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# **Is Physical Activity Effective In Reducing The Gastrointestinal Symptoms Associated with Irritable Bowel Syndrome?**

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

In Partial Fulfillment of the Requirements For

The Degree of Master of Science

In

Health Sciences – Physician Assistant

Department of Physician Assistant Studies  
Philadelphia College of Osteopathic Medicine  
Philadelphia, Pennsylvania

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## Abstract

**OBJECTIVE:** The objective of this selective EBM review is to determine whether or not physical activity is effective in reducing the gastrointestinal symptoms associated with irritable bowel syndrome in adults 18 years of age and older.

**STUDY DESIGN:** Review of three English language primary randomized controlled trials from peer reviewed journals published between 2008-2015.

**DATA SOURCES:** Three randomized controlled trials were found using PubMed and Cochrane.

**OUTCOMES MEASURED:** All three studies measured irritable bowel syndrome (IBS) gastrointestinal symptom severity using self-reported questionnaires including the irritable bowel syndrome severity scoring system (IBS-SSS) and the Birmingham IBS Symptom Questionnaire.

**RESULTS:** Kavuri et al. found that a remedial yoga module significantly improved the gastrointestinal symptoms in adult patients with IBS when compared to the wait-list control group. Although Johannesson et al. reported improvements in IBS symptoms in the physical activity group when compared to the control group, the results were not significant. Daley et al. reported significant improvement in the constipation symptoms of IBS in the physical activity group when compared to control, but no other significant differences in symptoms scores were noted.

**CONCLUSIONS:** Based on the results of these three trials, it seems that there is a benefit to increasing physical activity in IBS patients. It is likely that physical activity can help alleviate IBS symptom severity, but further studies should be conducted to better explore these improvements.

**KEY WORDS:** Irritable bowel syndrome, physical activity

## INTRODUCTION

Irritable bowel syndrome (IBS) is defined as a disorder of the digestive tract that is characterized by a cluster of uncomfortable symptoms, most notably discomfort in the abdomen and alterations in bowel habits.<sup>1</sup> Although diarrhea is a more common symptom of IBS, some patients may have constipation-predominant IBS or a combination of both constipation and diarrhea.<sup>2</sup> Because irritable bowel syndrome is a chronic condition, it requires lifelong attention and management, primarily through dietary and lifestyle modifications.

Irritable bowel syndrome is very common, as its worldwide prevalence is approximately 11%.<sup>1</sup> Because IBS can be disruptive to one's daily activities, many IBS sufferers seek medical care. In fact, IBS accounts for 3.5 million healthcare visits annually in the United States.<sup>3</sup> These visits contribute greatly to an estimated \$30 billion of IBS-related healthcare costs each year in this country.<sup>4</sup> Although many IBS patients are initially seen in primary care settings, the disorder makes up 25-50% of referrals to gastroenterologists.<sup>1</sup>

Although the symptoms of IBS have been well-established, the exact cause of the disorder is known. The hallmark symptom of abdominal pain, experienced by many IBS patients, is often described as crampy and relieved by defecation.<sup>1</sup> Besides diarrhea and constipation, many patients will report abdominal bloating and increased gas production.<sup>1</sup> Based on these symptoms, it is easy to see how IBS can significantly interfere with one's daily responsibilities. In fact, IBS accounts for the second most common reason for work absence in the United States.<sup>1</sup>

As mentioned above, the exact cause of IBS has not been found. Currently, it is believed that many factors contribute to the disorder such as abnormalities with intestinal peristalsis and gastrointestinal nervous system innervation.<sup>5</sup> Additionally, each individual suffering from IBS may have specific triggers that cause their IBS to flare up, including stress and certain foods.<sup>5</sup>

Currently, there are no treatments available to cure IBS. Because of this, dietary and lifestyle modifications constitute the mainstay of treatment for most patients with this disorder.<sup>5</sup> Treatment plans are usually customized based on the patients' triggers and whether or not they have constipation-predominant or diarrhea-predominant IBS. Dietary changes include eliminating high gas foods and gluten.<sup>5</sup> In patients who complain of constipation, adding fiber may also be helpful. Lifestyle modifications including eating at the same time every day and finding ways to relieve stress.<sup>5</sup> Although many patients treat their IBS without medication, the most commonly utilized drugs for IBS treatment include anti-diarrheals, antispasmodics, and antidepressants.<sup>5</sup>

As previously stated, the gastrointestinal symptoms associated with IBS can be extremely disruptive and debilitating to the lives of many patients. Although there is no current cure for IBS, lifestyle modifications have been shown to provide significant, lasting relief to IBS sufferers. While medications have shown to be effective in reducing IBS symptoms in some patients, these drugs come with troublesome side effects that can end up causing more harm than good. Because stress reduction plays such a critical role in IBS treatment, it is proposed that exercise programs may be effective in reducing the gastrointestinal symptoms in patients with IBS. This paper evaluates three randomized controlled trials, comparing the efficacy of physical activity for improving the gastrointestinal symptoms in adult patients with irritable bowel syndrome.

## **OBJECTIVE**

The objective of this selective EBM review is to determine whether or not physical activity is effective in reducing the gastrointestinal symptoms associated with irritable bowel syndrome.

## **METHODS**

Three open-label, randomized controlled trials that included adults 18 years of age and older with a diagnosis of IBS using the Rome criteria were selected for analysis. All three trials compared the experimental group undergoing a 12-week physical activity intervention to a control group that was asked to maintain current care and lifestyle. The outcomes measured in all three studies were irritable bowel symptom severity. These symptoms include pain severity, frequency, abdominal distention/bloating, bowel habit satisfaction, and interference with life.

All three articles included in this analysis are randomized controlled trials that were published in peer-reviewed journals, in English, between 2008-2015. To find these articles, the key words “irritable bowel syndrome and physical activity” were entered into searches on PubMed and Cochrane. Articles were selected based on their application to the clinical research question and if the outcomes were ones that mattered to patients. The inclusion criteria used for this review was randomized controlled trials published between 2006 and the present. This review excluded trials that included patients that were younger than 18 years old. Several different statistics were used in each article to determine significance. In all three of the articles, p values were calculated. Additionally, one article calculated pooled means, one used numbers needed to treat (NNT), and one performed an analysis of covariance to compare mean symptom scores between groups.

Table 1: Demographics and Characteristics of Included Studies

<b>Study</b>	<b>Type</b>	<b># patients</b>	<b>Age (yrs.)</b>	<b>Inclusion Criteria</b>	<b>Exclusion Criteria</b>	<b>W/D</b>	<b>Intervention</b>
Kavuri, 2015 <sup>6</sup>	RCT open label	97	>18 years old	- > 18 y.o. - A diagnosis of IBS using the Rome III criteria - Have not practiced Yoga in the last 6 months	- Being pregnant - Physical/mental disability inhibiting ability to perform Yoga -History of drug/alcohol abuse within 6 months prior to screening -Having an organic bowel disease -Inability to comply with study and follow-up procedures	19	Remedial yoga module for 1 hour 3x/week for 12 weeks
Johannesson, 2011 <sup>7</sup>	RCT open label	102	18-65 y.o.	->18 y.o. -A diagnosis of IBS using the Rome II criteria -Able to increase current physical activity	-Being pregnant -Having a respiratory or cardiac disease -Having an organic GI disorder	27	20-60 minutes of physical activity 3-5x/week for 12 weeks
Daley, 2008 <sup>8</sup>	RCT open label	56	18-65 y.o.	-18-65 y.o. - A diagnosis of IBS using the Rome II criteria	-Being pregnant -Unable to understand English or provide written, informed consent -Having another major illness -Being already regularly active	13	30 minutes of moderate exercise 5x/week for 12 weeks

## **OUTCOMES MEASURED**

Irritable bowel syndrome symptom severity was the patient oriented outcome measured in all three of the studies. To measure this outcome, patients were given self-reported questionnaires to fill out. The Kavuri et al. study utilized the Irritable Bowel Syndrome Symptom Severity Scoring System (IBS-SSS) which contained questions about abdominal pain, severity, and frequency, abdominal distention and bloating, bowel habit satisfaction, and interference of these symptoms with daily living.<sup>6</sup> This questionnaire was given to the participants pre-intervention, mid-intervention (at 6 weeks), and post-intervention (at 12 weeks).<sup>6</sup> The score for each question ranged from 0-100 with a visual analog scale, with the total possible score being 500.<sup>6</sup> The researchers considered a drop of 50 points to be significant for irritable bowel symptom improvement.<sup>6</sup> From these questionnaire scores, the researchers were able to determine the treatment effect by calculating differences in mean symptom scores at the different time points in both of the yoga groups and the control group.<sup>6</sup> The Johannesson et al. study also employed the IBS-SSS.<sup>7</sup> The only difference is that participants only filled out the questionnaires twice, once pre-intervention and once post-intervention.<sup>7</sup>

Unlike the two aforementioned studies, Daley et al. measured IBS symptom severity using the Birmingham IBS Syndrome Questionnaire.<sup>8</sup> This 11-item questionnaire specifically looked at total IBS symptoms, constipation, diarrhea, and pain.<sup>8</sup> Participants completed these questionnaires at baseline and again post-intervention at 12 weeks.<sup>8</sup> From this, analyses of covariance were able to be performed to calculate the differences in mean IBS symptom scores.<sup>8</sup>

## **RESULTS**



This review investigated three open-label randomized controlled trials, comparing the efficacy of physical activity for improving the gastrointestinal symptoms in patients diagnosed with IBS, compared to waitlist control groups. All three studies included adults >18 years old with a diagnosis of IBS using the Rome criteria.

The Kavuri et al. study included 97 patients randomized to either the yoga intervention group, combination of yoga and current-care group, or the wait-list control group.<sup>6</sup> Patients in the yoga only group were asked to cut back on any IBS related medications during the trial, while patients in the combination group were allowed to continue taking any medications or supplements.<sup>6</sup> Patients with a disability preventing them from performing yoga were excluded from the study.<sup>6</sup> Additionally, pregnant patients, patients with a history of drug or alcohol abuse within six months prior to screening, patients with an organic bowel disease, and those unable to comply with the study and follow-up procedures were excluded from the study.<sup>6</sup> In the end, 78 patients, referred to the study from physicians' offices in Los Angeles, California were able to complete the study.<sup>6</sup> In total, 28 of the participants had constipation-predominant IBS (median age 43), 23 participants had diarrhea-predominant IBS (median age 45), and 27 participants had mixed symptom IBS (median age 45).<sup>6</sup>

In the end of the Kavuri et al. trial, there were 25 patients in the yoga group, 26 patients in the combination group, and 27 patients in the wait-list control group.<sup>6</sup> The yoga and combination groups participated in a remedial yoga module for one hour, three days a week for 12 weeks.<sup>6</sup> As mentioned above, the combination group could continue any IBS medications while the yoga only group could not.<sup>6</sup> The waitlist control group also could continue any IBS medication, as they were told to maintain their current care and lifestyle.<sup>6</sup> Because it was required that participants in the yoga groups attend at least 75% of the sessions, compliance was good.<sup>6</sup>

Attendance was taken at each yoga session, and on average, participants attended 33/36 total classes (90% attendance).<sup>6</sup>

Kavuri et al. compared the differences in mean IBS symptom scores at each of the three time points in each of the three groups, in order to determine the efficacy of the yoga exercise intervention.<sup>6</sup> The researchers found no significant differences in IBS symptoms between the yoga only group and the combination group at either 6 weeks or 12 weeks ( $p$ =not significant).<sup>6</sup> They did, however, find significant differences in IBS-SS scores between the yoga and waitlist control groups at both 6 weeks and 12 weeks ( $p$ <0.001); and the combination group and waitlist control groups at the same time points ( $p$ <0.001).<sup>6</sup> Additionally, as can be seen in Table 2, the mean IBS-SS scores in the yoga only group significantly decreased between weeks 0 and 12 ( $p$ <0.001); and in the combination group between weeks 0 and 12 ( $p$ <0.001).<sup>6</sup> The mean IBS-SS scores did not significantly change between weeks 0 and 12 in the waitlist control group ( $p$ =not significant).<sup>6</sup> In terms of adverse events, three patients taking part in the remedial yoga module initially reported an increase lower back pain, but after their yoga modules were modified, the back pain went away, so these occurrences were not officially recorded as adverse events.<sup>6</sup>

**Table 2: Changes in mean IBS-SS scores at Week 0 (pre-intervention) and Week 12 (post-intervention) for Kavuri study<sup>6</sup>**

Study group	IBS-SSS week 0±SD	IBS-SSS week 12±SD	p-value
Yoga-only group	321.73±62.71	81.23±51.89	<0.001
Combination group	334.27±72.63	111.78±65.15	<0.001
Waitlist control	303.81±70.87	305.64±58.91	Not significant

The Johannesson et al. study included 102 patients randomized to either a physical activity group or a wait-list control group.<sup>7</sup> Patients were excluded from the study if they were pregnant, had a respiratory or cardiac disease or had an organic gastrointestinal disorder.<sup>7</sup> In the end, 75 patients, referred from a hospital in Sweden were able to complete the study.<sup>7</sup>

At the end of the Johannesson et al. trial, there were 37 patients in the physical activity group (median age 36) and 38 patients in the wait-list control group (median age 38.5).<sup>7</sup> The physical activity intervention group participants were asked to exercise for 20-60 minutes, three to five days per week for 12 weeks.<sup>7</sup> They had access to a physiotherapist who was able to give them advice about physical activity as well as motivate them to stay active.<sup>7</sup> The waitlist control group participants were told to maintain their current care and lifestyle.<sup>7</sup> Like the intervention group, they were also able to contact the physiotherapists for support during the 12 weeks.<sup>7</sup> Because the physical activity intervention was a home-based intervention that was not monitored, the researchers were unable to fully comment on the compliance of the study.<sup>7</sup>

The researchers in Johannesson et al. classified a clinically significant decrease in the IBS-SS score as a >50 point decline from the baseline score to the 12-week follow up score.<sup>7</sup> Only 16 participants, comprising 43% of the patients in the physical activity group had a clinically significant decrease in IBS-SS score.<sup>7</sup> In the waitlist control group, only 10 participants, comprising 26% of the patients in that group had a clinically significant decrease in IBS-SSS score.<sup>7</sup> As it can be seen in Table 3, the p value was 0.07, so the decreases in IBS-SS scores between the intervention and control groups were not considered to be significant.<sup>7</sup> The researchers included a full per-protocol analysis in their results.<sup>7</sup> The per-protocol analysis here means that only the data of the patients who completed the treatment originally allocated were analyzed.<sup>7</sup> Because the outcomes were reported as dichotomous data, the relative benefit increase, absolute benefit increase, and number needed to treat were able to be calculated. As can be seen in Table 4, the RBI was calculated to be 0.65, the ABI was calculated to be 0.17, and the NNT was calculated to be 6. This means that for every six patients getting the experimental exercise intervention, one more will have a clinically significant decrease in >50 points in their

IBS symptom score compared to the control. Although the NNT is fairly low at 6, because the p value is  $>0.05$ , the results cannot be considered to be statistically significant.<sup>7</sup> In terms of safety, no adverse events were recorded in this trial.<sup>7</sup>

**Table 3: Proportion of participants with clinically significant decreases in IBS-SS scores from Week 0 (pre-intervention) to Week 12 (post-intervention) for Johannesson study<sup>7</sup>**

IBS-SS score	Physical Activity Group, N (%)	Control group, N (%)	p-value
Decrease of $>50$ points	16, (43%)	10, (26%)	0.07

**Table 4: Calculations for treatment for Johannesson study<sup>7</sup>**

Relative benefit increase (RBI)	Absolute benefit increase (ABI)	Number needed to treat (NNT)
0.65	0.17	6

The Daley et al. study included 56 patients randomized to a physical activity intervention group or a wait-list control group.<sup>8</sup> Patients who were pregnant or unable to understand English were excluded from the study.<sup>8</sup> Additionally, patients who had another major illness or who were already regularly physically active were excluded.<sup>8</sup> In the end, 43 patients diagnosed with IBS recruited from gastroenterologists at the Good Hope Hospital in England completed the study.<sup>8</sup>

At the end of the Daley et al. trial, there were 21 patients in the physical activity intervention group and 22 patients in the wait-list control group.<sup>8</sup> The participants in the exercise intervention group were asked to get 30 minutes of physical activity, five days per week for 12 weeks.<sup>8</sup> They also received two, 40-minute individualized exercise consultations over the 12 weeks.<sup>8</sup> The waitlist control group participants were told to maintain their current care and lifestyle during the 12 weeks.<sup>8</sup> Because the exercise was self-reported and not monitored, the researchers were unable to fully comment on the compliance of the study.<sup>8</sup>

Daley et al. used analyses of covariance to compare the differences in mean IBS symptom scores at the 12-week follow up, to determine the efficacy of the physical activity intervention.<sup>8</sup> The researchers found that participants in the exercise intervention group reported

significantly decreased constipation symptoms at the end of the intervention when compared the control group ( $p < 0.05$ ).<sup>8</sup> As can be seen in Table 5, the mean difference in constipation symptoms between the groups was 10.9, 95% CI= -20.1, -1.6.<sup>8</sup> There was no significant decrease in pain, diarrhea, or the total symptoms score between the two groups.<sup>8</sup> In terms of safety, no adverse events were recorded in this trial.<sup>8</sup>

**Table 5: Changes in IBS symptom scores at Week 12 (post-intervention) for Daley study<sup>8</sup>**

Symptom	Control group score, (SE)	Exercise group score, (SE)	Mean difference	95% CI	p-value
Pain	46.4 (3.4)	49.3 (3.2)	3.8	-5.8, 13.4	Not significant
Diarrhea	30.6 (2.8)	31.1 (2.7)	0.5	-7.3, 8.4	Not significant
Constipation	32.8 (3.2)	21.9 (3.3)	-10.9	-20.1, -1.6	<0.05
Total symptom score	28.3 (2.3)	25.4 (2.3)	-2.9	-9.5, 3.7	Not significant

## DISCUSSION

As the results above indicate, two of the three studies concluded that physical activity can sufficiently improve IBS symptoms, at least short-term. Both studies only lasted 12 weeks which is not extensive amount of time, so these results may not be fully applicable for long-term control of IBS symptoms. While the Kavuri et. al study found that yoga significantly decreased the total IBS symptom severity scores, the Daley et al. study found that exercise only significantly improved constipation scores.<sup>6,8</sup> Although Johannesson et al. found a greater decrease in IBS-SS scores in the exercise intervention group compared to the waitlist control group, the difference was not significant.<sup>7</sup> Because physical activity is a relatively inexpensive intervention, and it can be done at home for free, it is a very cost-effective and readily available treatment option for patients with IBS. Exercise therapy also plays a role in the treatment of a variety of other conditions such as arthritis, neurologic disorders, and cardiovascular conditions.

There are several limitations noted in each of the three selected studies. A common limitation for all the studies was the inability to keep the patients and study workers blind to the treatment. Due to this, the placebo effect could certainly have affected the results of all three studies. Additionally, the Kavuri et al. study employed yoga as its form of physical activity.<sup>6</sup> Because the practice of yoga combines physical activity with breathing control and meditation, it is possible that these parts of the intervention were responsible for the decrease in IBS symptom severity.<sup>6</sup> A limitation unique to the Johannesson and Daley studies is that a significant number of participants were lost to follow-up.<sup>7,8</sup> There were 26% lost in the Johannesson study and 23% lost in the Daley study, thus the outcomes from these people that were not included in the analysis might have affected the significance of the results.<sup>7,8</sup> A final limitation is the small sample sizes in all three studies, which can affect the generalizability of the results presented.

## **CONCLUSION**

In conclusion, it seems that physical activity is an effective form of treatment in adults with irritable bowel syndrome. The majority of the randomized controlled trials presented in this review showed improvement in total or aspects of IBS symptom scores after physical activity interventions. Although Daley et al. showed improvement in IBS symptoms in the exercise group compared to control, these improvements were not significant. Due to the wide availability and low cost of exercise programs with few adverse effects, exercise programs should be considered as monotherapy or supplement to other treatment modalities in adults with IBS.

Besides having a greater sample size and a longer follow-up time, future studies would benefit from having more supervision of the physical activity intervention which would ensure patient compliance. Additionally, future study is warranted to determine frequency, duration, intensity, and kind of physical activity that produces the most improvement in IBS symptoms.

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