

REVIEW ARTICLE

Non-pharmacological exercise-specific
programs to manage irritable bowel syndrome:
The importance of strong embodied
consciousnessMaria Kosma* 

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Abstract

Irritable bowel syndrome (IBS) is a widespread chronic functional disorder characterized by both gastrointestinal and psychological symptoms, including abdominal discomfort (e.g., intestinal distension and pain), altered bowel habits, indigestion, and such psychological comorbidities as anxiety, depression, and somatization. About 12% of the United States population is affected by IBS, with women being at higher risk than men. Pharmacotherapy is the first-line treatment for IBS, but it has several limitations, including high medical costs, adverse effects, intolerance, and a high placebo response rate. Instead of relying solely on drug therapy, the purpose of this critical narrative review is to examine the effects of regular endurance training and holistic mind–body movement programs (mainly yoga) on IBS symptomatology. The review summarizes evidence on these exercise approaches and examines their proposed physiological and psychophysiological mechanisms. The findings are interpreted through Merleau-Ponty's concept of embodied consciousness, with body schema used as a conceptual framework linking physiological and psychological responses to regular exercise. Overall, this reviewed evidence suggests that regular multimodal exercise programs can maintain holistic benefits for IBS symptoms. Such programs lead to a balanced body schema that integrates the body's psychophysiological structures for homeostasis and health.

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1. Introduction

Irritable bowel syndrome (IBS) is a widespread functional disorder characterized by both gastrointestinal (GI) and psychological symptoms. These manifestations include intestinal permeability, distension, pain, anxiety, and depression that can lead to a decline in quality of life.¹⁻³ According to *NIH MedlinePlus Magazine*, the prevalence of IBS in the United States is about 12%, affecting nearly twice as many women as men.⁴ People with more severe cases of IBS and women report significantly lower quality of life than those with less severe symptoms and men.⁵ Beyond decreased quality of life, the unemployment rate and impaired work productivity were significantly higher

among Norwegian people with IBS than in the general population.⁶

Pharmacotherapy is the first-line treatment for IBS, but has several limitations, such as high medical costs, adverse effects, intolerance, and a high placebo response rate.⁷⁻¹⁰ Instead of relying solely on drug therapy, the purpose of this critical narrative review is to explore the effects of regular endurance training and holistic, mind-body movement programs on IBS symptomatology. Grounded in the philosophical underpinnings of Merleau-Ponty's embodiment (mind-body unison),¹¹ holistic, multimodal exercise training is recommended for a balanced body schema (motor habit or the habitual body) that links psychophysiological structures (e.g., hormonal regulation, digestion, breathing techniques, emotions, and perceptions) for health and well-being.¹¹⁻¹⁵

In **Section 2** of this paper, the condition of IBS and its links to the microbiome-gut-brain axis (MGBA) and mental disorders are explained. In **Section 3**, the author describes Merleau-Ponty's concept of embodied knowledge (mind-body unison) and the importance of regular exercise in shaping a balanced body schema. In **Section 4**, the researcher delineates the review's methodological approach, including its strengths, potential limitations, and measures taken to minimize them. The subsequent sections show the effectiveness of endurance training and yoga for IBS symptoms, including their potential physiological mechanisms. The paper concludes with implications for movement programs and conclusions.

2. Irritable bowel syndrome and the microbiome-gut-brain axis

Irritable bowel syndrome is a chronic functional disorder of the MGBA characterized by such symptoms as abdominal discomfort (e.g., intestinal distension and pain), altered bowel habits, indigestion, and such psychological comorbidities as anxiety, depression, and somatization.¹⁶⁻¹⁹ Patients with IBS and such mental conditions as anxiety and depression share overlapping genes, affecting both the central nervous system and enteric nervous system.¹⁷

Beyond genetic factors, a dysfunctional hypothalamic-pituitary-adrenal (HPA) axis can cause increased cortisol levels, worsening IBS symptomatology via increased intestinal dysbiosis. Gut microbiota dysbiosis, which is common among people with IBS, leads to decreased neurotransmitter production and increased intestinal permeability; thus, toxins and harmful pathogens can negatively affect the central nervous system via the vagus nerve, causing mental health problems like anxiety and depression.^{13,20-22} Endurance training and holistic mind-body movement programs can improve the GI symptoms

and mental health conditions of people with IBS via a balanced body schema.^{13,14} The importance of a balanced body schema via regular exercise for holistic health will be discussed in the next section.

3. Merleau-Ponty's embodied consciousness and holistic health

According to Merleau-Ponty's *Phenomenology of Perception*, the mind and the body are not two separate entities, as in Cartesian theorizing. Instead, they are interdependently linked (embodied consciousness) and work in unison, leading to homeostasis and health.^{11,12,15,23} In his philosophy of embodied consciousness, Merleau-Ponty explained that the body is not inferior to the mind. The body is not an object that responds mechanistically to brain stimuli.^{11,12} Instead, it is a Lived Body that has consciousness and acts toward and within the world: It walks, jogs, climbs, dances, and expresses.^{12,15,23-26}

The body has in-itself (physiological) structures, such as blood vessels, arteries, organs, glands, and cells, and for-itself (psychological) essence, such as thoughts, emotions, and perceptions. These two types of being (body as being in-itself and for-itself) are hypothesized to be inextricably connected via embodied consciousness.^{11,12} Such consciousness derives from the body's habituation to the world—the body schema, or the habitual body. The body throws itself into meaningful movement significations, through which the body schema, or motor habit, forms as a Gestalt.^{11-15,24-26} The habitual body acts without much cogitation; it integrates different senses and tacitly navigates and perceives the world.^{11,12} Body schema is not a quantifiable structure to be measured with great accuracy. Rather, it reflects a non-linear entity, indicating body awareness, confidence, expression, and a sense of intersensory unity. It is an embodied consciousness that can be approximated.^{25,26}

The way body schema connects the in-itself (physiological) structures and for-itself (psychological) essence of the body has been explained for different conditions, such as phantom limb syndrome and autoimmune disorders affecting the functions of the HPA axis, hypothalamic-pituitary-thyroid axis, and MGBA.^{11-14,24} For example, regular exercise and holistic movement programs lead to a balanced body schema that can regulate in-itself structures such as the secretion and inhibition of stress hormones (e.g., cortisol) and neurotransmitters, and for-itself essence such as perceptions, emotions, and breathing.¹² Although certain in-itself and for-itself structures of the body can be measured (e.g., cortisol levels, gamma-aminobutyric acid [GABA], the ratio of gut microbiota, and exercise perceptions), they do not

constitute body schema per se, though they are part of it. One's body schema, or habitual body, can influence how its interconnected parts function synergistically. Regular exercise improves body schema, facilitating the modulation of cortisol levels, breathing, vagal tone, and gut neurotransmitters among people with anxiety and GI disorders.¹²⁻¹⁴ Similarly, a body that is habituated to a congenital limb deficiency is less likely to experience phantom limb syndrome than a body that is used to function with four limbs and later in life experiences a traumatic amputation.^{11,12,24}

It is erroneous to view bodily functions mechanistically, where different processes (e.g., the neuroendocrine cascade of exercise training) are explained without any consciousness beyond that in the brain. The body also has consciousness and is in unison with the mind: The two act as one. A "mindful" body via regular exercise can lead not only to physical and mental health but also to the long-lasting love of movement.^{15,23,25,26}

In this paper, the author holistically examines IBS management by showing how regular, multimodal exercise training improves both physiological and psychological symptoms. Regular exercise is necessary to maintain a balanced body schema and thus experience consistent benefits on IBS symptomatology.¹³ If exercise ceases, improvements in IBS symptoms decrease or disappear, and the condition can worsen.^{13,27}

4. Methodology: Critical narrative review

The author conducted a critical narrative review of endurance exercise training and mind-body movement interventions (e.g., yoga and Pilates) among adults with IBS. This methodological approach is recommended when interpretive analysis is used to address a research question within a philosophical paradigm and, consequently, to advance knowledge in the field.^{28,29} Unlike standardized, predetermined systematic review protocols, critical narrative reviews explore more diverse methodological designs, supporting a more comprehensive approach to interpreting results.²⁸ In the current review, the author targeted randomized controlled trials (RCTs), along with a few meta-analyses and review studies, mainly from the last five years. The findings were interpreted in relation to proposed physiological mechanisms regarding the effects of exercise on IBS symptomatology. This approach enabled the author to interpret the findings through the philosophical framework of embodied consciousness: Regular exercise can lead to a balanced body schema, modulating MGBA structures. Outcome measures included the physiological and psychological symptoms of IBS. Non-RCTs or experimental designs among nonhuman animals or people with other clinical conditions and disabilities were

not targeted in this analysis. The search strategy included different databases, such as Google Scholar, Medline/PubMed, and Scopus. Different keyword combinations were used, such as "exercise, endurance training, mind-body, and holistic movement programs," "yoga, Pilates, IBS, exercise and mechanisms in IBS symptomatology," and "effects of exercise on psychological symptoms of IBS."

Typical methodological limitations of a critical narrative review include potential selection bias due to its non-standardized design.³⁰ Considering the paper's flexible and interpretive methodological approach, the author implemented recommended measures to minimize these limitations. The review followed a clearly defined philosophical framework of embodied consciousness, delineating the effects of different exercise programs on IBS symptomatology. The author used major, diverse bibliographic databases and search engines, and recent (mainly within the last five years) methodological designs (e.g., RCTs, systematic reviews, and meta-analyses) to examine the phenomenon comprehensively.²⁸

5. Effects of endurance exercise training on irritable bowel syndrome

Moderate-intensity aerobic exercise programs have numerous benefits for patients with IBS. They increase gut motility and intestinal microbiota diversity, including the predominance of beneficial bacteria like *Bifidobacterium* and *Lactobacillus*. These bacteria produce short-chain fatty acids, which inhibit pro-inflammatory cytokines and thus prevent inflammation.^{27,31,32} Low inflammation also strengthens intestinal integrity and decreases bowel permeability.³³ Mucosal immunity and the integrity of the gut barrier are further supported via the production of immunoglobulin A following regular endurance training.^{27,34}

Given the high comorbidity between mental disorders and IBS, a recent meta-analysis showed that regular "moderate-intensity aerobic exercise," such as running, swimming, yoga, and Pilates, decreased anxiety, depression, and dysphoria while improving quality of life among patients with IBS.³⁵ Certain proposed mechanisms for these positive effects include modulation of the MGBA and neurotransmitter systems, the HPA axis, parasympathetic dominance, vagal activation, and autonomic regulation.^{35,36} On the contrary, prolonged high-intensity exercise (e.g., competitive sports, high-intensity interval training, and running a marathon) that is not performed properly can exacerbate IBS symptoms, including splanchnic hypoperfusion (decreased blood flow to the GI tract), increased intestinal permeability ("leaky gut"), abdominal distension, and systemic inflammation.^{13,32,33,37-39}

Positive exercise effects on IBS symptomatology and mental health have been observed after four weeks of moderate-intensity endurance training with varied frequency between three–six days per week.^{35,40} Although the studies reported on diagnosed cases of IBS, exercise training may vary by IBS type. Overall, light to brisk walking may be beneficial for all types of IBS (constipation- or diarrhea-predominant or mixed); however, high-intensity exercise may exacerbate the symptoms of the diarrhea-predominant type.³⁷

6. Positive effects of yoga on irritable bowel syndrome

Yoga includes gentle poses and physical postures (asanas) as well as breathing techniques (pranayama) that can alleviate IBS symptoms. Based on recent meta-analyses and RCTs, yoga interventions decreased intestinal distension, pain, anxiety, and depression, improving quality of life among patients with IBS.^{41–43} A summary of potential physiological mechanisms related to these positive effects includes increased body awareness, self-awareness, and parasympathetic dominance. Yoga can also modulate the HPA axis (cortisol regulation) and GABA. In this way, it can improve mood and vagal tone while decreasing inflammation (e.g., reducing and silencing pro-inflammatory cytokines and genes, respectively).^{41,42,44,45}

A recent RCT by Bhattacharya and colleagues⁴⁶ found that resting heart rate and heart rate variability significantly improved in the yoga group compared with the control group. Although Bhattacharya and colleagues did not examine physiological mechanisms for this change, they attributed the positive effects to enhanced parasympathetic activity. Their three-month, one-hour online yoga program via Google Meet also resulted in between-group differences in symptom-specific quality of life, favoring the yoga group. In another RCT, the between-group differences in IBS symptom severity, quality of life, anxiety, depression, physical function, and autonomic symptom score (self-reported) favored the yoga (yoga and reduced medication) and combination (yoga and regular medication) groups compared to the wait-list control group (only medication) at 6 weeks and 12 weeks posttest.⁴⁷ Importantly, the yoga group showed improvements in the vagal reflex, as assessed by the 30:15 ratio (supine-to-upright posture electrocardiogram test), at both week 6 and week 12. The researchers concluded that a stand-alone yoga program performed three times per week can be effective for parasympathetic dominance.

Although yoga interventions tend to modulate sympathetic and parasympathetic activity and strengthen the HPA axis and GABA,⁴⁸ there are no studies in which

biomarkers such as cortisol or GABA levels are directly measured in patients with IBS. Similarly, there is no literature examining the effects of yoga on different types of IBS. Nevertheless, researchers confirm that moderate-intensity exercise tends to benefit all IBS types.^{37,41,48} It is also crucial to examine any differences in the effects of yoga on IBS symptomatology and quality of life by gender or age. In a large Japanese survey, it was shown that females and adults with IBS with constipation reported more severe symptoms than males and older adults.⁴⁹

Overall, the literature supports the positive effects of yoga on IBS symptomatology, psychological factors, and quality of life.^{27,34} However, a 2025 meta-analysis of 11 RCTs, including seven adult trials contributing to key pooled analyses, found no group differences in GI-related IBS symptoms.⁵⁰ Proposed reasons for this result included high methodological and group heterogeneity (e.g., inclusion of pediatric groups, adolescents, and young adults) and high risk of bias.⁵⁰

7. Discussion

In this critical narrative review, the researcher explored the effects of regular endurance training and holistic, mind–body movement programs, such as yoga, on patients with IBS. Given the comorbidity and interactions of GI symptoms and mental health problems in IBS and the limitations of pharmacotherapy, it is crucial to examine how regular endurance training and holistic mind–body movement programs like yoga affect IBS symptomatology. Grounded in Merleau-Ponty’s philosophical underpinnings of embodied consciousness, it is evident that regular multimodal exercise programs can maintain holistic benefits for IBS symptoms. Such programs lead to a balanced body schema, integrating the body’s in-itself and for-itself elements of the MGBA: increased gut motility and intestinal microbiota diversity, reduced inflammation, improved breathing regulation, body awareness and control, and decreased anxiety. In this way, the MGBA can be strengthened to improve IBS symptomatology (Figure 1).

Based on current literature, regular moderate-intensity endurance exercise training positively influences both GI and mental symptoms among people with IBS.²⁷ Positive effects can be observed within four weeks and last up to three months.^{35,40,46,47} Consistency (e.g., three–five days per week) is key to maintaining the benefits of exercise.^{13,27} Proposed mechanisms related to these effects include decreases in intestinal permeability and inflammation, and increases in vagal tone.^{27,32} On the contrary, participating in extensive, high-intensity exercise programs without proper rest and consideration of exercise levels can worsen

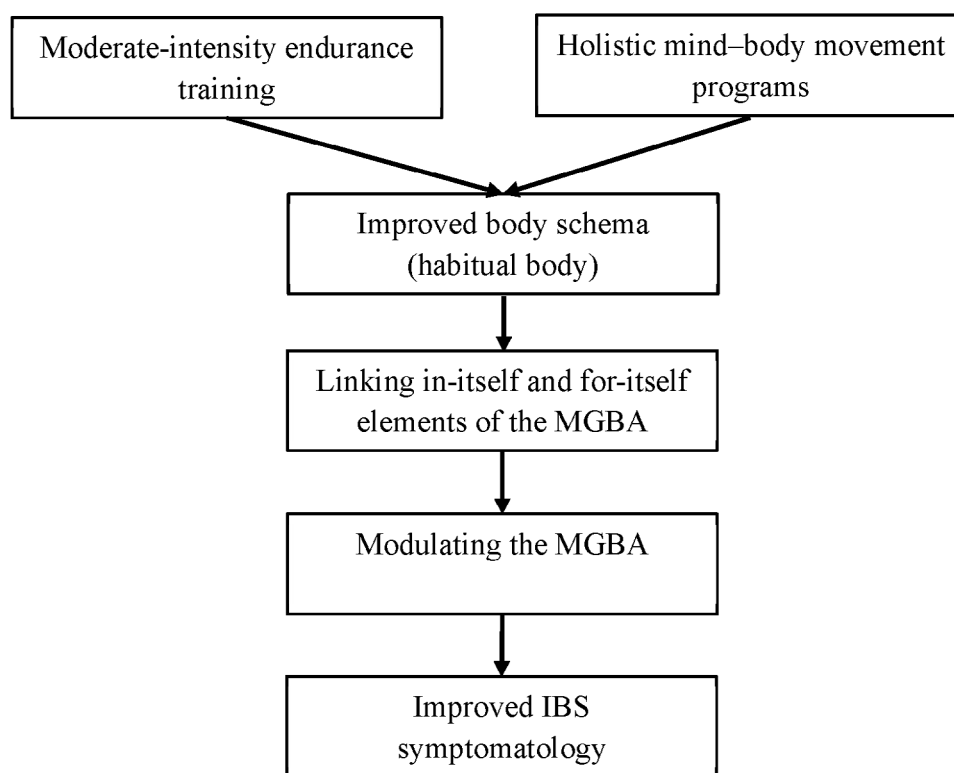


Figure 1. Moderate-intensity exercise and mind-body movement programs can improve body schema and holistically modulate the MGBA. Linkage of in-itself and for-itself elements of the MGBA: increased gut motility and intestinal microbiota diversity, reduced inflammation, improved breathing regulation, body awareness and control, and decreased anxiety.

Abbreviations: IBS: Irritable bowel syndrome; MGBA: Microbiome–gut–brain axis.

IBS symptomatology.^{13,37}

Similarly, holistic mind-body movement programs, such as yoga and Pilates, can decrease GI symptoms and mental health conditions among people with IBS.^{41–43} Such holistic movement programs can overall lead to improved body awareness, confidence, and control, as well as decreased inflammation, leading to the management of IBS symptomatology among other clinical conditions.^{13–15,51}

Implications for movement programming include the importance of developing and implementing multimodal regular exercise programs for people with IBS. Such programs should include moderate-intensity endurance exercise training and holistic, mind-body movement techniques that support a coherent body schema and, in turn, IBS management. Future research should address methodological issues in yoga-based interventions to confirm the sustainability of positive effects.

8. Conclusion

The purpose of this critical narrative review is to examine the effects of regular endurance training and holistic,

mind-body movement programs, such as yoga, on patients with IBS. There is a wide global prevalence of IBS, and instead of relying only on pharmacotherapy, it is crucial to emphasize non-pharmacological approaches for this disorder. Based on this review, multimodal exercise training that incorporates endurance and holistic movement programs can improve IBS symptomatology. Not only are such approaches effective on GI symptoms, but also on the comorbid mental health conditions in IBS. The management of IBS is viewed holistically. Regular exercise training is key to sustaining a balanced body schema and thus improving IBS symptoms (Figure 1).

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The author used the free version of Grammarly for minor edits like grammar, spelling, and readability during manuscript preparation. The author reviewed and edited all AI-assisted suggestions and took full responsibility for the content of the publication.

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