

Erica Moraes<sup>1</sup><https://orcid.org/0009-0009-5173-9116>Karoline Pereira<sup>2</sup><https://orcid.org/0009-0005-6448-5101>Helena Moraes<sup>1,2</sup><https://orcid.org/0000-0002-8505-4627>

# Effects of mind-body exercises in a patient with mood disorders: a case report

*Efeitos de exercícios mente-corpo em uma paciente com transtorno de humor: um relato de caso*

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## RESUMO

**Introdução:** A justificativa deste estudo de caso foi avaliar um sujeito com ansiedade e depressão em tratamento para ansiedade e depressão com sintomas corporais e doenças físicas significativas, configurando também um quadro psicossomático. Investigamos um novo protocolo de exercícios mente-corpo (MCE) e seus efeitos na relação corpo-mente por meio de análises qualitativas e quantitativas. **Relato de caso:** M.S., 47 anos, com diagnóstico de depressão, ansiedade e diversas outras doenças e queixas físicas, foi submetido semanalmente sete sessões de MCE. Em seguida, foram avaliadas ansiedade, depressão e interocepção. Além disso, escalas de afeto e excitação foram administradas após cada sessão. **Discussão:** Foram identificadas melhorias em todas as dimensões da interocepção, com resultados mais pronunciados na não distração (pré: 4/pós: 0,25), consciência emocional (pré: 1,6/pós: 5), autorregulação (pré: 2,29/pós: 4,29) e confiança (pré: 0/pós: 4), além de reduzir sintomas de depressão (pré: 17/pós: 14) e ansiedade (pré: 29/pós: 24) e aumento para afeto positivo (pré: 2,2 ± 3,0/pós: 3,6 ± 1,7) e excitação (pré: 4,5 ± 1,9/pós: 5,9 ± 0,4). **Conclusão:** Concluímos que o MCE melhorou a capacidade interoceptiva e reduziu os sintomas de ansiedade e depressão. Através dessas mudanças percebidas e relatadas, o paciente foi capaz de aprender a lidar com o estresse e a ansiedade e a se autorregular.

## PALAVRAS-CHAVE

Transtorno de Humor, Depressão, Exercício Mente-corpo, Ansiedade, Relato de Caso.

## ABSTRACT

**Introduction:** The rationale of this case study was to evaluate a subject with anxiety and depression under treatment for anxiety and depression with significant bodily symptoms and physical illness, configuring also a psychosomatic condition. We investigated a new protocol of mind-body exercise (MBE) and its effects on the body-mind relationship through qualitative and quantitative analysis. **Case Report:** M.S., 47 years old, diagnosed with depression, anxiety, and several other illnesses and physical complaints, was submitted a weekly seven sessions of MBE. After that, anxiety, depression, and interoception were evaluated. Moreover, affect and arousal scales were administered after each session. **Discussion:** Improvements were identified in all dimensions of interoception, with more pronounced results in not-distracting (pre: 4/ post: 0,25), emotional awareness (pre: 1,6/ post: 5), self-regulation (pre: 2,29/ post: 4,29) and trusting (pre: 0/ post: 4), in addition to reducing symptoms of depression (pre: 17/ post: 14) and anxiety (pre: 29/ post: 24) and increase for positive affect (pre: 2,2 ± 3,0/post: 3,6 ± 1,7) e arousal (pre: 4,5 ± 1,9/post: 5,9 ± 0,4). **Conclusion:** We conclude that MBE improved interoceptive ability and reduced symptoms of anxiety and depression. Through these perceived and reported changes, the patient was able to learn to deal with stress and anxiety and self-regulate.

## KEYWORDS

Mood disorders, Depression, Mind-body exercise, Anxiety, Case report.

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1 Programa de Pós-graduação em Psiquiatria e Saúde Mental (PROPSAM)- Instituto de Psiquiatria da Universidade Federal do Rio de Janeiro (IPUB/UFRJ), Rio de Janeiro, RJ, Brazil.

2 Escola de Educação Física e Desportos – Universidade Federal do Rio de Janeiro (EEFD/UFRJ), Rio de Janeiro, RJ, Brazil.

**Address for correspondence:** Erica Simone Rodrigues Moraes. Venceslau Braz, 71, fundos – 22290-140 – Rio de Janeiro, RJ, Brazil.

E-mail: ericamoraes.psicologia@gmail.com



## INTRODUCTION

Depressive and anxiety disorders stand as the most prevalent mental illnesses in the global population. Despite the extensive utilization of psychotropic medications to alleviate symptoms, various non-pharmacological interventions, such as physical exercise, have undergone extensive investigation in literature, yielding beneficial results<sup>1</sup>. While exercise is generally well-received by individuals with depression, several factors—such as genetics, obesity, and personality traits—can affect adherence to exercise regimens. Another non-pharmacological avenue involves mind-body therapies, particularly mind-body exercises (MBE), encompassing breathing exercises, Qigong, Tai Chi, relaxation therapy, yoga, and other modalities. While evidence exists for depression<sup>2</sup>, there remains a dearth of studies exploring anxiety, and the available evidence is inconclusive<sup>3</sup>.

Both depression and anxiety manifest numerous physical symptoms and often co-occur with various other physical comorbidities. Patients experiencing somatic symptoms typically undergo treatment involving antidepressants, anti-anxiety medications, and psychotherapy. However, a holistic approach encompassing physical intervention is imperative for effective management of these conditions. The interoceptive capacity, denoting the perception of internal bodily sensations, appears to be a contributing factor to the mind-body connection's influence on mental health. A heightened ability to perceive bodily reactions is intricately linked to a more nuanced emotional experience, facilitating a deeper understanding of one's and others' emotions and empathy. Consequently, certain MBE, including body scanning, meditation, postural control, and mindfulness training, have exhibited notable enhancements in interoceptive aspects among healthy individuals.

In the context of anxiety and depression, there exists an imbalance within the system, resulting in disturbances in afferent information transmission characterized by aberrant signals. Consequently, attaining a profound comprehension of one's physiological and emotional states, achieved through mind-body therapies, serves to attenuate somatization. Despite the demonstrated enhancement of interoceptive capacity through physical exercise in various mental health conditions, the literature lacks comprehensive studies on the effects of MBE on individuals with anxiety presenting significant physical complaints. The primary objective of this case study was to assess a subject grappling with anxiety and depression, undergoing treatment for these conditions alongside pronounced bodily symptoms and concurrent physical illness, thereby constituting a psychosomatic state. Notably, the novelty of this investigation lies in exploring the impact of a novel protocol utilizing interoceptive parameters. This exploration is motivated by the limited efficacy

observed in previous mindfulness protocols regarding the enhancement of body awareness<sup>4</sup>.

We posited that interventions could ameliorate symptoms of anxiety and depression while concurrently enhancing interoceptive awareness. This heightened awareness, in turn, would enable the subject to self-regulate and cultivate a sense of trust in their physiological responses, empowering them to make proactive decisions for their well-being.

## CASE REPORT

### Participant information

M.S., 47 years old, an obese woman, treated at the University Hospital Clementino Fraga Filho (HUCFF/UFRJ), firstly by the rheumatology sector with lupus and antiphospholipid syndrome and subsequently referred to psychiatry. She is an app driver, divorced, and has a minor daughter. The principal complaints were fatigue, sleep disorders, job dissatisfaction, and body aches.

### Clinical findings

M.S. has reported experiencing labyrinthitis, low back pain, headache, gastritis, dyspnea, and hypertension, all of which were acquired during her pregnancy at the age of 19. The patient also disclosed a history of physical trauma during childhood and adolescence, extended pacifier use until adolescence, and trichotillomania in her adult life. Additionally, at the time of the interview, she disclosed engaging in self-mutilation of the fingers. M.S. is currently undergoing polymedication, using a total of eight medications, including those prescribed for hypertension, anxiety, depression, and mood stabilization.

The patient, hereafter referred to as M.S., presents with a chief complaint of heightened stress levels and overall dissatisfaction. Currently residing with her mother and daughter, M.S. reports strained relations with her mother due to psychiatric symptoms, expressing a lack of comprehension regarding her ailment. Conversely, her relationship with her daughter is reportedly positive. In 2018, M.S. experienced a pulmonary embolism, followed by thrombosis in the leg. She expresses a desire to reinstate physical exercise routines reminiscent of her youth, particularly engaging in swimming during childhood and later transitioning to gym training and volleyball in adolescence. M.S. discloses discomfort pertaining to various aspects of her physique, expressing a wish to effect comprehensive changes.

In order to address this multifaceted presentation, a holistic approach is recommended. The psychiatric symptoms warrant further elucidation, necessitating collaboration with

mental health professionals to enhance M.S.'s understanding of her condition and facilitate the development of coping mechanisms. Physical activity goals, aligned with her historical engagement in swimming, gym training, and volleyball, should be established collaboratively, taking into account her previous medical history involving pulmonary embolism and thrombosis. Body image concerns necessitate exploration, with consideration given to involving a specialized therapist or counselor. Moreover, efforts should be directed towards optimizing communication and understanding within M.S.'s familial milieu, particularly with her mother. The involvement of a multidisciplinary team, encompassing mental health professionals, nutritionists, and physical therapists, is advised for a comprehensive and tailored intervention strategy. Regular follow-up assessments will be imperative to gauge progress and effectuate necessary adjustments in the treatment plan.

## Diagnosis

The psychiatry diagnoses were Major Depressive Disorder and Generalized Anxiety Disorder.

## Intervention

After the doctor's referral to the program, the patient was invited to participate in the research, registered in ClinicalTrials.gov, under N<sup>o</sup>. NCT05667844 and Ethics Committee for Studies in Human Beings (CAAE: 62992122.8.0000.5257). The interview included anamnesis and risk stratification for performing physical activities<sup>5</sup>, which classified as low risk for exercises.

The scales administered before and after the MBE program were: Hamilton Depression Rating Scale (HAM-D)<sup>6</sup>, Hamilton Anxiety Rating Scale (HAM-A)<sup>7</sup>, and Multidimensional Assessment of Interoceptive Awareness (MAIA)<sup>8</sup>. Moreover,

feeling scale and felt arousal were administered before and after each session to measure affect and arousal, respectively.

The program consisted of seven weekly sessions, with a duration of 1 hour and 15 minutes each with a theme based on the MAIA scale. Details of the program and description of each session were placed in material supplementary and Table 1, respectively.

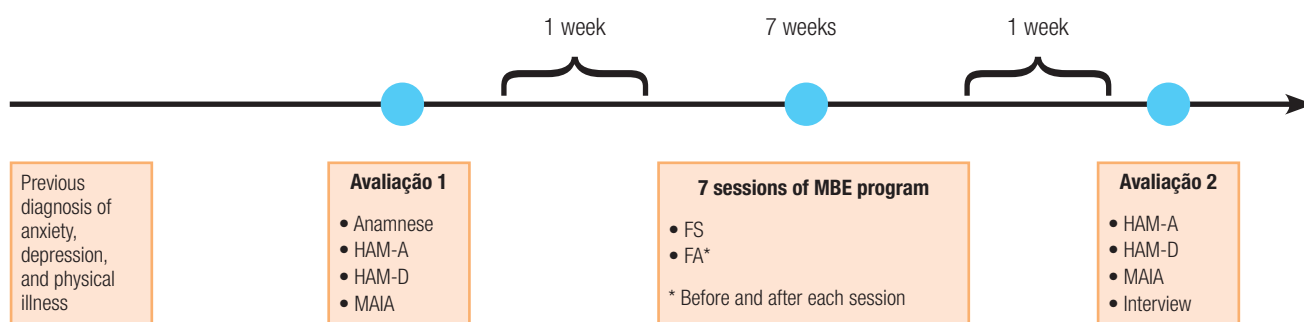
After the end of the program, a semi-structured interview was applied with questions regarding the changes perceived in the body-mind relationship (supplementary material).

The historical information was illustrated in Figure 1.

## Outcomes

M.S. completed all training sessions of the program at the agreed times and days, without missing a single session. Improvements were identified in all dimensions of interoception, with more pronounced results in not-distracting (pre: 4/ post: 0,25), emotional awareness (pre: 1,6/ post: 5), self-regulation (pre: 2,29/ post: 4,29) and trusting (pre: 0/ post: 4), in addition to reducing symptoms of depression (pre: 17/ post: 14) and anxiety (pre: 29/ post: 24) (Table 2). The average Subjective Perceived Effort was  $4,4 \pm 2,3$  classified as "somewhat easy". Analysis of the feeling scale and felt arousal scale reflect an increase right after each session. The mean of the pre-exercise Feeling Scale was  $2,2 \pm 3,0$ , classified as "reasonably well", and the mean post-exercise was  $3,6 \pm 1,7$ , classified as "feeling well". For the Felt Arousal Scale (FAS), the mean pre-exercise was  $4,5 \pm 1,9$  and the mean post-exercise was  $5,9 \pm 0,4$  (Table 3).

Applying the semi-structured interview, it was possible to identify two statements that were most repeated about the impact of exercises on the patient's life: "I didn't look in the mirror, I didn't buy clothes for myself" and "It improved my self-esteem, will to live, looking at myself in the mirror because I hated mirrors, wanting to get out of the box because I was always hiding."



**Figure 1.** Timeline of historical information and intervention of the case.

**Table 1.** Descriptions of each session of Mind-body program

	Preparatory phase	Main phase	Final phase
Session 1 (Noticing)	Body scan noticing comfort and discomfort	Elbow flexion Sit and stand Tree posture March in place Upper abdominal *Slow execution	Dead body posture Body scan
Session 2 (Not being distracted)	Body scan noticing the discomfort	Elbow flexion Sit and stand Tree posture March in place Upper abdominal *Fast execution	Relaxation progressive muscle
Session 3 (Not worrying)	Mindfulness meditation with stimulation of the 5 senses	Elbow flexion Sit and stand Tree posture March in place Upper abdominal *Execution with mind-muscle connection	Dead body posture Body scan
Session 4 (Attentional regulation)	Meditation with attentional regulation with external stimuli and internal sensations	Elbow flexion Sit and stand Tree posture March in place Upper abdominal *Slow execution with attention	alternate nostril breathing
Session 5 (Emotional awareness)	Imagine being angry or calm and stimulating bodily contractions and bodily relaxation	Elbow flexion Sit and stand Tree posture March in place Upper abdominal *Moderate intensity	Visualization exercise with positive and emotional experiences
Session 6 (Self-regulation)	Meditation mindfulness	Elbow flexion Sit and stand Tree posture March in place Upper abdominal *Fast execution Sun salutation yoga flow	Respiratory exercise to dissolve tension
Session 7 (Trust)	Meditation mindfulness Grounding exercise	Short squat with isometrics and combined plantar flexion and arms raised upwards	Visualization exercise floating in the sea

**Table 2.** Results of the dimensions (interoception scale), symptoms of depression and anxiety pre and post the intervention.

	PRE	POST
MAIA (score)		
Noticing	3,3	3,6
Not-distracting*	4,0	0,25
Not-worrying	1,25	2,75
Attention Regulation	3,0	4,2
Emotional Awareness*	1,6	5,0
Self-Regulation*	2,29	4,29
Trusting*	0,0	4,0
HAM-D	17	14
HAM-A	29	24

MAIA: Multidimensional Assessment of Interoception Awareness Questionnaire. HAM-D: Hamilton Depression; HAM-A: Hamilton Anxiety

**Table 3.** Results of pre- and post-exercise of feeling scale and felt arousal scale.

	PRE	POST
Feeling Scale (FS) (average $\pm$ SD)	2,2 $\pm$ 3,0	3,6 $\pm$ 1,7
Felt Arousal Scale (FAS) (average $\pm$ SD)	4,5 $\pm$ 1,9	5,9 $\pm$ 0,4

FS: Feeling Scale, FAS: Felt Arousal Scale; SD: standard deviation

## DISCUSSION

The objective of the current study was to analyze, through a case study, the effects of a MBE program on interoceptive awareness, anxiety, depression symptoms, and its impact on the daily activities of a psychiatric patient. The investigation revealed improvements across all interoception dimensions, particularly notable in domains such as not-distracting, emotional awareness, self-regulation, and trusting, as evidenced by elevated scores. Furthermore, a significant reduction in anxiety and depression symptoms was observed, accompanied by a positive increase in feelings and arousal scales immediately following each MBE session.

Anxiety and depression were conceptualized as interoceptive disorders, posited to diminish individuals' capacity to accurately report bodily information, thereby giving rise to altered experiences such as diminished self-esteem or anticipation of future self-harm. Consistent with Gibson's framework<sup>9</sup>, a fundamental aspect of MBE involves intentional focus on bodily sensations, facilitating the achievement of desired physiological changes.

A previous investigation employing the same interoception scale documented significant enhancements across six interoception dimensions<sup>10</sup>. Conversely, another study examining the impact of a mind-body intervention on body awareness in individuals with comorbid active depression identified a significant difference in three dimensions of the Multidimensional Assessment of Interoceptive Awareness (MAIA): self-regulation, non-distraction, and emotional awareness<sup>11</sup>.

The positive impact of MBE may be explained by a bottom-up activation mechanism involving the modulation of cortical areas. Neuroimaging studies have demonstrated associations between changes in self-reported mindfulness ability and alterations in activity within cortical regions, including midline prefrontal, dorsomedial prefrontal cortex, medial prefrontal cortex, anterior cingulate cortex, and insula reactivity—primary components of the interoceptive system<sup>10</sup>.

Additionally psychological effects stemming from MBE participation have been observed, contributing to the overall results. The constitution of the "self" and the comprehension of its relationship with the world and with itself emerge as impactful factors in interoceptive capacity. For instance, the "trusting" dimension of the MAIA scale assesses an

individual's ability to feel secure and trust their own body. The study's outcomes underscore the significance of interoceptive awareness in fostering fundamental emotional awareness skills and the ability to engage in novel processes of evaluating and re-evaluating emotion regulation, crucial elements in addressing depression and anxiety.

Taking into account the predefined thresholds of the scales utilized, it is pertinent to highlight that in the current investigation, the participant experienced a reduction of three points on the depression scale, thereby maintaining a classification of mild depression. However, noteworthy was the transition from severe anxiety to moderate anxiety, reflecting a reduction of five points. While randomized controlled trials have reported substantial reductions in anxiety symptoms comparable to medication effects<sup>12</sup> and decreases in depressive symptoms<sup>13</sup>, earlier meta-analyses have indicated a modest impact of MBE exercises on anxiety<sup>10</sup>. This modest effect is attributed to the limited number of eligible studies displaying a high risk of bias concerning sample selection and intervention methodologies.

In relation to affective response, while there exists substantial literature delineating the favorable outcomes of physical exercise, studies incorporating MBE are relatively scarce. Henriques *et al.*, (2023)<sup>14</sup> noted elevated Feeling Scale scores subsequent to stretching exercises and lower scores on the Felt Arousal Scale. Conversely, another investigation reported an augmentation in both arousal and positive affect following yoga, tai chi, and stretching exercises<sup>15</sup>, aligning with the findings observed in our study.

MBE practices, including fatigue, lack of motivation, low self-esteem, absence of a workout partner, physical ailments, and fear of injury. Despite these challenges, the participant demonstrated commendable commitment by completing all sessions without any absence. Notably, the interview revealed perceptible shifts in her body perception, potentially influencing her body image. It is essential to acknowledge that body image, defined as the mental representation one forms of their own body, may undergo transformation even in the absence of discernible changes in body measurements. This shift towards a more positive relationship with her body, fostering a sense of reconciliation, could serve as an initial and pivotal transformation with cascading benefits.

Nevertheless, certain limitations warrant consideration in interpreting the findings of this study. The single-case design restricts the generalizability of results, as outcomes may not

be universally applicable to diverse individuals. Furthermore, relying solely on subjective assessments for evaluating interoception poses limitations; incorporating additional non-subjective assessments could enhance the robustness of the findings.

Future research should be conducted considering a larger sample size with the comparison of a control group.

## CONCLUSION

The clinical significance of this investigation lies in establishing MBE as a viable non-pharmacological intervention, providing individuals with the means to effectively address and/or regulate their psychiatric symptoms. This restoration of autonomy and bolstering of self-confidence underscore the potential of MBE as a valuable tool in psychiatric care

## INDIVIDUAL CONTRIBUTIONS

**Érica Simone Rodrigues Moraes** - Manuscript writing.

**Karoline Almeida Pereira** - analyzing and interpreting all the data, manuscript writing.

**Helena Sales de Moraes** – Manuscript supervision and final revision.

## INTEREST CONFLICTS

Érica Simone Rodrigues Moraes, Karoline Almeida Pereira and Helena Sales de Moraes have no conflicts of interest to be declared.

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