efficacy of TA, further research on the neurobiological correlates of artistic experiences, including immersive technologies, is warranted. Studies such as those conducted by Riva *et al*. (53), have demonstrated the potential of using transformative experiences of sublime aesthetics as stimuli. The results of our work encourage the continuation of TA laboratory activities within a comprehensive approach to managing fibromyalgia. This highlights the need for personalised treatment plans within a multimodal intervention framework that incorporates lifestyle modifications and psychological strategies for chronic pain management (54). We propose integrating TA into a weekly multidisciplinary programme comprising educational activities, physical therapies, ergonomic guidance, postural orientation, combined cognitive-behavioural strategies, and psychosocial and occupational management strategies. Such a programme could be beneficial for improving the quality of life and clinical expression of FM patients (33).

In our proposal, all activities should be conducted within a transdisciplinary (TrDip) framework to ensure an integrated and holistic approach.

Future research should explore mitochondrial dysfunction's role in FM pathogenesis and its potential as a biomarker for diagnosis and treatment evaluation. Correlations between the ECS, mitochondrial cannabinoid receptors (mtCB1), and mitochondrial psychobiology (50-52) should also be investigated. Further insights into the neurobiological correlates of transformative artistic experiences-mediated by immersive technologies (53) may enhance the definition of TA parameters for greater efficacy.

TA activity could be integrated into weekly multidisciplinary programmes tailored to improving FM patient quality of life, within a transdisciplinary framework addressing lifestyle and psychological attitudes toward chronic pain (54).

We propose integrating TA into a weekly multidisciplinary programme comprising educational activities, physical therapies, ergonomic guidance, postural orientation, combined cognitive-behavioural strategies, and psychosocial and occupational management strategies. Such a programme could be beneficial for improving the quality of life and clinical expression of fibromyalgia patients (33).

In our proposal, all activities should be conducted within a transdisciplinary (TrDip) framework to ensure an integrated and holistic approach.

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