

Combining traditional context and sailing in the psychological approach to patients with muscular dystrophies. A pilot study

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Introduction. Muscular diseases (MDs) are rare genetic conditions marked by progressive motor, cardiac, and respiratory decline, often accompanied by significant psychological and social challenges. Anxiety, depression and reduced quality of life (QoL) are common among individuals with MDs, highlighting the importance of integrating psychological assessment and support into multidisciplinary care. Although evidence on psychosocial interventions remains limited, emerging research suggests that nature-based therapeutic activities – particularly adapted sailing – can reduce anxiety and enhance psychological well-being in people with various disabilities. Recent studies indicate improvements in state anxiety, QoL, and respiratory perception associated with exposure to the marine environment.

Patients and methods. Based on this evidence, the multidisciplinary team of the Naples NeMO Clinical Center developed the “Anima Libera” project, a sailing-based therapeutic program aimed at evaluating the psychological and clinical effects of an integrated intervention for individuals with muscular diseases.

The project included 12 patients with different types of muscular dystrophies aged between 28 and 55 years.

Results. All patients showed an improvement in psychological well-being and respiratory parameters.

Discussion and conclusions. These data, although preliminary indicate that sailing could act as a complementary therapeutic tool within psychological support and rehabilitation programs for patients with muscle diseases.

Key-words: muscular dystrophies, quality of life, psychological intervention, sailing

Introduction

Muscular diseases (MDs) are a heterogeneous group of rare and genetic conditions characterized by the progressive deterioration of motor, cardiac and respiratory functions. In addition to physical limitations, they have a significant impact on psychological and social aspects. Anxiety and depression are frequently associated with chronic conditions¹, and in patients with muscular disorders, quality of life (QoL) and mood are often compromised². Psychological variables appear to play an important role in these outcomes suggesting the potential effectiveness of targeted interventions. However, the available literature remains limited³. Several authors have emphasized the importance of psychological factors in QoL and mood among patients with MDs, highlighting the central role of specific psychological

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interventions⁴. Psychology plays a crucial role in comprehensive care so psychological assessment and support should be integrated within the multidisciplinary approach to MDs⁵.

Nevertheless, as highlighted by Walklet et al.⁶, there is still no definitive evidence on the effectiveness of psychosocial interventions in improving well-being in this population, despite some promising data. In recent years, there has been growing interest in innovative therapeutic approaches based on nature experiences, which may reduce stress and promote psychological well-being. Among these, sailing has received particular attention. One qualitative study⁷ and five quantitative studies⁸⁻¹² have investigated the potential impact of adapted sailing activities in individuals with physical disabilities resulting from neurological^{7,8} or oncological conditions⁹⁻¹³. These experiences have been shown to function as therapeutic tools associated with a significant reduction in state anxiety and an improvement in psychological quality of life. Moreover, some studies reported decreases in both state and trait anxiety at follow-up⁹.

The results of a recent review¹⁰ confirm the positive impact of adaptive sailing activities as part of rehabilitative and social interventions in different populations with various degrees of disabilities and psychopathology.

In addition to psychological and social benefits, it is important to note that contact with the marine environment also brings physiological benefits: air rich in negative ions, the reduced exposure to pollutants, and the relaxing sensory stimuli promote ventilation and improve respiratory perception. Some studies have documented increases in peripheral oxygen saturation and reductions in dyspnea among patients with chronic respiratory diseases exposed to the marine environment¹⁴.

In light of this evidence, the multidisciplinary team at the Naples NeMO Clinical Center, composed of psychologists, physiotherapists, nurses, physicians, and other healthcare professionals developed the “Anima Libera project”, a sailing therapy intervention designed for individuals with muscular diseases. The project aimed to assess the psychological and clinical effects of a combined therapy that included sailing.

Patients, Methods and Instruments

Patients

Inclusion and Exclusion criteria

Inclusion criteria were confirmed diagnosis of muscular dystrophy, clinical stability for at least three months prior to enrollment, and ability to participate in group and sailing activities with the support of a caregiver. Exclusion criteria included acute respiratory exacerbations, severe cardiac comorbidities, or cognitive impairment interfering with participation.

Methods

Anima Libera project description

The program included eight sessions led by the psychologist and structured as follows:

- 4 *in-person sessions*, held weekly and focused on psycho-ed-

ucation, emotional management, relaxation techniques and experience sharing;

- 4 *sailing sessions*, held biweekly, focused on experiential dynamics, cooperative exercises, body and breathing awareness, in which sailing was used as a metaphor for resilience.

Each in-person session lasted approximately two hours and followed a semi-structured format. The four main areas of intervention (psychoeducation, emotional management, relaxation techniques, and experience sharing) were defined at the beginning of the program. Each meeting was dedicated to one of these themes maintaining a flexible structure that allowed participants to bring personal reflections and experiences to the discussion.

The sailing sessions, carried out at the end of the psycho-educational sessions and each lasting approximately three hours took place in the Gulf of Naples, in collaboration with a sailing instructor and the multidisciplinary clinical team. Although the patients primarily acted as passengers on board, they also participated in experiential sessions involving relaxation and body-breathing awareness techniques. The sessions were conducted in small groups of patients, not simultaneously.

Instruments

Psychological assessment was evaluated through the following instruments

1. The **Beck Depression Inventory-II (BDI-II)**¹⁵ which is a validated tool for the assessment of depression. Systematic administration of the BDI-II allows for the early identification of depressive symptoms, enabling for the timely activation of appropriate support programs. The BDI-II consists of 21 items, each evaluating a depressive symptom on a 4-point Likert scale referring to the previous two weeks. The total score ranges from 0 to 63, classified as follows:

- 0-13: minimal or no depression
- 14-19: mild depression
- 20-28: moderate depression
- 29-63: severe depression

A cut-off score of 14.5 was adopted which is frequently used to identify clinically significant depression in patients with neurodegenerative conditions¹⁵.

2. The **Hospital Anxiety and Depression Scale (HADS)**^{16,17}, specifically developed for medical settings, excludes somatic items and reduces the risk of false positives, making it suitable for patients with MDs. The HADS consists of 14 items divided into two subscales: 7 assessing anxiety (HADS-A) and 7 assessing depression (HADS-D). Each item is scored on a 4-point Likert scale ranging from 0 to 3, with higher scores indicating greater symptom severity. The total score for each subscale ranges from 0 to 21. According to the standard cut-off values, 0-7 indicates a normal range, 8-10 indicated a borderline or mild symptomatology, and 11-21 indicate clinically significant anxiety or depression. The questionnaire refers to the patient's psychological state in the previous week. The absence of somatic items makes this tool particularly suitable for populations with chronic or progressive physical conditions, such as muscular dystrophies¹⁵. Psychological assessments were conducted at baseline (T0) and at 6 months (T2).

Respiratory assessment

A portable pulse oximeter (Gima S.p.A, Gessate, MI) was used to

measure peripheral oxygen saturation (SpO₂) at rest, and a portable spirometer (Minispir MIR, Gima S.p.A. Gessate, MI) to measure forced vital capacity (FVC) and forced expiratory volume in the first second (FEV1) in order to monitor the potential ventilatory benefits associated with sailing. Respiratory rate (RR) was measured manually at rest. Measurements were performed at baseline (before the start of the program) (T0), on board (during the fourth sailing session) (T1) and at 6 months (T2).

Qualitative Feedback Collection

At the end of the program, a structured qualitative feedback form with open-ended questions was administered to the patients to explore their subjective experiences in five areas: personal experience, psychological dimension, relational dimension, bodily and respiratory dimension, and the symbolic meaning of sailing. The questionnaire consisted of five open-ended questions, one for each thematic area, designed to encourage spontaneous and reflective responses. The form was completed individually with the psychologist's support and was used to complement quantitative data with narratives and lived experiences. Caregivers were allowed to provide logistical assistance when needed but the answers were given personally by the patients to ensure the authenticity of individual perspectives. The psychologist facilitated the process in a quiet environment at the NeMO Clinical Center, immediately after the last sailing session. Qualitative data were analyzed using a thematic content analysis approach. All responses were transcribed verbatim, grouped by thematic area and coded independently by two psychologists. This qualitative analysis was used to complement the quantitative results with patients' narratives and lived experiences.

Statistical analysis

Psychological outcomes (BDI-II, HADS-A and HADS-D) were expressed as a mean and standard deviation (SD). Comparison between baseline and at 6 months values was performed by a paired t-test, the significance level being set at $p < 0.05$.

Respiratory outcomes were analyzed by the one-way ANOVA test to assess the differences between the three subsequent measurements (before, during and after intervention). The significance was set at $p < 0.05$. Tukey's HSD (Honestly Significant Difference) test was per-

formed to determine which specific means differed significantly from each other. Statistical analysis was performed using GraphPad Prism (GraphPad Software, version 10.0.2, San Diego, CA, USA)

Results

The intervention was proposed to twelve eligible patients. Eight patients with muscular dystrophies (4 affected by Duchenne muscular dystrophy, 2 affected by Becker muscular dystrophy and 2 from Limb-Girdle Muscular Dystrophy (LGMD) followed up at the NeMO Clinical Center in Naples agreed to participate to the project. They were six males and two females, with a mean age of 42.6 years (range 28-55). All had stable clinical conditions and were deemed eligible to participate in the activities. Each patient was accompanied by a primary caregiver who provided logistical support throughout the program. Four patients declined to participate for logistical or personal reasons.

Psychological outcomes

A descriptive analysis of the data revealed an overall improvement in depressive and anxiety symptoms among all participants at the end of the intervention, suggesting a general positive effect of the program on both mood and anxiety levels. Pre-intervention scores regarding depression assessed with the BDI-II ranged from 14 to 23, corresponding to mild or moderate depression. After the intervention, all subjects showed a significant reduction in scores, ranging from 7 to 15. Specifically, four patients moved into the "minimal" category, while the remaining four fell within the "mild" range. At the end of the program, no cases of moderate or severe depression were recorded indicating a clinically relevant and consistent improvement across the entire group. Depression scores, assessed using the HADS-D subscale, followed the same pattern. At baseline, three patients had pathological scores, four were borderline, and one was within the normal range. After completing the program, six patients returned within the normal range, while two (P1 and P5) had borderline scores. Again, no participant showed clinically significant depressive symptoms after the intervention.

The results from the HADS-A (anxiety) scale showed a similar posi-

Table 1. Individual psychometric scores at baseline and at 6 months.

Patient-	BDI-II Pre	BDI-II Post	HADS-A Pre	HADS-A Post	HADS-D Pre	HADS-D Post	Clinical outcome
P1	22 (moderate)	12 (mild)	13 (clinical)	8 (borderline)	11 (clinical)	7 (normal)	Improvement in anxiety and depression
P2	16 (mild)	8 (minimal)	10 (borderline)	6 (normal)	9 (borderline)	5 (normal)	Mood normalization
P3	19 (moderate)	13 (mild)	12 (clinical)	9 (borderline)	10 (borderline)	6 (normal)	Significant reduction of symptoms
P4	14 (mild)	7 (minimal)	11 (clinical)	7 (normal)	8 (borderline)	4 (normal)	Near-complete remission
P5	20 (moderate)	15 (mild)	14 (clinical)	10 (borderline)	12 (clinical)	8 (borderline)	Partial improvement
P6	17 (mild)	9 (minimal)	9 (borderline)	5 (normal)	10 (borderline)	6 (normal)	Return to normal range
P7	15 (mild)	7 (minimal)	8 (borderline)	4 (normal)	7 (normal)	3 (normal)	Disappearance of anxiety symptoms
P8	23 (moderate)	14 (mild)	13 (clinical)	9 (borderline)	11 (clinical)	7 (normal)	Significant improvement
Mn ± SD	18.25 ± 3.28	10.63 ± 3.25*	11.25 ± 2.12	7.25 ± 2.12°	9.75 ± 1.67	5.75 ± 1.77#	
Legenda: * $p < 0.0001$; ° $p < 0.0021$; # $p < 0.0003$.							

tive trend. At baseline, four patients had a score in the pathological range (≥ 11), three were borderline (8-10), and only one was within the normal range. After the intervention, all scale scores decreased: five patients returned within the normal range, and three were borderline although improving compared to baseline levels. No participants reported scores consistent with clinically significant anxiety at follow-up. The analysis of psychometric scores at baseline and at 6 months is shown in Table I.

The thematic analysis of the qualitative responses regarding project participation identified five main themes: emotional well-being and relaxation (87.5% of participants), group cohesion and mutual support (75%), sense of freedom and ease of breathing (62.5%), resilience and coping strategies (50%), and connection with nature and the sea (37.5%).

Participants described the experience as a moment of shared pleasure and emotional relief, where the group dimension fostered authentic connection and a sense of belonging. Being together on a boat represented a break from the daily routine and the worries of illness, generating a sense of lightness, relaxation and serenity. The theme of freedom emerged strongly: sailing was perceived as an opportunity for movement and openness, in contrast to the immobility or limitations often associated with disease. From this perspective, sailing acquired a symbolic value of liberation and rebirth, an experience in which *“the body, even if fragile, regains its presence in the world.”*

Some representative quotes from participants were: “For the first time in a long time, I felt like I could breathe freely” or “Being on the boat made me feel free” or “Working together on board helped me rediscover the pleasure of being with others, without thinking about fatigue” and “Looking at the sea and feeling the wind gave me a peace I hadn’t felt in years” or “Sailing was a metaphor for my life, sometimes you lose balance, but you keep going”.

These narratives further corroborated the quantitative results, highlighting how the combination of group experience, contact with nature and the symbolism of sailing, fostered pleasure, relaxation, freedom and detachment from daily routine, significantly contributing to the overall psychological well-being of participants.

Respiratory outcomes

The results of the respiratory parameters measured at baseline, during sailing and at 6 months are shown in Table II and Figure 1.

Table II. Respiratory parameters mean values measured at baseline during sailing and at 6 months.

Parameters	Baseline	On board	At 6 months	ANOVA test (p)
SpO ₂ , mean (%)	94	97	95	21.15 (< 0.00001)
RR, mean (breaths/min)	24	18	19	77.15 (< 0.00001)
FVC, mean (Liters)	2.81	3.09	2.93	0.10 ($= 0.898$)
FEV ₁ , mean (Liters)	2.62	2.88	2.70	0.08 ($= 0.911$)

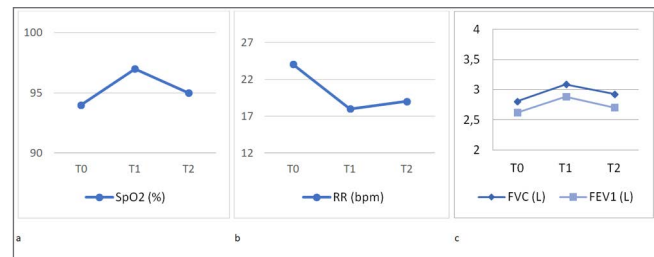


Figure 1. Trend of SpO₂ (a), RR (b), FVC and FEV₁ (c) values during sailing and at 6 months, compared to baseline.

A positive trend was observed especially during sailing sessions, with SpO₂ increasing by 3% (M2 97%; $Q = 8.97$; $p = 0.00001$) compared to baseline. However, it decreased at 6 months (M3 95%; $Q = 6.24$; $p = 0.00068$) while remaining above baseline values.

Respiratory Rate showed a mean reduction of 6 points (M2 18 bpm; $Q = 16.40$; $p = 0.00001$) during navigation and remained stable at 6 months (M3 19.25 bpm; $Q = 2.73$; $p = 0.15$).

FVC showed a mean increase of +0.280 L (2.81 L versus 3.09 L) onboard and +0.120 (2.81 L versus 2.93 L) at 6 months. This result, although not statistically significant ($p = 0.898$), suggests an indirect benefit of sailing on respiratory function related to increased awareness of breathing and greater motivational engagement. FEV₁ showed a similar trend with a mean increase of +0.260 L (from 2.62 L to 2.88 L) on board, and of +0.080 L, at 6 months.

Qualitative outcomes

The quantitative data were supported by qualitative feedback collected through the final questionnaire. Patients reported greater group cohesion and perceived mutual support, experiencing the boat as a space for both symbolic and tangible collaboration. During the sailing sessions, several participants described a feeling of greater freedom of breath, perceived as relief and well-being. Sailing has often been interpreted as a metaphor for resilience, representing the challenges of illness and the personal and collective resources needed to address them.

Discussion and conclusions

The results of this pilot study indicate that integrating psychological sessions with sailing activities may help improve both emotional well-being and respiratory awareness in individuals with muscular dystrophies. The reduction in anxiety and depressive symptoms, along with positive changes in oxygen saturation and respiratory rate observed during sailing indicate a potential integrative benefit of this approach.

Qualitative reports further corroborate these results, emphasizing the shared pleasure, group cohesion, mutual support, and sense of freedom and relaxation experienced at sea. Participants' accounts highlighted the value of connection, both with others and with the marine environment, as a source of renewed balance and relief from the daily burden of disease.

However, these results should be treated with caution due to several limitations such as the small sample size ($n = 8$), the lack of a control group and the short follow-up. These limitations prevent definitive

conclusions and make it difficult to separate the effects of sailing itself from other concomitant influences, such as emotional support or disease progression. Furthermore, the short follow-up period did not allow us to assess whether these benefits persist over time. Despite these constraints, the experience proved feasible, well received by participants, and capable of providing significant moments of psychological and physical relief.

This integrative approach appears suitable for inclusion in multidisciplinary care pathways, as it combines emotional expression, group interaction, and contact with natural elements, all aspects known to promote resilience and quality of life. It could also serve as a basis for future programs that integrate psychological support with contact with nature, encouraging both well-being and a renewed sense of autonomy through interaction with the marine environment.

However, future studies on larger groups of patients are needed to consolidate and expand the preliminary results from this experience and scientifically validate sailing as a complementary therapeutic tool within psychological and rehabilitative support programs for patients with muscular diseases.

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Conflict of interest statement

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Authors contributions

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Ethical consideration

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

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